ABSTRACTS.

AUTHOR INDEX.

The numbers refer to the Abstract Number.

Oilfield Exploration and Exploitation.

Geology.

1. Formation of Hydrocarbons from Fatty Acids by Alpha-Particle Bombardment. C. W. Sheppard and W. L. Whitehead. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 32.—This paper describes some of the results obtained to date in the American Petroleum Institute research project 43c, dealing with the possibility of a radioactive origin of petroleum.

Four members of the saturated fatty acid series were subjected to bombardment in turn from alpha-particles. The latter were obtained from capsules of radon gas, arranged in a suitable apparatus.

The experiments are described, and the products identified are listed, as far as they could be determined. E. N. T.

2. Submarine Slumping and Location of Oil Bodies. R. W. Fairbridge. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 84.—The author suggests that a study of submarine slumping effects may assist in the discovery and appraisal of oil prospects, The paleogeographical occurrences of slumping seem to have been an associated factor in oil formation. The Carpathian and Caucasus areas are cited as excellent examples of this phenomenon. E. N. T.

3. Conodonts as Palæozoic Guide Fossils. S. P. Ellison, Jnr. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 93.—80 Conodont genera are listed, with sketches and notes of their geologic time ranges. The use of conodonts as methods of stratigraphic identification are discussed, with particular reference to the Devonian. E. N. T.

4. Origin of Continental Shelves. J. H. F. Umbgrove. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 249.—Almost everywhere the real edge of a continent lies about 200 metres below sea-level. That is to say that the continents are bordered by shallow platforms, whose total area is about 10,000,000 square kilometres.

These continental shelves can be accounted for by spasmodic warpings having taken place along the continental border, causing submergence of the edges of the continents. It is suggested that the periodic action of sub-crustal convection currents may account for this phenomenon. E. N. T.

5. Porosity through Dolomitization. K. K. Landes. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 305.—A number of oilfields in the United States produce from locally dolomitized limestones. Notable examples are the Trenton field of Ohio and Indiana and the Adams and Deep River fields in Michigan. Previous theories advanced to explain the porosity due to locally dolomitized zones in limestones are inadequate. It is suggested that local diastrophism may have produced master fissures in the limestones, and artesian currents circulated upwards from deeper dolomites into the limestones. These waters may have replaced some of the limestone by dolomite that is locally porous where there has been an excess of solution over precipitation. From the point of view of exploration, it is suggested that a dry hole in which the limestone samples contain more than average magnesium carbonate should encourage exploration laterally in the hope of finding true dolomites. E. N. T.

6. Studies on Redox Potential of Marine Sediments. C. E. Zobell. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 477.—The redox potential is a quantitative measure of the state of a reversible oxidation-reduction system. It is measured in volts and termed E_h, where

$$E_h = E_0 + 0{\cdot}03 \log \frac{(\text{Ox.})}{(\text{Red.})}.$$

In this equation E_0 and 0·03 are constants and (Ox.) and (Red.) are concentrations of the oxidized and reduced forms of the systems. When (Ox.) = (Red.), or when the system is 50% in the oxidized and 50% in the reduced states, $E_h = E_0$. Thus, E can be defined as the E_h of a reversible O/R system which is half reduced.

The redox potential is an expression of the reducing intensity or electron-escaping tendency of a system, which are distinct from the reducing capacity or poise of a system.

Techniques for estimating the redox potential and reducing capacity with indicator dyes are outlined, as well as electrometric methods. Accuracy of determination with marine mud samples is no greater than $\pm 0{\cdot}01$–$0{\cdot}05$ volts. The E_h of recent marine sediments varies between $+0{\cdot}350$ and $-0{\cdot}500$ volts, and the pH ranges from 6·4 to 9·5. Negative E_h values are characteristic of fine sediments, rich in organic matter and bacteria. Positive E_h values tend to occur in coarse, well-oxygenated material.

The study of the redox potentials of sediments may be of great significance in the problem of petroleum origin. E. N. T.

7. Transformation of Organic Material into Petroleum under Geological Conditions (The Geological Fence). B. B. Cox. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 645.—This outline summarizes the present position of the problem of petroleum genesis, which is being investigated under the American Petroleum Institute Fundamental Research Project No. 43.

The limiting conditions considered are those of marine environment, relatively low pressures and temperatures of formation, and the time factor. Knowledge of these matters is fairly definite, but details of the processes and actual reactions leading to the formation of petroleum from organic matter are still unknown.

The possible processes of conversion are those of radioactivity, bacterial action and catalysis. The evidence regarding each of these processes is summarized, and suggestions for future study in chemistry, physics, and biology are made.

E. N. T.

8. Grain Roundness—A Valuable Geologic Tool. G. Rittenhouse. *Bull. Amer. Ass. Petrol. Geol.* 1946, **30**, 1192.—The roundness of heavy minerals can be used as a valuable tool in geologic work, particularly in exploration for gas and oil.

Examples are given to illustrate how in the Appalachian Basin roundness has been used to differentiate producing zones and help interpret the geologic history of the area. E. N. T.

9. Geologists' Place in Service. P. H. Price. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1115.—Geologists were used in the late war, both in uniform and as civilians, to a far greater extent than in the 1914–18 war.

However, the potential value of the geologist in time of war as well as in peacetime has not yet been fully realized in official circles. E. N. T.

10. Expanding Activities of Paleontologists. J. R. Sandidge. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1088.—Economic paleontologists were originally employed as microscopists for the routine examination of well samples. Today they are being given considerably wider scope and responsibilities.

Paleontologists are providing useful appraisals of stratigraphic history for exploration and exploitation work, and their work in these fields is likely to expand.
E. N. T.

11. Publication of Geophysical Case Histories. H. C. Cortes. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1095.—The need exists for publishing more geophysical case histories. It is suggested that a plan can be followed for this publication which will ensure that no information that a company wishes to withhold will be published, while at the same time providing useful data for workers and students in this field.
E. N. T.

12. The Geological Attack. M. G. Cheney. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1077.—This is the presidential address of the thirty-first annual meeting of the American Association of Petroleum Geologists, which was held in Chicago on April 2, 1946.

The author outlines the applications of geologic science, particularly with relation to the oil industry. E. N. T.

13. Pre-Selma Upper Cretaceous Stratigraphy of W. Alabama. W. H. Monroe, L. C. Conant, and D. H. Eargle. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 187.—The pre-Selma Upper Cretaceous beds of western Alabama have long been divided into the Tuscaloosa and Eutaw formations, but recent field work shows that six unconformable stratigraphic units can be mapped. These are, going down, the Eutaw, McShan, Gordo, Coker, Eoline, and Cottondale formations. Details of lithology are given.
E. N. T.

14. Mineralogy of Late Upper Cretaceous, Paleocene, and Eocene Sandstones of Los Banos District, West Border of San Joaquin Valley, California. S. N. Daviess. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 63.—The heavy mineral composition of 192 outcrop and core samples from Los Banos sandstones of late Upper Cretaceous, Paleocene, and Eocene age is tabulated. The conclusion is made that a study of the mineralogy of these sediments does not permit stratigraphic differentiation.

It is interesting to note that the minerals present seem to have been derived from both eastern and western sources. E. N. T.

15. Miocene Conglomerates of Puente and San Jose Hills, California. A. O. Woodford, T. G. Moran, J. S. Shelton. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 514.—The Puente and San Jose Hills form a triangular upland that rises above the Los Angeles, San Gabriel, and other physiographic basins east and southeast of the city of Los Angeles. Most of the conglomerates of the middle Miocene Topanga formation and the Upper Miocene Puente formation are in the form of thick lenses, with pebbles and boulders of plutonic, and metamorphic rocks.

It is probable that the basin which included the present area of these hills received debris from the north and east during Miocene times, and the transgressing shore line moved slowly inland, crossing the present northeast margin of the hills in early and middle Puente time. E. N. T.

16. Gramp's Field, Archuleta County, Colorado. W. A. Waldschmidt. *Bull. Amer. Petrol. Geol.*, 1946, **30**, 561.—The oilfield of this name was discovered in Colorado in 1935. Oil comes from the Upper Cretaceous Dakota sandstone, of which the producing thickness is 152 ft. The producing area is 127 acres, all privately owned. All wells are at an average height of more than 8000 ft. above sea level, and the average hole depth is 1250 ft.

Total production from Gramp's field up to January 1945 has been 2,124,202 brl. The structure is an east–west fault crossing a north–south anticlinal axis. E. N. T.

17. Correlation of Paleozoic Rocks Across Las Animas Arch in Baca, Las Animas, and Otrero Counties, Colorado. J. C. Maher. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1756.—The Hankins No. 1 well in S.E. Baca county, Colorado, penetrated Permian, Pennsylvanian, Mississipian, and Ordovician rocks and was abandoned at 6171 ft in the Arbuckle limestone. This well was low on the southeast flank of the Las Animas arch, and wells drilled near the crest of the arch showed that more than three-quarters of this sequence is absent there, where Permian overlies thin Arbuckle strata, underlain by the pre-Cambrian.

On the west of the arch Mississipian formations overly the Ordovician. E. N. T.

18. Kinderhook Dolomite of Sedgwick County, Kansas. W. A. Ver Wiebe. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1747.—The Kinderhook dolomite of Sedgwick county, Texas, has given oil from several wells. It has been variously called Westerfield, Misener, Viola, and Hunton in the past, but the writer suggests that it is definitely Kinderhook in age. E. N. T.

19. Siluro-Devonian Strata in Central Kansas. Hall Taylor. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1221.—The Siluro-Devonian Hunton Limestone and overlying Misener sandstone occur in the subsurface over much of Central Kansas. They are only approximately equivalent to Oklahoma formations of the same name.

In some areas these beds are oil reservoir rocks. The lithology, correlations, and areal extent of the formations are described.

In north-central Kansas the Hunton is dolomitic. It thins southwestwards from several hundred feet to nothing. The Hunton of south-central Kansas is normally less than 60 ft thick, and is not directly connected with the northern beds. It is here probably Silurian in age. E. N. T.

20. Buried Pre-Cambrian Hills in N.E. Barton County, Central Kansas. R. F. Walters. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 660.—Six buried pre-Cambrian hills have been defined by drilling in the Kraft-Prusa, Beaver, and Bloomer oilfields. These are flat-topped quartzite modanocks on a Cambrian peneplain eroded across pre-Cambrian quartzite, schist, granite, syenite, granite-gneiss, and pegmatite. The hills are now buried under 3300 ft of Pensylvanian, Permian and Cretaceous rocks. Oil comes from Pennsylvanian limestones, shore-line sands of the Pennsylvanian, marine conglomerate, Cambro-Ordovician dolomite and residual sand, and pre-Cambrian quartzite.

The structural relationship of the buried hills to the overlying sediments is exhaustively analyzed. E. N. T.

21. Fossil Plants and Jurassic–Cretaceous Boundary in Montana and Alberta. R. W. Brown. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 238.—Fossil plants seem to indicate that there is an unconformity in the basal part of the Kootenai formation in Montana, and at the base of the Blairmore formation in Canada.

This unconformity probably marks the Jurassic–Cretaceous boundary. E. N. T.

22. Ellis, Amsden, and Big Snowy Group, Judith Basin, Montana. P. T. Walton. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1294.—The Judith Basin area of Central Montana is a topographic and structural low. Gently northeast dipping Upper Cretaceous Colorado shale beds occupy most of the Judith Basin, but outcrops of steeper, older formations are found in the surrounding mountains.

The Big Snowy group is divided into the Heath, Otter, Kibbey, and Charles formations, in descending order. It lies disconformably on the Madison in the southern part of the area.

The upper marine Amsden limestone overlaps successively the lower Amsden red-beds and the upper Big Snowy beds.

The Ellis is a transgressive marine deposit resting on a Jurassic marine evaporite series in the eastern part of the area, and overlapping the Amsden, the Big Snowy members, and the Madison at other localities. E. N. T.

23. Algæ Reefs in Cape Rock of Ogallala Formation on Llano Estacado Plateau, New Mexico, and Texas. W. A. Price, M. K. Elias, and J. C. Frye. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1742.—Reef bodies have been found in the Ogallala cap rock on the Llano Estacado plateau of New Mexico and Texas similar to those previously described from a limestone in the same position in Kansas and elsewhere on the Northern High Plains.

The characteristic concretionary structures of the reefs is described, and a syngenetic origin upheld for the banded concretionary bodies. E. N. T.

24. Stratigraphy of Upper Nehalem River Basin, N.W. Oregon. W. C. Warren and H. Norbisrath. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 213.—The rock sequence of the Upper Nehalem river basin is here divided into three distinct groups, separated by unconformities. The oldest group is the Tillamook Eocene volcanic series, which is followed by a belt of sediments ranging in age from Upper Eocene to Middle Miocene. The youngest group is that of the Columbia River basalts, which are of Middle Miocene age. E. N. T.

25. Lower Pennsylvanian Terminology in Central Texas. R. C. Spivey and T. G. Roberts. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 181.—The presence of fusiform fusulinids in Marble Falls limestone shows that this formation is post-Morrow in age. Lampasas is not appropriate as a series name, so elevation of the Atoka formation of Oklahoma to Atoka series, and use of this term in Central Texas is proposed. E. N. T.

26. Geology of Katy Field, Waller, Harris, and Fort Bend Counties, Texas. A. P. Allison and others. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 157.—The Katy field, 35 miles north of Houston, was discovered in 1935. The productive area is about 30,000 acres in extent, and contains the most important gas-condensate reserve in the United States.

The structure is a broad, unfaulted anticline. Gas-condensate and oil are produced between depths of 6250 and 7450 ft from Yegua sands.

On July 1, 1945, 85 wells had been completed in this field, of which 44 gave gas, 29 gave oil, and 12 were dry. At this date the average daily allowable production from this field was 1000 brl of oil, 14,000 brl of condensate, and 450 million cu. ft of gas, of which 85% is being returned to the reservoir. E. N. T.

27. Stratigraphy of Waller and Harris Counties, Texas. R. L. Beckelhymer. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 52.—In the Waller and Harris counties, Texas, a thickness of 11,004 ft of Gulf Coast Plain formations are known, ranging from the Lissie formation (Pleistocene) to the Wilcox (Eocene). The writer describes all possible methods of classifying and subdividing these sediments. E. N. T.

28. Lower Middle Ordovician of S.W. Virginia and N.E. Tennessee. C. E. Prouty. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1140.—The lower middle Ordovician of S.W. Virginia and N.E. Tennessee can be divided up into 29 lithologic and faunal units.

The two median belts directly autochthonous to the Saltville thrust show the most complete sections.

Detailed sections measured along seven belts are compared with the revised standard section of Tazewell County, Virginia, and the stratigraphy is examined in detail.

It is concluded that the current classification of major boundaries in Virginia and Tennessee should await further comparisons with the standard sections. E. N. T.

29. Late Paleozoic and Early Mesozoic Stratigraphy of Uinta Mountains, Utah. H. D. Thomas and M. L. Krueger. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1254.—At the western end of the Uinta Mountains the Jurassic formations are, going upwards: Nugget sandstone, Twin Creek limestone, Preuss redbeds, Stump sandstone, and Morrison formation.

Going eastward along the mountains, it is found that the Nugget sandstone persists, but is called the Navajo; the Twin Creek limestone intertongues with the Carmel redbeds; the Preuss redbeds grade into the cross-bedded Entrada sandstone; the Stump sandstone grades into Curtiss shales and limestones; the Morrison thins and becomes less conglomeratic. E. N. T.

30. Recent Investigations by United States Geological Survey of Petroleum Possibilities in Alaska. J. C. Reed. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1433.—As a war emergency measure the United States Geological Survey in 1944 and 1945 examined the oil possibilities of several areas in Alaska. These were the Gulf of Alaska area, the Alaska Peninsula–Cook Inlet area, and northern Alaska.

In the Gulf of Alaska area the oil accumulations will be confined to Tertiary strata. In the Alaska Peninsula–Cook Inlet region Jurassic rocks overly a possible source in the Triassic limestone. In Northern Alaska exploration work is being carried on by the Navy Department in Naval Petroleum Reserve No. 4. Here there is a great area of gently folded Cretaceous rocks.

It is concluded that much additional information must be gathered before it is possible for geologists to estimate the potential oil reserves of Alaska. E. N. T.

31. Tectonic Framework of Northwest South America. F. E. Von Estorff. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 581.—This paper is a discussion of the tectonics which have influenced the area between Latitude 12° North and 6° South, and Longitudes 66° and 82° West. It covers all of Colombia and Ecuador, and parts of Panama, Venezuela, Brazil, and Peru.

It is concluded that there are two major trends, orientated at approximately N. 40° E. and N. 30° W. These trends are continuous over large areas and intersect at about 70°. These trends probably reflect the orientation of large crustal blocks, and have a profound influence on the sediments and consequently the accumulation of oil. E. N. T.

32. San Pedro Oil Field, Province of Salta, N. Argentina. L. C. Reed. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 591.—The San Pedro oilfield is the most important of the northern Argentina fields. There are seven fields in this area which have between them accounted for some 10% of the total oil production of Argentina. San Pedro had produced 12,941,259 brl of oil up to the end of 1944.

Geologically, it is situated in the Permo-Carboniferous Tarija basin, in which there is probably as much as 30,000 ft of sediments. The oil reservoirs are in the glacial sediments of the Permo-Carboniferous, the oil source rocks being probably Devonian. The structures are typically thrust-faulted anticlines.

The Tarija Basin fields are remarkable for the great age disparity between the formation of the source beds, in the Devonian, and the first folding, in the late Tertiary, which could have caused accumulation. E. N. T.

33. Micropalæontology of Upper Cretaceous and Paleocene in W. Ecuador. H. E. Thalmann. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 337.—In the western, coastal area of Ecuador, the Upper Cretaceous is present as the Callo and Guayaquil formations, and the Paleocene is represented by the Estancia formation. This paper gives notes on the lithology and microfossil content of each of these formations, which are very poor in microfauna when compared with the equivalent strata in northern Peru and Colombia. E. N. T.

34. Geological Reconnaissance of S.E. Peru. V. Oppenheimer. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 254.—This paper gives the results of a geological reconnaissance made across the Cordillera de Vilcanota and the Cordillera de Carabaya of southeastern Peru.

The regional geology is largely represented by pre-Cambrian schists and quartzites, overlain by Ordovician slates. Upper Paleozoic shales and sandstones occur to the west of the section, and to the east there are vast Tertiary plains.

Structurally, this part of the Cordillera Oriental is normally block-faulted.
E. N. T.

35. Geology of Maracaibo Basin, Venezuela. F. A. Sutton. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1621.—The Maracaibo Basin in northwest Venezuela occupies a structural and topographic depression between the Andes de Merida and the Sierra de Perija. The basin extends into eastern Colombia.

The area of the basin is 23,572 square miles, of which about 5000 square miles are covered by the brackish Lake Maracaibo. The maximum elevation in the basin is 328 ft, and large tracts are therefore swampy.

Oil was first discovered in 1914 in the Mene Grande field, and at present there are thirteen active fields within the basin—eight in Venezuela and five in Colombia. In 1945 the production was 9% of the world total, *i.e.*, 221,730,000 brl. On December 31, 1945, the cumulative production was 2,634,430,000 brl. Present reserves are estimated as 5,500,000,000 brl.

The highlands bordering the lake show a geologic section extending from the pre-Cambrian to the Recent. Oil is found in all but two of the seventeen formations between the top of the Middle Cretaceous and the Middle Miocene. This sequence has an overall thickness of 23,000 ft.

Accumulations are both stratigraphic and structural.

The Bolivar Coastal field, one of the largest fields in the world, is on the lakeward-dipping northeastern limb of the basin, on a monoclinal structure. This field produced 186,861,000 brl during 1945. E. N. T.

36. Geological Occurrence of Oil in United Kingdom, with Reference to Present Exploratory Operations. H. R. Lovely. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1444.—The search for oil has been carried on in the United Kingdom since 1936 by several major companies. " Wild-catting " by independent operators has not been encouraged, and geological information of the subsurface is therefore still relatively limited.

This paper discusses in detail the geological history of the country from the petroleum geologist's point of view. Great Britain has lain for the most part outside the major geosynclines of sedimentation, and has been subjected to three violent orogenies.

These factors have limited the possible oil accumulations to local pools in the Carboniferous and Jurassic rocks.

There are widespread minor oil shows, but to date the only commercial accumulations have been found in the English equivalent of the Pottsville, Pennsylvanian system.

It is concluded that while future oilfields are likely to be found, these will be of a restricted nature. E. N. T.

37. Petroleum Geology of Aquitaine Basin, France. A. J. Eardly. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1517.—The French Government and some private interests are at present exploring the oil possibilities of the Aquitaine Basin in S.W. France. This is a large Mesozoic and Tertiary basin, about 200 miles across. Gas has been found in one district near the Pyrenees.

The possible oil beds are the Jurassic and Upper Cretaceous, which should be found not deeper than 3000 ft in the central part of the basin.

There is an interesting zone of gypsiferous shale plugs or domes in a foothill belt of the Pyrenees. E. N. T.

38. Oil Fields of Carpathian Region. R. P. Walters. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 319.—This paper reviews the known oilfields of Europe west of Russia. All these fields lie in the region of the Carpathian Mountains, which are a northern off-shoot of the Alps, extending from the Little Carpathians east of Vienna, through Poland and Roumania, and bending eastwards into the Balkan Mountains.

The major oilfields of Poland, the eastern Roumanian fields and the rich southern fields of Roumania lie on the outer edge of this mountain arc. The Transylvanian gas fields and the small oilfields of S.W. Hungary lie inside the arc, and the Austrian fields are associated with the outside.

In the Vienna Basin oil comes from the Sarmatian (Upper Miocene), the Schlier (Mid-Lower Miocene), and from the Flysch. Structures are related to faulting along a buried Flysch ridge.

In Poland production comes from complex overthrust structures, from Oligocene reservoir horizons. In eastern Roumania there are mainly overthrust structures with Oligocene, Eocene and Lower Miocene reservoirs. The southern Roumanian fields, centred round Ploesti, produce 98% of that country's oil, mainly from Pliocene sands (Dacian and Meotian), with some Miocene and Oligocene production. Salt has played an important structural part in the Roumanian oilfields.

In Transylvania, much gas is obtained from Sarmatian beds in anticlinal folds. The southwest Hungarian fields give oil from normal anticlines from lower Pliocene strata. E. N. T.

39. Evolution of Reef Corals in East Indies since Miocene Time. J. H. E. Umbgrove. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 23.—It has been found that the percentage analysis of Upper Tertiary corals in the East Indies can be used as a method of stratigraphic correlation. The percentage of present living species increases from 0–50 in the Miocene to 50–70 in the Pliocene and 70–100 in the Pleistocene and Recent. It seems likely that the evolution of the reef corals evolved smoothly except for accelerations in the Upper Miocene and Pliocene, the reasons for which are discussed. A comparison is made between the evolution rates of reef corals and of molluscs.
E. N. T.

40. Oil Basins of East Indian Archipelago. H. M. Schuppli. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1.—This paper analyses the regional tectonics of the Tertiary oil basins of the East Indies. There is an accompanying geotectonic sketch map of the area.

The oilfields of Sumatra, Java, and Borneo had produced more than a billion barrels of oil up to the end of 1940. There are still very considerable proved reserves. Most of the oil was produced from Miocene and Pliocene sands, but shortly before the Japanese invasion commercial pools were discovered in the Eocene. Triassic oil is known in the Boela field of Ceram.

Structures are usually gentle to moderately steep anticlines, and stratigraphic traps which doubtless also occur have as yet not been exploited.

The geotectonics are complex, being the result of the folding of two major geosynclines into orogenes and their intersection. These are the circum-Asiatic and the Australo-Pacific geosynclines. The Tertiary basins of Borneo lie outside these two belts and are really intra-continental geosynclines. E. N. T.

Geophysics and Geochemical Prospecting.

41. Geophysical Patent. H. T. Kennedy, assr. to Gulf Research and Development Co., U.S.P. 2,406,611, 27.8.46. Geochemical Prospecting Method.—A method of prospecting for subterranean gas and oil deposits based on the quantitative determination of the ethane content of ground water samples taken from surveyed points in the region. R. B. S.

Drilling.

42. Developments in Oil Drilling Equipment. A. G. Arend. *Petroleum*, 1946, **9**, 240.—The search for reliability in drilling plant, especially necessary at great depths, has led to the development of improved rotary plant, and a general simplification in construction. Comparison is given with plant used in earlier practice.

Stepless regulation has now been replaced by 4, 6, or 8 rates of speed which has been found satisfactory even at extreme depths. Construction of modern motors is discussed and details of modern drilling technique given. K. C. G. K.

43. Development, Use, and Care of Drilling Equipment. F. F. Murray. *Oil Gas J.*, 5.10.46, **45** (22), 100.—A brief and general discussion of the need for co-operation between manufacturer and user of drilling equipment is presented. A. H. N.

44. Drilling Costs Up Sharply Above Prewar. D. I. Siskind. *Oil Wkly*, 7.10.46, **123** (6), 37.—The causes for higher drilling costs are analysed. These include higher wages and salaries, more expensive equipment, shortages, less efficiency among workers, greater drilling depths, more wildcatting, and relatively more dry holes drilled. A. H. N.

45. Hard-Rock Rotary Drilling. F. L. Scott. *Oil Gas J.*, 5.10.46, **45** (22), 74; *Oil Wkly*, 7.10.46, **123** (6), 17. (*Presented before San Antonio Meeting of American Association of Oil Well Drilling Contractors.*)—Comparative hardness of rocks is discussed and tabulated. Diagrams are presented from which the speed of drilling in different rocks may be estimated from the speed of rotation and weight on the bit. Increase in weight on hard rock may increase rate of penetration; in soft formation it may merely flounder the bit. Experience has to be gained before using general rules. A sharp bit, when run with initially heavy weight on dolomite (a hard rock having high strength), will suffer undue tooth breakage. A programme including a minimum starting weight, with a gradual increase as the bit dulls, would not only maintain an average desirable penetration rate throughout the run, but should secure more footage/round trip. The stresses in teeth of roller bits are briefly indicated, and the metallurgy and engineering problems of bit design are outlined. The influence of the circulating fluid and drill stem on drilling are discussed. A. H. N.

46. Bollard Method for Shallow Water Drilling. A. J. Tucker. *Oil Wkly*, 16.9.46, **123** (3), 98.—The method is developed for depths from 8 to 21 ft. A landing ship (tanks) is converted for drilling by installing a derrick and requisite machinery on the forecastle head. In the hull, where the bow ramp aperture was located, an alteration has been accomplished so that drilling can be conducted through the bottom of the ship. On deck and abaft the rig, pipe racks have been installed on either side of the centre line to hold drill stem, casing, and spare pipe. Between these racks, the "lawdown" device travels. Vessel is moored to four buoys on bow and quarter and is sunk onto the ocean floor. The Bollard is sunk in position in the drilling chamber and is enclosed within the three walls and the bow doors, thereby serving as pivot point for the ship. Through the Bollard, drilling operations are conducted. Safety and other considerations are briefly discussed. A. H. N.

47. Shell's Rig Makes Successful Attack on West Texas Chert. E. H. Short, Jr. *Oil Gas J.*, 12.10.46, **45** (23), 76.—The drilling in West Texas is very hard and a special rig was made which cost approximately 7% more than the standard rig, but which effected about 23% saving in well cost. The derrick was raised by 7 ft 8-in and the drum speed was increased with automatic brake controls being introduced. In order to reduce circulating pressures in deep drilling, a special string of 5–9/16-in drill pipe was used. This string was made up of standard A.P.I. Grade E Range 3 drill pipe with a special requirement of 42–44 ft range length, with 4½ to 5¾-in o.d. by 3–5/32-in i.d., extra-hole tool joints, flash-welded on to the pipe. A groove was cut at the thickest part of the pin end of the tool joint to enable the driller to see the break point clearly when coming out of the hole. In view of the requirement for deep drilling that either slush pump should be available for mixing mud or standby, and that the engine powering the rotary table should preferably not be connected to any engines which are operating pumps, four 6-cyl engines were included in rig design to obtain the utmost flexibility. Incorporation of all main engines into one transmission permits the maximum use of available horsepower, and breakdown of one engine usually affects the performance of the rig only slightly. The engines operate on natural gas and deliver a peak total of about 1200 hp. at 800 r.p.m.

Other changes were effected in mud tanks and ditches and auxiliaries. The performance of the rig is described with the aid of charts and other records of the drilling operation. A. H. N.

48. California Drilling Practices. F. N. Kellogg. *Oil Gas J.*, 19.10.46, **45** (24), 140.—Practical details of the average practices in California, of sizes and capacities of drill pipe, bits and other equipment, of speeds and weight on bits, of mud characteristics and safety practices are reviewed. A. H. N.

49. Boring with Diamond Drill. Anon. *Petroleum*, 1946, **9**, 230.—Details are given of recent achievements in coring with diamond drill bits containing 400 to 500 diamonds totalling 60 to 100 carats in an aluminium bronze alloy bond. The tests were made in central Oklahoma, western Kansas, and southeastern Mexico at 7300 ft, 3700 ft, and 7000 ft total depths in limestone and dolomite formations. K. C. G. K.

50. Big Slush Pump. J. E. Kastrop. *Oil Wkly*, 9.9.46, **123** (2), 58.—This recently introduced duplex power-driven pump is capable of transmitting almost 600 hp. into the drilling fluid circulatory system. This makes it possible to handle high viscosity fluids at great depths with little concern for overburdening pumping equipment or sticking drill pipe. From the characteristic curve of the pump it is seen that 763 gal of mud/minute are delivered with a 7¾-in piston at 55 strokes/minute with permissible pressures up to 118 lb/sq. in. A maximum permissible pressure of 2910 lb/sq. in is developed by the 5-in diameter piston which delivers 295 gal/minute at the rated speed of 55 strokes/minute. These figures are based on 100% volumetric efficiency up to a maximum permissible pressure indicated for each size liner. Pump design considerations are discussed. A. H. N.

51. Reverse Circulation in Oklahoma Wells. C. L. Myers. *Oil Wkly*, 23.9.46, **123** (4), 29.—Reverse circulation is being used in completion of wells up to 10,000 ft in depth. Reverse circulation completions have been found especially effective in wells plagued with caving shale which is easily and quickly washed to the surface without clogging the pay and thus reducing porosity. Where the oil horizon is a sandy shale and has to be shot, or in bore holes with a low bottom-hole pressure, this method has been found successful. Rigs used in reverse circulation completions or cleanouts resemble larger rotary units, but are much smaller. The rigs contain certain features peculiarly adapted to the class of work they must perform. One company operating out of the Tulsa area has developed several unique devices, including a washing tool, an application of the torque converter for servicing, a four-way valve, and a specially constructed packoff head, all of which have been used effectively. In the Stroud pool approximately 38 wells serviced by this method and using these and other specially designed equipment reported exceptionally good results and increased production. Typical examples are reported. An important advantage claimed for reverse circulation is that of accurate logging while drilling in. Because of the velocity with which cuttings are brought to the surface, it is possible on a 4500-ft hole to cut one foot of formation and have the cuttings at the surface in seven minutes. Using normal circulation it would take cuttings from a comparable depth approximately 2½ hours to reach the surface. Other advantages claimed for the method include rapidity in putting wells on production, protection to the producing formation, no loss of oil or gas in the process, greater efficiency in shot holes, and greater economy. The method and equipment can be successfully applied to drilling in, deepening, cleaning out, plugging back, acidizing, fishing, pulling tubing and rods or running same, swabbing, sand pumping, bailing, drilling out retainers and cement, and conditioning hole for squeezing and perforating. Reverse circulation is compared with standard drilling under different circumstances. A. H. N.

52. Drilling Patents. V. Guillemin. U.S.P. 2,406,764, 3.9.46.—Automatic Graph Drawing Recorder: a graph drawing machine (which could be adapted to log drilling rig functions).

M. O. Johnston. U.S.P. 2,407,081, 3.9.46. Gun Perforator for Well Casing: a gun perforator in which the projectiles are held by a flange until the firing power of the explosive shears the flange from the projectile. R. B. S.

Production.

53. Trends and Developments in Petroleum Production Engineering. S. E. Buckley. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1131.—This paper summarizes the trends and developments in petroleum production engineering since 1941.

The most important trend in recent years has been the transition from the qualitative to the quantitative stage. This process is by no means complete yet, but the modern petroleum production engineer must think more and more in a quantitative fashion. E. N. T.

54. Bacteria in Oil Production. Anon. *World Pet.*, 1946, **17** (12), 78.—A brief description is given of the efforts being made by the Pennsylvania Grade Crude Oil Association to eradicate those water-borne bacteria which are undesirable (sulphate reducers, slime producers, etc.). The degree of toxicity of the additives being investigated is limited by the fact that the input water is used for drinking. A short review is given of the work of Dr Zobell, pertaining to the part bacteria play in the formation and transformation of petroleum hydrocarbons. F. S. A.

55. Mathematical Methods of Decline Curve Extrapolation and Reserve Calculation. S. J. Pirson. *Oil Wkly*, 9.9.46, **123** (2), 45.—There are several types of decline curves and these must be defined strictly for any particular problem. The different types are defined and explained. In order to estimate the future production of a well, tract, field, or pool by means of production decline curves, it is necessary to project into the future the past performance of the producing unit. The accuracy and reliability of this projection depends to a large extent upon the accuracy of the production data as recorded in the past and on the judicious application of correction factors for disturbances caused by well repair jobs. The reliability of the reserve estimates will further depend on the proper use of methods of curve extrapolation. These methods may be grouped into two classes, as follows : (1) Mathematical methods. (2) Graphical methods. Essentially, the mathematical solution of a decline curve problem involves three problems : (*a*) The recognition of the type of formula or curve which best fits the data or measurements in the present case production rate (y) in barrels/unit of time (t) chosen (year, month, week, or day). (*b*) The calculation of the arbitrary constants which enter the formula which fits best. (*c*) The calculation of the expected future production or reserves to a given or assumed economic limit. The paper gives the mathematics of decline curves, which are : (1) linear, ($y = mt + a$) ; (2) exponental ($y = a \exp(-bt)$) ; (3) parabolic, ($y = at^{-b}$) ; (4) hyperbolic ($y = a + \frac{b}{t}$) or $y = \frac{1}{a + bt}$, and (5) complex parabolic curves requiring several constants. The method of successive differentials (Loss Ratio Method) is also given. Each formula is derived and an example is worked out in detail as illustration.

A. H. N.

56. The Permian Basin Fights Corrosion. G. Weber. *Oil Gas J.*, 14.9.46, **45** (9), 76.—In attempting to deepen wells producing from three sands it was found that corrosion above the gas–oil contact severely attacked the pipes in a New Mexico field. Following this discovery indicating serious corrosion in other wells in the field, the company adopted measures to remedy the damage already done and to prevent its continuing. All wells showing casing leaks are being lined with 5½-in casing. Then, following a practice adopted in the Mangolia field of South Arkansas, a production packer is set near the bottom of the tubing string, and the annulus between tubing and casing is filled with sweet, refined gas oil. The same programme, except for lining of the 7-in casing, is followed for wells not yet showing casing leaks. Whether caused by chemical or electrolytic action, corrosion will be halted by the static oil column. At first crude oil was used to fill the annulus, but since such oil is sour and contains as much as 1% of water it would require treating before being considered entirely safe for such use. The small additional cost of gas oil was considered worth the complete protection it affords. A total of 14 flowing wells at Hobbs have been reworked in this manner, and the company has scheduled 8 more for immediate attention. In addition, key wells throughout the field which are flowing at high gas–oil ratios and making water are being calipered, and if it is indicated that corrosion justifies remedial work, it will be undertaken. On the basis of what was learned at Hobbs, the company is investigating wells in other fields. Corrosion of tanks in the same fields is also discussed. Aluminized steel tanks have been found resistant to sour crudes for 2 years.

A. H. N.

57. Sodium Chromate as a Corrosion Inhibitor In Gas-condensate Wells. Part 1. C. K. Eilerts, H. A. Carlson, R. V. Smith, F. G. Archer, and V. L. Barr. *Oil Wkly*, 30.9.46, **123** (5), 17 ; 7.10.46, **123** (6), 30.—See Abstract No. 875, 1946.

58. Scales in Oil-producing Equipment. L. C. Case. *Oil Gas J.*, 28.9.46, **45** (21), 76.—It is stated that scale formation constitutes a secondary source of equipment troubles and treating costs, when compared with, say, oilfield corrosion. Various types of scales occur in different parts of field equipment which handle water. Formation of these scales is due to a variety of causes, which may be present in water ranging from fresh to quite salty in nature. In general, scale formation should be considered as a chemical precipitate resulting from two main causes : (1) supersaturation, (2) the mingling of two different waters having incompatible compounds in solution. There is usually nothing difficult about the identification of a scale deposit. A few simple tests will serve to establish the major constituents. It should be understood that some of the solid substances found in scales may result from either one of the two main causes, or they may be due to a combination of these physical and chemical conditions. Certain scale components can be due only to one definite mode of origin. Thus, identification of the main constituents in a scale may point immediately to its origin and a practical method of prevention. Scales are classified, in tabular form, and characteristics of the chief types are briefly described. The chemistry of scale precipitation is given, followed by typical scale surveys in different localities—in some examples several tons of scales may be removed from tanks on a lease, or 6-in pipes may be found completely blocked. Prevention and removal of scale are not discussed here; they are deferred to a following article. A. H. N.

59. Prevention and Removal Methods for Scales in Oil-producing Equipment. L. C. Case. *Oil Gas J.*, 5.10.46, **45** (22), 68.—Hard scale deposits, consisting essentially of the sulphates of barium, strontium, or calcium, are both difficult and expensive to remove from oilfield equipment. It should be clearly understood from the acid tests which serve to identify this type of deposit that it cannot be removed satisfactorily by acid treatment. Ordinarily, the sulphate scales are sufficiently hard to prevent displacement by either scrapers or boring tools. The last resort of hanging tubing or pipe in the derrick and dislodging the scale with hammers is very unsatisfactory, especially when damage to the pipe is taken into consideration. Prevention of scale formation is the best remedy. Prevention is accomplished in the most positive manner by not allowing mixtures to take place which cause the precipitation. If this method is definitely impracticable, continuous treatment with organic protective colloids, plus lesser amounts of certain polyphosphates, offers considerable promise of future development in reducing the rate of hard scale accumulation. Once allowed to accumulate, the removal of hard scales presents various difficulties which may be overcome only to some extent by full use of the latest developments. Soft scales, consisting mainly of carbonates of calcium, are easier to remove chemically and mechanically than the hard sulphate scales. HCl is used successfully in various strengths. The use of polyphosphates alone or with caustic quebracho tannin has also been reported. However, even for soft scale, prevention is recommended as better than removal. Several typical examples are discussed. A. H. N.

60. Sucker Rod Scrapers Eliminate Paraffin. C. E. Blackburn. *Oil Wkly*, 30.9.46, **123** (5), 29.—Over 385 wells are reported to have been equipped with this novel device. In pumping wells having paraffin accumulation, the depth at which the paraffin commences to accumulate is determined and rods equipped with scrapers to cover this distance plus an additional 200 ft are installed. The rods, with the attached scrapers, are rotated a fraction of a revolution on each reciprocation of the rods by means of a rotating hanger. As the blades reach within a fraction of an inch of the tubing wall, the reciprocation and rotation of the blades prevent any paraffin from accumulating. This provides a mechanical method which requires no attention after installation, as the action of preventing paraffin accumulation is automatic and continues as long as the well is pumped. For 2-in tubing the scrapers are ½ in thick by 1½ in wide × 2 ft long and are shrunk-welded to a prefitted ring around the rod. The scraper blades are spaced 2 ft apart and six such blades are placed on each rod. As the rod string is rotated and reciprocated, the full tubing area is wiped of paraffin. For tubing larger than 2 in, proportionally wider blades are used. The rotating head is rotated automatically by a bridle line from the jack head. A. H. N.

61. Mid-Continent Water-Flood Trends. W. A. Heath. *Oil Wkly*, 23.9.46, **123** (4), 33.—Methods of evaluating oil-in-place in the sands are briefly indicated. Well spacing in the 5-spot pattern is the most popular. The use of old wells for water injections are discussed followed by a study of unitization projects, experimental floods, selective shooting and plugging, and general production characteristics.
A. H. N.

62. Capped 65,000,000 cu. ft. Well Loose at Surface Hole. Anon. *Oil Gas J.*, 28.9.46, **45** (21), 87.—In an expensive California oilfield well exceedingly high pressure developed in the annulus between the 11¾-in surface pipe and the 7-in oil string, culminating in failure of the surface connections. Failure started with a leak in the weld securing the base unit to the surface casing and in a short time the flow of gas, sand, mud, and water cut out the side of the base unit and then cut out the christmas tree and suspension parts supporting the 7-in casing at the ground level. Remaining portion of the christmas tree was removed from the well by the operating crew, and all surface fittings were stripped down to the base plate. Decision was reached to use a packer constructed in the form of an inverted liner hanger, of such size that it could be passed down around the 7-in oil string and inside the 11¾-in surface pipe. Thus, it was hoped the 11¾-in casing could be sealed in and the pressure equalized in the annulus. It was also decided to screw a nipple on top of the inverted hangar and use a gate valve to close the well. The technique adopted in stabbing the well—and the solution of certain unexpected troubles which developed during the operations—are described and illustrated diagramatically. A. H. N.

63. Shell Runs New Well-Screening Device. W. S. Crake. *Oil Gas J.*, 5.10.46, **45** (22), 65–66.—A typical sand analysis is presented for a particular field from which it is seen that a screen with openings of only 0·008-in has to be used if sand is to be excluded. With such fine-mesh screens, it is impossible to set the screen in mud and then clean it; the mud sticks to parts of the screen, causing excessive flow in other parts, which ruins the screen. The device described in the paper consists of a fully enclosed, wire-wrapped screen which is run into the well in an oil- or grease-filled case to avoid damage to, or mudding up and clogging of, the screen while going in the hole. The device, which is suspended on a washing-type shoe, carried a delayed-action liner hanger and packer on the top portion of the enclosing case. The well is washed with water to bottom with the entire assembly, to be sure the well is clean to the final shoe-setting point. This washing operation is carried on until the well is free of liquid mud at bottom and, if desired, until the well shows signs of life, at which time at least part of the mud filter cake is probably dislodged. The entire assembly is then raised to the hanging point, the liner hanger is engaged against the casing, and enough weight is applied to the assembly to shear the upper pin which holds the device in a telescoped position. The screen is then lowered out of its oil-bath case in a perfectly clean condition into a well free of mud until it is fully extended, where it is latched into a locked position. Continuous washing is maintained during this time.

When the well is considered sufficiently well washed in, additional weight on the tool shears the pins on the liner-hanger slip bowl and the packer is collapsed, thus sealing off the device. The tubing is then disconnected from the shoe by simple right-hand rotation and picked up to the desired hanging position, and the well is then placed on production. The device can be recovered by releasing the packer and using the outer case as a washover tool to enclose and remove the screen.

A. H. N.

64. Co-operative Salt Water Disposal System Serves Erath Operators. Anon. *Oil Wkly*, 7.10.46, **123** (6), 28–29.—A co-operative salt water plant has been recently installed in Louisiana and it has been designed with neatness, compactness, efficient oil separation, and facilities for handling overflow emergencies as main features. The plant is described. A. H. N.

65. Ark-La-Tex. Has Good Gas—Conservation Record. G. Weber. *Oil Gas J.*, 2.11.46, **45** (26), 82.—An account is given of the conservation of waste gas in the Arkansas area. The gas waste situation in South Arkansas was complicated by the presence of hydrogen sulphide in 98% of wet gas to the extent of between 30 to 4450 g/cu. ft. The state forbids the use of gas for carbon-black manufacture. During the six years ending December 1945 the wet-gas production more than doubled, but waste in the fields was reduced from 19 billion to about 5½ billion cu. ft annually. Three treating plants with a network of gathering lines process the sour gas for liquid fractions and treats the residue for refinery, industrial, and domestic conservation. Low pressure gas formerly flared is now processed and delivered to the field for gas lift and to pipelines, saving 1,000,000,000 cu. ft of gas. G. A. C.

66. Production Patents. W. H. J. Brock, assr. of one-half to Automotive Products Company, Ltd. U.S.P. 2,406,488, 27.8.46. Coupling Device for Pipes or Tubes:

a tube coupling device in which a collar is forced to contract into biting engagement with the pipe to form a fluid tight seal.

L. C. Hudson. U.S.P. 2,407,010, 3.9.46. System for Producing Regulated Liquid Pressure : a system for regulating an adjustable flow control valve.

H. Schiller and A. Shapiro, assrs. to Socony Vacuum Oil Co. Inc. U.S.P. 2,407,180, 3.9.46. Method of Purifying Oil Field Waters : a method of removing traces of petroleum from oil field waters by passing through a clay bed containing granules of ferrous sulphide, which absorbs the petroleum.

L. G. Daniels. U.S.P. 2,407,538, 10.9.46. Automatic Water Treating Device : an automatic water treating system combining a treatment tank and a reagent tank with a special conduit system for automatically adjusting the flow of raw water, treated water, regeneration reagent, and waste. R. B. S.

Oilfield Development.

67. Statistics of Exploratory Drilling in 1945. F. H. Lahee. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 813.—During 1945, 5613 exploratory holes were drilled in the United States. Of these, 3036 were new-field wildcats, 1364 were new-pool tests, and 1213 were outposts. Among the new-field wildcats 351 were successful; among the new-pool tests 383 were successful; among the outpost tests 480 were successful.

The total exploratory footage drilled was 23,030,266 ft, or 4103 ft per hole.

Although all these figures show an increase over 1944, the *degree* of success, measured in barrels of oil discovered, shows a decline. E. N. T.

68. Developments in Eastern Interior Basin in 1945. A H. Bell. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 879.—Drilling in the Eastern Interior Basin decreased 15% and production decreased 2½% in 1945. Total production in 1945 amounted to 88 million brl, which was 5·1% of the United States total. E. N. T.

69. Developments in South Arkansas and North Louisiana in 1945. W. S. Hoffmeister and Van D. Robinson. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1007.—A total of 692 wells were drilled in this area in 1945, compared with 547 in the preceding year.

South Arkansas claimes 3 new oilfields and three new producing zones in old fields. North Louisiana had 7 new oilfields, 4 new gas fields and several new oil and gas horizons.

The total South Arkansas production for 1945 was 28,547,400 brl, while that of North Louisiana was 25,722,270 brl. The total for the whole area showed a decrease of 2·9% since 1944. E. N. T.

70. Developments in Arizona, Western New Mexico, and Northern New Mexico in 1945. R. L. Bates. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 958.—3 dry holes were drilled in the southern half of Arizona and 16 unsuccessful wildcats in northern New Mexico.

Three successful wells were drilled in the San Juan area. The Barker dome of northern San Juan County gave a large volume of Pennsylvanian gas. E. N. T.

71. Developments in California in 1945. G. B. Moody. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 829.—410 exploratory wells were completed in California in 1945, with a total footage of 1,772,920 ft. This is an increase of 95 wells over the 1944 figures.

269 wildcat wells were drilled, with 9·7% success; 50 new pool tests were drilled, with 40% success; 91 outposts were drilled, with 44% success.

38 oilfields and 8 gas pools were discovered. Although the new fields added about 220,000,000 brl to the reserves, none of them could be classified as a major discovery.

Production in 1945 was 326,444,000 brl of oil and 552,932,000 million cu. ft of gas. E. N. T.

72. Developments in Louisiana Gulf Coast in 1945. F. W. Bates and J. B. Wharton. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 999.—There were 12 new fields brought in in this area during 1945, only one less than in the previous year. There were also 29 extensions of known fields and 38 new sands discovered.

New discoveries were all made at great depths, most below 10,000 ft, while one well discovered oil at 13,520 ft, which is the deepest production in the world.

During 1945, 615 wells were drilled and 107,379,429 brl of oil were produced.

E. N. T.

73. Developments in Michigan in 1945. H. J. Hardenberg. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30,** 886.—In 1945, 801 wells were drilled in Michigan, and 2,005,044 ft were drilled. Of the completions, 334 are oil or gas wells, a success of 41% compared with 44% in the previous year.

Oil production was 17,267,493 brl compared with 18,489,470 brl in 1944. 14 oilfields and 8 gas fields were discovered. E. N. T.

74. Developments in North Midcontinent in 1945. V. B. Cole and E. A. Koester. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30,** 895.—Kansas produced 98,429,869 brl of oil and 124,100,219,000 cu. ft of gas in 1945.

Most significant discoveries were in the western part of the state, from Mississipian limestone.

The most extensively developed pool discovered during the year was the Ryan pool in Rush and Pawnee Counties.

Gamma-neutron and electrical logs were used in this area to an increasing degree.

E. N. T.

75. Developments in Appalachian Area in 1945. Appalachian Geological Society. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30,** 861.—In the Oriskany development in New York State, 20 wells were completed and 16 were drilling. There were no new discoveries. In the Tuscarora Township field about 700 acres were proved productive. In the oil area of southwestern New York State completions were 1350, and daily average production was 12,402 brl per well.

In Pennsylvania, there was a decline of 19% in the wells completed in western Pennsylvania, compared with 1944. The only large new gas pool found was that in the Haskell sand, near Bradford, in McKean County.

Oil production from the Bradford field showed a further 11% decline, but still accounted for 50% of the Pennsylvania-grade oil produced in the Appalachian province.

In Ohio, 1034 wells were completed, of which 220 were oil wells, 429 were gas wells, and the remaining 385 were dry.

There was little activity in the Trenton fields of northwestern Ohio.

The only important new field opened during the year was in Columbiana and Mahoning counties, where oil was found in the Oriskany sand in a stratigraphic trap at a depth of 3600 ft.

Fewer wells were drilled in West Virginia than in the previous year. There were no new discoveries.

In Kentucky the most important oil developments were extensions to the pools in Elliot, Menifee, and Jackson Counties. Proven areas produced 1,524,764 brl of oil.

In Tennessee there were only 5 completions during the year. Oil production east of the Cincinnati Arch was about 6000 brl. E. N. T.

76. Developments in Oklahoma in 1945. J. L. Borden. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30,** 6902.—Production of crude oil in Oklahoma totalled 139,227,502 brl in 1945, an increase of 12% on 1944. Reserves, however, declined by 8·3% to 889,839,000 brl.

2351 wells were drilled during 1945. The number of successful exploratory wells was 118. 51 new oilfields and 22 new gas fields were discovered, but there were no very outstanding discoveries in this area. E. N. T.

77. Developments in Rocky Mountain Region in 1945. E. W. Krampert. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30,** 912.—Most discoveries in this area were in Wyoming, but even these were few in number.

The total footage drilled in the Rocky Mountain region was a little more than 1944, but the number of wells was less. Oil production increased by 5,000,000 brl due to the development of the Rangely field. By the end of the year, Colorado's daily production was almost equal to that of Montana. E. N. T.

78. Production Report—Salt Creek Pool. H. S. Norman. *Oil Gas J.*, 19.10.46, **45** (24), 136.—This field, discovered through intensive re-examination of available geologic data, is small but relatively " rich ". Covering only 100-odd acres, flowing production of 1700 brl/day (restricted) has easily been built up. Depth : 2800 ft ; indicated recovery : 320,000 brl/well. Details of the pool are discussed. A. H. N.

79. Developments in Southeastern States in 1945. C. W. Alexander. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1020.—Alabama had 21 wildcats drilled, of which only 1 produced gas. The Gilbertown field had 14 new wells drilled into it and gave 186,817 brl of oil during the year.

Florida had 14 wildcats abandoned. One producer was added in the Sunniland field.

5 dry wildcats were drilled in Georgia.

In Mississipi, 117 wildcats were drilled which discovered 5 new fields and 3 salt domes. Mississipi fields gave 19,005,971 brl of oil in the year, as compared with 16,429,346 brl in 1944. E. N. T.

80. History of Reserves and Production of Natural Gas and Natural Gas Liquids in Texas. Perry Olcott. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1123.—The categories of natural gas and natural gas liquids are as follows : non-associated gas (free), associated gas (gas cap), and dissolved gas. The reserves of these three classes in Texas on January 1 1946 were a total of about 75 trillion cu. ft, divided respectively as 69%, 22%, and 9%.

Natural gas liquids are liquids obtained from any of the groups of natural gas by current field or plant practice. The total natural gas liquids reserves in Texas are estimated as 1·5 billion brl.

The gauged gas production in Texas during 1945 was 2·9 trillion cu. ft, and the natural gas liquids amounted to 61·5 million brl. E. N. T.

81. Developments in North and West-Central Texas in 1945. North Texas Geological Society. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 963.—Total oil production of this area in 1945 was 54,283,064 brl, a small increase over 1944. Wichita County was the leading producer.

2240 tests were drilled in 1945, resulting in 1227 productive wells and 1013 failures.

The most important areas of development were in the Sivell's Bend area in northern Cooke County, in central Montague County, and in the Harrold area, Wilbarger County. E. N. T.

82. Developments in the Texas Panhandle in 1945. P. A. Montgomery and Le Roy Fugitt. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 925.—There was a decided increase in drilling operations during the year. 516 new wells were completed during the year, of which 317 were gas wells, 159 were oil wells, and 40 were dry.

No new fields or producing formations were discovered.

In 1945 the Texas Panhandle produced more than 31,000,000 brl of oil from 6034 wells. This is a decline of 3,000,000 brl from the 1944 figures. E. N. T.

83. Developments in East Texas during 1945. T. H. Shelby, Jnr., and G. J. Loetterle. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 980.—The total of wells drilled in East Texas increased by 75 over the 1944 figure to a total of 392.

One new oil-producing area and four new gas-producing areas were discovered in 1945. All these fields produced from the lower Glen Rose or Travis Peak formations. E. N. T.

84. Developments in South Texas in 1945. B. Scrafford. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 972.—A record total of 1618 wells were drilled in this area during the year. Some of these were dually and triply completed.

479 wildcats resulted in the discovery of 47 new fields and the extension of 37 producing areas.

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Total production of oil was 132,923,000 brl, *i.e.*, 7·7% of the United States total. The Frio-Vicksburg trend accounted for 47% of the new fields discovered and the majority of the production. E. N. T.

85. Developments in Upper Gulf Coast of Texas in 1945. D. M. Davis and C. F. Beilharz. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 991.—Wildcat drilling increased by 24% and field drilling by 25% during the year. New discoveries were 26, mostly small in size.

Production decreased by 2½% during the year. Most of the wildcats were drilled on seismic prospects. E. N. T.

86. Developments in West Texas and Southeastern New Mexico in 1945. E. H. Woods, C. L. Chase and J. E. Bucher. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 930.—In West Texas 1744 wells were completed in 1945. Of the 278 exploratory wells, 47 were successful producers of oil and gas. 10 new Permian pools and 20 new pre-Permian pools were discovered. Pipeline runs were 175,540,000 brl in 1945, as compared with a total 14,760,000 brl lower in 1944.

In New Mexico, 393 wells were completed, including 67 exploratory wells, of which 19 were new producers. 9 new Permian fields were found, of which Paddock was the most important, and 1 pre-Permian field (Brunson).

New Mexico production for 1945 was 36,870,000 brl, a decrease of more than 2,000,000 brl on the 1944 total. E. N. T.

87. Development in Canada in 1945. G. S. Hume. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 851.—There was a decline in Canadian production from 10,166,208 brl in 1944 to 8,568,815 brl in 1945. This was due to the lack of new discoveries to offset the normal decline of Turner Valley, and the closing of the Canol pipeline which isolated the Norman Wells field.

Most of the 1945 drilling was done in Alberta. No new fields were discovered here. In the southern plains of Alberta the Conrad and West Taber fields have been extended.

The first commercial field in Saskatchewan, at Lloydminster near the Alberta boundary, began production in 1945. Previous production had been solely from the Alberta side of the boundary.

Test drilling has been carried out without notable success in various localities of Eastern Canada and also in the Mackenzie River area. E. N. T.

88. Exploration and Production of Petroleum. III. Anon. *Ind. Min.* (*Argentina*), 1946, **6** (60), 27–32.—Drilling methods are compared from the standpoint of efficiency and cost, and the various ways of lifting oil to the surface are described. (Cf. Abstract No. 1049/46.) A. C.

89. Status of German Oil Fields. F. Reeves. *Bull. Amer. Ass. Petrol. Geol.*, 1946, **30**, 1546.—This paper is a detailed and exhaustive review of the German oilfields, including much information about the fields discovered in the last few years.

28 new fields were discovered in the ten years prior to 1945, giving 62% of Germany's cumulative production. The annual production was doubled between 1935 and 1940, and in the latter year the peak production of 7,393,309 brl was obtained. This has since declined to 3,838,709 brl in 1945.

Most German oil comes from the Lower Cretaceous and Jurassic rocks on the flanks of salt domes. Only one important field, Reitbrook, has given oil from the crest of a deep-seated dome.

No new commercial oil has been found in the Middle Zechstein dolomites of central Germany since the original Volkenroda discovery in 1930.

New oilfields were found near the Dutch border in 1942 and 1943. They are situated on low folds, and produce from Lower Cretaceous sands and shell beds.

At Heide in Schleswig-Holstein, oil is found in Middle Zechstein dolomitic limestones and a pre-Neocomian scree breccia on the west flank of an elongate salt structure.

The Munich basin is the only untested area at present that might justify exploration work. E. N. T.

90. Post-War Development Progressing in Holland's Coevorden Field. Anon. *World Pet.*, 1946, **17** (12), 66–68.—Although the presence of oil was established in Holland in 1923, no serious search was made until 1933, when B.P.M. acquired certain rights. After the occupation the Germans resumed the work which the Dutch had had to abandon at the outbreak of war, and established several producing wells before 1945. Work has been resumed, but progress is slow on account of the use of out-of-date equipment and the waxy nature of the 25° A.P.I. gravity crude. Production statistics, geological information, and maps are reproduced. F. S. A.

91. Dutch Shell Group Restoring East Indies Properties Demolished on Eve of Invasion. Anon. *Oil Gas J.*, 12.10.46, **45** (23), 62.—The present status and future plans for the rehabilitation of the East Indies properties of the Royal Dutch Shell group of companies is summarized.

In Northwest Borneo the 20,000 brl Sarawak refinery and the Miri and Seria oilfields were demolished, and after recapture in July, 1945, drilling was resumed in 1946.

400 wells and tankage were destroyed on Tarakan, the 46,000 brl refinery at Balik Papan and oilfields on the east coast of Borneo also being demolished. Similar damage was done before the Japanese invasion at Ceram, New Guinea, Sumatra, and Java. The extent to which the invaders were able to reconstruct gave them an estimated yield of about 55% of the 1941 production, although they had arrived fully equipped to carry out repair work, Pladjoe and Java providing the greatest returns.

For reconstruction now, it is estimated that some 200,000 tons of equipment are necessary, including 27 strings of drilling tools, 600 pumping units, 40,000 kWh power generating capacity, and 200 miles of oil-well tubular goods, together with material to restore to the full the 20 million barrels of tankage.

Also an unknown portion of 3,000 miles of 4-in and larger pipelines must be replaced. G. A. C.

Transport and Storage.

92. Growth of the Pipeline Industry. Anon. *Oil Gas J.*, 21.9.46, **45** (20), 173.—The total crude oil and total gathering lines in the United States are shown from 1880 to 1915, for every five years, and yearly from 1916 to 1944. Petroleum pipeline traffic, trunk lines in thousands of miles, is shown from the year 1936 to 1944 for crude oil and refined products. The grand totals in each case are given, and the source of the data is shown. W. H. C.

93. Precise Engineering Features New California Crude Line. H. S. Norman. *Oil Gas J.*, 21.9.46, **45** (20), 230.—A description is given of the construction, laying, testing, and operation of the Standard Oil Co., of California's new pipeline between Kettleman Hills and the Los Medanos tanks at San Francisco Bay. The line is composed of 167 miles of 18-in and 9 miles of 20-in pipe and has a volume of 283,000 brl of crude oil, and a daily pumping capacity of 110,000 brl. There are 2 pumping stations. The line is provided with 6 boxes for inserting scrapers, and 13 gate valves to minimize loss and possible damage of territory in the event of a rupture. The pipes were electrically welded together and have yield strengths of 52,000 and 45,000 p.s.i., and ultimate tensile strengths of 72,000 and 65,000 p.s.i. respectively, on the first 30 miles of the discharge ends of each pumping station and the remainder of the lines. 27 miles of the line were made by the pressure-weld process. Gamma-ray testing was made on the welds. Water pressure tests on the various sections were made at 1000 and 1300 p.s.i. Part of the line was Somastic coated, where the most corrosive soil would be encountered, the remainder was wrapped with asphalt and asbestos felt. At Kettleman Hill intake station centrifugal pumps driven by steam turbines provided 940 p.s.i. pumping pressure; at Los Banos station the centrifugal pumps were operated by 800-hp. electric motors. The cost was $4,000,000. W. H. C.

94. 1946 Trends in Pipeline Practices. W. G. Heltzel. *Oil Gas J.*, 21.9.46, **45** (20), 182.—This paper discusses the future growth of product distribution pipelines, possibilities of lines for transmitting coal gas, and problems of pipelines serving new oilfields. Up to about 1928, lines were constructed with threaded screwed pipes and couplings, and on this account a definite wall thickness was necessary so that standard weight pipes were used in which the wall thickness of the unthreaded portion provided greater strength than the operating pressures employed required. Lap-welded lines also required a substantial wall thickness to allow for the part expanded. The introduction of welding of circumferential joints and the adoption of electrically welded higher-carbon steels allowed greater scope for the designer, with the result that today thinner wall pipes and larger diameter lines are employed. Larger diameter systems are discussed; by substituting them for the present smaller lines, about half the number of pumping stations will be eliminated. Their advantages are: (1) low investment and low operating costs per brl of capacity; (2) means of obtaining greater pumping distances and as a corollary fewer pumping stations; (3) simplicity of operations; (4) adaptability for transporting crude oils having a wide range of viscosities; (5) suitability for batching; and (6) a medium through which a modernization programme of present trunkline systems can be carried out. The main disadvantages are: (1) large capital expenditures for first cost; (2) all of most of the capacity being in one line; (3) the problems encountered in the use of large valves and fittings; and (4) more difficult to construct. A tabulation shows the important data for pipelines from 6 to 24 in diameter, based on 960 p.s.i. working pressure, 24,000 p.s.i. working stress, 12 p.s.i. friction loss per mile, and 80 mile pumping distance, using tapering weights (except for the 6 to 10 in) that are suitable for the hydraulic gradient and practical for construction. Contamination of oils through batching is discussed in relation to various systems of pipelines. W. H. C.

95. Trends in Pipeline Practices. W. G. Heltzel. *Oil Gas J.*, 28.9.46, **45** (21), 81.—The shortage of high-grade iron ore in the United States necessitates the efficient use of steel for its conservation; this is supported by the economic limitations under which pipelines operate, which are conducive to the use of high-tensile steel, greater working pressure and thinner pipe walls. It is considered good practice to use a working stress equivalent to one-half of the rupture yield. The practical considerations when planning pipeline construction of less wall thickness are discussed with respect to internal and external corrosion, strength for bending, etc. According to the author, the practical limitations with respect to wall thickness for the various diameter pipes are as follows: 7/32-in wall can be used for 8 and 10 in and probably less wall for 6 in. Possibly 7/32-in can be used for 12 in. For 12 and 16 in. ¼-in wall has been used satisfactorily in seamless and electrically welded higher-tensile-strength pipe. It may prove satisfactory for 18 in. For 20 in and 22 in a minimum wall of not less than 5/16-in is recommended; experience may show that this minimum wall thickness can be reduced still further. He cannot offer an opinion on 24- and 26-in pipes.

The trend toward the use of less wall thickness is reflected in the quantities of the various sizes of pipe, having reduced walls, that have been used in some lines in recent years is shown by data giving length, size, and wall thicknesses. The use of tapering weights, *i.e.*, various weights of pipes in a section of a line tapering in wall thickness from the higher to the lower pressure end, primarily applied for one direction flow, is discussed and some examples of such construction are given, and the practical and economic advantages are discussed. These permit fewer pumping stations and longer pumping distances, etc. Pumping equipment, diesel engines employed, and the use of turbochargers and possible employment of gas turbines are surveyed.

W. H. C.

96. Pipeline Dimensions. W. L. Nelson. *Oil Gas J.*, 2.11.46, **45** (26), 91.—This issue No. 117 of the Refiners Notebook Series concerns the most economical tube length for some common still arrangements. An arrangement should be sought which utilizes few bends and tubes, but extremely long tubes are expensive. The distance between the top of the bridge wall and the roof tubes should never be less than 36 ins and preferably should exceed 4 ft if the still is narrow. A figure is given showing economical tube length as a function of heat duty of the still; types of still shown include three varieties of down convection, two of straight-up, and one of overhead convection. Notebook 104 should also be consulted. G. A. C.

97. Big-Inch Flow Chart. Affords simplified and quick method of determining line pressures to be maintained. H. W. Lambert. *Oil Gas J.*, 21.9.46, **45** (20), 222–4.—A Big-Inch Flow Chart is presented and its construction and method of use are discussed. The chart is for pipes from 13 in to 23·5 in internal diameter, and is a four-part logarithmic graph with the lines plotted for turbulent flow of viscous liquids in pipe lines. It accounts for losses due to pipe rougher than new clean steel pipe. The relationships used as the basis are well-known formulas, being arranged in such a manner as to solve quickly any ordinary flow problem. The chart was developed on account of the lack of meters at some of the line junction points, which made it necessary to rely upon pressure gauges to divide the streams in pumping determined quotas to their destination, and its construction afforded a simple and quick method of determining the line pressures to be maintained. The chart has been checked many times against various size lines and grades of crude oil and products. It has been found most useful when running scrapers through product lines. A flow chart is also given for 1½-in to 12-in lines, which has been constructed by P. Buthod. Its method of use is described. W. H. C.

98. Protection of Two 8-in Coated Pipelines With Magnesium. A. Smith. *Oil Gas J.*, 21.9.46, **45** (20), 195.—A description is given of the Cathodic protection given by magnesium anodes to 4·4 miles of twin brine pipelines of the Dow Chemical Co., at Freeport, Texas. A resistance survey of the ground in which the line would be laid, from which the number of anodes required for protection, is described. Types of magnesium anodes are discussed as to size, weights, current developed, and life when under definite conditions of efficiency and output. The electrolyte or "backfill" in which the anodes are buried is described, and the protection of bare and wrapped pipe is discussed. W. H. C.

99. Standardized Electrification Pattern for Pipeline Pumping Stations. R. B. Mills. *Oil Gas J.*, 21.9.46, **45** (20), 217.—A recent electric installation is described. It was designed to modernize and extend a large oil company's pipeline system aiming at uniformity and standardization with compactness, reliability, and attractive appearance. At the sub-stations the main pumps are housed in a separate building to facilitate servicing, the operators control station being a pressurized room in the building. The transformers and switchgear are situated in the open, adjacent, but far enough away from the pump house for the latter to be in a safe area. All other electrical equipment is housed in separate compartments. The following types of equipment were installed: 750–2000 kva oil-cooled transformers, and switchgear with main and feeder breakers of the magneblast type; a 15 kva 2400–115/220-volt transformer for station lighting; a 2400–480-volt Pyranol transformer of either 37½ or 100 kva, and the number required of full-voltage motor starters. The important data relative to the various control, switchgear, and starting equipment are given. W. H. C.

100. High Pressure Pipelines Transport Valuable Helium at 2800 p.s.i. J. J. Reynolds. *Oil Gas J.*, 12.10.46, **45** (23), 84.—The two pipelines transporting helium from the Bureau of Mines plants are described.

The lines are 90 miles and 35 miles in length respectively, and are of 2⅜-in o.d., extra heavy seamless steel pipe coated with primer solution and coal-tar enamel and wrapped with asbestos. Pressure-welded joints were made.

The quicksand bed of the Canadian River was a major problem with the Amarillo–Enell line, two parallel lines 1500 ft in length and 500 ft apart were buried beneath the river bed. On the Shiprock–Gallup line overhead bridges were necessary to carry it over steep-sided dry creeks.

Tests capable of detecting the smallest leaks were made by pressuring the line with natural gas to 2800 p.s.i. reducing to 1000 p.s.i. and submerging in water, on 4-mile sections, throughout whole length. Special excess-flow valves were fitted at 5-mile intervals in case of a break developing, which were found to be effective in the condition existing in the presence of natural gas used for testing purposes remaining in the line after helium was admitted. G. A. C.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

101. Equivalent Heating Value of Refinery Fuels. W. L. Nelson. *Oil Gas J.*, 12.10.46, **45** (23), 111.—No. 114 in the Refiner's Notebook series lists the heating value of refinery fuels in two tables, from which three examples are worked out, including the equivalent in electricity, cracked gas, gasoline, heavy fuel, etc., of 1000 cu. ft of dry natural gas and 1 ton of coal. G. A. C.

102. Heat Absorption and Radiant Section. Refiners Notebook No. 112. W. L. Nelson. *Oil Gas J.*, 28.9.46, **45** (21), 111.—A chart is given from which the heat absorption of the radiant section of a tube-still furnace can be obtained. The composition of the chart and the method of its use are described. The left scale of the chart shows a factor which consists of the absorption rate in B.Th.U. per sq. ft, multiplied by tube diameter and divided by the centre-to-centre tube spacing. The figure is normally used by deciding, from the Refiners Notebook No. 111, 21.10.46, or other source, what allowable radiant absorption rate may be used, and then reading from the chart the percentage of the net heat developed that will be absorbed by the radiant section. W. H. C.

103. Operational Details of Talco's Waste-Water Disposal Plant. C. G. Rook. *Oil Gas J.*, 2.11.46, **45** (26), 75.—An average of 108,000 gal per day of water from the Mount Pleasant, Texas, plant of the Talco Asphalt and Refining Division, containing certain quantities of emulsified oils, sulphur compounds, caustic and wash waters, and other contaminants, has been successfully treated.

The water is neutralized with sulphuric acid to 7·0 pH, ferrous sulphate added to precipitate sulphides, the iron removed by 15% chlorinated lime slurry, and the floc produced enmeshes the suspended matter and oil in emulsion. Periodic tests are made to maintain the correct pH. The sludge is removed by a centrifugal pump and discharged through a 1-ton filter press, the cake being used for filler in the refining area. Average cost per 1000 gal of water treated is 15 cents. G. A. C.

Distillation.

104. Fractional Distillation of Ternary Mixtures. Part II. A. J. V. Underwood. *J. Inst. Petrol.*, 1946, **32**, 598–613.—In a previous paper (*J. Inst. Petrol.*, 1945, **31**, 111–118) the computation of the composition on any plate in a fractionating column for ternary mixtures was derived. In this Part, an alternative derivation of the equations is presented. Five examples are worked out to illustrate the use of the equations when the proportions of the 3 components vary between different limits. A. H. N.

105. Fractional Distillation of Multi-Component Mixtures—Calculation of Minimum Reflux Ratio. A. J. V. Underwood. *J. Inst. Petrol.*, 1946, **32**, 614–626.—By extending a method which has been applied to ternary mixtures, equations are derived by which the minimum reflux ratio for multi-component mixtures can be readily calculated when the fractionation between the key components is a sharp one, relative volatilities and molal reflux being assumed constant. Numerical examples are given to illustrate the method of calculation. A. H. N.

106. Questions on Technology. W. L. Nelson. *Oil Gas J.*, 5.10.46, **45** (22), 85.—A series of questions are answered, referring to pipe still transfer line temperature, cyclones, and viscosity of gasolines. Tables, formulæ, and diagrams fully illustrate the answers. G. A. C.

Cracking.

107. New Coking Unit Adds Versality, Increases Yields at Pure's Refinery. A. L. Foster. *Oil Gas J.*, 7.9.46, **45** (18), 74.—To meet any variations in present and immediate future product demands, the Toledo refinery of the Pure Oil Co. is installing a complete new delayed coking unit. For some years past operations have been conducted in three combination C.H.P. units and an independent thermal reforming unit, and in 1944 a hydroforming plant and toluene recovery unit were added. These units and their operation are described and flow diagrams of two of them are shown. They are four-furnace assemblies with a reforming section, one light gas-oil section, one heavy gas-oil section and a viscosity-breaking section, all working in synchronism with the crude-topping section of each. The third unit has only three cracking coils. The capacities of the three units are, 9000, 11,000 and 10,000 brl/day of crude oil, operating for 50%, 40%, and 30% bottoms respectively.

When the new coking plant is ready, the flow of the crude oil feeds will be re-arranged, so that all the charge is reduced to 30% bottoms for its feed. The new unit will add a great deal of flexibility of both product type and product quality to the refinery operations. The delayed coking plant will consist essentially of a double-coil heater, two coke drums, which are actually soaking drums, a fractionating column, three stream stripping columns, and various auxiliaries. The new unit is illustrated by means of a flow diagram, and its operation and range of products, from 30% reduced crude oil, are described. Each coke drum is sufficient for 24 hours production. Coke from a drum is removed by a hydraulic method, which employs a rotary cutter for cutting a 3-ft hole vertically, and uses a special head, with several rotary nozzles through which water at 1500 p.s.i. is ejected horizontally on to the cut walls, and traversing from bottom to top, cuts away the coke which falls out of the bottom man to an open car for removal and drying.

The overall yields are given for operations without and with delayed coking. The production of motor gasoline is 52·7% and 59·4%, and residual fuel 27·6% and 17·2%, of the crude oil charged respectively. The other main streams were kept at the same level. The A.S.T.M. clear octane numbers of the gasolines produced were 60 and 64 respectively. W. H. C.

108. Improved Fluid Catalytic Cracking Unit Reduces Maintenance Costs. B. J. Flock. *Oil Gas J.*, 5.10.46, **45** (22), 72.—A catalytic cracking unit to meet the requirements of small-scale refiners, designed by Universal Oil Products Co., is described.

Maintenance costs have been cut down, principally in the catalyst unit where erosion of cyclone separators, reactor system and line has been met by using wear plates and special cements. Hot catalyst will be carried in alloy or carbon-steel lines, layout being such as to obtain smooth flow. A unit has been in operation for 2 years, using 2–6 chrome alloy and carbon steel lines, without replacements. Operating pressures in the regenerator will be 10 p.s.i.g., thus reducing velocity and wear, and cyclone capacity has also been increased with the same object. Micro-spherical types of catalyst which do not possess the cutting power of the ground type are to be employed. Side-valves have been remodelled to give wider openings, and erosion reduced. It is expected that records of over 90% on-stream will be obtained with these improved units. G. A. C.

109. Commercial T.C.C. Operations on Partially Vaporized Charge Stock. H. D. Noll, A. W. Hoge and D. M. Luntz. *Oil Gas J.*, 19.10.46, **45** (24), 116.—The results of some concurrent flow operations after alteration to the reactor of the Socony Vacuum Oil Co. T.C.C. Commercial installation at Paulsboro', New Jersey, are presented.

The catalytic section of the unit is composed of a 16-ft i.d. solid-bed reactor and a 10-zone, 10-ft square solid-bed kiln with a nominal catalyst circulation rate of 100 tons per hr. Various vaporized and partially vaporized charging stocks are processed with concurrent flow of synthetic bead catalyst and oil through the reactor. The alterations to the reactor consisted of reversing the external oil piping, installing a vapour-catalyst disengaging device and revising the catalyst distributing system in the top of the reactor, and equipping the reactor with a fog nozzle for injecting non-vaporized charging stocks.

The results show that mixed phase concurrent T.C.C. cracking is practical and efficient, the concurrent flow results in better utilization of the heat content of the inlet catalyst and oil stream. Higher reactor temperatures for given oil and catalyst inlet temperatures are obtained, which results in higher octane number gasolines.

As for mechanical efficiency, carry-over of catalyst fines to the synthetic crude tower is negligible, and the vapour catalyst disengager operates satisfactorily, and uniform coke laydown is achieved. The reactor seal legs in existing counter current T.C.C. units are adequate for concurrent operations. A flow-diagram is given, together with tables showing plant conditions, comparative once-through concurrent and countercurrent operations, and comparisons of commercial and pilot-plant T.C.C. cracking. G. A. C.

Alkylation.

110. Ethylation of Benzene in Presence of Solid Phosphoric Acid. V. N. Ipatieff and L. Schmerling. *Industr. Engng Chem.*, 1946, **38**, 400–402.—Phosphoric acid on kieselguhr (the so-called solid phosphoric acid) is an excellent catalyst for the alkylation of benzene with ethylene in continuous flow operation. The yield of ethylbenzene increases with increase in temperature and pressure; 80% conversion of ethylene in a single pass (at benzene space velocity of 2 cc./hr/cc. of catalyst) is obtained at about 325° C and 600 p.s.i., or at about 280° C, and 900 lb pressure. The ratio of monoethylbenzene to polyethylbenzenes increases markedly with increase in benzene-ethylene ratio; it is thus readily possible to obtain an alkylation product, over 90% of which is the desired styrene intermediate. The life of the catalyst is very satisfactory. A. W.

Isomerization.

111. Isomerization of Normally Liquid Hydrocarbons. No. 14. Modern Refining Processes. 1-Hexane. G. Armistead. *Oil Gas J.*, 28.9.46, **45** (21), 93.—During the war isomerization processes were primarily directed to the production of aviation components and the conversion of naphthenes to toluene. The Isomate process is described and discussed from the aspect of motor gasoline manufacture. It uses an aluminium chloride-hydrocarbon complex catalyst, promoted by anhydrous hydrogen chloride, and hydrogen is introduced to inhibit cracking at the high pressures employed (above 500 p.s.i.); it also serves to hydrogenate the catalyst complex and, by retarding the dehydrogenation action, thus lengthens catalyst life. A flow sheet of a naphtha isomerization unit and product fractionation is shown. The fresh feed should contain the least amounts of C_4 and C_7 hydrocarbons for the reasons given, which relate to the effects of $AlCl_3$ on the various hydrocarbons and types processed. In the Isomate process, both the feed and recycle gases are dried before admission to the HCl absorber, and are passed through a heater and are joined by a hydrogen stream before entering the reactor, in which a constant level of the catalyst complex is maintained. The $AlCl_3$-hydrocarbon complex catalyst has a specific gravity of about 1·5, and a viscosity somewhat greater than an SAE 50 lubricating oil. The reactor effluent, after passing through hot and cold settlers, goes to the HCl stripper, and then flows to caustic and water washers before entering the fractionating system. The effluent from the reactor remains comparatively free from $AlCl_3$, provided the $AlCl_3$ content of the complex is kept below 70%. The washed *iso*mate enters the depentanizing tower, from which overheads pass to the debutanizer, and the butanes therefrom are eliminated from overhead. The butanizer bottoms pass to the pentanes splitter, from which *iso*-pentane passes overhead and normal pentane from the bottom, which may be recycled. The depentanizer bottoms are passed to the hexane splitter, from which *iso*meric hexanes, including neohexane and di*iso*propyl, pass as overheads, and the bottoms go to the rerun tower from which the methylpentanes and normal hexane are taken as overheads; the latter may be recycled. The C_6 naphthenes and heavier fractions flow from the bottom. Typical operating conditions for isomerizing Mid-Continent hexanes are shown for (1) 35% pentanes and 65% hexanes, and (2) mixed hexanes, and a graph shows the effect on yields and quality of recycling ratios from 1 : 1 to 4 : 1. The products are discussed. Recycling gives best yields and highest octane-number products. Up to 93% of 91 octane number neohexane is formed at 4 : 1 recycle ratio. W. H. C.

112. Isomerization and Isoforming. 2-Pentane. G. Armistead. *Oil Gas J.*, 5.10.46, **45** (22), 80.—This is Part 15 of a series on modern refining processes, and Part 2 on isomerization and isoforming of pentane mixtures.

The feed passes first to the *iso*pentane tower, overhead from which initial *iso*-

pentane and lighter is removed. Normal pentane and heavier from the base of the tower pass to a rerun tower, where hexanes plus are removed from the bottom and reactor feed from the top. 0·5% of benzol is introduced with the feed to the reactor to reduce cracking and extend life of catalyst. HCl is removed from the hydrocarbons in a stripper and eventually C_4 is produced as overhead and *iso*pentane product as bottoms from a debutanizer. Hastelloy " B " or nickel reactor linings with water cooling on the outside of the vessel shell have greatly decreased corrosion caused by the aluminium chloride-hydrocarbon complex.

The isoforming process is a catalytic operation in which vaporized gasoline is passed over a silica-alumina catalyst at between 750° and 1000° F and at pressures of 5 to 10 p.s.i.g., using high space rates of from 4 to 40 b/v/hr.

Little has been disclosed about this process, but a feature is the yield-octane relationship, the octane number improving to a certain point and then degrades with increasing operation severity. A table illustrates this point. The process is applicable both to fixed-bed and fluid operation. The *iso*mate type of process can be operated at a cost of 0·7 to 1·0 cent per barrel of reactor feed, and when applying to straight-run paraffinic gasolines is competitive with the use of tetraethyl lead only on low-quality feed stocks. Isomerization processes may also find application with increase in octane levels and future emphasis on reduction of processing losses. G. A. C.

Chemical and Physical Refining.

113. Vacuum Distillation, Chemical Treating make Quality Lubricating Oils. A. L. Foster. *Oil Gas J.*, 28.9.46, **45** (21), 78.—A description is given of the plant used at the Houston refinery of the Sinclair Refining Co., and its operation with a South Texas crude oil for the production of five grades of lubricating oils which have exceptionally low Conradson carbon residues and low pour points. The plant consists of a battery of shell stills, three in parallel, for the removal of the 5% gasoline in the crude ; and two in series, for stripping the virgin gas-oil ; two furnaces, one vaporizer-stripper, atmospheric and vacuum fractionators, heat exchanging assemblies and a caustic neutralizing vessel. The crude charge flow takes up heat in the following sequence from : the gas-oil stream from the atmospheric tower, the heavy and extra heavy lube oil distillate vacuum streams, from the stripper-vaporizer, and from the vapours in the top of the vacuum fractionator. The stream then feeds the five shell stills as mentioned, and the flow from the last, goes to a furnace, is heated to 750° F and passed to the caustic mixer in which 25° Be caustic soda solution (0·35 lb/brl oil) is introduced, the mixed stream then flows to the atmospheric tower, from which overheads go to the gas-oil exchanger, and two side-streams to separate compartments at the head of the vapour-stripper, producing a non-viscous and a light lubricating oil distillates. The tower bottoms are pumped to the second furnace, and at 750° F enter the vacuum fractonator operated at 2–4 in mercury abs. This fractionator provides three side-streams and an overhead, viz., medium, heavy, and extra heavy lube distillates and an intermediate cut respectively. The residue from the base is called caustic bottoms. The five lubricating fractions are : 55–60, 100, 300, 1200 distillates and the heaviest fraction, each receive substantially the same treatment ; but the heaviest is diluted with the 100 viscosity cut (50 : 50) before treating. The treatment given is by acid, neutralization hot-water washes and earth filtration. The amounts of acid used are 10, 15, 25, 30, and 40 lb/brl, and 1, 1·5, 2, 2·5, and 3 lb soda ash/brl, respectively. Filtration through fullers earth then follows. The diluted heavy fraction is steam stripped in a shell still, after neutralization and before earth treatment. The finished lubricating grades are : 55–60, 100, 300, 1200, and 2000 Pale, and have the following pour points and Conradson carbon values respectively : −65, −45, −25, −5, and 20° F ; and 0·01, 0·03, 0·04, 0·08, and 0·28%. Three other grades, 200, 500 and 750 distillates are also made ; these are not taken directly from the stills, but are blended from the distillates before treating. Their properties are also given. The Conradson carbon values are 0·02, 0·05, and 0·07%.
W. H. C.

114. Purification of Commercial Benzene by Azeotropic Distillation. J. Griswold and R. H. Bowden. *Industr. Engng Chem.*, 1946, **38**, 509–512.—Non-aromatic hydrocarbon impurities were separated from commercial benzene (coke manufacture) by azetropic distillation with acetone. The approximate purity of the original benzene was 98·5%, and it is shown that benzene of approximately 99·7% or higher purity may be readily prepared by azeotropic distillation of the commercial material with acetone. A. W.

115. Benzoic Acid from Phosgene and Benzene. W. H. C. Rueggeberg, R. K. Frantz, and A. Ginsburg. *Industr. Engng Chem.*, 1946, **36**, 624–626.—The preparation of benzoic acid through the aluminium chloride-catalysed reaction between benzene and an excess of liquid phosgene was found to be superior to the previously known reaction between these reagents in such inert reaction solvents as carbon disulphide. The yields of benzoic acid in the process here described are dependent upon the reaction time and the molar ratios of aluminium chloride to benzene and phosgene to benzene, respectively. For a molar relation of phosgene to benzene to aluminium chloride equal to 3 to 1 to 1, a maximum yield of benzoic acid of 55–58% of theory, based on benzene, is obtained after a reaction period of 16 to 18 hr at 3 to 8 C. The by-product of the reaction is benzophenone. An increase of the aluminium chloride-benzene molar ration above unity accelerates the reaction, but does not increase the overall yield of benzoic acid. A decrease of the phosgene-benzene molar ratio below 3 to 1 reduces the yield of benzoic acid and increases the yield of benzophenone. The reaction between phosgene and benzene produces a grade of benzoic acid which is free of chlorine, but it has not yet been studied in pilot plant equipment. A. W.

116. The Alkylation of Paraffins in the Presence of Homogeneous Catalysts. A. A. O'Kelly and A. N. Sachanen. *Industr. Engng Chem.*, 1946, **38**, 463–467.—Paraffins of normal and iso-structure can be alkylated in the presence of small amounts of halogen, nitrogen, or oxygen compounds as catalysts at temperatures ranging from 300° to 400° C and under pressures of the order of 3000 p.s.i. or more. Good examples of these homogeneous catalysts are chloroform, nitromethane, and trichloracetaldehyde. This type of alkylation produces a series of paraffinic hydrocarbons, some of which predominate, and represent primary alkylation products. These are not generally similar to those obtained from alkylation reactions using isomerization catalysts, and their structure corresponds to what might be expected as a result of the interaction between tertiary or secondary carbon atoms of paraffins and unsaturated carbon atoms of olefines. Alkylation of *n*-butane with ethene produces predominantly 3-methyl pentane; of *iso*butane with ethene, neohexane; of *iso*pentane with ethene, 3 : 3-dimethyl pentane; alkylation of *iso*butane with propene gives 2 : 2-dimethyl pentane with 2-methyl hexane and triptane in smaller yields. A. W.

Special Processes.

117. Western German Hydrogenation Plants. I. Anon. *Industr. Chem.*, 1946, **22**, 637–641.—The development of coal hydrogenation in Germany is briefly traced; this process was the country's most important liquid fuel source. The Gelsenberg and Scholven installations are dealt with in some detail. The operating pressures of the sump and vapour phases were 700 and 300 atm respectively. Gasoline production (15,000 tons/yr) commenced in 1937, the capacity being increased in 1942. Output was reduced in 1943 owing to bomb damage at the hydrogen plant. The gasoline produced had O.N. 72 (Motor) increased to 89 by the addition of 0·12% T.E.L. Bombing caused the abandonment of the plant in Sept. 1944. Hydrogen was produced mainly from water gas using a Fe–Cr catalyst, brief details of the production and purification procedures being given. The Scholven plant had an earlier beginning, and by 1940 production had attained 20,000 tons/yr. The plant was abandoned, due to bomb damage in Oct. 1944. A description of the process used in both plants is given. The overall yield at Scholven was 55% gasoline on dry ash-free coal. F. S. A.

118. Production of Benzyl Chloride by Chloromethylation of Benzene. F. C. Whitmore, H. A. Nottorf and others. *Industr. Engng Chem.*, 1946, **38**, 478–485.—Anticipated large-scale production of benzyl chloride, coupled with the shortage of toluene for this purpose, led to an investigation of the chloromethylation of benzene as a possible source of benzyl chloride. Laboratory and pilot plant studies show the effects of hydrogen chloride addition at atmospheric pressure and 50–100 mm. mercury above atmospheric pressure, temperature, speed of agitation, speed of hydrogen chloride addition and total amount used, replacement of the zinc chloride catalyst with zinc oxide, iron and copper halides, preheating reactants before addition of hydrogen chloride, paraformaldehyde-benzene ratio, and reaction time. Distillation of benzyl chloride under various conditions has been studied. Results indicate that benzyl chloride can be prepared in yields of 70% or better, and that the zinc chloride catalyst can be regenerated and re-used repeatedly. A. W.

Metering and Control.

119. Graphical Method for Determining Maximum Flow in Systems using Centrifugal Pumps. B. C. Phenix. *Oil Gas J.*, 2.11.46, **45** (26), 72.—The method described is for studying installations where pressure drop is a limiting factor to increased production, and as an aid in the design of liquid flow systems.

An example worked out concerns the use of a stand-by pump, either in series or in parallel, in a system where one pump is used to supply liquid to two parallel systems, and a second example is provided by the problem of increasing the feed supply system capacity of a commercial unit whose flow sheet is depicted.

The given examples are fully discussed and worked out, in the latter case material and pressure-balance tests were also made. G. A. C.

Safety Precautions.

120. Evaluation of Barrier Creams. C. G. A. Sadler and R. H. Marriott. *Brit. Med. J.*, 1946, ii, 769–773.—Barrier creams, which if properly applied should have a thickness of 10–20 μ, have to be of four types, to afford protection against (i) irritant dusts, (ii) aqueous materials, (iii) solvents and oils, and (iv) substances that are both aqueous and oily. In view of the difficulty of organizing and interpreting clinical trials there is need for a laboratory method of evaluation. Eight creams were investigated both qualitatively and quantitatively. Of these, three had excessive pH values (over 9) which would cause them to be condemned. A description of the technique and apparatus for carrying out a permeability test developed by the authors is given. The material used is filter paper (Whatman No. 5), and results are given for the rate of penetration of both water and white spirit. It is concluded that such tests can give a good indication of the value of these substances; whilst creams giving good *in vitro* results may not always protect against dermatitis, those creams which failed the laboratory test were also found to break down in use. V. B.

Patents.

121. Patents on Refining Processes and Products. H. O. Folkins, assr to Pure Oil Co. U.S.P. 2,399,174, 30.4.46. *n*-Butane is cracked in the presence of oxygen and a phosphorus oxychloride.

P. P. Alexander, assr to Metal Hydrides Inc. U.S.P. 2,399,192, 30.4.46. Transformer oil is freed of moisture by passage through a bed of finely divided metal hydride.

V. Haensel and V. I. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,399,224, 30.4.46. The bromine number of a cracked gasoline is reduced by treating the light portion with a phosphoric acid catalyst and the heavy portion with a combined silica-refractory oxide catalyst.

S. H. McAllister, J. Anderson, and W. E. Ross, assrs to Shell Dev. Co. U.S.P. 2,399,240, 30.4.46. An acid process of alkylating *iso*paraffins with olefins.

J. M. Musselman, assr to S.O.C. Ohio. U.S.P. 2,399,243, 30.4.46. A lub. oil additive obtained by the reaction between phosphorus sulphide and a fatty acid ester of a monoatomic alcohol.

C. L. Thomas, assr to U.O.P. Co. U.S.P. 2,399,261, 30.4.46. Aviation gasoline is obtained when a suitable cracked gasoline is passed over a silica-magnesia catalyst at 650°–1050° F under controlled conditions.

R. A. Frang, assr to United Gas Improvement Co. U.S.P. 2,399,340, 30.4.46. A polymerization inhibitor and oxygen are employed in the distillation of a heat polymerizable aromatic olefin.

J. P. Jones, assr to Phillips Petroleum Co. U.S.P. 2,399,353, 30.4.46. Liquid *iso*paraffins are obtained from low boiling *iso*paraffins by treatment with ethylene in the presence of hydrofluoric acid and finely divided nickel at 150°–350° F.

J. Kellett, M. M. Marisic, and A. A. O'Kelly, assrs to Socony Vacuum Oil Co. U.S.P. 2,399,354, 30.4.46. Paraffin hydrocarbons are isomerized by passage through a catalyst comprising inorganic oxides at 700°–1000° F under not less than 500 lb pressure.

M. P. Matuszak, assr to Phillips Petroleum Co. U.S.P. 2,399,368, 30.4.46. An olefin such as propylene and an *iso*paraffin such as *iso*butane are converted to propane and *iso*octane respectively by the hydrofluoric acid process.

F. T. Weiss and C. E. Arbuthnot, assrs to Shell Dev. Co. U.S.P. 2,399,413, 30.4.46. An aviation gasoline which contains from 1% to 15% hydrindene.

E. R. Butcher, assr to Gulf Research & Dev. Co. U.S.P. 2,399,464–5, 30.4.46. Stable liquid dust laying compositions which consist of low viscosity petroleum distillate (21 to 32° API) containing minor amounts of naphthenic acids, sodium salt of a sulphonated higher alcohol, oleic acid, and a germicide.

M. P. Matuszak, assr to Phillips Petroleum Co. U.S.P. 2,399,496, 30.4.46. Chromium oxide catalyst and hydrogen are employed to reduce the sulphur content of an oil at about 300° C and 250 lb.

A. G. Rocchini, assr to Gulf Research & Dev. Co. U.S.P. 2,399,510, 30.4.46. Cyclohexylamine oleate is added to a steam turbine oil containing a water insoluble alkyl phenolic antioxidant, in order to prevent corrosion during use.

W. S. Tyler, assr to Tide Water Associated Oil Co. U.S.P. 2,399,521, 30.4.46. Amorphous wax rendered oil free by solvent treatment of a centrifuge wax is added to oil free crystalline wax to inhibit its tendency to crack on chilling to low temperatures.

D. E. Carr, assr to Union Oil Co. U.S.P. 2,399,540, 30.4.46. Hot combustion gases from fuel mixed with finely divided metallic oxides are employed to crack hydrocarbon oils.

F. H. Amon, assr to G. L. Cabot Inc. U.S.P. 2,399,591, 30.4.46. The production of carbon black by the impingement process.

R. E. Burk and E. C. Hughes, assrs to S.O.C. Ohio. U.S.P. 2,399,662, 7.5.46. Benzol is alkylated with ethylene in the presence of hydrogen fluoride promoted by boron fluoride at about 200° F and 50 lb.

A. D. Green, S. C. Lane, and E. T. Marshall, assrs to Jasco Inc. U.S.P. 2,399,672, 7.5.46. Rubber-like products are obtained when an *iso*mono-olefin in an alkyl chloride diluent is polymerized at about −40° C in contact with a Friedal Crafts type catalyst.

E. J. Houdry and H. A. Shabaker, assrs to Houdry Process Corpn. U.S.P. 2,399,678, 7.5.46. A selected hydrocarbon is dehydrogenated using a preconditioned catalyst of the type which contains a polyvalent multivalent heavy metal oxide carried by surface active refractory metal oxide support.

M. H. Arveson, assr to S.O.C. Indiana. U.S.P. 2,399,717, 7.5.46. A process for coating particles of an adhesive material with a finely divided solid dust.

W. Hull, assr to American Cyanamid Co. U.S.P. 2,399,739, 7.5.46. β-Cymene is obtained from a monocyclic terpene by passage over a catalyst containing chromium oxide and copper oxide.

W. J. Mattox, assr to U.O.P. Co. U.S.P. 2,399,751. 7.5.46. A multi-stage process to produce aromatics from petroleum including cracking, deolefination and aromatization.

B. H. Shoemaker and B. L. Evering, assrs to S.O.C. Indiana. U.S.P. 2,399,765, 7.5.46. Pentane and hexane are separately isomerized.

G. B. Beacon, assr to The Texas Co. U.S.P. 2,399,780–1, 7.5.46. Toluene is produced by catalytic conversion of a mixture of benzene and higher boiling aromatics.

P. E. Hurley and J. B. Dunlap, assrs to Shell Dev. Co. U.S.P. 2,399,805, 7.5.46. An aviation gasoline of increased aromatic content is obtained when a straight run naphtha is thermally cracked in the pseudo-liquid phase in a multistage process.

R. E. Meyer, assr to Socony Vacuum Oil Co. U.S.P. 2,399,817, 7.5.46. The viscosity characteristics of an oil are improved by the minor addition of a neutral copolymer of a diolefin and a carbonyl compound.

J. D. Upham, assr to Phillips Petroleum Co. U.S.P. 2,399,837, 7.5.46. A method of recovering an aliphatic conjugated diolefin from a monosulphone.

J. G. McNab and D. T. Rogers, assrs to S. O. Dev. Co. U.S.P. 2,399,877, 7.5.46. C. F. Van Gilder and H. G. Schneider, assrs to S. O. Dev. Co. U.S.P. 2,399,878, 7.5.46. Processes for the manufacture of metal derivatives of alkyl phenols such as barium *tert.*-octyl phenol sulphide.

N. F. Myers, assr to S. O. Dev. Co. U.S.P. 2,399,883, 7.5.46. A C_4 fraction is acid treated and contacted with porous alumina prior to isomerization.

W. D. Seyfried and S. H. Hastings, assr to S. O. Dev. Co. U.S.P. 2,399,895, 7.5.46. A C_4 fraction is contacted with a catalyst comprising 80% MgO, 14% Fe_2O_3, 3% CuO at 1150° to 1300° F to effect dehydrogenation and isomerization.

D. A. Howes and E. W. M. Fawcett, assrs to Anglo-Iranian Oil Co. U.S.P. 2,399,927, 7.5.46. *iso*Paraffins are obtained by contacting normal hydrocarbons with a compound selected from the oxides and sulphides of metals of Group VI of the periodic table at 400° to 550° C and up to 250 atm.

I. Williams and F. W. Selfridge, assrs to J. M. Huber Corpn. U.S.P. 2,399,969, 7.5.46. An apparatus for carbon black manufacture by the impingement process.

E. R. Littman, assr to Hercules Powder Co. U.S.P. 2,400,012, 7.5.46. P. cymene is obtained by dehydrogenation of a monocyclic terpene using a palladium-active carbon catalyst.

J. A. Pierce and C. T. Steele, assrs to S. O. Dev. Co. 2,400,020, 7.5.46. A cracking catalyst is obtained by activating bentonite clay with oxalic acid.

W. L. Finley and J. H. Kirk, assrs to Sinclair Refining Co. U.S.P. 2,400,492, 21.5.46. A lub. oil additive consisting of the mixed calcium salts of alkyl phenol sulphides.

F. A. Kent and C. W. Patrick. U.S.P. 2,400,515, 21.5.46. Crude petroleum is purified and deodorized by treatment with hydrated lime then a chlorine acid.

C. S. Kuhn, Jr., assr to Socony Vacuum Oil Co. U.S.P. 2,400,520–1, 21.5.46. Propylene is polymerized in the presence of hydrofluoric acid to give higher boiling saturated hydrocarbons and unsaturated terpene-like hydrocarbons.

F. L. Mark. U.S.P. 2,400,563, 21.5.46. An asphalt composition comprising an oxidized asphalt, mineral filler and kiln dried deatomaceous earth.

H. L. Norway, assr to The Bastian Blessing Co. U.S.P. 2,400,569–70, 21.5.46. A design of a dispensing system for liquified petroleum gas.

H. G. Smith, T. L. Cantrell and J. G. Peters, assrs to Gulf Oil Corpn. U.S.P. 2,400,611, 21.5.46. An improved anti-rust additive for a turbine oil is a homogeneous blended mixture of a polyvalent metal salt of N-alkyl phthalamidic acid and amine addition salts of 3-methyl butyl 2-ethyl-hexylphosphoric acid with primary fatty amines and secondary cyclohexyl amines respectively.

L. C. Huff, assr to U.O.P. Co. U.S.P. 2,400,645, 21.5.46. A device for separating gases and solids such as encountered in fluid catalytic cracking units.

T. A. Petry and H. K. Holm, assrs to Secony Vacuum Oil Co. U.S.P. 2,400,654, 21.5.46. Toluene is separated from a complex mixture with non-aromatics by distillation of the mixture with aqueous methanol.

U. Tsao, assr to The Lummus Co. U.S.P. 2,400,669, 21.5.46. A process of isomerizing paraffin hydrocarbons in the vapour phase using anhydrous $AlCl_3$ and including recycling of the catalyst.

G. B. Arnold, assr to The Texas Co. U.S.P. 2,400,732, 21.5.46. A multi-stage process in which a naphtha is extracted with water in the liquid phase under pressure at 500°–600° F to separate aromatics following with catalytic isomerization of the paraffins in the raffinate and recycling a portion of the naphthenes obtained by removal of the isomerized paraffins.

C. W. Watson, assr to The Texas Co. U.S.P. 2,400,795, 21.5.46. A method of preparing gasoline rich in aromatics and paraffins from straight-run and cracked gasoline by dehydrogenation of the former and hydrogenation of the latter concurrently in the same reaction zone.

G. B. Arnold, assr to The Texas Co. U.S.P. 2,400,802, 21.5.46. Toluene is separated by solvent extraction of cracked gasoline employing water containing 5–25% olefin glycol at 420° to 525° under pressure.

W. A. Schulze and C. J. Helmers, assrs to Phillips Petroleum Co. U.S.P. 2,400,843, 21.5.46. Aviation gasoline is obtained by subjecting cracked gasoline to a multistage catalytic process employing bauxite and synthetic silica-alumina catalysts.

G. R. N.

Products.

Chemistry and Physics.

122. Surface of Solids XVII. A First- and Second-Order Phase Change in the Adsorbed Film of *n*-Heptane on Graphite. G. Jura, W. D. Harkins, and E. H. Loeser. *J. Chem. phys.*, 1946, **14**, 344.—The films of *n*-heptane formed by adsorption on the surface of graphite between 25° and 40° C exhibit a first- and a second-order phase transition. The first-order transition occurs between the gaseous and liquid expanded phases. The second-order transition occurs between the liquid expanded and liquid intermediate phases, and between the gaseous and liquid intermediate phases above the critical temperature. Since the behaviour of the film is the same as that observed with insoluble films on aqueous subphases, the nomenclature for the latter is used. The critical constants for the gaseous film were determined as: temperature, 31° C; area, 400 A per molecule; and film pressure, 1·05 dyne cm^{-1}. These values are different from those found for *n*-heptane on ferric oxide, which shows that the solid as well as the gas plays an important rôle in the determination of the adsorption isotherm. The heat of transition for the first-order change is estimated as 13,000 ± 5000 cal. $mole^{-1}$ at 25° C. It is found at corresponding temperatures, within this large experimental error, that the heat evolved in the first-order transition is the same on graphite and ferric oxide.

J. T.

123. Molecular Weight—Physical Property Correlation for Petroleum Fractions. F. W. Mills, A. E. Hirschler, and S. S. Kurtz, Jr. *Industr. Engng Chem.*, 1946, **38**, 442.—Several correlations of molecular weight with physical properties are presented which cover the ordinary range of petroleum fractions. For fractions of 70–300 mol. wt. (gasolines, kerosenes, light lubricating oils) boiling point and gravity are employed; the correlation gives good results for pure hydrocarbons of various types (average deviation 2·4% for 134 compounds) as well as for petroleum cuts. For lubricant fractions of 240–700 mol. wt., correlations are described for viscosity at 100° with viscosity at 210° F; the former are not, in general, applicable to pure hydrocarbons, but give good results for many lubricant fractions, with the exception of two highly naphthenic distillates (Gulf Coast and Californian) above 350 mol. wt. With the use of a correction, the viscosity–gravity correlations give good results for these oils also. The correlation of viscosity at 100° with viscosity at 210° F is in approximate agreement with the data for pure hydrocarbons of various types, and gives good results for all types of petroleum fractions for which data are available. For petroleum waxes melting point and refractive index at 80° C are employed; the correlation is in good agreement with the data for the n-paraffins, as well as for petroleum waxes of various types. A. W.

124. Molecular Volumes of Mononuclear Aromatic Hydrocarbons. N. Corbin, M. Alexander, and G. Egloff. *Industr. Engng Chem.*, 1946, **38**, 610–611.—The molecular volumes of 1-phenylalkanes and 2-phenylalkanes at any given fraction of the critical temperature, are linear functions of the number of carbon atoms. Molecular volumes of fourteen homologous series of mononuclear aromatic hydrocarbons at 20° C are also linear functions of the number of carbon atoms. Both of these relationships may be expressed by equations of the form :—

$$M/d = V = a + bn.$$

The constants a and b are simple functions of the reduced temperature (T_R). These functions may be expressed by equations of the form :—

$$a(\text{or } b) = K + pT_R + qT_R^2.$$

A. W.

125. The Tendency to Smoke of Organic Substances on Burning. Part I. A. E. Clark, T. G. Hunter, and F. H. Garner. *J. Inst. Petrol.*, 1946, **32**, 627–642.—The British incendiary bomb, used in very large quantities by the R.A.F. for the bombing of German towns and cities, was essentially a 30-lb bomb filled with a special benzol gel together with white phosphorus. The benzol gel filling produced on burning a large amount of black carbon smoke which obscured the target, and resulted also in an appreciable portion of the filling being wasted as unburned carbon. In addition, copious white smoke produced by the burning phosphorus increased the obscuring effect over the target. The possibility of replacing this benzol gel-phosphorus combination with a smokeless filling of a satisfactory nature was therefore investigated. Toward this end the smoking tendency of a large number of organic compounds was assessed by flame-height measurements in a special lamp based on the I.P. smoke lamp. A burning organic substance has a flame-height at and above which smoking occurs, and this height is a measure of the tendency to smoke. A new form of lamp was devised to measure flame-heights, from about 9 to 450 mm, of liquid compounds burning freely in air. A wide range of hydrocarbons, alcohols, ketones, esters, and nitro-compounds was examined—115 compounds in all. In general, a compact molecule was found to give a smoky flame. The order for increasing tendency to smoke for hydrocarbons is : n-paraffins (in which increased chain length or chain branching gave increased smoke), naphthenes, olefines, and aromatics (in which appreciable aliphatic side chains on the benzene ring appeared to give no marked reduction in smoke).

In general, increased oxygen content of an organic compound resulted in decreased smoking tendency and compounds such as methyl acetate containing high percentages of oxygen only smoked at very large flame-heights. Some compounds, such as allyl alcohol, although having appreciable oxygen contents, had relatively high smoking tendencies, due to the nature of the carbon-hydrogen portion of the compound. Of the aliphatic alcohols, the tertiary compounds were more smoky than the primary compounds. This also applied to nitro-paraffins. For each set of isomeric aliphatic esters, the flame-height at which smoking began increased with the chain length attached directly to the carboxylic carbon atom. At equal oxygen content, the general order for increasing tendency to smoke was : n-primary alcohols, n-primary nitro-paraffins, propionates, acetates, lactates, and formates, although the order varied slightly for different oxygen contents. A. H. N.

126. The Scattering of Electrons by Hydrocarbon Films. J. Karle. *J. Chem. phys.*, 1946, **14**, 297.—Several formulæ expressing the intensity of electron scattering are derived for a variety of orientations of hydrocarbon films on a solid surface. From these formulæ intensity contour maps may be constructed for arbitrarily chosen models. These maps are helpful for the determination of the structure of a film and are prepared for future publications. J. T.

127. Relation between Bond Force Constants, Bond Orders, Bond Lengths, and the Electronegativities of the Bonded Atoms. Walter Gordy. *J. Chem. phys.*, 1946, **14**, 305.—A relation of the form $k = aN(x_A x_B/d^2)^{\frac{3}{4}} + b$ is found to hold for a large number of diatomic and simple polyatomic molecules in their ground states. k is the bond-stretching force constant, N the bond order, x_A and x_B are the electronegativities of the bonded atoms, and d is the bond length. The average deviation of k calculated from k observed for 71 cases is 1·84%. If k is measured in dynes/cm $\times$ 10^{-5} and d in Angstrom units, in the case of stable molecules exhibiting their normal covalencies, except those in which both bonded atoms have only one electron on the valence shell, a and b have the values 1·67 and 0·30, respectively. For diatomic molecules of the alkali metals, Na_2, NaK, etc., a and b are 1·180 and −0·013, respectively; for hydrides of elements having a single electron in the valence shell, 1·180 and 0·040, respectively; and for diatomic hydrides of elements having two to four electrons in the valence shell, 1·42 and 0·08, respectively. Numerous applications of this relation are made and certain exceptions pointed out. J. T.

128. Pressure Dependence of Accommodation Coefficients. I. Amdur. *J. Chem. phys.*, 1946, **14**, 339.—An explanation of the pressure dependence of accommodation coefficients of gases on metals is given by assuming that these coefficients vary linearly with the fraction of the surface covered with absorbed gas, and that the accommodation coefficient has a negligibly small value a_0 on a gas-free surface and an asymptotic value a_∞ on a saturated surface. The assumptions lead to an accommodation coefficient isotherm which reproduces the pressure dependence of 119 values of accommodation coefficients for the gases on platinum with an average absolute deviation of 1·5%. J. T.

Analysis and Testing.

129. Molecular Weights in Practice and Theory. (1) Practice. A. V. Brancker. *Petroleum*, 1946, **9**, 235.—A review of methods used in determining molecular weights. K. C. G. K.

130. Crankcase Oil Ageing Tests (1). M. Freund. *Petroleum*, 1946, **9**, 226.—This article is the first of three dealing with long-term service investigations made on fast-running diesel engines. A thorough examination has been made of the changes occurring in crankcase lubricating oil, and an attempt made to determine the part played by sludge in relation to the properties of the used oil.

New and modified test methods have been devised to determine the amount of foreign solid matter, hard asphalt, and petroleum resin present in the same sample, as well as to determine neutralization number and acid tar number.

Although test results must be evaluated very carefully, it is shown that to characterize oil ageing during service it is sufficient to know the properties of undiluted crankcase oils such as viscosity, neutralization number, hard asphalt content, and solid matter.

A table of inspection data is included for the effect of sludge removal on diesel crankcase oil characteristics after varying periods of service. K. C. G. K.

131. The Application of Spreading Measurements on Oil Tests. N. E. M. Hagethorn and F. H. Stieltjes. *J. Inst. Petrol.*, 1946, **32**, 587–597.—The expanse of the surface of an oil duplex film in a Langmuir trough is a measure of the quantity of surface active compounds present in the mineral oil. Using a paraffin-wax trough, slide, and barrier in the usual manner, the area of the oil film is measured and plotted against the pressure on the barrier. Extrapolation to zero pressure gives the specific spreading value. Cable oils centrifuged from different parts of the cable and subjected to different temperatures exhibited differences in specific spreading values, although no conclusions could be drawn from their power factors about their differences in composition. Similarly spreading values could be correlated with oxygen absorption of an oil on oxidation, with degree of purification of another oil by charcoal or clay and with hydrogenation which remove the active components. A. H. N.

132. Normal Heptane as a Reference Fuel in Measuring Anti-knock Quality of Gasoline. H. M. Trimble and A. W. Suderman. *Oil Gas J.*, 2.11.46, **45** (26), 66.—Results of a series of tests to evaluate 99% normal heptane as a road test reference fuel are given.

Among the advantages of using pure compounds as reference fuels are ease of reproduction of pure materials, less sensitivity to engine conditions than are impure fuels containing a more sensitive compound or impurity, and results are easy to interpret because of the close relationship of pure products. The cost of primary reference fuels has prohibited their use for road-test and other full-scale work. Secondary reference fuels are used in practice and various errors may be introduced.

A table gives some important characteristics of 99% normal heptane and primary and secondary antiknock reference fuels. Road tests were conducted with 2 middle-priced and 3 popular-priced cars. Blends of 99% normal heptane in F-6 reference fuel were used to rate specific A.S.T.M. (F-2) octane number mixtures of A-6, C-12, and F-4 secondary reference fuels, and blends of C-13, F-6 and M-4 secondary reference fuels. It was concluded that road antiknock rating based on pure-type reference fuels will be numerically different and higher than with secondary reference fuels using the present rating system.

Normal heptane of 99% purity in F-6 reference fuel will give closer checks with primary reference fuel values than will the secondary type reference fuels; and variation in quality and antiknock value will be greatly minimized by the use of pure type reference fuels. The results are tabulated. G. A. C.

133. Viscosity Characteristics of Greases. 3. Type and Concentration of Soap. V. P. Varentzov. *Petroleum*, 1946, **9** (10), 232. (From the symposium on the Viscosity of Liquids and Colloidal Solutions, *Academy of Sciences of the U.S.S.R.* 1941, 1, 197–210).—See Abstract No. 1054 (1945).

Gas.

134. Questions on Technology. W. L. Nelson. *Oil Gas J.*, 12.10.46, **45** (23), 83.—Questions on the thermal conductivity of natural gas, its heat content, and on fuel consumption of a diesel engine operating at 50 hp. are answered, the text being illustrated by labels and a chart. G. A. C.

Gas Oil and Fuel Oil.

135. Combustion Testing Complications. Factors Difficult to Evaluate Determine Real Efficiency. J. W. Schulz. *Fueloil & Oil Heat*, Aug. 1946, **5** (4), 47–50.—Describes in a simple manner combustion characteristics, the operation of and improvements by which economies in operating domestic oil-fired boilers or furnaces may be obtained, and what is meant by overall efficiency of a heating installation. The tests carried out for evaluating the efficiency by means of a stack thermometer and CO_2 draft gauge tester are described, and the results of good or poor combustion are discussed. A stack loss chart is presented and the basis of its construction and the way it is used are described. The chart is based on the gross calorific value and continuous burning of a No. 2 fuel oil, and relates stack temperature, and per cent CO_2 in the flue gases, to per cent excess air, and stack loss, *i.e.*, the loss of heat in terms of total heat in the oil. The limitations of such charts are emphasized, and it is pointed out that different charts and tables may give different results, as they are not all constructed on the same basis, and also that tables and charts are usually based on complete combustion and continuous operation of the burner, whereas in actual practice the burning is usually intermittent. W. H. C.

136. Which Kind of Efficiency? According to Basis Used, Same Job is 58% or 87% Efficiency. J. W. Schulz. *Fueloil & Oil Heat*, Sept. 1946, **5** (5), 46.—(*Continuation of paper in Abstract No.* 135).—Examples are given of the different efficiency results reported by three experts, through their different method of estimating the efficiency from an identical CO_2 test and stack temperature reading from a test run on a heating installation. Their methods of evaluation are given and the subject is discussed. The meaning of "efficiency" starts with the meaning of the calorific value of the fuel oil.

In the U.S.A., the standard used is the high heating value of the oil, which includes the latent heat of condensation of the water vapour in the combustion products. In Great Britain and other countries, other values are used, such as :—the lower, net or available heat values, which do not include the latent heat of the water vapour produced. The overall efficiency of boilers or water heaters, by the evaporation test, and such terms as the absorption efficiency, preventible stack loss and avoidable stack loss, are described and the conditions under which they are determined are explained. The effect of non-continuous burning as applied to boilers and water heating installations is discussed and illustrated in a graph, showing the effect of on–off cycling on overall efficiency, and a table shows similar data when using standard and light firebrick furnace linings. Because the overall efficiencies of boilers and furnaces can be estimated only with difficulty on actual installations, a conservative course is recommended to those who report efficiencies derived from CO_2 and stack temperature readings. Such, if properly taken and reported, are indisputable. Where, in addition, such figures as "estimated stack loss," etc., are recorded, the manner of their derivation should be stated. It is not wise to report such "efficiencies" for intermittently fired installations unless circumspect allowance has been made for the decrease in efficiency that results from non-continuous operation of the unit.

W. H. C.

137. Fuel Oil and Oil Firing. G. J. Gollin. *Heating Ventilating Engr*, 1946, **20** (230), 78.—The importance of oil and air control in fuel oil burning systems is discussed in this article. Devices for maintaining constant viscosity and constant pressure of the fuel are described and illustrated. Of equal, if not greater importance, is the control of air for combustion. It must be admitted to the oil cloud in the correct quantities at each stage with the correct directional flow. The direction and quantity of air relative to the spray are critical and primary and secondary air must be carefully controlled. Types of combustion chambers giving desired effect are illustrated.

J. N.

138. Fuel Oil and Oil Firing. G. J. Gollin. *Heating Ventilating Engr*, 1946, **20** (231), 101.—The principal four types of fully automatic self-contained oil-burning units are dealt with in this article. They are : (*a*) Pressure jet atomizer ; (*b*) medium pressure air atomizing ; (*c*) horizontal rotary cup plus low pressure air ; and (*d*) vertical rotary cup plus low pressure air.

Of these four (*a*) is the most widely used in U.S.A., U.K., and Europe for three main reasons : (1) Few parts are required and construction is simple ; (2) provided oil is delivered to the nozzle at constant pressure and temperature, no metering device other than the nozzle is necessary ; (3) easy ignition by electric spark. This type is described in detail followed by briefer description of types (*b*), (*c*), and (*d*). J. N.

139. Fuel Oil and Oil Firing. G. J. Gollin. *Heating Ventilating Engr*, 1946, **20** (229), 12.—The seventh article of this series continues the description of factors to be taken into account in the design of oil-burning installations.

Storage tanks should be vented to allow air to pass out when the tank is being filled and to prevent a vacuum being formed in the tank when it is being emptied. Each tank should be equipped with devices to indicate its contents, and two types are described.

For safety purposes, to guard against possible leaks, tanks should be installed in oil-tight pits of sufficient capacity to accommodate, with a margin, the contents of the tank.

Where a heavy viscous grade of oil is used, it must be warmed to keep it at a viscosity at which it is pumpable. Tanks with heating coils should be carefully insulated.

Filters for oil burning installation can generally be divided into two classes :—(*a*) Coarse ; (*b*) Fine. The coarse filters protect pumps and heaters, and the fine filters, metering, orifices and atomizers. J. N.

140. Fuel Oil and Oil Firing. Advantages and Defects of the Intermittent Burner. G. J. Gollin. *Heating Ventilating Engr*, 1946, **20** (232), 150.—In the tenth article of this series the advantages and disadvantages of self-lighting intermittent burners are discussed, and various types of automatic control systems are described.

The self-lighting intermittent burner can be adjusted and left running for months with the certainty that the oil throughout, and air supply, will remain reasonably constant, and that a good standard of efficiency will be maintained. It has, however, to be adjusted initially to give smokeless combustion under the worst conditions under which it is expected to operate and therefore may not give maximum efficiency at every point throughout the whole operating range. Another disadvantage lies in the drop in mean efficiency due to idle periods.

Automatic controls perform two main functions. One, to match the heat input by the burner to the load demand, and two, to ensure that the burners will not work unless all the controls are in good working order and to shut off the fuel in the event of flame failure.

The systems are electrically operated, thermostats and flame sensitive devices being used to open or close circuits controlling the several units involved. J. N.

Lubricants.

141. Principles of Filtration 3. Filters. A. H. Stuart. *Petroleum*, 1946, **9**, 233.—Magnetic filters will not retain iron oxide or non-magnetic matter occurring in used oil. Electrostatic methods are very slow and suitably only for batch treatment. The pros and cons of adsorbent filters are discussed. Polar oils contained as additives may be removed by such filters.

In any filter, the finer the particles retained the greater will be the pressure drop and for any given size of filter the slower the rate of flow. A by-pass filter may be necessary where insufficient space is available to provide a filter passing oil at a sufficient rate.

In such cases the main part of the oil from the pump passes to the engine-bearings while the remainder returns via the filter to the sump or other oil container.

Drawbacks to this arrangement are mentioned. K. C. G. K.

142. Lubrication Vade Mecum. Addendum (8). E. W. Steinitz. *Petroleum*, 1946, **9**, 242.—This concludes the Addendum and deals with Pneumatic Rammers, Pneumatic Tools, and Thrashing Machines under section XI. Under Section XII lubrication as applied to the Woodworking Industry is considered under the headings of Veneer Cutting Machines, and Frame Saws. K. C. G. K.

143. Machinery of Plain Bearings with Single-Point Tools 3 (1) Bearing Characteristics. P. Grodzinski. *Petroleum*, 1946, **9**, 244.—Conditions necessary to obtain a smooth bearing surface are indicated. Cross grooves should be nearly eliminated to give the best conditions for fluid film lubrication. The fine boring of bearing surfaces is stated to have the following advantages; 1. Bearing clearance is measurable and predetermined; 2. Initial wear is reduced; and 3. The supporting area is large, even in the newly assembled state. The points raised are dealt with in the article. The question of the necessity of using diamond tools for finishing lead bronze bearing is also discussed. K. C. G. K.

144. Continuous Process for Aluminium Greases. H. G. Houlton, M. Sutton, and H. W. Bevarly. *Oil Gas J.*, 19.10.46, **45** (24), 127.—Plant data for a continuous process manufacturing aluminium grease at the rate of 1500 to 2000 lb per hr is presented.

An oil-and-soap slurry, made under 22–26-in vacuum, is pumped at 1500 lb per hr through a steam-heated Votator to dissolve the soap, then through a cooling Votator to cool the grease. The cooled grease passes into insulated gel tanks of 5500 lb capacity, where the grease is uniformly gelled, isothermally, and then pumped through a worker to break down to constant consistency, no intermixing being necessary.

The slurries were prepared under vacuum to prevent entrainment of air. Both the heating and cooling Votators are fitted with temperature controls. Operating conditions are dependent on source and refinery treatment of the oil and type and manufacture of soap. A uniform product is obtained by separating the cooling and gelling stages, the high film coefficient of the Votator ensuring this.

Visual tests of surface sheen, brightness, transparency, and float are made on gelling conditions. Figures show the effect of blending at heavy oil with a light one on critical temperature and bleed tendency, the properties of greases made from commercial aluminium stearate soaps; and the relation of pumping pressure and Votator power loads to critical temperature. G. A. C.

Special Hydrocarbon Products.

145. Crystallography of Waxes 3 (3) Photomicrographs. L. Ivanovszky and J. H. Wredden. *Petroleum*, 1946, **9**, 241.—Four photomicrographs of crude Russian ozokerite, white Russian ozokerite, yellow Roumanian ozokerite and white ozokerite R.K. respectively. K. C. G. K.

146. Solubilization of Insoluble Organic Liquids by Detergents. J. W. McBain and P. H. Richards. *Industr. Engng Chem.*, 1946, **38**, 642–646.—Solubilization is attributed to incorporation of the insoluble substance within and upon the colloidal particles or micelles of the soap or detergent. This paper presents a first attempt at a systematic investigation of the characteristics of an insoluble organic substance that determine the extent to which it is solubilized. A number of cation-active and anion-active detergents have been used with a series of aliphatic and aromatic hydrocarbons, in addition to a number of polar compounds. Substances of very low molecular weight are freely solubilized, but the extent of solubilization falls off rapidly with increase in molecular weight or molar volume. Polar compounds are more readily solubilized than hydrocarbons. Although in general the various detergents show parallel behaviour, differing only in degree of solubilizing power, and the cation-active detergents are generally better solubilizers than the anion-active detergents, there are numerous specificities and influences of structure, both of the detergent and of the material being solubilized. Soaps and detergents that have in common the twelve-carbon paraffin chain differ greatly in solubilizing power, each favouring particular classes of chemical substances. A. W.

Derived Chemical Products.

147. Rust Preventive Oils. G. D. Pilz and F. F. Farley. *Industr. Engng Chem.*, 1946, **38**, 601–609.—Rust-preventive oils, composed of polar organic compounds in mineral oils, have been employed extensively in film applications for the temporary protection against rusting, of iron and steel parts during manufacturing operations, storage, shipment, and use. The condensation of moisture in droplets on such oil-coated steel parts produces a dynamic system composed of water, oil film, and metal. A study of the contact angles formed by such a system where a drop of water rests on a horizontal oil-coated steel panel has established a relationship between contact angles and rust-preventive ability. A mathematical analysis of the forces involved in the spreading of a water drop on a rust-preventive oil film has shown that the equilibrium surface tensions of the water and oil, and their interfacial tension, are the major factors determining the magnitude of the contact angle. These findings are in agreement with the theory of rust prevention which postulates orientation of the polar organic additive at the oil-metal interface and establishment thereby of a barrier to normal mode of entry of the rusting agents—oxygen and water.

Contact angles were measured by a microscope fitted with a goniometer eyepiece; they have been employed in determining that solubility in water is of prime importance among the physical properties of rust-preventive additives, and have found application in controlling plant production of rust-preventive oils. A. W.

148. Colloidal Carbon. W. H. Cadman. *T. Roy. Soc. Arts*, 1946, **94**, 464.—See Abstract No. 1449 (1946).

Miscellaneous Products.

149. Furniture Polishes. M. A. Lesser. *Soap*, 1946, **22** (10), 130.—Twenty-four formulæ for various furniture polishes are given.

Furniture polishes are provided as liquids or pastes, the liquid products being broadly classified as oil and emulsion polishes, and the pastes as wax-solvent mixtures and wax emulsions.

Carnauba, bees, bleached montan ceresin, and paraffin waxes are often incorporated into polishes. Straight oil polishes, consisting mainly of mineral oil, are easiest to produce. Oils are sometimes blended, and various combinations of oils and solvents are used. Paste-type furniture polishes, although not produced in such volume, require more labour in application, but give good durable finishes.

They consist essentially of waxes thinned or pasted with solvents such as turpentine and petroleum naphtha. G. A. C.

Engines and Automotive Equipment.

150. Note on the Use of Ceramics in Gas Turbine Design. S. W. G. Foster. *J. R. aero. Soc.*, 1946, **50**, 893.—Reviews the developments in Germany during the war of the use of ceramic materials in turbine design. The Siemens turbine running at 30,000 r.p.m. had a diameter of approximately 31 in with blading of sintered alumina. The high temperature strength of this material is impressive and comparisons with silicon carbide, Ardostan (Kaolin and soapstone), Calit (soapstone), and Steatite are made. Porcelains and glasses suffer from poor thermal shock resistance. A brief description is given of Dr Schmidt's method of cooling rotor blades.

The original references are : C.I.O.S. file No. 30, 66 and C.I.O.S. File No. 31, 22.
I. G. B.

151. On the Steady Flow of a Gas Through a Tube with Heat Exchange or Chemical Reaction. P. Chambre and Chia-Chiao Lin. *J. Aero. Sci.*, 1946, **13**, 537.—This paper is concerned with a simple discussion of gaseous combustion through a tube and related phenomena involving hydrodynamic, thermodynamic, and chemical considerations. It is also indicated how the discussion can be conveniently developed into a treatment from the point of view of microscopic chemical kinetics. Indeed, some interesting results are already obtained without such an extension. For instance, when there is no chemical reaction, it is found that for the range of Mach Numbers of flow $1/\sqrt{r} < M < 1$ in the subsonic region, the temperature of the gas is actually decreasing while external heat is being added. It is also shown that by continuous heating both subsonic flows and supersonic flows will eventually approach the sonic state. When the system undergoes chemical or physiochemical transformations, the situation is much more complicated. In extreme cases, it is possible that the temperature of the mixture decreases continuously for all Mach Numbers while heat is being evolved by the transformation. The results apply successfully to the phenomenon of detonation. A general discussion of the propagation of flame front in a tube is then made, both in the region of slow burning and in the region of detonation.
I. G. B.

152. The History of the Opposed Piston Marine Oil Engine. W. Kerr Wilson. *Trans. Inst. mar. Engrs.*, 1946, **58**, 172.—A survey of the opposed piston engine development since 1874 indicates that most features of opposed piston mechanisms were disclosed in the years preceding 1900.

In this article, the author describes, in some detail, patents taken out on opposed piston engine design from 1874 onwards. Some of the principal difficulties encountered and overcome are discussed and reference is made to several ingenious designs produced after 1900, including double acting, swash plate and free piston arrangements. J. N.

153. The 2000 H.P. Hercules. Anon. *Aeroplane*, 1946, **71**, 542.—Latest variant of the Bristol sleeve-valve radial engines is the Hercules 230 and its civil counterpart, the Hercules 730. Strengthening of certain components has enabled the output to enter the 2000–2500 h.p. range, the engine showing an increase in maximum power of 310 h.p. over the previous series on 100/130 grade fuel without methanol/water injection. With higher-grade fuels a target of 2500 h.p. has been set for further development work. Leading particulars are as follows :—

Dimensions : Diameter over cylinders, 52 in ; length overall 69·5 in.

Weights : Bare (dry), 2,060 lb ; baffles and exhaust, less tail pipe, 177 lb.

Performance : Maximum power for take-off, 2000 h.p. at 2800 r.p.m. + 12 lb/sq. in boost at sea-level: maximum emergency power, 2055 h.p. at 2800 r.p.m. + 12 lb./sq. in boost at 3500 ft; maximum continuous rich mixture cruising power 1605 h.p. at 2400 r.p.m. + 8 lb/sq. in boost at 4750 ft. Maximum continuous weak mixture cruising power is 1305 h.p. at 2400 r.p.m. + 3·5 lb/sq. in boost at 11,500 ft. Fuel consumption at 1305 h.p. and 2400 r.p.m. is 0·428 lb/h.p./hr or at 760 h.p. and 1400 r.p.m. it is 0·411; average oil consumption is 1·0 gal/hr and 0·35 gal/hr respectively.
I. G. B.

154. A New British Engine in Paris. Anon. *Aeroplane*, 1946, **71,** 557.—A new 5·3 litre flat six engine, designed and built by Roy Fedden, Ltd., is being exhibited for the first time at Paris. Designed for thin wings, it can be accommodated entirely inside a 14 in thick wing. Use is made of sleeve valves of nickel-manganese-chromium alloy high expansion steel. The engine uses direct fuel injection equipment metering the fuel direct to the inlet ports. Leading particulars given are :—

Bore 4·3 in : stroke 3·75 in ; compression ratio 8 : 1 using 90 octane fuel.

Dimensions : width, 31·7 in (excluding baffles); length (without starter), 30·25 in ; height, 12·25 in (plus a small blister over the fuel injection pump of 2·5 in).

Weight : 310 lb without starter, generator, reduction gear, baffles, or exhaust system.

Performance : ungeared, 160 h.p. for take-off at 2750 r.p.m. ; cruising, 123 h.p. at 2500 r.p.m. ; geared, 185 h.p. for take-off at 3400 r.p.m. ; cruising, 150 h.p. at 3150 r.p.m. ; fuel consumption, ungeared, 0·46 lb/b.h.p./hr geared 0·47 lb/b.p.h./hr.
I. G. B.

155. Aircraft in the Paris Show. Anon. *Aeroplane*, 1946, **71,** 614.—Four countries show aircraft of various sorts including aeroplanes, helicopters, and gliders.

Britain : Products by A.W.A., Avro, Bristol, Gloster, Fairey, Handley Page, Hawker, Miles, Percival, Saro, Short, Vickers.

France : Products by Aerocentre, Arsenal, Bloch, Breguet, Guerchais, Holste, Morane-Saulnier, S.N.C.A.N. (Nord), Sud-Est (S.E.), S.E.C.A.N., S.I.P.A., S.N.C.A.S.O.

Czechoslovakia : Products by Avia, Sokol, Zlin, Praga. I. G. B.

156. The Supermarine Spitfire Trainer Mk. VIII. Anon. *Aeroplane*, 1946, **71,** 632.—A cutaway drawing by J. H. Clark of this aeroplane shows the installation of the 1315 h.p. Rolls-Royce Merlin 66 engine. Cockpit layout details are also given. I. G. B.

157. Aircraft Industry Review. *Aeroplane*, 15.11.46, **71** (1851), Special supplement.—This supplement to " The Aeroplane " gives valuable information on current products of the British aircraft industry. Details are given under the following headings.

Civil Aircraft : Type, accommodation, power-plant, dimensions, weights and performances of the following aircraft :—Bristol, Type 167, Mk. I, Saro SR/45, Avro Lancastrian, Avro Tudor I and II, Avro York, Handley-Page Halton, Short Sandringham, Short Shetland, Short Solent.

Naval Aircraft : Blackburn Firebrand V, De Havilland Sea Hornet XX, Fairey Firefly IV and Spearfish I, Hawker Sea Fury X, Short Sturgeon I, Vickers-Armstrong Supermarine, Seafire 47, and Seafang 32.

Jet Propelled Aircraft : De Havilland Vampire I, Gloster Meteor IV, Vickers Supermarine E10/44, De Havilland DH 108.

Military Aircraft : Hawker Tempest VI, De Havilland Mosquito 34, Westland Welkin IIA, Bristol Brigand I.

Trainer Aircraft : Percival Prentice I, Fairey Firefly Trainer I, Vickers-Armstrong Supermarine Spitfire Trainer VIII, Reid and Sigrist Desford I.

Personal Aircraft : Auster Autocrat and Arrow, Miles Messenger, Percival Proctor V, Miles Gemini.

Feeder Transport : Airspeed Consul, Bristol Wayfarer, De Havilland Dove, Miles Aerovan and Marathon, Avro XIX, Vickers-Armstrongs Viking IB.

Heavy Military Aircraft : Avro Lincoln II, Handley Page Hastings.

Jet Engines : Armstrong Siddeley Mamba and Python, De Havilland Goblin II and Ghost, Rolls-Royce Derwent V and Nene, Bristol Theseus I, Metropolitan-Vickers F.2/4A.

Reciprocating Engines—Aircooled : Alvis Leonides, Armstrong Siddeley Cheetah 25, Blackburn Cirrus Major III & Minor II, Bristol Hercules and Centaurus 57, De Havilland Gipsy Major X, Major 51, and Gipsy Queen 71.

Reciprocating Engines Liquid-Cooled : Napier Sabre VII, Rolls Royce Merlin 620 and Griffon 74. I. G. B.

158. Leonides Air Tests. Anon. *Flight*, 1946, **50**, 491.—Alvis, Ltd., have just started small-scale production of the latest Leonides following successful completion of the full military type-test and more than 50 hours test flying with 2 units installed in an Airspeed Oxford. The Leonides is a 9-cyl radial, giving a max. output of 515 h.p. at 4000 ft and having an international rating of 425 h.p. at 9000 ft. Overall dia. is 42 in and max. power/weight ratio 1·44 lb/b.h.p. The weak-mixture fuel consumption is 0·49 pt/b.h.p./hr. I. G. B.

159. Principal Data of British Power Units. Anon. *Flight*, 1946, **50**, 567.—*Piston Engines :* Under the headings : Maker's Name and Engine type ; No. and Arrangement of Cylinders ; Cooling ; Bore × Stroke (in) ; Capacity, litres ; Reduction Gear Ratio ; Max. Power Rating (b.h.p., r.p.m., Boost lb/sq. in, ht (ft) ; Recommended Economical Cruising Power (b.h.p., r.p.m., Boost lb/sq. in, ht (ft)) ; Take-Off Power ; Fuel Consumption R.E.C.P. G.P.H. ; Dry Weight (lb) and Notes ; details are given of the engines produced by Alvis, Armstrong Siddeley, Blackburn, Bristol, De Havilland, Fedden, Monaco, Napier, Rolls-Royce.

Gas Turbine Power Units : Under the headings : Maker's Name and Engine Type ; Type of Compressor ; No. of Combustion Chambers ; Max. Power Rating (Sea Level Static) (Thrust lb, Shaft h.p., r.p.m.) ; Recommended Economical Cruising Power (R.E.C.P.) (Thrust lb, Shaft h.p. r.p.m., Speed (m.p.h.) and Ht.) ; Fuel Consumption (R.E.C.P.) G.P.H. ; Diam. and Length in ; Dry Weight lb ; and Notes ; details are given of the engines produced by Armstrong Siddeley, Bristol, de Havilland, Metropolitan-Vickers, and Rolls-Royce. I. G. B.

160. Engines at the Paris Show. Anon. *Flight*, 1946, **50**, 569.—A review is given of the products shown. Especially interesting is the diagrammatic section of the Rateau A.65 turbo-jet which has 4 low-pressure and 12 high-pressure stages of compression. The 9 combustion chambers are grouped round the compressor casing and are of the reverse-flow type feeding rearwards into the 2-stage turbine. A portion of the air from the low-pressure stages of compression is by-passed to the tail pipe at a point level with the cone behind the turbine. Here extra fuel can be injected to give after-burning. I. G. B.

161. Britain's Power Units. Anon. *Flight*, 1946, **50**, 567.—Cutaway sketches and photographs of the following engines are given :—*De Havilland :* Goblin II, Ghost and Gipsy Queen 71, and Gipsy Major 31.

Metrovick : F/9.
Rolls-Royce : Derwent, Griffon and Nene.
Armstrong Siddeley : Cheetah, Mamba, and Python.
Bristol : Centaurus and Theseus.
Alvis : Leonides.
Napier : Sabre.
Blackburn : Cirrus Minor, Series II, and Cirrus Major, Series III. I. G. B.

Miscellaneous.

162. " Germany under Control " Exhibition. 1. Petroleum Production and Refineries in Germany. Anon. *Petroleum*, 1946, **9**, 228.—Diagrams, tables, and maps are given illustrating the products and monthly output from German oilfields and refineries (Oct. 1945–June 1946) in the British occupation zone. K. C. G. K.

163. Bolivia will Develop her Petroleum Industry to Advantage. Anon. *Ind. Min.* (*Argentina*), 1946, **6** (60), 33–35.—Known reserves at Camiri are about 20 million brl. It has been decided to concentrate most new drilling in this area and to construct a pipeline from Camiri to Cochabamba (about 250 miles) at a cost of 5 million dollars. Cochabamba being favourably located for water supply and as a distributing centre, it will become the home of a complete refinery, designed by Foster Wheeler Corp., and costing 7 million dollars, which will make from Bolivian crude all the petroleum products needed in the country. A. C.

164. Post-War Research Forges Ahead. Anon. *Chem. Ind.*, 1946, **49,** 259–267.—The achievements of the U.S. industrial chemical research during the past two years are recorded in seven articles by experts, who discuss and evaluate the developments from their particular aspect.

The branches of industry covered are those of inorganics, synthetic organics, coal-tar products, Naval stores, pharmaceuticals, plastic materials and polymers, and dyestuffs.

Another aspect of the chemical field is surveyed under the title " Chemical Specialities Open New Markets " (pp. 269–277). Precise definition of what is and what is not a chemical speciality is difficult. It is classified rather arbitrarily as " any standard chemical product which has been elaborated on in any way before sale." Outlines of recent trends and developments in this field are contributed by authorities, in their special spheres, in fourteen articles in which 160 new chemical specialities are quoted. The sections cover the following uses—household disinfectants, household cleaners, polishes, air deodorants, insecticides, rubber chemicals, leather chemicals, industrial adhesives, industrial cleaners, industrial disinfectants, agricultural chemicals, pulp and paper chemicals, textile chemicals, and protective organic coatings. The foregoing two aspects of post-war research includes some 400 new chemicals and chemical specialities. W. H. C.

165. Liquid Methane as a Motor Fuel. 3 Fuel Performance. R. M. Bridgwater. *Petroleum*, 1946, **9,** 227.—An outline of various road trials carried out with liquid methane as fuel between 1939 and 1944 is given, and difficulties of tanking with liquid methane are mentioned. The thermal capacity of the filling pipe and connections must be kept as low as possible. The vehicle tank should not be allowed to get completely empty, since otherwise liquid is evaporated in cooling it down from air temperature. The design of storage tanks is also discussed. As regards safety, although methane is much more volatile than petrol the explosive mixture limits in air are quite different from petrol (5·3–14·9% methane, 1·5–5·5% petrol) and methane cannot be ignited by a heat source below 700° C while petrol vapour may ignite at 200–300° C. The methane flame is readily blown out and a considerable fire can be extinguished by carbon dioxide. K. C. G. K.

166. Mixed Metal Organic Salts. Anon. *Paint Tech.*, 1946, **11,** 286.—B.P. No. 549,332, granted to Nuodex Products Incorp., New Jersey, U.S.A., relates to the manufacture of complex salts of organic acids, *e.g.*, naphthenates, resinates, linoleates, benzoates, etc., comprising a water-soluble constituent containing a metallic radical from the group, sodium, potassium, lithium, and ammonium, and a water-insoluble constituent containing a metal from the group, cobalt, manganese, lead, zinc, iron or copper. Such materials are soluble in paint and varnish vehicles, and are useful as driers and wetting and dispersing agents, etc., for paint varnish and lacquer manufacture. A colour-intensifying agent is also specified.

The components, quantities, and conditions of preparing such materials are given for the following :—Lead sodium naphthenate, which in mineral spirits is soluble in raw linseed oil, varnishes, etc., and remains clear for long periods. Zinc potassium naphthenate has wetting and dispersing properties when used in paints and enamels. Calcium sodium naphthenate is a satisfactory dispersing agent for pigments in similar manufactures. Zinc sodium naphthenate is stated to be more satisfactory than either napthenate alone for softening rubber compositions. A complex material made from naphthenic acid, ammonium acetate, lithium carbonate, barium hydroxide, with or without hydrogen peroxide, when treated with " ink mineral oil " as described, is stated to save 75% of the expensive blue toner used in ink manufacture. W. H. C.

167. Agents, Basic Causes, Control and Prevention of Corrosion. F. A. Prange. *Oil Gas J.*, 7.9.46, **45** (18), 90.—The elements and compounds that bring about corrosion of metal surfaces are described. The two main types of corrosion that occur are: (1) That due to direct chemical action, *e.g.*, scaling of steel at elevated temperatures, or the action of acids on pure metals; and (2) more importantly, that due to electrolytic action, *e.g.*, the action of acids on commercial metals, rusting, bimetallic corrosion, and pitting of metals.

Corrosion by pitting is particularly serious and may occur in two ways: (*a*) through high-velocity flow of liquids (cavitation, termed corrosion-erosion), is described; (*b*) that due to electrolytic action, which is discussed from the aspects of four kinds of cells, (1) the simple galvanic cell, (2) the metal ion cell, (3) the oxygen concentration cell, and (4) the stray-current cell.

The principles of the cells 1, 2, and 3 are shown in diagrams indicating the reactions involved. The effects of temperature and of concentration are outlined, and the effect of materials that accelerate corrosion, *e.g.*, the action of sodium chloride and the use of materials which act as inhibitors to corrosion, are discussed. This paper will be concluded in a later issue of the journal. W. H. C.

168. Application of Dust-Laying Oil to Fabrics. C. H. Bailey, A. S. Weatherburn, and G. F. R. Rose. *Canad. Chem. and Process Industries*, Sept. 1946, **30** (9), 43.—During bed-making a considerable amount of bacteria containing dust is disseminated into the air and it is believed may cause infection of nearby patients in hospitals. An effective means of preventing such contamination of the air has been found; it consists of impregnating the bed-clothes with 3–7% of liquid paraffin oil, and affords a 95% reduction of the number of bacteria scattered into the air. Experiments were conducted on wool and cotton treated with emulsions by the method developed by Harwood, Powney, and Edwards. For wool, a dilute oil-in-water emulsion is used which is stabilized with a cation-active emulsifying agent; this imparts a positive charge to the oil drops of the emulsion. Wet wool has a negative charge, so that when contacted with the emulsion the oil drops are deposited by electrostatic attraction. The emulsifier used is Triton-K-60, and the oil is a technical white oil. Cotton oiling can be accomplished by the mutual coagulation of two oppositely charged oil-in-water emulsions. The negatively charged emulsion is made by using Igepon T; the positively charged emulsion is similar to the one described. Two types of dual emulsions are described, as to oil content, and ratio of emulsifier used, both types being adjusted so that each of the emulsions would contain equivalent amounts of positive and negative charges. The chemistry of the process is discussed, the tests carried out on the emulslons, and their composition are given. The practical application of the process in pilot and commercial plant trials are described. The degree of oiling can be accurately controlled, and the fabrics can be treated after laundering with the normal laundry equipment. The costs of materials, exclusive of normal laundering costs, for wool and cotton is approximately 60 cents and 65 cents per 100 lb respectively. W. H. C.

BOOKS RECEIVED.

An Introduction to the Principles of Physical Chemistry. O. Maass and E. W. R. Steacie. Pp. 395 + ix. New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd.: 2nd edn. 1939, reprinted 1946.

In this revised edition new chapters have been added on atomic structure, the phase rule, and colloidal systems. Other chapters have been rewritten or extended to bring the matter up-to-date.

Manual on Hot-Mix Asphaltic Concrete. Pp. 112. New York: The Asphalt Institute, 1945.

This manual contains two specifications for asphaltic concrete—" dense graded aggregate " type " and " graded aggregate type "—the fundamental difference being in the manner of specifying aggregate gradation and the relative emphasis placed on density of the compacted mixture. Sections on recommended thickness requirements and on inspection are included.

Journal of The National Lubricating Oil and Grease Federation. Vol. I, No. 1, Oct. 1946.

This new quarterly publication is mainly devoted to the affairs of the Federation and matters concerning the lubricating oil trade. It also includes an article on "Post-War Oil Supplies," by Harold Moore.

British Lubricating Oil and Grease Research Association, Publications and Information Panel Journal. Vol. I, No. 1, Sept. 1946.

This publication is the first of a series to be published by the recently formed British Lubricating Oil and Grease Research Association, and will appear quarterly. This number contains articles on "Anti-Wear and Anti-Corrosion Additives," by R. J. S. Perry, and on "Lubricants and the Nation," by J. E. Southcombe, together with abstracts of literature on lubricants and lubrication.

Recommendations for Open-Textured Asphalt Carpets. D.S.I.R. Road Research Bulletin No. 5. Pp. 6 + iii. London: H.M. Stationery Office, 1946. 3*d*.

First published in 1941 as Wartime Road Note No. 3, only minor alterations have been made to the original text, which relates to carpets containing asphaltic bitumen binders.

Asphalts and Allied Substances. Herbert Abraham. 2 Vols. 5th Edn. New York: D. Van Nostrand Co., 1945. Pp. 2142 + xviii + viii.

This fifth edition of Herbert Abraham's well-known book has been revised and brought up-to-date in respect of technological developments, methods of testing, bibliography, and references. The bibliography embraces more than 1300 treatises and the references total over 20,000, including about 12,000 U.S. and other patents. Indexes of "Specifications," "Names" and "Patents" are useful additions.

Important Facts About Texas Oil and Gas. Dallas, Texas: The Texas Mid-Continent Oil & Gas Association, 1946. Pp. 43.

A complete and comprehensive compilation of information on the petroleum and natural gas industry of Texas.

The Centenary of the Technical University of Lwow, 1844–1944. 1946. Pp. 103.

A historical account of the work of the Technical University of Lwow, including a chapter on the part played by Graduates of the University in the petroleum and chemical industries.

Reports on Fuel Economy since 1939. London: World Power Conference, 1946.

Further reports in series prepared for the Fuel Economy Conference at the Hague, Sept. 2–10, 1947, are:

British Report. Pp. 52. 1*s*. 6*d*. Covers the history of the Ministry of Fuel & Power's Fuel Efficiency Campaign during the war years, and includes a 6-page bibliography.
Swedish Report. Pp. 20. 1*s*. Includes a section on liquid and gaseous fuels.
Danish Report. Pp. 6. 6*d*.
Netherlands Report. Pp. 5. 6*d*.

A Classified List of Industrialists' Reports on Germany.

The 973 reports by the teams of British and Allied experts who have visited Germany are listed under subject headings. The list includes all reports issued up to July 27, 1946, and covers 510 C.I.O.S. (Combined Intelligence Objectives Sub-Committee) reports, 347 B.I.O.S. (British Intelligence Objectives Sub-Committee), 108 F.I.A.T. (Field Information Agency, Technical), and 8 J.I.O.A. (Joint Intelligence Objectives Agency).

Petroleum Facilities of Germany. Prepared by the Enemy Oil Committee for the Fuels and Lubricants Division, Office of the Quartermaster General. March 1945. Pp. 372.

This report describes briefly all of the significant aspects of the petroleum economy of Germany and of the more important petroleum installations in that country.

The Dispersal of Fog from Airfield Runways. E. C. Walker and D. A. Fox. 1946. Pp. 321.

A record of the work of the Petroleum Warfare Department in relation to fog dispersal.

History of Development of Hades and Rapex Burners. W. T. Moore. 1945. Pp. 31 + diagrams and charts.

An account of the development of the Hades and Rapex Burners in connexion with fog dispersal investigations.

Additive Engine Oils. Los Angeles, Cal. : Petroleum Educational Institute, 1945. Pp. 150. $3.75.

This work is an " effort to contribute further to the elementary material already published on the subject of petroleum and its products " by means of simple diagrams and explanatory text. It is particularly related to motor lubricants and lubrication " for the benefit of maintenance personnel at service stations, car and truck dealers, repair shops, and flat operators."

The Future of Industrial Research. New York : Standard Oil Development Co., 1945. Pp. 173 + viii.

In October 1944 the Standard Oil Development Co. made its Silver Anniversary a Forum on the Future of Industrial Research, and this book presents the papers and discussion. For Part I the theme is " What should be the guiding principles and objectives for the commercial programmes of industrial research and development organizations ? "; for Part II, " How can small business serve itself and be served by industrial research and development ? "; and for Part III, " What place should industrial research and development organizations allocate to future work directly primarily toward national security ? "

Oil in Your Future. Oklahoma City : Interstate Oil Compact Commission, 1946. Pp. 28.

This booklet was prepared by the Interstate Air Compact Commission in order that " the public may become better informed about and more sympathetic to the perplexing problems encountered in the conservation of oil and gas."

New British Standards. The following have recently been issued by the British Standards Institution :

B.S. 1321 : 1946. Synthetic-Resin Bonded-Paper Sheet (Thermosetting) for use in the Building Industry. 2*s*. post free.

B.S. 1328 : 1946. Methods of Sampling Water used in Steam Generation. 3*s*. 6*d*. post free.

B.S. 1333 : 1946. Acid Resisting Silicon Iron Pipes and Pipe Fittings (Elbows, bends, tees, crosses). 2*s*. post free.

P.D. 539. Recommendations for Phosphate Coatings as a Basis for Painting Steel. 1*s*. post free.

TECHNICAL MISSIONS TO GERMANY.

The following reports have been received in addition to those listed in the *Journal* 1945, on pp. 226A–230A, 316A–318A, 408A–410A :

B.I.O.S. Reports.

42.* Reports on W.I.F.O. Oil Storage Depots located at Eickeloh, Ruthen, and Nieuberg, with particular reference to drum and can filling. Pp. 14.

123. Visits to Miscellaneous Aeronautical Establishments in the British Zone. Pp. 15.

537 (Appendix). Production Control in the Heinkel Aircraft Organization. Pp. 51.

538. Report on German Patent Records. Pp. 16.

620. The German Motor-cycle Industry. Pp. 179.

663. Manufacture of Synthetic Resins by I.G. Farbenindustrie, Ludwigshafen. Pp. 5.

664. I.G. Farbenindustrie, Leverhausen : Salicyclic Acid, Sodium Salicylate, Synthetic Phenol. Pp. 10.

666.* I.G. Farbenindustrie, Uerdingen : Manufacture of Phthalic Anhydride, Benzoic Acid, etc. Pp. 7.

667. I.G. Farbenindustrie, Mainkur. Pp. 5.
686. Ethylene Oxide by Direct Oxidation of Ethylene at Zweckel, I.G. Farbenindustrie. Pp. 4.
697.* Fire Protection of Oil Installations in Germany. Pp. 44.
704.* Mechanical Foam Liquid and Equipment. Pp. 13.
709. Production of Tetranitromethane and Nitroform at I.G. Farbenindustrie, Hochst-am-Main. Pp. 13.
710. Manufacture of Biolase (starch-hydrolysing enzyme) at Kalle & Co. (I.G. Farben. A.G.), Wiesbaden, Biebrich. Pp. 5.
719. Interview with Prof. Otto Bayer (formerly Head of Scientific Laboratories, I.G. Farben., Leverkusen). Pp. 6.
732.* Lüneburger Wachswerke A.G., Lüneberg: Waxes. Pp. 15.
736. Chemical Laboratory Instrumentation in Germany. Pp. 28.
740. C. F. Boehringer und Soehne, Mannheim-Waldhof: Commercial Organic Solvent Production. Pp. 7.
741. Zellitafffabrik A.G., Mannheim. Pp. 7.
742. Preparation and Polymerization of Vinyl Ethers and Preparation of Acetaldehyde from Methyl Vinyl Ether at I.G. Farbenindustrie, Ludwigshafen. Pp. 10.
743. Manufacture of Cyclohexanol, Cyclohexanone, Cycleketone Resins at I.G., Ludwigshafen. Pp. 11.
748.* Manufacture of Fatty Acids by Oxidation of Paraffins; Hydrogenation of the Fatty Acids at I.G., Ludwigshafen-Oppau. Pp. 15.
749. Pilot Plant at I.G. Höchst on the Manufacture of Diketene from Acetic Acid. Pp. 3.
750. Manufacture of Monomeric Styrene at I.G. Ludwigshafen. Pp. 9.
751. Pilot Plant Manufacture of Vinylacetylene at I.G. Höchst. Pp. 4.
757. Manufacture of Ethylene Cyanhydrin at I.G. Ludwigshafen. Pp. 3.
764. Production of Aluminium Compounds in Germany. Pp. 38.
766. Manufacture of Pharmaceuticals and Fine Chemicals in the U.S. and French Zones of Germany. Pp. 329.
768. The German Automobile Industry. Pp. 74.
805.* Aspects of the Synthetic Fatty Acid and Synthetic Fat Industry in Germany. Pp. 99.
835.* Benzole Refinery, Amalia, Bochum. Pp. 2.
837. Design, Construction, and Production of High Speed Centrifuges. Pp. 14.
877.* Oxidation of Hydrocarbons to Ethylene and of Methane to Acetylene, with Conversion of Acetylene to Acetone, I.G., Oppau. Pp. 7.

F.I.A.T. Reports.

92. German Processing of Fats, Oils, and Oilseeds. Pp. 125.
299.* Supplemental Report on the Ruhrol Hydrogenation Plant, Welheim, Ruhr. Pp. 5.
499. Production of Wood Sugar in Germany and Its Conversion to Yeast and Alcohol. Pp. 117.
525. Poppet Valves for Automotive and Aircraft Engines. Pp. 19.
564. Boilers, Forced Draft Blowers, Steam Piping and Evaporators Used in the German Mercantile Marine. Pp. 25.
581. Beier Infinitely Variable Speed Friction Drive Transmission. Pp. 18.
600. Air Filters and Oil Filters for Engines. Pp. 12.
713. Cellulose Acetate Manufacture at Schering A.G., Berlin. Pp. 13.
721. Agfacolour Negative-positive Method for Professional Motion Pictures. Pp. 32.
873. Self-ignition of Mixtures of Hydrocarbons and Air Subjected to Very Sudden Adiabatic Compression. Pp. 10.
857. Production of Acetic Acid at Burghausen and Knapsack; Concurrent Production of Acetic Acid and Acetic Anhydride at Knapsack. Pp. 24.

J.I.O.A. Reports.

34. German Chemical Fire Extinguishers. Pp. 108.
64. Instructions for Preparation of the Dyestuffs Filterblaugrun Spietloslich and Filterblaugrun Wasserloslich. Pp. 6.
66. Glossary of Some German Names for Chemical Products Used in the Paint, Varnish and Lacquer Industry. Pp. 13.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

JANUARY, 1947.

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

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

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

Applications for Membership.

ASHMAN, Stanley Ernest, Refinery Shift Supervisor, London & Thames Haven Oil Wharves, Ltd. (*E. G. Hannah; E. Hunting.*)

BUNING, Harm Leopold, Technical Adviser, Royal Dutch Shell Group, Hamburg. (*J. A. Oriel; J. S. Jackson.*)

COBLEY, Ronald Charles, Process Engineer, Manchester Oil Refinery Ltd. (*E. J. Dunstan; E. S. Sellers.*)

DODD, Alfred Herbert, Chief Chemist & Director of Research, Newton, Chambers & Co. Ltd. (*W. W. Goulston; J. S. Jackson.*)

DUGDALE-BRADLEY, John Oliver, Chief Engineer, Stanlow Refinery, " Shell " Refining & Marketing Co. Ltd. (*J. A. Oriel; E. LeQ. Herbert.*)

FOURET, Emile, Chief Chemist, Société des Pétroles Jupiter-Shell.

HECKMAN, Maxwell, Technical Representative, Wilson, Sons & Co. Ltd. at Rio de Janeiro. (*J. T. T. Robinson; B. G. Banks.*)

HINE, Edmund, Chartered Accountant, Petrocarbon Ltd. and Manchester Oil Refinery Ltd. Group. (*E. J. Dunstan; G. H. Harries.*)

HUTTON, Horatio W., Managing Director, Hydrol Chemical Co. Ltd. (*F. H. Rogers; P. H. Snow.*)

KURDI, Hamdi El, Lubricating Sales Co-ordinator, Standard Oil Co. of Egypt Ltd. (*M. A. Selim; J. E. Jenkin.*)

LAMBERT, Charles Edward, Chief Chemist, New South Wales Railways. (*R. E. Cowles.*)

LONGBOTTOM, Frank William, Process Engineer, Manchester Oil Refinery Ltd. (*T. G. Hunter; A. H. Nissan.*)

OEHL, Victor Gustave, Clerk, Petroleum Board. (*J. S. Jackson; T. C. R. Baker.*)

SUTTON, Robert Henry George, Director & Manager, Urquhart's (1926) Ltd. (*G. R. Llewellyn; R. J. Bressey.*)

TAYLOR, Frank Paul, Chemist, Petroleum Board. (*C. Chilvers; H. N. Harrap.*)

TULLIS, David High, Sales Chemist, Lobitos Oilfields Ltd. (*J. S. Parker; D. M. Glendinning.*)

TYLER, John Wyatt, Petroleum Inspector, Vacuum Oil Co. of South Africa Ltd. (*R. G. Pomeroy; I. H. Versfeld.*)

VISSER, Gerardus Hendricus, Deputy Director of Research, B.P.M. Laboratories, Amsterdam.

WAGNER, Reginald Arthur, Installation Superintendent, British Oil Storage Co. Ltd. (*R. St. A. Griffiths; E. Evans-Jones.*)

WRIGHT, Victor Barry, Chemist, Sternol Ltd. (*A. L. Read; C. H. Hudson.*)

WYLLIE, David, Senior Scientific Officer, Admiralty Chemical Dept (*D. Clayton; P. Kerr.*)

Candidates for Admission as Students.

(Proposed by V. C. Illing.)

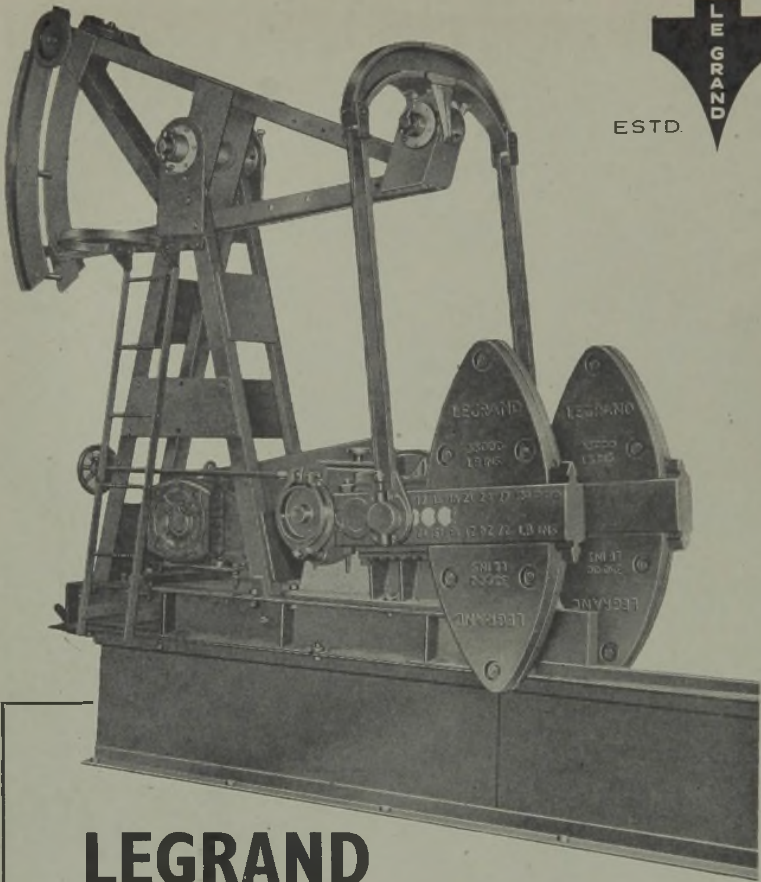
DOUGLAS, James Robert, Student, Royal School of Mines.
FOTHERGILL, Colin Arnold, ,, ,, ,, ,,
MARTIN, Richard Ernest, ,, ,, ,, ,,
OWENS, Ronald Ellis, ,, ,, ,, ,,
TAYLOR, Peter Walter, ,, ,, ,, ,,

Applications for Transfer.

BLACK, John Linton, Refinery Manager, Stanlow Refinery, "Shell" Refining & Marketing Co Ltd. (*J. A. Oriel; E. LeQ. Herbert.*) (Member to Fellow.)

BONSTOW, Thomas Lacey, Consulting Engineer, Whitehall Securities Corpn., Ltd. (*G. H. Coxon; A. E. Chambers.*) (Member to Fellow.)

SELLERS, Ernest Stanley, Refinery Superintendent, Manchester Oil Refinery Ltd. (*E. J. Dunstan; G. H. Harries.*) (Member to Fellow.)



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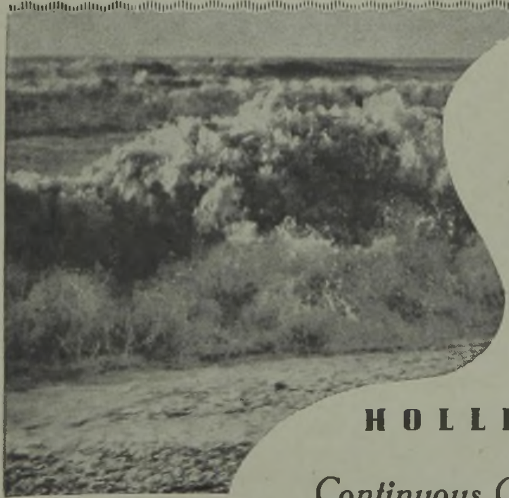

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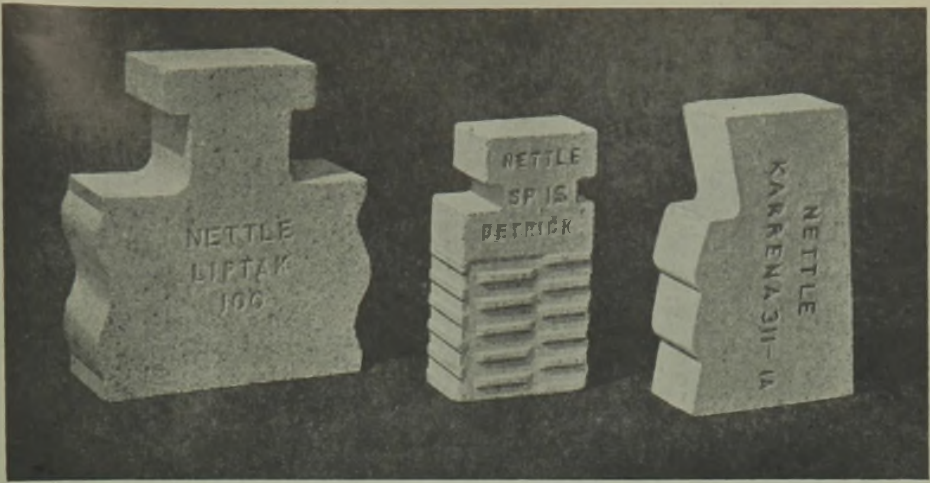

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STEIN SILLIMANITE (62% Al_2O_3) has outstanding resistance to spalling, hot-load strength and volume stability. Recommended for any parts where unusually severe conditions are experienced.

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MAKSICCAR PATCH is supplied in " ready to use " consistency. Will be found valuable for repairing damaged brickwork, etc.

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Standard crates 34" × 29" × 24" overall hold 100—9 × 4½ × 3" squares or 112—2½". Gross weight approximately 8¾ cwts. each.

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The following range offers a wide selection according to users requirements :—

NETTLE CEMENT (42% Al_2O_3) Refractory test Seger Cone 34 = 1750° C.
Contains a proportion of pre-calcined material which eliminates shrinkage in drying and in use.

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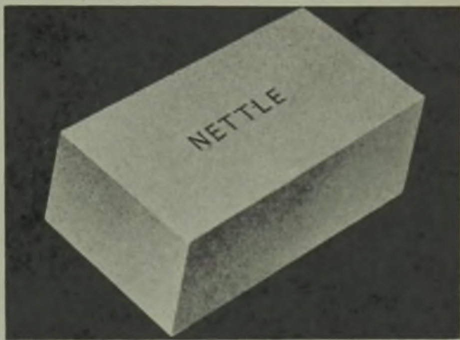
MAKSICCAR II DRY REFRACTORY CEMENT. Refractory test Seger Cone 31 = 1690° C. Moderate air-setting bond.

MAKSICCAR II PLASTIC REFRACTORY CEMENT. Refractory test Seger Cone 30 = 1670° C. Strong air-setting bond.

STEIN SILLIMANITE CEMENT has similar characteristics to Sillimanite brick. Also recommended as a wash-coating over brickwork to protect against corrosion.

Approximately 6 cwts of Refractory Cement per 1,000 9 × 4½ × 3" is required for jointing.



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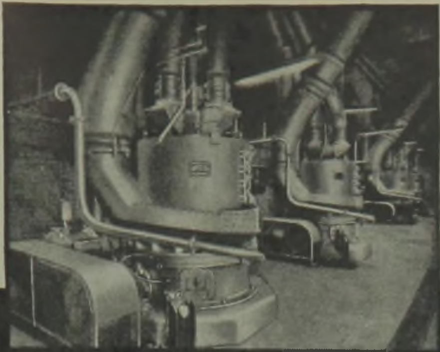

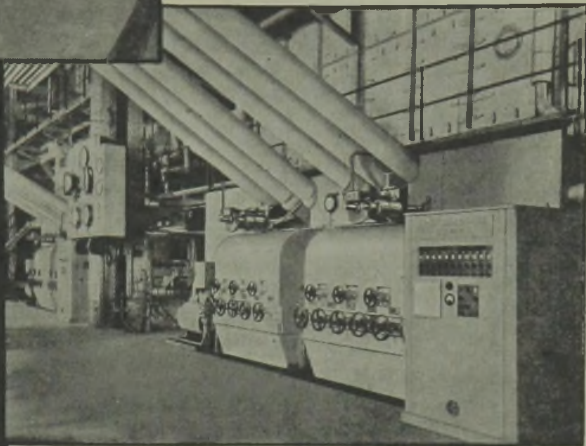

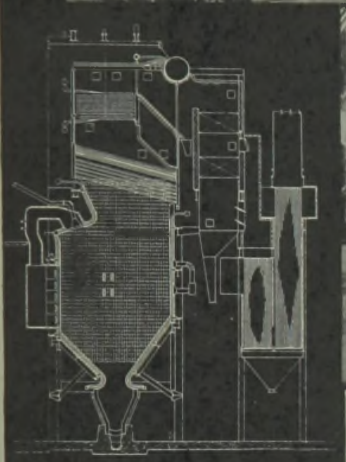

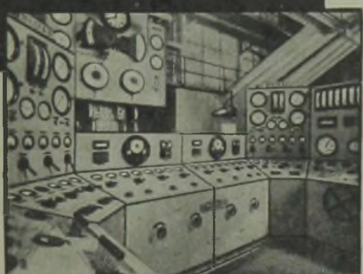

AT the North Tees "B" Power Station of the North-Eastern Electric Supply Company Ltd., there were recently installed two B. & W. High Head Boilers each for an evaporation of 180,000 lb. per hour at 475 lb. per sq. inch and 725° F.

The boilers are fired with pulverised fuel through vertical burners direct from Type "E" Mills and are equipped with Bailey Hopper Bottom Furnaces, Self-draining Superheaters, Flash welded Economisers and Tubular Air Heaters, the boiler drums being of fusion welded construction.

Messrs. Merz & McLellan acted as Consultants for the extensions at this Station.

THE ILLUSTRATIONS SHOW :—

TOP. A view of the B. & W. Type "E" Mills in the basement.

RIGHT.—A view in the firing aisle showing the burner controls and some of the automatic electrically operated soot blowers with the soot blower control panel.

LEFT.—A side sectional elevation through the boiler.

BOTTOM.—One of the boiler control panels.

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