ABSTRACTS.

AUTHOR INDEX.

The numbers refer to Abstract Numbers.

Oilfield Exploration and Exploitation.

Geology.

681. Exaggeration of Vertical Scale of Geologic Sections. H. H. Suter. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 318.—Many sections drawn in the study of petroleum geology are constructed with an exaggerated vertical scale. The author analyses the frequency of such exaggerations in the literature and points out the serious distortional effects which result. It is suggested that exaggerated sections should be replaced by true sections and when the depiction of areas of flat geology or large basins is undertaken, an accurate presentation can be made by coupling a true geologic section with a stratigraphic section. E. N. T.

682. Log Map, New Type of Sub-surface Map. T. H. Bower. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 340.—In 1938 A. L. Payne developed a sand-distribution map which was the prototype of the present log map. This is essentially a structure contour map, whereon the lithological variations are depicted by a series of electric or other logs.

As with all attempts to depict three dimensions on a two-dimensional surface, this type of sub-surface map has certain limitations. However, it has been found particularly useful as a method of analysis in sub-surface geology, particularly in an area such as Trinidad, where the complex structural and stratigraphical conditions could not be accurately defined by the older conventional types of map. E. N. T.

683. Palæozoic Seaways in Western Arizona. E. D. McKee. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 282.—A study has been made of gravels derived from rocks of various pre-Mesozoic periods and preserved as conglomerates in Cretaceous (?) strata in the New Water Mountains of Western Arizona. These gravels, having been little transported, furnish data regarding the former distribution of Palæozoic rocks in the region.

In the conglomerates, rocks of Cambrian, Devonian, Mississippian, Pennsylvanian (?), and Permian age have been recognized. The relationship of these rocks to strata of corresponding age in the formations of northern and southern Arizona is discussed.

Lithology and fossils of the gravels indicate that this part of west-central Arizona was covered by marine waters at various times from the Middle Cambrian to the Late Pennsylvanian. All these seaways are believed to have extended into the western Grand Canyon, and some may have connected with those of corresponding age in southern and southeastern Arizona. E. N. T.

684. Diastrophism During Historic Time in Gulf Coastal Plain. M. M. Sheets. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 201.—There are evidences of five kinds of diastrophic activity in the Gulf Costal Plain—earthquakes, fissuring and faulting, regional warping, local subsidence and uplift, and pseudo-diastrophic features.

Earthquakes, which have taken place fairly frequently in the past, are also to be expected in the future. There have been many reports of fissuring and faulting in recent years, of which the author has investigated a considerable number. A few items of warping are described. Local subsidence and uplift, frequent in the past, are taking place in some regions to-day—for instance, the Hoskins Mound salt dome appears to have risen ½ ft in 23 years.

The diastrophism in the Gulf Coast can be largely ascribed to the force of gravity, but it is also influenced by two important local features—inequalities in support and large variations in density. It is suggested that the resultant warping might be caused by waves in the earth's crust travelling at geologically slow speeds.

The Basin of the Gulf of Mexico is an area of active diastrophism. More attention and study should be devoted to the subject. There is much more evidence to be obtained and correlated, and the search can be facilitated by the use of aerial photography.

It is hoped that publicity on the subject will bring forth further evidence.

E. N. T.

685. Cambrian and Ordovician Rocks in Recent Wells in Southeastern Michigan. G. V. Cohee. *Bull. Amer. Ass. Petrol. Geol.*, 1947, 293.—In the Southern Peninsula of Michigan all the wells drilled to the pre-Cambrian lie within five counties in the southeastern area of the State, near the Ontario boundary.

The depth to the pre-Cambrian ranges from 3300 ft to 6400 ft. The thickness of the Middle Ordovician varies from 660 ft to 965 ft, and that of the Upper Ordovician from 585 ft to 750 ft.

Oil is produced from Middle Ordovician rocks in Kent County, Ontario, and in small areas of the Upper Trenton limestone in Lenawee, Monroe, and Wayne Counties, Michigan. There are Upper Cambrian rocks, of thickness varying from 1160 ft to 140 ft, resting on the pre-Cambrian in southeastern Michigan. The Cambrian, however, is missing in most of southwestern Ontario, where the Middle Ordovician directly overlies the pre-Cambrian.

There are showings of oil and gas in Upper Cambrian rocks of southeastern Michigan and southwestern Ontario.

E. N. T.

686. Rangely Field Geology and Development. B. M. Bench. *Oil Wkly*, 2.9.46, **123** (1), 18.—The Rangely structure was recognized before 1900. Seepages occur and in 1902 a well found a little oil in the Mancos shale at 750 ft and shows at 1700 ft. Some 350–400 wells have been drilled to the Mancos, but not many found significant production. The Mancos oil is in cracks and crevices. Large flows of gas were found in a few wells drilled to the Dakota sandstone. Oil saturation and gas shows have been noted in the Morrison. In 1933 the Raven 1 well found gas in the Dakota and Nugget, and oil in the Weber sand (Pennsylvanian). This well was shot, and after producing 8000 brl it was shut in until 1943.

The Rangely anticline is 20 ml long and 8 ml wide. It runs N. 70° W. Mancos shale is exposed on the crest. The closure exceeds 2100 ft. The northeast flank dips at 6°, and the southeast flank at 13–21°.

Sandstones occur in the top and bottom of the Mancos shale. The Dakota includes shales, sandstone, conglomerate, and some limestone, while the Morrison consists of shale, clay, limestone, and sandstone. The remaining Jurassic beds include limestone, sandstone, and shale. Some 820 ft of Triassic shale, sandstone, and gypsum is present, and 130 ft of Permian shale, sandstone, and limestone. The Weber sandstone is at the top of the Pennsylvanian. Oil-bearing sands occur in the upper part of the Weber.

The sub-surface structure appears to be gentler than the surface structure. Some faults are present. The Mancos shale oil occurrence is related to fracture zones, and the oil may be indigenous. The Weber oil is anticlinal. Only one well has found a substantial flow of oil in the Morrison. Some gas and oil have been found in the Trias.

Weber sand wells have potentials of 100–1000 brl/day. The G.O.R. is 250–300 cu ft/brl. 82 Weber sand wells have been drilled, their June average production being 26,000 brl/day. Over 2,000,000 brl of Mancos oil has been produced. Weber wells range $100,000–$250,000 and average $125,000 in cost. The oil-producing area is expected to exceed 25,000 acres, and ultimate recovery estimates range 5000–25,000 brl/acre. The best wells occur in the northern and northwestern areas. All the wells flow, but some require shooting first. The gas contains 11–27% of nitrogen. The average depth of Weber sand wells is 6300 ft.

Notes are given on drilling practice, land status, markets, and future developments. A map and cross-section are included.

G. D. H.

687. Marine Jurassic of Black Hills Area, South Dakota and Wyoming. R. W. Imlay. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 227.—The Marine Jurassic in the Black Hills area includes the Sundance and Gypsum Springs formations. The former represents the Callovian and Oxfordian stages of the Middle and Upper Jurassic, the latter the Upper Bajocian and Bathonian stages.

The Sundance formation is subdivided into five members, of which the upper is marked basally by an unconformity. These are described, from the lowest upwards, as the Canyon Springs sandstone member, the Stockade Beaver shale member, the Hulett sandstone member, the Lak member, and the Redwater shale member.

The Gypsum Spring formation, which is Middle Jurassic in age, and correlative with the Gypsum Spring and Sawtooth formations of Central Wyoming and Western Montana, represents the first widespread invasion and withdrawal of marine water during the Jurassic in the Western Interior region.

The Canyon Springs sandstone member and the Stockade Beaver shale member, which are of Upper Jurassic age, can be correlated with the Sundance and Rierdon formations of Central Wyoming and Montana. The Hulett sandstone member, which is correlative with the " Lower Sundance " formation in Central Wyoming, is probably also present in South Dakota and southeastern Montana, although it is not to be found in the outcrop in Montana. The Lak member, which consists of redbeds, appears not to be marine; it is correlative in part with the Entrada and Preuss sandstones to the west. It also has not been identified in Montana, but may be present in North Dakota. The Redwater shale member represents the last Jurassic marine invasion in the Western Interior region. Oxfordian in age, it is correlative with the Swift, Stump sandstone, Curtis, and " Upper Sundance " formations further west. E. N. T.

688. Modal Analyses of Well Cores from Basement Complex in West Texas. L. T. Patton. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 307.—The results of studies of cores from ten wells in ten different counties of West Texas are presented. The modes of the rocks are computed from Rosiwal mineralogical analyses, and an improved Wentworth recording micrometer graduated to read to 0·005 mm was employed in measuring the mineral grains.

Classifications are made according to the Johannsen quantitative minerological system. E. N. T.

689. Palæozoic Formations near Cody, Park County, Wyoming. T. F. Stipp. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 274.—Palæozoic strata ranging in age from Cambrian to Permian are exposed in Shoshone River Canyon, 5 ml west of Cody. These formations have been drilled in the Oregon Basin, and a study was made of the area as an aid in the administration of the Federal mineral-leasing laws.

The average thickness of the section measured is 3200 ft. Up to date no Silurian strata have been recognized.

A well recently drilled 17 ml southeast of Shoshone Canyon penetrated a Palæozoic section approximately 3000 ft thick. The well cores and bit cuttings on examination showed the well section to be similar to the surface section. There are indications that the well section thins slightly southeastward from the mountains. A chart showing the correlation of the two sections is attached to this paper. E. N. T.

690. Progress of Petroleum Geology in Western Canada in 1945. J. O. G. Sanderson. *Canad. Min. metall. Bull.*, June 1946, **49**, 256.—G. A. Dawson was Canada's first petroleum geologist, and he caused the Government to drill several wells between 1890 and 1900, resulting in the discovery of the Pelican gas-field in 1897. He trained several men. F. G. Clapp was engaged to carry out work in 1912 and was assisted by L. G. Huntley. Considerable contributions to the petroleum geology of western Canada were made by members of the Geological Survey of Canada and the Research Council of Alberta.

Before the depression of the early 1930's several fields were discovered. Viking (1923), Wainwright (1926), Skiff (1927), Coutts (1929), Kinsella (1930), and Twin River (1931). Effective search for oil was resumed in 1936 and further discoveries were made: Del Bonita, Taber (1936), Princess (1938 and 1944), Lloydminster (1938 gas, 1944 oil), Vermilion (1939), Brazeau (1940), Jumping Pound (1944), Unity (1944), Conrad (1945), and West Coutts (1945).

Before 1924 it was generally believed that only the Mesozoic held commercial amounts of hydrocarbons, but the discovery of Turner Valley changed the picture. Later it was shown that the Devonian of the foothills was a source and reservoir rock. The area in which the Madison limestone occurs is probably quite small. The Devonian may be the source of oil found in the Lower Cretaceous in Alberta and Saskatchewan. The Colorado shale may be a source rock.

Recently oil has been found in the Madison on the plains. This formation may be productive in southern Saskatchewan. The Unity area has closure of 70–100 ft over several thousand acres. Undoubtedly there were pre-Mesozoic structures.

During the past 20 years practically all of the plains area and most of the foothills from Wapiti river to the International boundary have been studied and mapped by the geological departments of many oil companies. G. D. H.

691. Brazeau Area, Alberta, Shows Promise. F. K. Beach. *Petrol. Engr*, June 1946, **17** (9), 74.—In 1940 a well on the Brazeau structure was abandoned at 8728 ft, after meeting a fault which dropped down the Madison. A pocket of gas was met. In 1945 a second test found the Madison at 9498 ft, passed through a fault at 9595 ft, re-entered the Madison at 11,599 ft and was in younger beds when drilling stopped at 11,689 ft. After acidizing, the shallower Madison " Splinter " gave 10,000,000 cu. ft. of gas/day. G. D. H.

692. Operation Muskeg. C. O. Nickle. *Oil Wkly*, 2.9.46, **123** (1), 13 (*International Section*).—The Muskeg Anticline of the north central foothills of Alberta is regarded as promising. The Madison limestone at about 10,000 ft is the objective. Geological and seismic work has been done. G. D. H.

693. Oil in Colombia's Llanos Region. G. O. Ives. *Oil Wkly*, 2.9.46, **123** (1), 16 (*International Section*).—Physically and topographically the Llanos region resembles the eastern Venezuelan oil region. Transportation is a serious problem and it is estimated that for economically sound operations a reserve of at least 1,000,000,000 brl must be found. This figure is based largely on the cost of a pipeline over the Andes ($150,000,000 for installation alone). Production must be at the rate of at least 100,000 brl/day to recover this reserve in the 30-year period allowed for exploitation.

The Llanos are covered largely by Pleistocene and Miocene deposits. Field work is very difficult between July and December because of the weather. Tropical is to drill a 12,000-ft test on the Meta river. Shell abandoned San Martin 2 at 6810 ft after testing. It gave some 14-gravity oil. Showings have been found on the Chafurray concession 125 km southeast of San Martin, Chafurray 5 having encountered tar sands. Four earlier wells were dry, and averaged 2500 ft in depth. Both San Martin and Chafurray are on seismograph anomalies. G. D. H.

694. Shell Opens New Field in Western Venezuela. Anon. *Oil Wkly*, 2.9.46, **123** (1), 28 (*International Section*).—Shell's West Tarra 2, near the Colombian border, west of the southern end of Lake Maracaibo, has found commercial oil production in the top of the Cretaceous limestone at about 7000 ft. It is estimated that the rate of flow was 2000 brl/day of 42-gravity oil. The limestone seems to be similar to that which produces northwest of the lake.

West Tarra 2 lies on a structure west of the Tarra Ridge on which the La Manueles, Tarra, and Las Cruces fields lie. Most of the production on the Tarra Ridge anticline is controlled by faulting and comes from the Eocene. Some 95,000,000 brl of oil has been obtained in 20 years.

The West Tarra structure was revealed by geological and geophysical work. G. D. H.

695. Western Australia. A. H. Telfer. *Oil Wkly*, 2.9.46, **123** (1), 8 (*International Section*).—Small oil shows have been noted in the eight wildcats drilled in Western Australia since 1921. The Ord River in East Kimberley area shows downfaulted blocks of Devonian and Permian sediments in an area of Cambrian sediments with lava flows. Devonian outcrops occur in the Desert Basin beneath unconformable Permo-Carboniferous beds which dip south. Tests in the northern section of this basin have shown oil traces. Permo-Carboniferous beds and seemingly favourable structures are known in the northwest Basin, but no drilling has been done. Mesozoic and Cainozoic beds are present. Reports of oil indications in the Coastal Basin are unconfirmed. The Eucla Basin has Miocene and Cretaceous beds. No signs of oil have been found. A map and summary of drilling results are given. G. D. H.

Geophysics and Geochemical Prospecting.

696. Electrical Resistivity an Aid in Core-analysis Interpretation. G. E. Archie. *Bull. Amer. Ass. Petrol. Geol.*, 1947, **31**, 350.—The electrical resistivity of a rock is closely related to porosity, and the actual type of rock structure has remarkably little effect on this factor provided the rock is well consolidated.

Rocks are heterogeneous in their nature, but although their characteristics cannot be expressed by limited mathematical formulæ, there are certain definite trends which can be followed. Electrical resistivity can be used in a quantitative way in core-analysis interpretation. E. N. T.

697. Airborne Magnetometer. J. R. Balsley. *Petrol. Engr*, July, 1946, **17** (11), 77; Aug., 1946, **17** (12), 104.—The airborne magnetometer now in use for geophysical surveys consists of a magnetic detector and a device for correlating the magnetic record with the plane's position in space. The total magnetic flux is measured electronically and recorded on a chart, commonly at ½–2 ml/inch. The sensitivity is instantly variable by a selector switch. The instrument is towed in a streamline " bird " or housed in a special non-magnetic tail section of a plane. The plane's position may be obtained in several ways. One method employs a gyroscopically stabilized sonné continuous strip camera and a recording radio altimeter. For unmapped or water-covered areas the Shoran radio navigation aid is used.

The most effective flight pattern is usually a series of parallel traverses flown at right angles to the geological grain. At least two traverses should cross each anomaly, but it is generally impracticable to use traverses less than ¼ ml apart. The flights should be at a mean constant height above ground. Experience indicates that 1000 ft is a suitable height. Traverses 25–50 ml in length are satisfactory. In detailing flights may be made at more than one level. The runs are eventually plotted on a map.

A mechanical device has been built for dealing with sensitivity and base value changes for the magnetic record, variation in plane speed, etc., and by means of it continuous magnetic profiles are prepared. In order to correlate the traverses base lines are flown at right angles to them near their ends. Magnetic contour maps can then be compiled.

A flying speed of 150 m.p.h. has proved satisfactory, giving about 100 ml of traverse per hr. A four-man crew can then cover 7500–10,000 ml of traverse per month since 75–100 hr of flying per months is a reasonable average. During May and June, 1945, such a crew covered 3170 sq ml in the Adirondacks with 1300 ml of traverse. The cost of an equivalent ground survey would be seventeen times greater and would occupy twenty-seven 6-month field seasons with a four-man crew. The ground survey would be less detailed and less accurate. Office compilation times may be about the same for ground and airborne surveys.

In airborne surveys some of the difficulties arising from drift and diurnal variation are minimized; disturbances due to pipes, etc., are reduced; on any traverse no anomaly can be missed due to improper station spacing; measurements at two heights improve the interpretation.

Airborne surveys do not replace the normal surveys, but serve to show where the latter will be most valuable, especially when close traverse spacing is needed. The overhead expenses of airborne surveys are high, and so they are uneconomic for small areas.

Maps showing the results of some surveys are included. G. D. H.

698. Geophysical Patents. O. S. Petty. U.S.P. 2,408,478, 1.10.46. Seismic Apparatus and Method.—A portable seismometer responsive only to vertical components of seismic waves.

O. S. Petty. U.S.P. 2,410,303, 29.10.46. Seismic Surveying.—A means for transforming seismic energy into electrical energy, and for recording same.

S. A. Scherbatskoy, assr to Seismic Engineering Co., U.S.P. 2,411,117, 12.11.46. Seismometer.—A geophone for translating earth vibrations into corresponding electrical oscillations: two independently supported plates immersed in a conductive liquid are caused to vibrate by earth tremors, thus varying the resistivity of the liquid between them and causing fluctuations in an electric circuit. R. B. S.

Drilling.

699. Magnolia Drills for Oil in the Gulf of Mexico. K. M. Fagin. *Petrol. Engr*, Nov. 1946, **18** (2), 82.—An account is given of the drilling of the Magnolia Petroleum Company's Louisiana Gulf (Block 58) No. 1 well 30 ml offshore in the Gulf of Mexico. The layout and construction of the drilling platform and the systems of supply and communication are described. R. B. S.

700. Nine Speed Drilling Rig Air-Operated. J. P. Van Vorst. *Petrol. Engr*, Nov. 1946, **18** (2), 184.—A new type of drilling rig having six major assemblies is described. These assemblies are: (1) draw-works, (2) nine-speed transmission, (3) three-engine compound unit, (4) three 330 h.p. engines, (5) substructure, and (6) two mud pumps. The clutches, brakes, transmission controls, etc., are operated by compressed air; the bearings are pressure lubricated, and the chain links are continually sprayed with oil. R. B. S.

701. Graphic Method of Selecting Roller Chain Drives for Multiple Speed Transmissions. W. Brown. *Petrol. Engr*, Nov. 1946, **18** (2), 156.—A graphical method is devised for designing chain drives. The chain length in pitches and the number of teeth required on the large sprocket and on the small sprocket can be determined by this method for a given sprocket ratio and a given centre distance between sprockets. The method is illustrated by an example. R. B. S.

702. Blowout Subdued Under Difficult Conditions. R. Sneddon. *Petrol. Engr*, Nov. 1946, **18** (2), 134.—The control of a blowout on the Havenstrite Barnes No. 1 well at Del Valle, in which the annulus between the 11¾-in surface string and the 7-in oil string had built up a pressure which caused the surface equipment to fail, is described. R. B. S.

703. Use of Formaldehyde to Inhibit Corrosion. J. A. Clay. *Petrol. Engr*, Nov. 1946, **18** (2), 111.—Formaldehyde is a satisfactory inhibitor in cases of corrosion due to hydrogen sulphide saturated brines and to acids at low temperatures. When corrosion is due to other causes (*e.g.* electrolytic currents) formaldehyde does not inhibit corrosion: this explains its apparent ineffectiveness in many cases where it has been declared a failure.

Three types of formaldehyde injection systems are described and illustrated. The amount of formaldehyde to be used must be scientifically determined for each well. This varies according to the amount of surface area, since it is believed that the inhibiting action of formaldehyde is due to the formation of an extremely thin protective layer on the surface of equipment by its reaction with the sulphides in the well fluids. The amount of formaldehyde to be used also depends on (1) the dilution effect of the produced fluids (this being a function of the amount of water produced), and (2) the severity of corrosion (this being a function either of the amount of hydrogen sulphide dissolved in the water or of the acid characteristics of the water). An initial injection of 2 to 5 gal is usually required, and thereafter up to ½ gal per 100 brl of water produced. Excessive amounts of formaldehyde are not damaging, but the inhibiting action is not increased in proportion to the increased expenditure. R. B. S.

704. Plastic Coating Inside Surface of Drill Pipe to Combat Corrosion Fatigue Failures. L. E. Frishman. *Petrol. Engr*, Nov. 1946, **18** (2), 194.—The corrosion fatigue failures of drill pipe always start on the inside, and in any case coating on the outside of the pipe would soon be polished off during drilling: hence coating the outside as well as the inside of the pipe would add little to the prevention of corrosion fatigue failures. Certain protective coatings applied to the outside of the pipe would also cause " gumming up " of the jaws of tools applied to the outside of the pipe. Suitable protective coating for the inside of pipe should have the following properties: (1) it should be impervious to water, (2) resistant to oil, (3) resistant to chemical attack by drilling mud and underground waters, (4) it should not soften or deteriorate at bottom-hole temperature, (5) it should be resistant to mild abrasion, (6) it should not be brittle, (7) it must be chemically stable and must not oxidize in contact with air, (8) it must adhere well to the surface of the pipe, (9) it must not change the physical properties of the surface of the pipe, and (10) it must be easy to apply inside the pipe.

The properties of many coating materials were examined and suitable ones (which fulfilled the above ten requirements) were tested under corrosion fatigue conditions. The methods of testing and the results obtained are described in detail. Both field tests and laboratory experiments showed that a thermo-setting phenolic-base plastic applied to the inside of pipe will substantially prevent corrosion fatigue failures. A definite endurance limit is obtained for coated test-bars under corrosive conditions in the laboratory. R. B. S.

705. Effect of Sodium Hexametaphosphate on the Yield Value and Viscosity of a Hydrogen Bentonite Solution. A. Read and N. C. Sen Gupta. *Nature*, 1947, **159**, 336.—Previous work on the treatment of drilling muds has established the effect of phosphates on the apparent viscosity of clay suspensions. In the present experiments various concentrations of sodium hexametaphosphate have been added to a 10% solution of hydrogen bentonite suspension, and the yield values and apparent viscosities of the system measured over a period of 20 days. Results are (1) the yield value is reduced to a greater extent than the viscosity by phosphate, (2) whilst the viscosities increase on standing the yield values at phosphate concentrations of 0·6–0·8% do not. The hypothesis that the phosphate ion enters the clay complex explains the reversion of viscosity to its original figure, but not the constancy of the low yield value.

H. C. E.

706. Drilling Patents. W. Stelzer. U.S.P. 2,407,856, 17.9.46. Hydraulic Brake Mechanism.—A brake-operating mechanism for a hydraulic brake system having a hydraulic brake cylinder and a pedal-controlled master cylinder.

P. S. Williams, assr to Standard Oil Development Co. U.S.P. 2,408,012, 24.9.46. Well Logging.—A method of well logging consisting of an apparatus which delivers sharp hammer-like blows against the walls of the well, and at the same time generates electrical impulses which are a function of the resistance of the formations in the walls of the well to these blows. These impulses are transmitted to the surface and logged.

C. B. Bazzoni and J. W. Millington, assrs to Sperry Sun Well Surveying Co. U.S.P. 2,408,029, 24.9.46. Electrical Prospecting Apparatus.—An electrical well-logging device in which a high frequency alternating current is produced in a coil adjacent to the walls of the bore-hole.

D. A. Bennett and A. R. Maier, assrs to Oil Well Supply Co. U.S.P. 2,408,364, 1.10.46. Rotary Drilling Unit.—A unit combining a prime mover, a rotary unit, and a means for separately interrupting the transmission of power from the prime mover to the rotary automatically.

F. E. Hutchison. U.S.P. 2,408,558, 1.10.46. Mud Screen.—A special type of screen for sifting cuttings from rotary drilling mud.

J. C. Stokes, assr to Reed Roller Bit Co. U.S.P. 2,408,892, 8.10.46. Slush Tube.—A special type of rotary drilling bit.

W. E. Winn and P. F. Dougherty, assrs to Sun Oil Co. U.S.P. 2,408,964, 8.10.46. Method of Logging Wells.—A well-logging method which consists of passing a gas through the drilling mud to remove hydrocarbons, and then analysing the effluent to determine the amount of these hydrocarbons originally present in the mud.

W. E. Winn and P. F. Dougherty, assrs to Sun Oil Co. U.S.P. 2,408,965, 8.10.46. Method of Logging Wells.—A well-logging method which consists of separating cuttings from the drilling mud, mixing them with carbon dioxide under pressure, applying vacuum, thus removing hydrocarbons with the carbon dioxide and subjecting this gas mixture to analysis, thus ascertaining the content of these hydrocarbons in the formation from which the cuttings were obtained.

S. Krasnow and L. F. Curtiss, assrs to Geophysical Development Corpn. U.S.P. 2,409,436, 15.10.46. Method and Apparatus for Direct Recording of Borehole Radioactivity.—A method of measuring borehole radioactivity involving an apparatus which consists of a radioactive sensitive element and a means of indicating this radioactivity at the surface.

R. G. Taylor and D. B. Hooser, assrs to the Guiberson Corpn. U.S.P. 2,409,811, 22.10.46. Setting and Releasing Tool.—A tool adapted to lower a member to be set into a well.

R. F. Farris and J. B. Clark, assrs to Stanolind Oil and Gas Co. U.S.P. 2,410,278, 29.10.46. Water Locating System.—A method of locating a zone of ingress of conducting fluid to a well producing both conducting and non-conducting fluids (*e.g.* water and oil).

A. L. Segelhorst. U.S.P. 2,410,589, 5.11.46. Automatic Slip Mechanism.—Automatic slips for supporting rotary drill pipe, etc.

S. Shinomiya (vested in the Alien Property Custodian). U.S.P. 2,410,753, 5.11.46. Drilling Device.—A flexible drilling collar enabling the bottom of a bore-hole to be drilled to a larger diameter than that of the bore-hole itself.

J. W. Sharp, assr to Permancute Cement Co. U.S.P. 2,410,954, 12.11.46. Silica Modified Cement.—A hydraulic cement containing very finely divided silica.

H. S. Brown. U.S.P. 2,410, 959, 12.11.46. Earth Drill.—A portable truck-mounted drilling unit.

G. W. Hall, R. F. Sens, and M. A. Furth, assrs to The Pure Oil Co. U.S.P. 2,411,209, 19.11.46. Bit.—A special type of elongated drilling bit.

R. C. Glover and R. O. Childers, assrs to Baker Oil Tools Inc. U.S.P. 2,411,260, 19.11.46. Apparatus for Supporting and Cementing Liners or Casings in Well Bores.

A. Wolf and L. G. Cowles, assrs to The Texas Co. U.S.P. 2,411,311, 19.11.46. Well Sounding Apparatus.—A means for recording pressure impulses from a well.

T. N. Pinion. U.S.P. 2,411,589, 26.11.46. Boiler Water Feed Device.—A device for automatically filling a steam boiler.

D. Silverman and T. Gilmartin, assrs to Stanolind Oil and Gas Co. U.S.P. 2,411,696, 26.11.46. Well Signalling System.—An electro-magnetic method of well logging.

R. B. S.

Production.

707. Production Patents. L. T. Monson, W. W. Anderson, and F. W. Jenkins, assrs to Petrolite Corpn Ltd. U.S.P. 2,407,895, 17.9.46. Process for Resolving Water in Oil Emulsions.—A demulsifying process in which the emulsion is subjected to the action of a surface-active heat-polymerized amino-alcohol.

O. D. Harper, assr to Standard Oil Development Co. U.S.P. 2,407,983, 24.9.46. Completion of Wells.—A multiple completion method using a casing having separable sections corresponding to the producing horizons: the lowermost section is cemented just above the lowermost producing horizon and the remainder disengaged and raised until its lowermost end is adjacent to the top of the next highest producing horizon, where it is then cemented, and so on.

O. J. McCullough, assr to McCullough Tool Co. U.S.P. 2,407,991, 24.9.46. Pipe Releasing Device.—An apparatus for unthreading sections of well tubing within a well bore.

W. H. Wineman, assr to Joy Manufacturing Co. U.S.P. 2,408,013, 24.9.46. Pumping Apparatus.—A hydraulically operated sucker-rod pumping unit.

F. Kowalski and R. L. Harper. U.S.P. 2,408,075, 24.9.46. Oil Well Pump.—A pumping unit operated by gas pressure.

R. G. De La Mater, assr to The Parkersburg Rig and Reel Co. U.S.P. 2,408,200, 24.9.46. Walking Beam Structure.—A special type of walking beam structure for sucker-rod pumping rigs.

J. L. Foster. U.S.P. 2,408,419, 1.10.46. Well Explosive Device.—A well-shooting device employing explosive projectiles.

J. F. McGlone. U.S.P. 2,408,795, 8.10.46. Control Means.—A control means for a double-acting fluid pressure motor.

W. O. Webber, assr to Standard Oil Development Co. U.S.P. 2,409,005, 8.10.46. Treating Emulsions.—A method for treating salt-bearing crude oil consisting of heating, adding water, and agitating to remove salts in the oil, and then removing the water by a filtering and settling process.

J. D. Cavaness. U.S.P. 2,409,104, 8.10.46. Sucker Rod Tightener.—A mechanical device for tightening sucker rods.

R. G. Taylor and D. B. Hooser, assrs to The Guiberson Corpn. U.S.P. 2,409,812, 22.10.46. Control Head Packer.—A removable packer device.

J. B. Meyer. U.S.P. 2,410,354, 29.10.46. Fluid Pressure Pump.—A hydraulically operated pump suitable for use in wells.

H. F. Johns, assr to V. V. Johns. U.S.P. 2,410,976, 12.11.46. Oil Well Pump Packing.

H. B. Landrum and C. A. Husted, assrs to The Texas Co. U.S.P. 2,411,044, 12.11.46. Paraffin Removal.—A method of removing paraffin from the inside of tubing, etc., by forcing with oil through the tubing a solid body of naphthalene which gradually dissolves.

L. D. Mowrey. U.S.P. 2,411,667, 26.11.46. Bottom-Hole Regulator.—A bottom-hole flow regulator adapted for mounting in a string of tubing.

H. T. Kennedy and P. L. Gassett, assrs to Gulf Research and Development Co. U.S.P. 2,411,793, 26.11.46. Treatment of Oil and Gas Wells.—A selective plugging method using a pumpable plastic.

W. H. Rupp and R. O. Wright, assrs to Standard Oil Development Co. U.S.P. 2,411,809, 26.11.46. Apparatus for Separating Fluids.—A plant designed for separating a substance in the vapour form from two immiscible liquid substances, and for then separating the two immiscible liquids. R. B. S.

Oilfield Development.

708. Completions Rate Drops But Exceeds 1945 Month. Anon. *Oil Wkly*, 23.9.46, **123** (4), 43.—An average of 546 wells/week were completed in August; the average for July was 575. Up to the end of August 16,937 wells had been completed in U.S.A. during 1946. 1441 of the 2729 wells completed in the 5 weeks of August found oil, and 269 found gas.

A table summarizes by States and districts the results of well completions in U.S.A. during August and during the first 8 months of 1946. G. D. H.

709. Gulf Coast Oilfields. J. S. Critz. *Oil Wkly*, 16.9.46, **123** (3), 110.—The Gulf Coast oilfields are arranged alphabetically under counties, also in alphabetical order, with brief notes on the location, discovery data, structure, producing formation, cumulative production, estimated reserves, number of wells, oil gravity, deepest well, oil outlet, and principal leaseholders. G. D. H.

710. Mexico Well Completions. Anon. *Oil Wkly*, 2.9.46, **123** (1), 10 (*International Section*).—6726 wells have been drilled for oil in Mexico, over 6200 being in the Tampico, Poza Rica, Golden Lane, and Tehuantepec areas, and only 150 being real wildcats. At present 7 wildcats are under way, two are in the Golden Lane area, and three in northeast Mexico.

Mexico's cumulative production is about 2,212,320,000 brl, nearly half having come from the Golden Lane. Poza Rica has given 236,200,000 brl, the Tampico–Panuco area 774,000,000 brl, and the Saline Basin only 137,600 brl. The Tamaulipas sector has provided 30,000,000,000 cu ft of gas.

Tables summarize drilling activity in 1946, and give the results yearly from 1932. G. D. H.

711. Bolivia Reveals Plans for Drilling ; Trinidad Production Down, Mexico Up. Anon. *Oil Wkly*, 16.9.46, **123** (3), 80.—The YPFB in Bolivia plans to drill in the Guariri and Mandiapecua areas. In the first quarter of 1946 Bolivia produced 86,799 brl of crude from Camiri (30,010 brl), Bermejo (29,257 brl), and Sanandita (27,532 brl).

Trinidad produced 4,988,659 brl in the first quarter of 1946, and Ecuador 580,480 brl (653,183 brl in the second quarter). Mexico produced 2,219,956 brl from Poza Rica, Naranjos, and Panuco in June, Peru produced 1,006,388 brl of crude in May, and Alberta 653,806 brl in May. G. D. H.

712. Natural Gas Prospecting is Planned in Australia. Anon. *Oil Wkly*, 2.9.46, **123** (1), 8 (*International Section*).—An oil-prospecting licence has been applied for over an area in northeastern South Australia, on the New South Wales border, where natural gas with 70% of methane escapes from shallow holes. G. D. H.

713. Oil, the Rainbow of Hope in Saudi Arabia. H. Ozanne. *Oil Wkly*, 2.9.46, **123** (1), 3 (*International Section*).—The first oil discovery of Saudi Arabia was Damman in 1935, the reserves being estimated at 800,000,000 brl, with 28 wells currently giving 100,000 brl/day. Abqaiq has a proved area of 23,000 acres, with reserves estimated at 2,500,000,000 brl. This discovery was made in 1941. Five wells give about 70,000 brl/day. Qatif was discovered in 1945, and oil has also been found at Abu Hadriza.

The crude is asphaltic in each case. At Damman the best production comes from 4700 ft and at Abqaiq from 6500 to 7000 ft. Pipelines run to Ras Tanura, the refining and shipping centre.

A general description of the conditions is given, together with a summary of the reserves in the Middle East, the concession holders, and a list of the refineries. G. D. H.

714. Netherlands East Indies Oilfields. Anon. *Petrol. Engr*, Nov. 1946, **18** (2), 138.—The activities of the Japanese in the Royal Dutch Shell oilfields of the Netherlands East Indies and rehabilitation plans for these fields are briefly discussed. R. B. S.

Transport and Storage.

715. Completion of New Kirkuk–Haifa Line Expected in Spring of 1949. E. Aschner. *Oil Gas J.*, 1.3.47, **45** (43), 46.—The new 16-in pipelines to link Kirkuk with Haifa and Tripoli will parallel the existing 12-in system. Work was commenced at the end of 1945, 150 miles of line having already been laid. The project is expected to be complete by spring 1949. Some 180,000 tons of pipe will be required, which will be manual welded. The existing terminal facilities at Haifa and Tripoli will have to be extended, and the stabilizer plant at Kirkuk is being enlarged while additional wells are being drilled in the field. G. A. C.

716. Transfer-Line Pressure Drop. W. L. Nelson. *Oil Gas J.*, 22.2.47, **45** (22), 171.—No. 132 in the *Refiners' Notebook* series displays transfer-line pressure drop for two types of stock, one mainly gas oil, naphthas, and benzenes, the other mainly crude oil. The charts are available for 20%, 40%, 60%, and 80% vaporized in tower. Reference is also made to No. 128 in the series. G. A. C.

717. Welded Magnesium Tanks. R. J. Cross. *Aircr. Production*, March 1947, **9**, 97.—In the preceding parts the author described the design and construction of aircraft fuel and oil tanks fabricated in magnesium by Essex Aero, Ltd. In this final instalment he reviews in some detail the technique adopted in order to take full advantage of the highly favourable weldability characteristics of the material. I. G. B.

718. Transport and Storage Patents. H. G. Smith, T. L. Cantrell, and J. G. Peters, assrs to Gulf Oil Corpn. U.S.P. 2,408,102, 24.9.46. Oil Compositions.—A corrosion inhibitor consisting of an oil soluble trivalent metal salt of *N*-alkyl, alkylol ortho phthalmidic acid.

H. G. Smith, T. L. Cantrell, and J. G. Peters, assrs to Gulf Oil Corpn. U.S.P. 2,408,103, 24.9.46. Mineral Oil Composition.—A corrosion inhibitor consisting of an oil soluble divalent metal salt of *N*-alkyl, alkylol ortho phthalmidic acid.

H. A. Starret. U.S.P. 2,408,105, 24.9.46. Storage Tank.—A tank for the storage of fluids under pressure, which is immune from damage by shock waves and abrupt horizontal displacements of earth under any of the foot plates.

S. G. Thornbury, assr to Turco Products Inc. U.S.P. 2,408,155, 24.9.46. Composition for and Method of Cleaning and Coating Metal.—A compound consisting of a solution, containing water, phosphoric acid, aromatic petroleum solvent, butanol, and ethanol, for removing oil, grease, metal oxide, etc., from, and depositing a metallic phosphate coating on metal.

C. W. Brandon and G. M. Brandon. U.S.P. 2,408,505, 1.10.46. Receptacle for Fluids.—A tank for the transportation of volatile fluids.

P. A. Howard, assr of one half to C. A. Mathey and one half to C. B. Harter. U.S.P. 2,408,517, 1.10.46. Pipe-Cutting Apparatus.—A portable pipe-cutting mechanism.

J. H. Higgins. U.S.P. 2,408,538, 1.10.46. Liquid Storage Apparatus.—A storage tank of the floating roof variety.

J. H. Higgins. U.S.P. 2,408,539, 1.10.46. Fluid Storage Apparatus.—A variable volume storage tank for light fluids.

E. Hart, assr to A. O. Smith Corpn. U.S.P. 2,408,637, 1.10.46. Double Casing High Pressure Pump.—A high pressure pump of the centrifugal type.

C. H. Scott and P. H. Scott, assrs to The Safety Tank Truck Corpn. U.S.P. 2,409,071, 8.10.46. Venting and Discharge Valves for Tanks.—A vent and breather valve for tanks for storing volatile liquids.

S. T. Fisher, assr to Rogers Majestic Corpn. U.S.P. 2,409,975, 22.10.46. Pump Pressure Control System.—An apparatus for maintaining selected pump pressure differentials.

A. J. Granberg. U.S.P. 2,411,261, 19.11.46. A Fluid Metering Apparatus.

R. B. S.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

719. Multi-Stage Centrifugal Compressor Applications. T. R. Foster. *Oil Gas J.*, 8.2.47, **45** (40), 67.—A compressor is defined as a machine of radial design with two or more shrouded-type impellers in series, and discharge pressures from 50 to 500 p.s.i. Details are given in tabular form of a range of compressors with 2000 to 60,000 cu ft/min inlet volume, and maximum discharge pressures from 110 to 300 p.s.i. in semi-steel.

The economic upper limit of capacity of a centrifugal compressor may be fixed at about 120,000 cu ft/min, and 22,000 h.p., accommodated by utilizing the drive-through principle. The lower limit of capacity depends on the exit volume, and figures of 500 cu ft/min and 500 h.p. per case for exit volume, and 1500 cu ft/min for minimum inlet volume, may be used as a yard-stick. Most commercial applications fall in the 500 h.p. and higher capacity range, though horse-powers as low as 300 may prove economically feasible with direct steam-turbine drives, exhausting live steam to process.

Utility and driver costs vary greatly, but in general, centrifugal air compressors find greatest usage where fuel cost is low, *e.g.*, in blast-furnace blowers and fluid catalytic cracking units. Descriptions are given of a centrifugal refrigeration installation at Standard Oil Co., New Jersey, a mixed petroleum–hydrocarbon gas-compression installation in the Cities Service Refining Co. at Lake Charles, and centrifugal refrigeration machines using petroleum as the refrigerant at La Gloria plant, Texas.

Characteristics of the centrifugal compressor differ from those of the reciprocating compressor, but are similar to those of centrifugal pumps, except that (1) liquid pumps operate with equal pressure rise, constant volume, and constant temperature through each impeller, while uncooled gas pumps operate with variable pressure rise, volume, and temperature, (2) width of impellers decreases through the gas-pump, but may remain constant in the liquid pump. Both are independent of density as regards head, but pressure ratios for a number of impellers vary when different gases are compressed. Deviations from adiabatic seem to depend largely on specific heat ratios of gases.

For calculations of compression horse-power needs, an adiabatic base and Mollier diagrams are normally favoured; if an adiabatic base is employed for a centrifugal compressor a corrective factor must be used when gases of widely differing specific heat ratios are considered.

One set of rating curves is sufficient if sonic speed is not exceeded, and the centrifugal machine should be selected for a speed which will produce the required pressure differential with the minimum gravity gas the machine will be called on to handle.

W. M. H.

720. Smokeless Burning of Refinery Vent Gases. A. K. Brumbaugh. *Oil Gas J.*, 22.2.47, **45** (42), 126.—A system for burning waste gases at the Torrance, California, refinery of the General Petroleum Corporation is described.

A venturi-type aspirating burner was designed in which *iso*-butane vapours were burned without smoke using a ratio of venturi throat to gas orifice area of 4 to 1. With gases containing up to 20% of unvaporized hydrocarbon this ratio had to be increased to 16 to 1. Stream pressure at the orifice was as low as $\frac{1}{8}$ p.s.i.g. without flame " popping back." Several burners of different sizes were employed, the installation handling 14,000,000 cu ft of gas per day, with an operating pressure range of $\frac{1}{4}$ to 4 p.s.i.g., the burners being automatically controlled to go into and out of service as gas pressure varied. An accumulator trapped liquid hydrocarbons to prevent them reaching the burners. G. A. C.

Distillation.

721. Preparation of Pure Paraffin Hydrocarbons by the Superfractionation of Synthetic Gasoline. L. Jacque, J. Givaudon, P. Schmitt, and R. Delion. *Rev. Inst. Franç. Pétrole,* 1946, **1**, 137–140.—A hydrogenated synthetic (Fischer) gasoline with *d* 0·688, b.p. 40–170° C and a content of aromatics + unsaturateds of less than $\frac{1}{2}$% was fractionated in a laboratory 5 l still fitted with a $2\frac{1}{2}$ m heated column. 1% cuts were taken and tested for n_D^{20} and an.pt. which, together with the b.p., were plotted against the vol. Examination of the graph shows that the composition of the gasoline is *n*-pentane 8–9%, *n*-hexane 22–23%, *n*-heptane 20–25%, *n*-octane 20–22%, and *n*-nonane 10–15%. Technical grades of *n*-pentane, *n*-hexane, *n*-heptane, and *n*-octane were prepared, the characteristics of these and of the pure compounds obtained from the technical grades by treatment with H_2SO_4 and re-distillation are given. It is suggested that compounds thus prepared would be of value in the laboratory, the *n*-hexane as a precipitant for asphaltic bodies, the *n*-heptane as a reference fuel for the CFR engine and, possibly, the *n*-pentane as a dewaxing solvent. V. B.

Cracking.

722. Naphthas from Fluid Catalyst Cracking. C. E. Starr, J. A. Tilton, and W. G. Hockberger. *Industr. Engng Chem.*, 1946, **39**, 195.—The compositions of naphthas derived from cracking with Fluid Catalyst vary within wide limits depending upon changes in operating conditions, types of catalyst employed, and feed stocks used. The compositions of nine naphthas are presented to illustrate the types of products obtained at low and high cracking temperatures with varying cracking severities, employing clay and synthetic catalysts with several paraffinic and naphthenic feed stocks. Composition data show that a number of valuable hydrocarbons, such as toluene, are present in the cracked naphthas to an extent which makes feasible their removal. The flexibility of the Fluid Catalyst cracking process permits operations for production of high quality fuels concurrent with a number of hydrocarbons that are individually valuable as raw materials for chemical manufacture. A. W.

723. More Gasoline—Less Coke—From New Catalytic-Cracker Design. Anon. *Oil Gas J.*, 1.3.47, **45** (43), 82.—A new type fluid catalytic-cracking pilot plant, designed by Universal Oil Products Co., is described.

A higher yield of gasoline is accomplished by better utilization of space in reactor and regenerator, and more efficient stripping of adsorbed light fractions from the spent catalyst. Amount of coke produced is substantially reduced. The plant has been operated on normal gas oils, and also on heavy gas oils with end points up to 1000° F, and has confirmed the expected increased gasoline and reduced coke yields. G. A. C.

Alkylation.

724. Monoalkylbenzenes by Vapour-Phase Alkylation with Silica–Alumina Catalyst. A. A. O'Kelly, J. Kellett, and J. Plucker. *Industr. Engng Chem.*, 1947, **39**, 154.—The monoalkylation of benzene with olefins of low molecular weight has been studied under laboratory conditions with batch and continuous apparatus, the catalysts being of the type used in commercial catalytic cracking. At elevated temperatures and relatively low pressures substantial yields of monoalkyl benzenes are obtained. The utilization of ethylene was found to be favoured by increased reaction time, increased temperature, and increased molar ratio of benzene to ethylene. Small amounts of polyethylbenzenes produced may be recycled in the charge stream to give increased yields of monoethylbenzene based on ethylene and benzene consumed. The catalyst indicates long life and sustained activity under the conditions used. A cyclic operation such as is used in catalytic cracking is adaptable to the production of monoethylbenzene in which air regeneration of the catalyst is carried out at temperatures in the same range as the reaction temperatures. A. W.

Special Processes.

725. Emersol Process. R. L. Demmerle. *Industr. Engng Chem.*, 1947, **39**, 126.—The preparation of commercial stearic and oleic acids is carried out by two principal methods; the continuous Emersol process, based on fractionation of the acids from a polar solvent, and the conventional batch method of mechanical pressing. The development of the former process led to the choice of 90% methanol in water as the most suitable solvent, consideration having been given to the factors of cost, type of crystal structure, refrigeration, stability, toxicity, and ease of removal. The commercial process, which is fully described, requires the introduction of a crystal promoter (usually a neutral fat) into the stream. Owing to the corrosive nature of methanol-fatty acid solutions, stainless steel or aluminium are necessary construction materials.

The demand for oleic acid now exceeds that for commercial stearic acid which generally contains 45 parts of stearic to 55 parts of palmitic. A. W.

726. Catarole Process. I. F. Kind. *Times Rev. Ind.*, Mar. 1947, 21.—Cat treatment at 1100–1250° F of a distillate with b.p. 225–550° F yields a product containing approximately equal amounts of liquid aromatics and gaseous olefins. The reactors can operate for 50–70 hr, after which the carbon on the cat is burnt off (8–10 hr) and the cycle recommences. The liquid product is fractionated to yield substantially pure aromatic compounds; solids, such as naphthalene, are further purified by recrystallization. The gaseous olefins produced are liquefied and separated by low temperature distillation. A list of products (with yields) is given. V. B.

Refining Patents.

727. Patents on Refining Processes and Products. H. C. Mayland, assr to U.O.P. Co. U.S.P. 2,404,393, 23.7.46. An alkylation process employing hydrogen fluoride as catalyst.

C. H. M. Roberts, assr to Petrolite Corpn. Ltd. U.S.P. 2,404,405, 23.7.46. Water dispersible substances contained in an oil of low water content are removed in a stage process involving emulsification with water and demulsification by means of an electric field.

C. C. Crawford and D. L. Yabroff, assrs to Shell Dev. Co. U.S.P. 2,404,436, 23.7.46. In the catalytic isomerization of methyl pentane to dimethylbutane about 1% hydroquinone is introduced into the reaction zone.

T. W. Evans, assr to Shell Dev. Co. U.S.P. 2,404,438, 23.7.46. The direct oxidation of ethylene to the oxide in the presence of a silver catalyst.

E. Lieber and A. F. Cashman, assrs to S.O. Dev. Co. U.S.P. 2,404,446, 23.7.46. An improved E.P. lubricant is obtained by multi-stage *iso*propyl alcohol extraction of a chlorinated paraffin alkali polysulphide reaction product.

I. G. Nixon, assr to Shell Dev. Co. U.S.P. 2,404,452, 23.7.46. Multi-cycle thermal cracking of a straight-run gasoline to produce aviation base.

F. E. Frey, assr to Phillips Petroleum Co. U.S.P. 2,404,483, 23.7.46. A combination isomerization-alkylation process to produce motor fuel from C_4 and C_5 hydrocarbons.

V. N. Ipatieff and G. S. Monroe, assrs to U.O.P. Co. U.S.P. 2,404,498, 23.7.46. Toluene is produced from benzene and methane in the presence of a metal catalyst or its oxide from the group in the atomic number range 26 to 29.

G. O. Morrison and M. M. Collins, assrs to Shawinigan Chemicals, Ltd. U.S.P. 2,404,519, 23.7.46. An aqueous emulsion of paraffin wax and polyvinyl acetate is used as a coating composition.

L. Schmerling and V. N. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,404,536–8, 23.7.46. The catalytic alkylation of aromatic hydrocarbons.

E. A. Naragon, assr to The Texas Co. U.S.P. 2,404,591, 23.7.46. The aromatic hydrocarbons in an aromatic naphtha are isomerized by an aluminium halide–hydrocarbon complex catalyst.

C. Richker and B. Eastman, assrs to The Texas Co. U.S.P. 2,404,595, 23.7.46. A catalytic cracking process in which the charging stock is slightly cracked thermally before catalytic conversion.

R. T. Sanderson, assr to The Texas Co. U.S.P. 2,404,599, 23.7.46. Alkyl-paraffins are obtained by the reaction between an aliphatic halide and an alkyl aluminium halide.

P. L. Veltman and L. W. Devaney, assrs to The Texas Co. U.S.P. 2,404,607, 23.7.46. Branched chain paraffins are obtained by the reaction between an alkyl halide and the reaction product of zinc and a *sec.* or *tert.* alkyl halide.

J. D. Grenko and L. R. Strawn, assrs to The Texas Co. U.S.P. 2,404,628, 23.7.46. A silica–alumina–zirconia catalyst is used to polymerize propylene to a polymer gasoline rich in aromatics.

R. T. Sanderson, assr to The Texas Co. U.S.P. 2,404,661, 23.7.46. 2 : 2 : 3-Trimethylbutane and 2 : 4-dimethylpentane are obtained when methyl aluminium chloride reacts with 2-chloro-2 : 3-dimethylbutane in solution in 2 : 3-dimethylbutane at − 58° to 32° F. Treatment of the mixed products with sulphuric acid at 70° to 125° F converts the 2 : 4-dimethylpentane to 2 : 3-dimethylpentane.

R. E. Burk and E. C. Hughes, assrs to S.O.C. Ohio. U.S.P. 2,404,788, 30.7.46. Olefins are polymerized with boron fluoride as catalyst, promoted by an oxygen-containing compound.

J. W. Latchum, Jr., and J. S. Connors, assrs to Phillips Petroleum Co. U.S.P. 2,404,854, 30.7.46. Separation of SO_2 from its mixture with gaseous hydrocarbons by the use of triethanolamine and regeneration of the latter.

P. R. Van Ess, F. J. Watson, and G. M. Whitney, assrs to Shell Dev. Co. U.S.P. 2,404,871, 30.7.46. A raffinate of a paraffinic lubricating oil is extracted with a mercury salt to produce a mercury salt sulphur compound complex from which the sulphur compounds are recovered.

W. N. Axe, assr to Phillips Petroleum Co. U.S.P. 2,404,897, 30.7.46. An alkylation process employing as catalyst a liquid addition compound of boron trifluoride and an acid of phosphorus.

W. H. Claussen and T. M. Powell, assrs to California Research Corpn. U.S.P. 2,404,902, 30.7.46. Pure aromatics are obtained from a selected narrow boiling fraction of a paraffin base petroleum by a multi-stage catalytic process, including reforming, dehydrogenation, and cyclization.

R. J. Patterson, assr to Phillips Petroleum Co. U.S.P. 2,404,923, 30.7.46. Catalytic isomerization of *n*-butane.

L. Schmerling and V. N. Ipatieff, assrs to U.O.P. Co. U.S.P. 2,404,927, 30.7.46. A multi-stage process to produce *iso*paraffins from an alkyl halide and a mono-olefin.

R. B. Thompson, assr to U.O.P. Co. U.S.P. 2,404,934, 30.7.46. Higher boiling alkylation products are contacted with *iso*butane in the presence of a catalyst to produce lower boiling hydrocarbons.

F. M. Stephens, assr to The Fluor Corpn. Ltd. U.S.P. 2,405,100, 30.7.46. An apparatus for dampening pulsations in a gas stream having pulsating flow created by a compressor. G. R. N.

Safety Precautions.

728. Characteristics and Uses of Fire Extinguishers. H. W. Boggess. *Oil Gas J.*, 8.2.47, **45** (40), 91.—A chart is given which lists the characteristics of various types of fire extinguishers under the main headings : method of operating ; effective range of stream ; liquid capacity ; quantity and type of extinguishing agent produced ; and whether effective for Class A fires (wood, textiles, rubbish), Class B (oils, greases), Class C (electrical machinery), or Class D (automobiles, trucks, etc.). The types of extinguisher discussed are tetrachloride, soda–acid, foam, carbon dioxide, and dry powder. W. M. H.

Products.

Chemistry and Physics.

729. Purification, Purity, and Freezing Points of 7 Heptanes, 16 Octanes, 6 Pentenes, cycloPentene, and 7 C_9H_{12} Alkylbenzenes of the API-Standard and API-NBS Series. A. J. Streiff, E. T. Murphy, V. A. Sedlak, C. B. Willingham, and F. D. Rossini. *Bur. Stand. J. Res., Wash.*, Dec. 1946, **37** (6), 331.—Continuing the work on preparation of standard samples of hydrocarbons (*Bur. Stand. J. Res., Wash.*, 1946, **37**, 141), a further 37 hydrocarbons of the API-NBS series have been purified and their freezing points and purity determined.

Information on amounts, source, and purity of starting materials is given in tabular form.

Purification was by distillation, the experimental procedure being as described for 2-methyl-1-butene. The refractive index of each fraction of distillate was measured to $\pm$ 0·001 on Valentine refractometers, and accurate values of boiling points were obtained from distillation records. Freezing points of selected fractions were measured, using the apparatus and procedure described in a previous report (*Bur. Stand. J. Res., Wash.*, 1945, **35**, 335). Tables show details of distillation for each compound, and graphs give refractive index, boiling point, freezing point, and purity of hydrocarbon distillates as a function of volume. W. M. H.

730. Heat Content, Free-Energy Function, Entropy, and Heat Capacity of Ethylene, Propylene, and the Four Butenes to 1500° K. J. E. Kilpatrick and K. S. Pitzer. *Bur. Stand. J. Res., Wash.*, Sept. 1946, **37** (3), 163.—Using as a basis (1) moments of inertia, (2) vibrational frequencies, and (3) potential barriers restricting internal rotation, calculations have been made of the heat-content function, free-energy function, entropy, heat content and heat capacity, in the ideal gaseous state to 1500° K, for ethylene, propylene, 1-butene, *cis*-2-butene, *trans*-2-butene, and *iso*butene.

A comparison is made of these values with calorimetric data on heat capacity and entropy. Agreement is best for ethylene and poorest for *cis*-2-butene, possibly due to the complicated nature of the restricting potential in the latter compound.

W. M. H.

731. Phase Equilibria in Hydrocarbon Systems. H. H. Reamer, K. J. Korpi, B. H. Sage, and W. N. Lacey. *Industr. Engng Chem.*, 1947, **39**, 206.—The volumetric behaviour of four experimental mixtures of methane and *n*-butane, approximately evenly spaced as to mole fraction, was explored at seven temperatures from 100° to 460° F and at pressures from near 400 to 10,000 p.s.i., to supplement previous measurements for this system. The experimental data, interpolated to even values of pressure, are presented in tabular form as molal volumes and compressibility factors. Diagrams illustrating the behaviour are included, and the new data are compared with previously reported results. A. W.

732. Emulsion Polymerization of Diene Hydrocarbons. H. W. Starkweather, P. O. Bare, A. S. Carter, F. B. Hill, Jr., V. R. Hurka, C. J. Mighton, P. A. Sanders, H. W. Walker, and M. A. Youker. *Industr. Engng Chem.*, 1947, **39**, 210.—The results of an exploratory study of the emulsion polymerization of conjugated diene hydrocarbons to yield rubber-like polymers are summarized. Such polymerization variables are discussed as purity of reagents, nature and amount of a second monomer, emulsifying agents, alkali concentration, catalysts, catalyst activators, modifying agents, temperature, and yield. An investigation of the influence of some 214 different compounds co-polymerized with butadiene reveals wide differences in the polymerization rate and properties of the co-polymers, depending upon the structure of the second monomer. Such vinyl compounds as methacrylic acid esters, methyl vinyl ketone, dimethyl vinyl ethynyl carbinol give with butadiene potentially useful co-polymers. Convenient forms of equipment for the small scale preparation, compounding and testing of new types of elastomers are described. A. W.

733. Peroxidation in Relation to Olefinic Structure. E. H. Farmer. *India Rubber J.*, 1947, **112**, 119.—The autoxidation of olefins, comprising peroxidation and peroxide breakdown, is reviewed with reference to (1) the mechanism and position of peroxidation, (2) its effect on molecular linking, (3) the stabilities of peroxide groups in relation to molecular structure, (4) the mechanism of breakdown and the influence of light, heat, or catalysts, and (5) the manner of utilization of " active " oxygen to give new oxygeno-groups or chain scission. C. N. T.

734. Thermochemistry of Carbon : Valence States, Heats of Sublimation and Energies of Linkage. L. H. Long and R. G. W. Norrish. *Proc. roy. Soc.*, 1946, **186**, 337.—The controversy which at present exists between the figures 125 and 170 K.-cal/g atom for the latent heat of sublimation of carbon into mono-atomic vapour is discussed. A scheme is suggested which reconciles points hitherto in apparent conflict which takes into account the energy associated with tetravalent state of carbon with special reference between bond energies and energies of dissociation. It has thus been possible to correlate previous experimental data associated with the thermo-chemistry of carbon. H. C. T.

735. Thermodynamic Properties of Hydrocarbons. II. Numerical Data and Examples. N. Tcherkezoff. *Rev. Inst. Franç. Pétrole*, 1946, **1**, 152–160.—(See Abstracts 432/47 and 433/47.) This instalment is devoted to a tabulation of recorded values of the heat of formation (@ 25° C) and of the entropy for a number of hydrocarbons. Two examples of the calculation of entropy from calorimetric data are given. V. B.

736. Degradation Activity of Fischer Synthesis Catalysts and the Participation of Methane in this Synthesis. O. Gœpfert. *Comptes Rendus*, 1947, **224**, 340.—The formation of long-chain hydrocarbons indicates that the Fischer synthesis catalysts are able to bring about the union of methyl and methylene radicles, formed by the reduction of carbon monoxide. The former aspect of the process can be examined, in an inverse manner, by studying the fission of C–C bonds in the ethane–hydrogen system, which results in the formation of methane. An analytical and kinetic study of this system shows that hydrogen, when present in excess, reacts to a less extent than ethane. The decomposition of the latter by a hydrogenation reaction to form methane is accompanied by its decomposition to give methane and carbon without hydrogenation. The latter product is subsequently converted into methane by hydrogenation at a much lower rate. It is considered that either mode of reaction of ethane proceeds in the adsorbed state, and intermediate steps involving methyl and methylene radicles are postulated.

On the basis of these results, the participation of methane in the Fischer synthesis is accounted for by the ability of Fischer catalysts to decompose adsorbed methane into methyl and methylene radicles which are then assimilated into the reaction products. G. H. B.

737. Development of Activity in Fischer Synthesis Catalysts. M. Perrin. *Comptes Rendus*, 1947, **224**, 342.—At 190° C freshly reduced catalyst forms solely methane and the normal reaction giving higher hydrocarbons sets in only after extended operation.

At 225° C, however, methane only is formed. This behaviour has been ascribed to the hydrogenating activity possessed by unused catalyst. The addition of methane to the synthesis gas represses the initial abnormal reaction and the substitution of an equal proportion of nitrogen has the same effect. The duration of the abnormal reaction with fresh catalyst can also be shortened by a temporary reduction in the reaction temperature to 175° or by decreasing the linear velocity of the reactants. Using fresh catalyst at 190° with the synthesis gas at normal pressure, the first layers of catalyst to meet the reactants attain a temperature of not less than 240° and methane alone is formed. When the activity of the catalyst has been modified, its temperature falls to 200–210° and the normal products are formed. This self-heating of the catalyst is responsible for the initial abnormal reaction, and if it is limited by, *e.g.*, a reduction in the partial pressure or charge rate of the reactants or a temporary reduction in bulk catalyst temperature, the normal reaction predominates from the start. G. H. B.

Analysis and Testing.

738. Molecular Weights in Practice and Theory. II. Theory. A. V. Brancker. *Petroleum*, 1947, **10**, 4.—A general theoretical discussion, dealing with the theory of molecular weight determinations as based on the law of dilute solutions.
K. C. G. K.

739. Simple Cyclic Falling-Film Molecular Still. J. K. Taylor. *Bur. Stand. J. Res., Wash.*, Sept. 1946, **37** (3), 173.—The chief difficulty encountered in the use of falling-film stills is the tendency to approach bulk distillation rather than surface evaporation, due to unequal distribution of the distilling liquid on the evaporator surface. The apparatus described here overcomes this problem by the use of a central vertical evaporator, on to which the distilling liquid is pumped from a reservoir through an annular orifice which ensures a persistently uniform film around the evaporator surface. The shortness of the column makes for increased efficiency. The charge which may be used ranges from a minimum of 10 mls to 1 l. W. M. H.

740. Laboratory Testing of Emulsified Oil. L. T. Monson. *Petrol. Engr*, Nov. 1946, **18** (2), 67.—The centrifuge methods of testing emulsified oil and the use of resolving agents in the determination of water content and of dry oil gravity are described.
R. B. S.

741. Viscosity by Different Instruments—High Range. W. L. Nelson. *Oil Gas J.*, 8.2.47, **45** (40), 99.—A table gives viscosity figures which are equivalent to kinematic viscosity, from forty-one to seven hundred centistokes, for the following instruments: Saybolt Universal at 100° F, 130° F, 210° F; Saybolt Furol; Redwood Admiralty No. 2; Engler; and Redwood Standard No. 1. W. M. H.

742. Viscosity Temperature Coefficients of Oils. H. K. Whalley and S. J. Leach. *Petroleum*, 1947, **10**, 2.—A critical examination of the V.I. as compared with the portraying of the viscosity temperature characteristics of lubricating oils by a curve relating the logarithm of viscosity and the reciprocal of the absolute temperature. The temperature dependence of viscosity may be expressed by the equation:

$$\log \nu = (E_v/RT) + C, \text{ i.e., } \partial \log \nu/\partial T = -E_v/RT^2$$
$$\text{or } \partial \log \nu/\partial(1/T) = E_v/R$$

where ν is the viscosity in centistokes, T is the temperature in ° K, E_v, is the activation energy of viscous flow and R is the gas constant. The term E_v/R is the temperature coefficient of viscosity, which is the slope of the lines obtained by plotting log ν against $1/T$. This latter method has certain advantages deriving from its theoretical basis and range of applicability. On the other hand V.I. is purely empirical, depending on arbitrarily chosen standard oils. In routine problems of oil technology it is true that the use of V.I. provides the basis of comparison for the properties of conventional oils, but in research work the more fundamental significance of the viscosity coefficient justifies its being preferred. K. C. G. K.

743. Engine Testing of Fuels and Lubricants. (3) 1. Fuel Consumption and Power Output. P. H. Moore. *Petroleum*, 1947, **10**, 18.—For both fuel consumption and power output determinations it is essential to employ an accurate method of measuring the quantity of fuel supplied to the engine. An inverted pipette type of fuel-measuring apparatus and a modification of Hoffert and Claxton's carburetter are described. As regards power units, it is necessary to employ a single-cylinder unit for spark ignition engines, since the single-induction manifold for all cylinders of the multicylinder type causes irregularities in the air–fuel ratio received by individual cylinders. A single-cylinder unit is not necessary for testing diesel fuels, since in the diesel engine there is an independent feed to each cylinder. K. C. G. K.

744. Detection of Light Hydrocarbons in Drilling Muds. E. Vellinger. *Rev. Inst. Franç. Pétrole*, 1946, **1**, 141–144.—An apparatus is described for determining the light hydrocarbon content of drilling muds, whereby the gas is withdrawn from a known volume of mud, by means of vacuum, and burnt on the surface of a heated platinum wire in a special apparatus. The hydrocarbon content of the gas is measured by the contraction in volume after combustion, the apparatus being calibrated with known mixtures. A determination can be performed by semi-skilled labour in 10 mins, thus permitting of the examination of strata during drilling. V. B.

Gas.

745. Natural Gas Stored in Buried Pipe at 2240 lb. C. R. Claxton, M. G. Markle, and D. V. Meilert. *Oil Gas J.*, 1.3.47, **45** (43), 60.—A natural-gas-storage installation placed in service by the Public Service Co., Illinois, is described.

The installation consists of 50 lengths of steel pipe, each 40 ft long and 24 in. in diameter, in each of which 25,000 cu ft of natural gas is stored at 2240 p.s.i., total capacity 1,250,000 cu ft.

Gas is supplied through a high-pressure distribution feeder main from 30 miles away, and distributed in the Kankakee area through a central low-pressure natural-gas system. The storage facilities described were installed to take care of a temporary failure of the feeder main.

The compressibility factor at 2240 p.s.i. is of such a magnitude as to increase the storage capacity by more than 40% over that of a perfect gas.

The operating pressure of 2240 p.s.i. conforms to the A.S.M.E.–A.S.A. code for pressure piping. The pipe weighs 500 lb per 40-ft length, and has a minimum wall thickness of 0·448 in. All underground piping is coated and has cathodic protection.

Additional equipment consists of a 3-stage compressor capacity 6000 cu ft/hr at 40 p.s.i.g. for filling the special pipe regulators for withdrawing the gas, and a boiler and heat exchanger for heating the gas prior to pressure reduction.

Operating experience has been satisfactory, and being underground, facilities are not subject to storm damage, atmospheric conditions, or aviation hazard. G. A. C.

746. Natural-Gas Reserves. E. De Golyer. *Oil Gas J.*, 4.5.46, **44** (52), 80.—See Abstract No. 1369 [1946].

Gas Oil and Fuel Oils.

747. Boiler Oil for Diesel Engines. Anon. *Motor Ship*, 1947, **28** (326), 485.—Further details are given of the performance of the Anglo-Saxon Petroleum Co.'s motor tanker *Auricula*, burning Ordoil of 1250 sec Redwood I at 100° F. Conditions of fuel valve, exhaust valve, reduction valve, piston crown, lubricating oil purifier, and piston-cooling water-system are reported on. I. G. B.

Lubricants.

748. Solvent Refining and Dewaxing of Lubricating Oil. W. E. Skelton. *Oil Gas J.*, 22.2.47, **45** (42), 137.—A general review of solvent refining and dewaxing is given. The process produces a refined oil freed of components susceptible to oxidation, sludge formation, and carbon deposition, and amenable to further improvement by the in-corporation of additives. The V.I. of the oil is improved, thus the oil is not as extremely viscous at low or as thin at high temperatures as the non-solvent refined product. The dewaxing process removes the wax and provides an oil which will remain fluid at low temperatures. The process is flexible and is applicable to a wide range of lubricating oil stocks.

Two flow diagrams are given. G. A. C.

749. Continuum Theory of Rheological Phenomena. K. Weissenberg. *Nature*, 1947, **159**, 310.—To develop this theory, the material is considered to be taken through a cycle from the initial (ground) state by imposing mechanical action to an energized state; then allowing a return to a ground state (not necessarily the initial state) by removing the force. The material is said to be *stable* if it can be taken repeatedly through the same cycle, and *general* or *special* if the recoverable strain (*i.e.* the difference between the ground states) is finite or zero respectively.

The experimental arrangement is that of a McMichael viscometer the internal cylinder of which is of special design. Using saponified oils, rubber solutions, starch, etc., the results indicate that the stress force comprises the shear–stress components and a pull along the lines of flow, the latter and the recoverable strain being finite or zero together.

An empirical law relating the three mutually perpendicular components of stress and recoverable strain to a generalized modulus of elasticity containing parameters of temperature and time has been replaced by an assumption, involving the similarity of mutually perpendicular traction forces in the energized and ground states, from which the empirical law can be derived. This assumption has been proved for materials isotropic in all ground states (1) in all classes of rheological states for certain orientations of planes; (2) for all possible orientations of planes in certain rheological states. H. C. E.

750. Lubricating Oil Tests. Anon. *Gas Oil Pwr*, 1947, **42**, 53.—Laboratory tests and specifications for engine lubricating oils include: determination of specific gravity, colour, flash-point, fire-point, viscosity, pour-point, demulsibility, carbon residue, neutralization and saponification values, ash content, asphaltenes, diluent and water content, and chemical stability. Whilst the Ramsbottam or Conradson tests for carbon residue do indicate the tendency of the oil to oxidize, chemical stability, measured in the Underwood test by spraying hot oil on to a split crankpin-bearing bush, is more significant. At the end of the 36 hr Underwood test, when the oil resembles in some respects a used automotive oil, it is examined for neutralization and saponification values, viscosity, and asphaltenes. Corrosion is estimated by weighing the bearing bush after cleaning. H. C. E.

751. Strontium Greases Satisfactory for Severe Service Applications. H. J. Worth and L. W. McClennan. *Oil Gas J.*, 1.3.47, **45** (43), 74.—The preparation, properties, and uses of complex strontium-base greases are described.

Compounding materials include strontium hydrate, mineral oils, and the usual soap stocks, and equipment used is the conventional steam-jacketed type fitted with agitators. Several types of commercial strontium greases have been marketed for special industrial purposes.

Various additives have been incorporated as in other greases. Either buttery or fibrous type strontium greases are produced, the properties are determined by type of oil or liquid vehicle used, and by characteristics of the saponifiable materials from which the soap has been made. The greases are prepared as anhydrous products, and are reversible over wide temperature limits. They resist the emulsifying and disintegrating effects of water, and are considerably resistant to the leaching action of light hydrocarbons.

Strontium greases are resistant to oxidation or break-down on exposure to elevated temperature, and the relatively superior rust-protective action is useful against moisture or salt spray corrosion.

Applications include lubrication of bearings in an atmosphere of sulphur and solvent vapour, as in the rubber and tyre industries, and for bearing points on aircraft where high temperatures are involved.

Tables show composition of representative strontium-base greases prepared by various procedures, and results of salt spray tests on steel panels coated with various greases. G. A. C.

752. Chemical Treatment for Wear Reduction. Anon. *Oil Engine & Gas Turbine*, 1947. **14**, 339.—Phosphate coating of any parts in an I.C. engine subjected to sliding friction has been found effective for preventing wear. Iron–manganese is the type most frequently used.

During treatment, a surface coating of insoluble complex iron–manganese phosphates is found on the iron surface to a total thickness of between 0·0002 and 0·0003 in. This is essentially a bedding-in layer, the wear on running-in being slightly greater than the coating thickness.

The advantage of this surface treatment is that oil is retained by the coating under conditions where it would otherwise be removed by excessive pressure on the high spots. The phosphate coating has also good corrosion-resisting properties, and has anti-welding properties in the absence of lubrication. In addition, it is possible to use a lower viscosity oil than with untreated surfaces, thus avoiding the use of special or more expensive lubricants.

Phosphate treatment can reduce " fretting " corrosion, which may occur when closely fitting surfaces are subjected to vibration, and has been found on the whole to be the most satisfactory process for postponing this type of corrosion. In some cases cadmium or tin coating has been found to be superior. C. D. B.

753. Improving Lubricating Oil Consumption, by " Five-Fifty ". *Oil Engine & Gas Turbine*, 1947, **14**, 341.—In experiments to reduce the oil consumption of certain diesel engines conducted by an operator with the co-operation of the manufacturer, it was found that after cleaning the engines under test at the end of about 1800 hr running, fitting new piston-rings, and grinding-in valves, an improvement in lubricating oil consumption resulted for a short time. The consumption, however, increased at more or less clearly defined intervals.

Modification to the original piston-ring arrangement (3 ordinary compression rings and 2 scraper rings) by replacing No. 1 (top) compression ring with Triple Seal ring resulted in an improvement of oil consumption of over 400%.

To prevent rise in oil consumption during operation, the scraper-ring slots and piston-drain holes had to be kept free of carbon. By increasing the rate of flow and by regular cleaning with perfectly dry compressed air the Streamline filter fitted to each engine was made more effective.

Keeping the soot content of the oil below 0·1% resulted in a reduction of oil consumption to one-third of its original value. C. D. B.

754. Oilspread and Lubrication (2). A. H. Stewart. *Petroleum*, 1947, **10**, 11.—Some of the conditions influencing the phenomenon of oil-spread are discussed. Mixtures of mineral oils with 1% of fatty acid show continuous sliding with the coefficient of friction only slightly larger than that of the fatty acid component. This suggests that the bulk of the mineral oil is squeezed out (the sliding member was a loaded ball) so that the adsorbed film providing the boundary conditions consists mainly of fatty acid. Furthermore, results seem to show that the fatty acid is desorbed as the temperature rises. Investigation of dry film lubricants (by Hughes and Whittingham) revealed that a colloidal graphite film had the lowest coefficient of friction and continuous motion was evident, when one of the metal surfaces was graphited. However, graphite is better known as an additive to lubricating oil. Tests have shown the value of the graphite film, once it is formed, in this connection. Graphited oils are also valuable, like certain oils with fatty acid additives, in avoiding seizure in an emergency when boundary conditions are established. They have the further advantage that the graphite film is unaffected by any temperature or load likely to occur in practice. Such boundary conditions are only a temporary phase, however, pending the restoration of fluid-film lubrication and it has been shown experimentally that the graphite film facilitates oil-spread. This applies also in the case of chromium-plated and stainless steel with a mirror finish. K. C. G. K.

755. Steam Turbine Lubrication Problems and their Solutions. 3 (2). Cooling Function of the Oil. A, Wolf. *Petroleum*, 1947, **10**, 13.—The temperatures of both the oil and the water entering and leaving a cooler should be logged daily so that any change in cooler efficiency will reveal itself. To guard against damage from vibration, the cooler should be built separated from the turbine. The oil pressure while passing through the cooler should be higher at all points than the water pressure, so that any leakage occurring will be relatively harmless, *i.e.*, oil into water. Leakage should always be tested for "hot," as hot oil has a much greater capacity for percolating through even extremely minute leaks. As regards the effect of leakage of water into the oil, a continuous entry of considerable amounts of water is sometimes thought to be even beneficial, provided that the water settling out in the oil reservoir is automatically discharged or drawn off at regular intervals. However, the accidental washing of the oil due to water leakage in the cooler is very detrimental, because the water droplets in the oil may generate sufficient steam on coming in contact with the hot journal to bring about local rupture of the oil film and consequent damage of the babbitt due to frictional heat. K. C. G. K.

Derived Chemical Products.

756. Vinyl Alkyl Ethers. C. E. Schildknecht, A. O. Zoss, and C. McKinley. *Industr. Engng Chem.*, 1947, **39**, 180.—The literature related to simple unsubstituted vinyl alkyl ethers is reviewed. New data are presented on the purification and properties of the vinyl alkyl ether monomers. Special attention is given to vinyl methyl, vinyl *n*-butyl, and vinyl *iso*butyl ethers, which have been made available for development purposes in this country by application of the Reppe synthesis. Correct physical data on these materials are of special interest, both because the monomers are comparatively unstable and because their behaviour in polymerization is greatly influenced by certain types of impurities. Chemical reactions of the vinyl alkyl ethers include addition to the double bond, hydrolysis, and polymerization. Some preliminary work on the polymerization of vinyl alkyl ethers is described together with observations on several commercial polyvinyl alkyl ethers from abroad. A. W.

Miscellaneous Products.

757. Evaluation of Lignite Tar. A. Gosselin. *Rev. Inst. Franç. Pétrole,* 1946, **1,** 145–151.—The investigation was carried out on a tar (d_{15}, 1·026, 80% volatile at 360° C, phenol content 41%) from the low temperature (450° C) carbonization of lignite from Bouches-du-Rhône. Physical characteristics and chemical analysis of the tar are given. Owing to the highly reactive nature of the tar, it cannot be treated like a pet product and hydrogenation is the best approach. This was carried out using a mixed catalyst based on molybdenum sulphide and using a 3 : 1-hydrogen–nitrogen mixture. Processing (at 400 atm and 470° C) for maximum gasoline production yielded 86% (wt) with b.p. 55–186° C and O.N. (Motor) of 75. An alternative is to hydrogenate with a view to production of solvents and lubricating oils. For this purpose the tar was separated by distillation (at 20 mm. and cutting at 220° C) into two equal fractions by volume. The light portion on hydrogenation (400 atm, 355° C) yields a gasoline/W.S. cut, a highly aromatic solvent fraction, a heavier cut (280–320° C) suitable as a plasticiser and a phenol fraction. The heavier portion of the tar is hydrogenated (400 atm, 380° C) to give a spindle oil and a medium viscosity (11·2 cs at 98·2° C) lubricating oil having moderate V.I. (64), good p.pt (− 7° C) and good oxidation characteristics. The overall yield of products on thus hydrogenating the tar in two portions is 86·9% (32% of gasoline and solvent, 9·7% of light phenols, 14·2% of spindle oil, 25·7% of medium lubricating oil and 5·3% of wax). It is concluded that hydrogenation is the only feasible method for utilizing such tars and that it could also be applied to indigenous (French) bitumens. V. B.

Engines and Automotive Equipment.

758. Research for the Motor Industry. Anon. *Gas Oil Pwr*, 1947, **42**, 51.—The Motor Industry Research Association is carrying out work on the following topics of engine design and operation: (1) The effect of piston ring design on engine operation;

(2) Petrol injection; (3) Investigation of the wear of journals running in combination with copper–lead bearings; (4) Correlation between fatigue strength of crankshafts and the properties of the component materials.

Subjects on which work is proposed include correlation of cetane number of diesel fuels with smoke and noise, cold starting, and engine fouling. H. C. E.

759. Power Installations. F. M. Owner. *J. R. aero Soc.*, 1947, **51** (434), 71.—The lecture formed part of a discussion on Engineering Problems of Future Aircraft and in its reported form gives the views of a member of the Bristol Aeroplane Co. on future power installations. Propulsion systems are tabulated and the paper deals with the following main items: classification of aircraft requirements; classification of power plants; possible power installations; installation requirements; general trend of development; conclusion on engineering problems. I. G. B.

760. Nene Installation. Anon. *Flight*, 1947, **51**, 217.—Details given of Rolls-Royce gas turbine power units in a Lancastrian. Many features of jet installation, such as the mounting structure, remote auxiliary drive arrangements, and the jet pipe relief duct, are shown for the first time. The tubular mounting is attached to the face of the front spar, part of the load being transferred to the rear spar by an interspar structure. The adapted fuel system includes two auxiliary kerosine tanks which have been added on the fuselage; the original No. 2 petrol tanks are retained for the inboard Merlins. I. G. B.

761. New Polar Diesel Engine. Anon. *Motor Ship*, 1947, **28**, (326), 477.—The Atlas Diesel Co. of Stockholm have in course of development a new type of marine diesel engine, of larger cylinder size than hitherto built and designed for ship propulsion either through gearing or with diesel drive. The first engine of the type to be installed in a ship is a 7-cyl set. It is of 2-cycle, single-acting design:

Cylinder diameter	500 mm
Piston stroke	700 mm
R.P.M.	250/155
B.H.P.	2800/2050
M.E.P.	5·23 kg/cm^2
Piston speed	5·83 in/sec.

I. G. B.

Miscellaneous.

762. Applications of Liquefied Petroleum Gas. A. G. Arand. *Petroleum*, 1947, **10**, 3. —The gas is neither pure butane nor propane, but a mixture blended to suit the industrial uses demanded under prevailing climatic conditions. The portability of plant operated by liquid petroleum opens up a variety of possible uses in industry and these are discussed. Burners and ranges using liquefied petroleum gas can be used for easily controlled room heating of various types. Apart from such uses, mixtures of protane and butane have certain advantages as motor fuel, for they do not strip lubricating oil from the cylinder walls and crank cases. K. C. G. K.

763. Argentine Petroleum Industry (3). A. Landoni and A. Zanetta. *Petroleum*, 1947, **10**, 14.—The third and final instalment of the series deals with the Argentine petroleum industry petroleum statistics, the development of the National Petroleum Company and future prospects. K. C. G. K.

764. Economics of Colombian Oil Industry. E. Ospina-Racines. *World Petrol*, 1947, **18** (2), 37.—In 1946 revenues from petroleum (29·2 U.S. cents/brl) comprised 6% of Colombia's total revenues. The varying ratio of oil industry income tax to royalties, within the last decade, is discussed. Further revenue from oil can be obtained only by increasing output and not by additional taxation. Other recent economic data (yield per employee, capital investment, exports and production) relating to Colombia's oil industry are briefly summarized. Greater government encouragement would rectify the Colombian oil industries' present uneconomic status. V. B.

765. Conversion of French Locomotives to Oil-Burning. Anon. *Engineer*, 1947, **183**, 171.—620 steam locomotives in France are to be equipped to burn oil instead of coal. The "141-R" class has been chosen because of its relatively large fire-box. As ancillary equipment, 100 storage tanks, each of 1000 cu m capacity, with suitable pumping facilities, are to be installed. The estimated oil consumption for 1947 is 600,000 tons, increasing to 1,000,000 tons in future years. A. C.

BOOK REVIEW.

Manual of Uniforming Accounting Practices for the Oil Well Drilling Contractor. Pp. 116 + xviii. **Costing Guide.** Pp. 108 + viii. Dallas, Texas: American Association of Oilwell Drilling Contractors, 1945.

The objective of the two companion manuals is not stated, but it is presumed that they aim at the standardization of oil-well drilling accounting in order that comparisons of costs, etc., can be made on sound bases.

The "Manual of Uniform Accounting" describes with great clarity and in detail the principles upon which all good accounting practices are built up.

Suggestions are made for standard forms of financial statements, but it is appreciated that these will require modifications to suit particular circumstances and needs.

It is in the chapters on uniform cost accounting that the value of the "Manual" mainly rests. As the authors state, it is essential that allocations of expenses should be made to the same accounts consistently, and that the names of various expenses should indicate the same thing to all and should not be changed without the knowledge and agreement of all.

It is recommended that all costs be divided primarily into seven major divisions: (1) labour and supervision; (2) supplies; (3) maintenance and repairs; (4) ordinary operating expense; (5) other operating expense; (6) depreciation; (7) overhead. Forms for presenting divisions and subdivisions of the above accounts are shown, and a noteworthy point is that size and file perforation standards are provided for.

The various methods of dealing with depreciation are fully discussed.

A method of subdividing the seven major accounts to afford greater detail is given and this is made up in such a way that great flexibility is possible.

In the summary the authors stress the importance of the time factor in drilling cost control.

The "Costing Guide" is, in effect, an alphabetically arranged index permitting any article or service to be correctly allocated in the uniform accounting procedure.

The uniform practice described is distinctly elaborate, but it can be reduced to suit individual requirements. Its adoption in full could not be justified by small concerns since much simpler procedures would be as satisfactory for the purposes of cost control and maintenance of efficiency.

Its adoption will be most beneficial in the U.S.A., where it is most common to carry out well-drilling through the contract system. E. C. S.

BOOKS RECEIVED.

Materialui po Litologii (Contributions to Lithology). Moscow, 1946. Pp. 88. Price: 10 rubles.

This is issue No. 3 (7) (New Series) of "Contributions to the Knowledge of the Geology of the U.S.S.R." It is published by the Natural History Society of Moscow and includes papers dealing with the genesis of bauxite, the structure of certain coal deposits and with carbonate minerals in saline lagoons. V. B.

A.S.T.M. Standards on Petroleum Products and Lubricants. Pp. 615 + xii. Philadelphia, Pa.: American Society for Testing Materials, 1946. $4. Obtainable also from The Institute of Petroleum, £1 1*s.* post free.

This latest annual edition of the A.S.T.M. Standards covering petroleum products and lubricants contains eighty-five more pages than its immediate predecessor and gives in their latest approved form ninety-nine test methods, twenty-eight specifications, and six lists of definitions. Numerous changes are detailed in the report of Committee D-2, the appendixes to which cover methods of test for (1) sulphated residue of lubricating oils; (2) phosphorus in organic materials; (3) aromatic hydrocarbons in mixtures with naphthenes and paraffins by silica gel adsorption.

1946 Book of A.S.T.M. Standards. Part I—A : Ferrous Metals. Pp. 1181 + xxiv. **Part I—B : Non-Ferrous Metals.** Pp. 917 + xxiv. **Part II : Non-Metallic Materials—Constructional.** Pp. 1762 + xxxviii. Philadelphia, Pa. : American Society for Testing Materials, 1946.

Normally a triennial publication, exhaustion of the 1944 Edition has necessitated issue with only a two-year interval. Opportunity has also been taken to publish in five parts instead of three to avoid bulky and inconvenient volumes.

Flowing Gold. The Romance of Oil. John J. Floherty. Philadelphia : J. B. Lippincott Co., 1945. Pp. 256. $2.50.

A popular story of the oil industry.

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

Further reports in the series prepared for this year's Fuel Economy Conference are :

Irish Report. Pp. 8. 6*d.*
French Report. Pp. 28. 1*s.* 6*d.* Includes a chapter on petroleum products.

Technical Missions to Germany.

Further official reports have been received as follows :

B.I.O.S. REPORTS.

380. The Bentheim Gas Field (History and Present Status as a Source of Natural Gas). Pp. 19.
446.* Reitbrook Oilfield. Repressuring using Flue Gas. Pp. 18.
513.* Notes on the Organization of the German Petroleum Industry during the War. Pp. 14.
636.* Mineralölwerke F. Harmsen, Kiel, Germany. Lubricants. Pp. 11.
637.* Olex Deutsche Benzin und Petroleum Gesellschaft. Fuels and Distribution. Pp. 13.
638.* Deutsche Erdöl A.G., Hamburg, Germany. Crude Oil and Products. Pp. 13.
690. Prevention of Atmospheric Pollution by Noxious or Offensive Gases, Fumes, or Dusts. Pp. 55.
734. German Brown Coal Industry. Pp. 42.
771.* Specifications and Testing of Oils, Fuels, and Lubricants in Germany. Pp. 236.
875. Phthalic Anhydride Plant at I.G. Farben. A.G., Verdingen, Germany. Pp. 8.
928. German General Rubber Goods Industry. Part II. Pp. 275.
935.* I.G. Farben., Ludwigshafen am Rhein. Manufacture of Phthalic Anhydride. Pp. 9.
937. Dr. F. Raschig G.m.b.H., Ludwigshafen am Rhein. Tar Products. Pp. 8.
967.* Deutsche Vacuum Oel A.G., Hamburg. Fuels and Lubricants. Pp. 159.
1117. The Benzin-Benzol Verband, Bochum, and the German Benzole Industry. Pp. 31.

F.I.A.T. REPORTS.

917.* Manufacture of 2-Ethyl-anthraquinone at the I.G. Farben. Plant in Ludwigshafen. Pp. 11.
935. The Production of Higher Vinyl Esters, Ludwigshafen. Pp. 7.

J.I.O.A. REPORTS.

70.* Some Notes from the Interview of Mr. Berendt of Blohm and Voss on the Blohm and Voss System of Oil Burning in Marine Boilers and an Ignition Starter for Cold Boiler Starting. Pp. 3.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

May, 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.

Bilton, Norman Frederick, Research Chemist, Vigzol Oil Refining Co. (London), Ltd., Ormskirk. (*L. Mills ; S. Elliman.*)

Bird, Thomas Reid, Manager, Contracts & Patent Dept., Esso Development Co. (*H. C. Tett ; F. H. Garner.*)

Boorman, Edward James, Senior Chemist, Esso European Laboratories. (*C. Chilvers ; A. Osborn.*)

Branch, Arthur Charles, Managing Director, Metal Propellers Ltd. (*A. E. Chambers ; T. L. Bonstow.*)

Burningham, John, Sales Manager, Messrs. Arthur Brown & Co., Ltd. (*F. A. Ostler ; C. B. Wingfield.*)

Cullingham, Ernest Keith, Student, Royal School of Mines. (*S. E. Coomber ; G. D. Hobson.*)

Davies, William David, Trainee, Fina Petroleum Products Ltd. (*H. W. Chetwin ; A. J. Wilson.*)

Dawson, Leonard Smith, General Manager, Oil Well Engineering Co., Ltd. (*R. B. Rogers ; E. G. Thorn.*)

Garde-Hansen, Hans, Student, Royal School of Mines. (*S. E. Coomber ; G. D. Hobson.*)

Gershon, John Charles, Sales Manager, Southern Area, Ragosine Oil Co., Ltd. (*G. J. Vineall ; V. M. Farrant.*)

Lester, Leslie John, Assistant Chemist, Messrs. Arthur Brown & Co., Ltd. (*F. A. Ostler ; C. B. Wingfield.*)

Raigorodsky, Paul M., Manager, Claiborne Gasoline Co., Houston, Texas. (*G. Egloff.*)

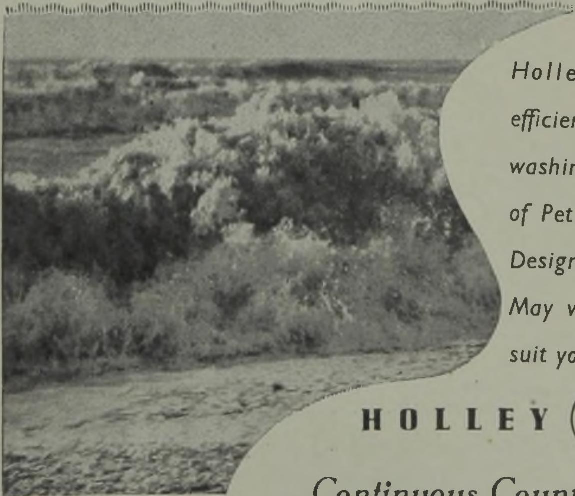
Selwood, Peter, Student, Royal School of Mines. (*S. E. Coomber ; G. D. Hobson.*)

Sheen, Ronald William, Petroleum Chemist, Messrs. Arthur Brown & Co., Ltd. (*F. A. Ostler ; C. B. Wingfield.*)

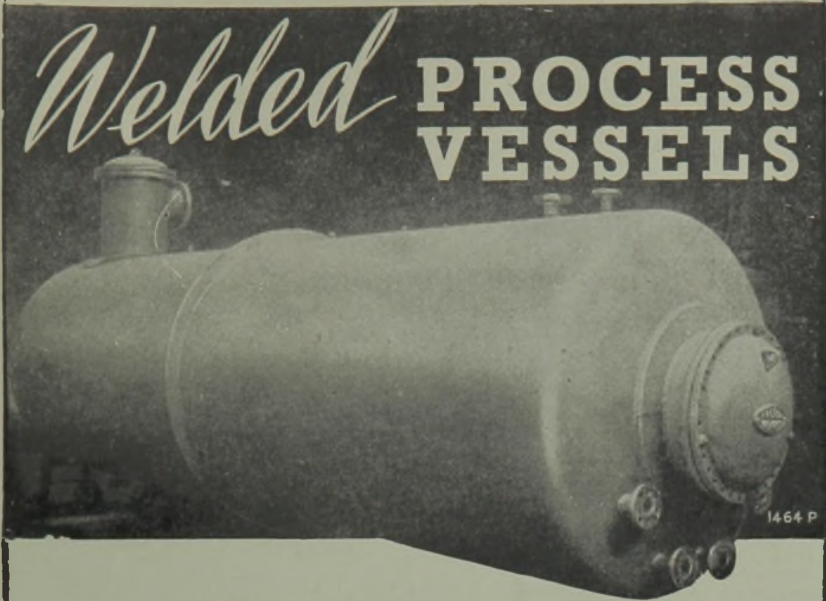
Transfer.

Clegg, Neville Aspinall, Assistant Chief Chemist, Manchester Oil Refinery, Ltd., Manchester. (*Harold Moore ; G. H. Harries*). (*Associate Member to Fellow.*)

Lehner, Hans Peter Ernst, Prospecting Officer, D.C.O.P., Ministry of Fuel & Power. (*G. D. Hobson ; S. E. Coomber.*) (*Student to Associate Member.*)

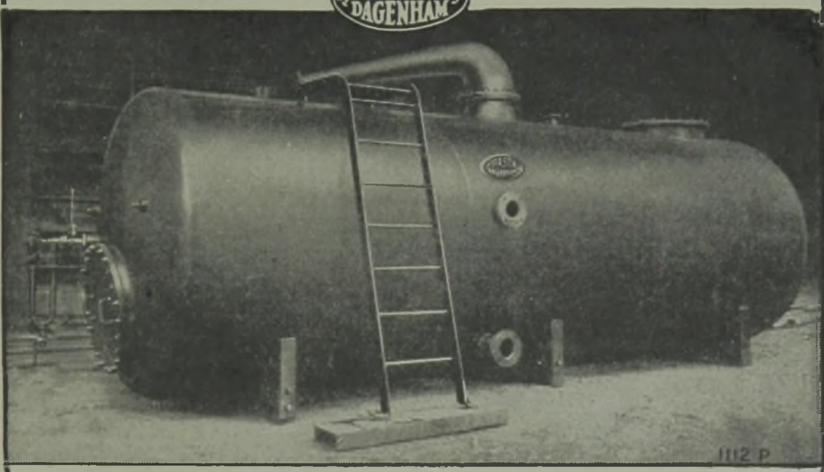


THE MOST ADVANCED TECHNIQUE IN—



Our facilities for X-ray examination of welds are of particular value in the case of vessels to contain Petroleum products during heat, pressure, or high vacuum processing.

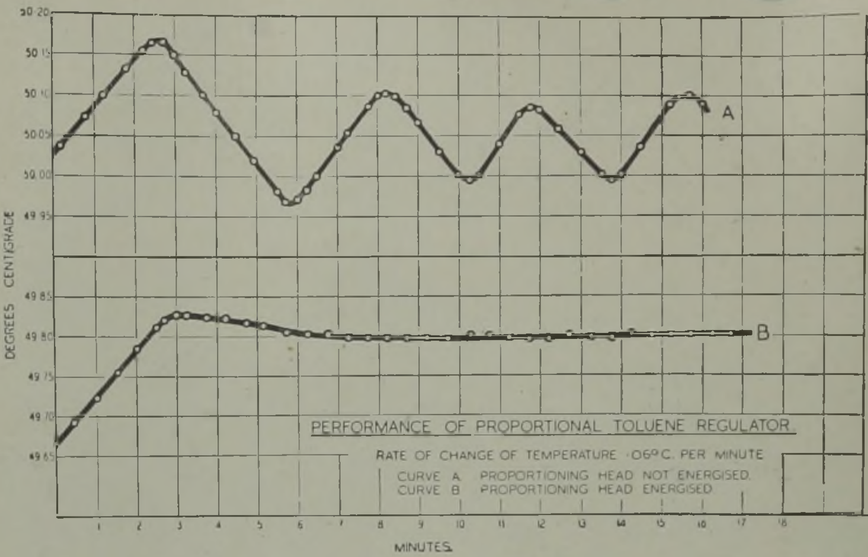
FRASERS of DAGENHAM



W. J. FRASER & CO. LTD., DAGENHAM, ESSEX.

TAS/FS.262

Kindly mention this Journal when communicating with Advertisers.



TENFOLD IMPROVEMENT IN TOLUENE REGULATOR PERFORMANCE

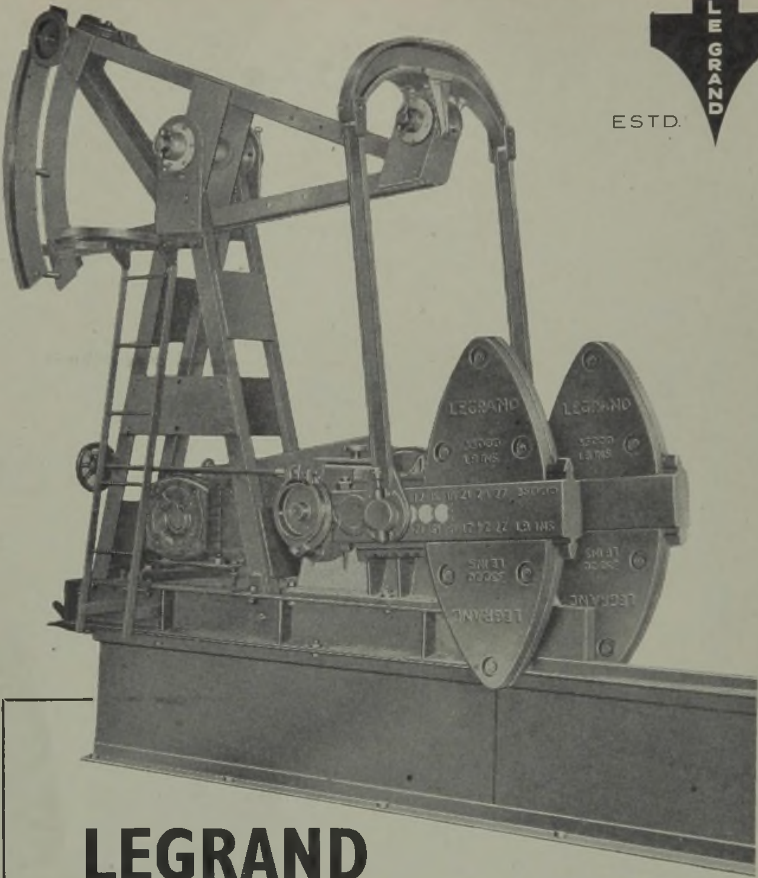
This record of an actual experiment shows how the SUNVIC Proportioning Head, used with any standard Toluene Regulator, improves the fineness of regulation, giving a stability of the order of 5 milli-degrees.

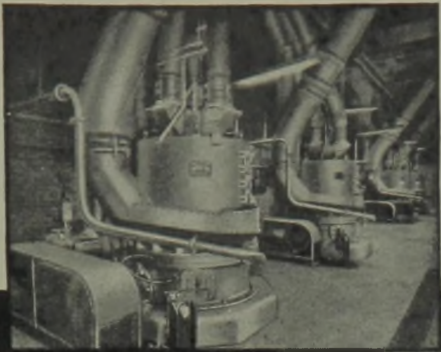
The SUNVIC Proportioning Head is normally used in conjunction with a SUNVIC Type EA2/T Electronic Relay.

This apparatus is fully described in Technical Publication EA11/13. Please request a free copy today.

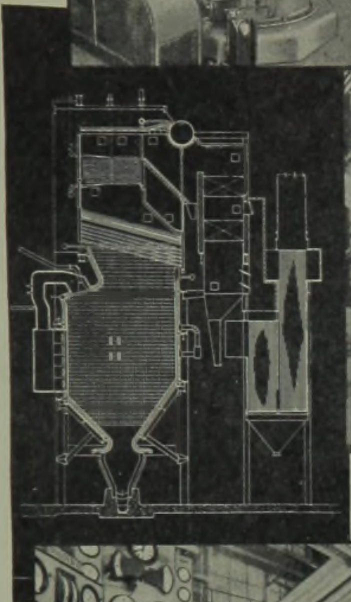
SUNVIC CONTROLS LTD., STANHOPE HOUSE, KEAN ST., LONDON, W.C.2

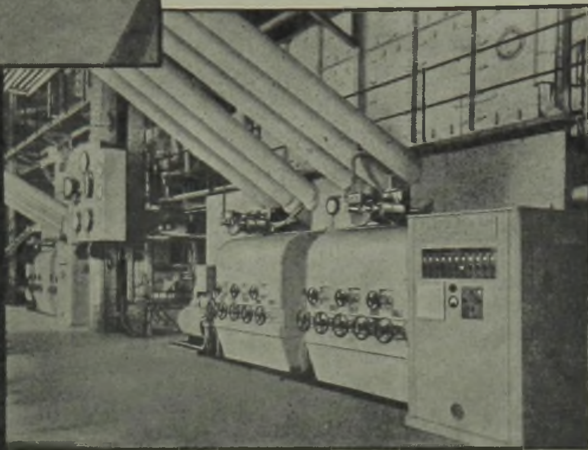
THE THERMOSTATIC **SUNVIC** CONTROL EXPERTS

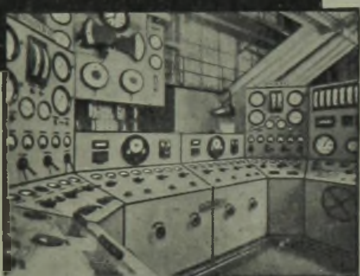




BABCOCK BOILERS
at NORTH TEES Power Station







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 :—

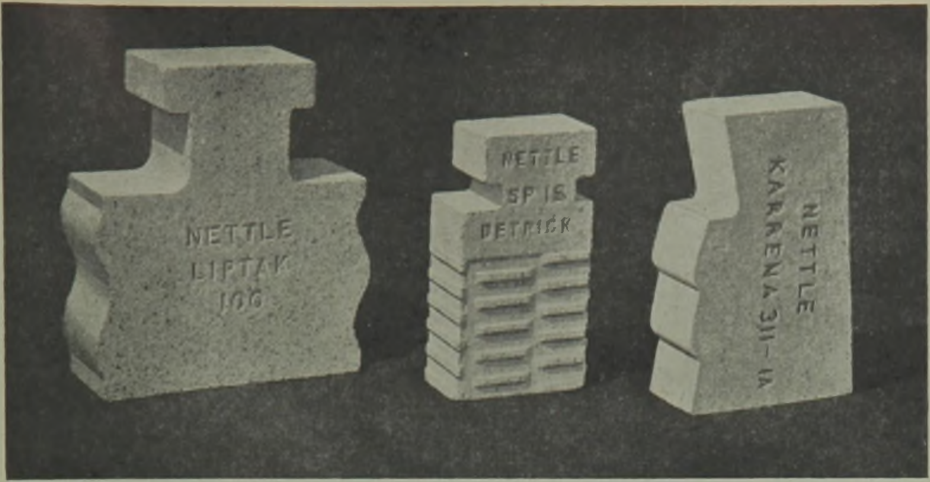
TOP. A view of the B. & W. Type "E" Mills in the basement.

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.

BABCOCK & WILCOX LTD., BABCOCK HOUSE, FARRINGDON ST., E.C.4



FOR OIL FIRED FURNACES

THISTLE ($35/37\%$ Al_2O_3) Firebrick is a general purpose first quality firebrick which enjoys a wide reputation for regularity of quality.

NETTLE ($42/44\%$ Al_2O_3) is a super grade brick of exceptional uniformity manufactured under close control in a modern plant and fired in Tunnel Kilns. The brick to brick variation in quality and shape is reduced to the absolute minimum. Recommended for those parts of the lining where conditions are more severe.

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.

SUSPENDED ARCH AND WALL TILES. We specialise in the manufacture of the various well-known types of these tiles in which accuracy of shape is an important consideration.

PLASTIC REFRACTORY.

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

EXPORT PACKING.

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

REFRACTORY CEMENTS.

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.

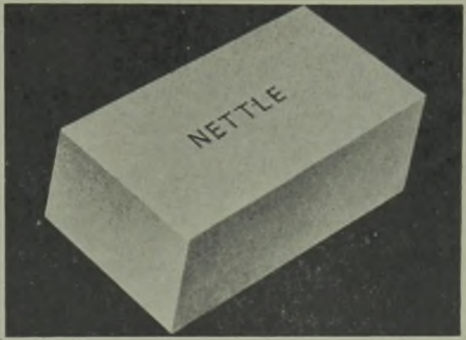
THISTLE FIRECLAY is a finely ground fireclay of similar characteristics to Thistle brick.

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.



STEIN

JOHN G. STEIN & CO., LTD.

BONNYBRIDGE SCOTLAND

Foster

Pyrometers

The refinement of petroleum products depends primarily upon temperature, and for the right products the correct temperature must be maintained. Every petroleum engineer knows this by heart—but not every petroleum engineer knows that

FOSTER PYROMETERS

measure and record these temperatures with outstanding success.

Foster Instrument Co., Ltd.

Phone: Letchworth 984 (3 lines).
Grams: Resila, Letchworth.

Letchworth, Herts.

"Yorkshire" Tubes

SEAMLESS DRAWN TUBES IN COPPER, BRASS, 'YORCALBRO' (Aluminium-Brass), CUPRO-NICKEL AND ALL NON-FERROUS ALLOYS

We specialise in the manufacture of seamless drawn Heat Exchanger and Condenser Tubes for the Oil Industry.

Our Research Department will be pleased to advise on any matter connected with the service of Non-Ferrous Tubes for Oil Refinery Requirements.

"Yorkshire" Fittings

(Pat. No. 419521)

Combined with 'Yorkshire' Copper Tubes provide an efficient, stream lined pipe line for all engineering purposes.

Details and Prices on application.