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Oilfield Exploration and Exploitation.

Geology.

1237. Results and Significance of Drilling Operations in the Athabaska Bituminous Sands. G. S. Hume. *Trans. Canad. Inst. Min. metall.*, 1947, 298–324.—The Steepbank area, 22 miles north of Fort McMurray, has an average of 11·96% of bitumen over 945 acres, with a ratio of bituminous sand to overburden of 2·5 to 1. The Horse River area, where the Abasand Oils plant was erected, is not considered satisfactory for large-scale operations. The deposit as drilled contains about 4,350,000 brl of bitumen. 22 ft of clay intervenes between the sand and the limestone. The area north of Steepbank river has no value, but the west deposit averages 12·3% bitumen over 92 acres. An area 3 miles north of the mouth of the Muskeg River had good grade bituminous sand interstratified with much clay.

Twenty-two miles north of Fort McMurray on the west bank of the Athabasca River is the Mildred–Ruth Lakes area. The Waterways formation (Up. Devonian) consists of grey limestones and shales overlying anhydrite and salt beds. Clays of Lower Cretaceous age occur on top in addition to residual clays. The McMurray sands are bituminous and in places cross-bedded and lenticular, with interbedded clay and shales. There are lignite seams and plant remains. The bitumen impregnation occurs over a large area. There is some interfingering of the deltaic deposits with marine shales, and some of the Lower Clearwater shales are contemporaneous with the Upper McMurray. In one boring the bituminous sands were 229 ft thick. The Clearwater has not been recognized in the Mildred–Ruth Lakes area, but is 275 ft thick at Boiler Rapids, and is overlain by the Grand Rapids formation. The McMurray–Waterways contact undulates and anticlines and synclines occur, mostly due to structure, but modified by erosion. The broader structural features of the limestone are probably displayed in the McMurray. Correlation of the bituminous beds is not always possible. Undoubtedly the limestone surface had some relief at the time of Cretaceous deposition. The McMurray thickens westwards in this area. The Devonian undulations may not be of tectonic origin, but may be due to changes in the underlying anhydrite and salt beds.

Generally, the lower part of the deposits is better impregnated than the upper part, and all bituminous beds are in the lower half. The amount of clay is variable. Deep, rich sands under thick overburden have no value. Usually the coarser sands have the better bitumen impregnation. As much as 83·2% of bitumen has been found, and in many beds it exceeds 50%. There is bitumen with sand in it. In the bitumen beds there is 9–26% of water, but in the bituminous sand beds there is little water. Temperature readings have been found to decrease with depth. The bitumen beds are interstratified with bituminous sands, and the thickest bitumen bed was 21 ft.

Bitumen seepages have been found, and bitumen appears to seep upwards through almost vertical tubes along with clear water. Apparently they arise from concealed beds of bituminous sand. These may explain the formation of the bitumen beds found in the McMurray, the latter having been formed during McMurray deposition. The bitumen beds suggest that the material must have been formed near at hand. The bitumen cracks at abnormally low pressures and temperatures as compared with residuums. A source to the west in dark marine shales seems possible. Evidence of shore-lines is provided by coals and conglomeratic beds. The sand grains have been

found to be water-coated inside the " oil," and the grains may have been oil-coated during deposition, and the oil not migrant into the sand.

The Mildred–Ruth Lakes deposit contains an enormous amount of bitumen. On the basis of some borings an acre might contain 330,000–350,000 brl of bitumen, and it is likely that an area of 120 acres could be selected for supporting a 10,000 brl/day plant for 15 years.

In the boring holes over 200 ft deep have normally been completed in 4–5 days, and core recovery in seventy holes averaged 95·3%. The poorest recovery was 83%.

G. D. H.

1238. How Fossil Fish Remains have been used in Pacific Coast Stratigraphy. L. R. David. *Petrol. Engr*, May 1947, **18** (8), 104.—Most oil-pools are believed to have been laid down in marine basins and the study of fossil remains associated with oil deposits is therefore expected to yield some information regarding the conditions under which these oil deposits came into existence. Many illustrations of fossils found in Pacific Coast formations are presented and their value in developing the Historical Geology and Stratigraphy of the area are discussed. Twelve references to papers on Palaeo-ichthyology are appended. R. B. S.

1239. Venezuela No. 2 Oil-Producing Nation. C. J. Deegan and P. Reed. *Oil Gas J.*, 28.12.46, **45** (34), 236.—Currently Venezuela produces about 1,100,000 brl/day, two-thirds being from the Maracaibo basin. Two-thirds of the drilling activity is in Eastern Venezuela. Reserves are estimated to amount to 8,000,000,000 brl.

In Venezuela the producer has a much higher indirect capital investment per brl of daily production than in U.S.A.

The sediments of the Eastern Venezuela basin wedge out against the Guayana shield. The basin is subdivided by a line through the igneous rocks on the Paraguana Peninsula and at El Baul, the parts being the Orinoco basin and the Apure or Barinas basin. On the east side of the Maracaibo basin the fields are structural and stratigraphic traps. Prolific Cretaceous limestone production has been found west of the Lake in the La Paz and Mara fields. La Paz also produces from Eocene sands and the Guasare sands, shales and limestones at depths of 2000–3000 ft.

In Eastern Venezuela wells drilled too far south find tar and dead oil. Most of the fields produce from the Oficina sands of Miocene age. The Greater Oficina area fields are of the fault-block type. They lie on the southern flank of the basin. The reservoir rocks are more or less broad sheets of sand dipping north and northeast, trapping being by faults and pinch-outs at depths of 4000–7000 ft. The Greater San Joaquin area to the north produces from steeply dipping beds which are frequently faulted. The depths range 6000–11,000 ft. Jusepin produces from three Miocene sand lenses. In the Greater Jusepin area sediments are believed to have been derived from the Northern Range. Jusepin also produces from truncated southwest-dipping Oligocene beds.

Quiriquire produces from Pliocene and Pleistocene beds deposited on truncated Cretaceous and Tertiary beds. Las Mercedes produces from the Miocene La Pascua sands. One well has been completed in the Cretaceous.

There is folding along a southwest to northeast line through the Greater San Joaquin area. G. D. H.

1240. French Geologists Look to Southwestern Region in Search for More Oil. J. Asty. *Oil Gas J.*, 28.12.46, **45** (34), 259.—In 1939 natural gas was found in a well at St. Marcet, and in 1940 oil was obtained. Geological and geophysical work was carried out in a zone at the foot of the Pyrenees.

In 1944 gas production reached 7,063,000 cu. ft./day.

Considerable efforts are being made to train personnel and to acquire equipment for proper oil investigations in France and her colonies. A five-year programme backed by 55,000 million francs has been arranged.

Gas has been found on the St. Marcet and St. Martoury structures, and there are encouraging signs of gas on the Plagne structure. Gas output is limited by lack of absorption plant and distributing lines, but an output of 35–42 million cu. ft./day is planned. G. D. H.

1241. China's Potential Oil Resources Large. G. Egloff. *Oil Gas J.*, 28.12.46, **45** (34), 243.—Oil exploration in China has been limited mainly to a few areas with seepages

and favourable structures. These extend along a 2000 miles arc from Sinkiang through Kansu, Szechuan, and Shensi provinces. Reserves of about 1,620,000,000 brl have been found. The known oil-bearing areas are the Tsungari, Tarini, North Kansu, North Shensi, Szechuan, North Manchuria, and East Jehol basins.

Poor communications are hindering exploration and exploitation.

The Yuman (Laochionmiao) field was opened in 1939 in northwest Kansu. In 1944 the output was 3000 brl/day. Seepages are present where a river cuts the crest of an anticline. Production was found at 200–550 ft, but there has been deeper development at 1300–1400 ft. Oil has also been found at 1638 ft. Up to February 1945 the cumulative production was 1,379,000 brl, 1,347,000 brl being from the 1300–1400 ft sands. The oil has 15% of wax. The field has two refineries. In 1945 the twenty-six wells were giving 1500–2200 brl/day. The proven area of 600 acres may have 45,000,000 brl of oil.

In the south and southeast of the Red Basin of Szechuan there are about 100 anticlines which generally run northeast to southwest. There are coal deposits, and brine wells 2000–3000 ft deep which have sometimes given a little oil and gas. The oil obtained at Mioerhkow has little sulphur, and gives only 2% of straight-run gasoline. The gas is from the Trias. One well gives 500,000 cu. ft./day. The Tzyeliusing gas field is perhaps 2000 years old. It appears that drilling at Wu Su in northwest Sinkiang found 49–52° A.P.I. oil at depths of about 4800 ft in association with large gas flows. There are oil seeps at a number of points.

Some wells on the southern edge of the Tsungari basin in north Sinkiang are reported to have given 75–225 brl/day. The Tarini basin of southern Sinkiang has seepages, but there has been no organized prospecting. Small oil pools are known in North Shensi, and some oil has been found in the north Manchuria and the East Jehol basins. An asphalt deposit is known in the Turfan basin of east Sinkiang. The Tsaidam basin appears to have oil possibilities and other possible areas are northwest Kueichow, western Yunnan, and Kwangsi.

Seven oil-bearing structures are known in western Formosa. These are near Byoritsu, and 143 of 224 wells produced gas or oil from depths less than 3275 ft. Oil production has averaged 80 brl/day, and gas production about 7,000,000 cu. ft./day. Shukkoko is the main field. The crude is a wax-bearing naphthene-intermediate base oil.

In 1939 the Fushun (Manchuria) oil shale was providing 2,000,000 brl/day of oil. The shale reserve is 5,500,000,000 tons, equivalent to 2,109,000,000 brl of oil. The Shensi oil shale reserve of 5,000,000,000 tons is equivalent to 852,000,000 brl of oil.

China's coal reserves are placed at 240,000,000,000 tons, mainly in Shensi and Shansi provinces. G. D. H.

1242. Oil in Japan. E. N. Tiratsoo. *Petroleum*, 1947, **10**, 80.—A brief survey of Japanese oilfields and their geology and structure is given together with statistics regarding crude oil production therefrom. Mention is also made of the work carried out to produce synthetic fuel.

Japanese resources of indigenous crude oil are small and the proved reserves are dwindling. This can be largely attributed to unbalanced exploitation and to neglect of geological and geophysical methods of exploration. If such systems were to be adopted, they might yet lead to the discovery of sufficient petroleum to meet the country's present-day requirements. F. W. H. M.

Geophysics and Geochemical Prospecting.

1243. About Certain Geochemical Processes in the Permian Deposits of the Sarabikulovo Oil Pool. M. S. Kaveyev. *Comptes Rend. Acad. Sci. URSS*, 1947, **55**, 425 (in English).—The oil accumulations discovered in the vicinity of Sarabikulova village, Shugurovo district, are mainly confined to the top of the Ufa series of the Permian deposits. Based on detailed analyses of well waters and gases, the geochemical processes responsible for the particular features of the deposits of the region are described. G. H. B.

Drilling.

1244. Drilling Costs in Rangely Field. N. Williams. *Oil Gas J.*, 26.4.47, **45** (51), 150.—An account is given of the methods used to reduce drilling costs in the Rangely field of Northwest Colorado. A decrease of 25% in drilling costs has been achieved. R. B. S.

1245. Casing and Wire Rope. Anon. *Oil Wkly*, 12.5.47, **125** (11), 42.—The future requirements of well casing and wire ropes to withstand the loads and stresses imposed by drilling wells of great depth is discussed. R. B. S.

1246. Drilling Barges for Lake Maracaibo. Anon. *Oil Wkly*, 5.5.47, **125** (10), 18 (*International Section*).—The design and construction of drilling barges for use 15 miles offshore on Lake Maracaibo, is briefly described. R. B. S.

1247. Self-Propelled Cementing Barge for Offshore Operations. N. Williams. *Oil Gas J.*, 12.4.47, **45** (49), 84.—The layout and manipulation of cementing barges designed for use at offshore locations along the Louisiana and Texas Gulf Coast are briefly described. R. B. S.

1248. Torque Converter Drives for Oil-well Drilling Rigs. Part I. C. M. O'Leary. *Oil Wkly*, 21.4.47, **125** (8), 42.—A detailed discussion is given of the design and operation of torque converter drives and the advantages resulting from their use in oil-well drilling rigs.

In this part the following are discussed: (1) the blading system; (2) reaction blades; (3) operation of converter; (4) efficiency curve; (5) match engine and converter curves; (6) measure of horse-power loss; (7) gearing; (8) lengthening of equipment life by use of torque converters; and (9) speed ratios. R. B. S.

1249. Drill-Pipe Handling. G. M. Wilson. *Oil Wkly*, 10.3.47, **125** (2), 60.—A brief description is given of a small drill-pipe carriage and inclined track system which simplifies the laying down or picking up of drill-pipe or casing. R. B. S.

1250. Non-Destructive Testing of Drill-Pipe. R. L. Cavanagh. *Oil Wkly*, 10.3.47, **125** (2), 42.—A brief description is given of an instrument suitable for predicting the failure of drill-pipe whilst running the string in or out of the hole, without interfering with normal drilling operations. The instrument consists of a cyclograph test coil, through the field of which the drill-pipe passes: this causes core-losses which control the output of an oscillator. These core losses are affected by the magnetic and electrical properties of the drill-pipe which, in turn, depend on their physical characteristics. Hence the output of the oscillator, which can be recorded by the use of a cathode-ray tube, is an indication of the physical condition of the drill-pipe.

Some field tests with this instrument are briefly described and some graphs of cyclograph readings obtained by these tests are shown. At present the work is only in the experimental stage and much work has to be done to perfect an instrument sufficiently sensitive and economical for practical use. R. B. S.

1251. Torque Strength of Oil-Well Tubing and Drill-Pipe. D. M. Best, C. F. Lewis, and R. M. Claypool. *Oil Wkly*, 14.4.47, **125** (7), 44.—The author derives the following equations for making a field determination of the torque to which a drill-pipe or tubing string is subjected:

$$S_{s\,\max.}^{2} = S_s^2 + \tfrac{1}{4}S_t^2; \quad n = \frac{S_s l}{E_s C 2\pi},$$

where $S_{s\,\max.}$ = maximum allowable shear stress in p.s.i.; S_s = shear stress due to torsion in p.s.i.; S_t = tensile stress in p.s.i.; n = number of revolutions of pipe end (with one end fixed) when the shear stress is equal to S_s; l = length of pipe in inches; E_s = modulus of rigidity; and C = outside radius in inches.

This equation can be used on a pulling job (*e.g.* pulling a packer) when the maximum allowable tensile pull is insufficient: the amount of straight tensile pull to be applied to the tubing (S_t) is first decided upon: with a knowledge of $S_{s\,\max.}$ for the particular

tubing installed the maximum allowable shear stress due to pure torsion (S_s) can be determined from the first equation. Using this value of S_s and knowing E, and C the value of n can then be calculated : if l is taken as 12,000 the n will be the maximum allowable turns of backlash which can be allowed per 1000 ft of tubing.

In the field the pull equivalent to S_t is taken on the pipe and the table rotated a number of turns in the desired direction equivalent to n. If the tubing then still fails to lift the clutch is released and the number of revolutions of backlash are counted : if these are less than n the deficit may be considered to be due to thread make-up. The procedure is repeated until n revolutions of backlash are obtained. If the string still cannot be pulled it is advisable to try other fishing methods for recovery to avoid a twist-off.

The author also discusses the assumptions used in the calculations and the modifying factors which should be applied in using the equation. A numerical example is also worked out. R. B. S.

1252. Proper Care of Wire Line Increases Life. E. McDaniel. *Petrol. Engr*, April 1947, **18** (7), 88.—A few hints are given concerning the installation and lubrication of wire lines, and the cutting back and changing of wire-line ends. R. B. S.

Production.

1253. Comparison of the Basic Parameters of Similitude in Underground and Sand-Free Pipes' [smooth-bore cylindrical tubes] Hydraulics. V. N. Shchelkachev. *Compt. Rend.* (*Doklady*) *Acad. Sci. URSS*, 1946, **54**, 673 (in English).—Five dimensionless parameters, including the Reynolds number, Leibenson's percolation number, the Darcy–Poiseuille number and a derivative of the Froude number are formulated and applied to the study of some problems in underground hydraulics involving fluid percolation through porous media. An expression is derived for the Reynolds number of such a system and two equations for the generalized law of percolation developed. From these the well-known formulæ of Poiseuille, Blasius, and Prandtl for fluid flow through tubes, and the percolation laws of Darcy, Smreker, and Krasnopolsky can be deduced for particular values of the appropriate constants. A convenient equation for the evaluation of experimental data on percolation flow is given from which deviations from the Darcy percolation law may readily be detected. G. H. B.

1254. Selection of Multi-cylinder Gas Engines. F. E. Hummel. *Petrol. Engr*, April 1947, **18** (7), 120.—The factors affecting the selection of multi-cylinder gas engines for oil-well pumping units are discussed in some detail. R. B. S.

1255. Formation Testing and Testing Equipment. J. C. Padgett. *Oil Wkly*, 24.3.47, **125** (4), 18.—The various methods of formation testing and developments in this field are briefly reviewed. Various auxiliary equipment is also necessary to ensure maximum safety and proper testing procedure. In this connexion the following equipment is discussed : (1) control heads ; (2) two-way circulation valves ; (3) by-pass chokes ; (4) equalizing by-passes ; and (5) safety joints. The following types of packers are also described : (1) cone packers ; (2) sleeve-type packers ; (3) hook-wall packers ; and (4) various combinations of these. Packer anchors and pressure and temperature-recording devices for testing purposes are also discussed. R. B. S.

1256. Chemical Treatment of New and Producing Wells. N. C. Wells. *Petrol. Engr*, April 1947, **18** (7), 90.—The conditions for which chemical methods of well cleaning are more satisfactory than other methods are discussed. The harmful materials which may accumulate around a well bore are : (1) silt ; (2) clay ; (3) wax (asphaltenes, paraffins, etc.) ; (4) mud cake ; (5) hydrated bentonic shale ; (6) calcareous and other scales ; and (7) stray cement : these are also briefly discussed. R. B. S.

1257. Unsalvaged Casing Menace in Abandoned Stripper Wells. F. R. Cozzens. *Oil Wkly*, 7.4.47, **125** (6), 58.—The detrimental effects caused by abandoning stripper wells without properly salvaging casing and plugging off formation are described. R. B. S.

1258. Selecting Artificial Lift Equipment. J. H. Field. *Oil Wkly*, 14.4.47, **125** (7), 49.—The factors necessary for consideration in selecting artificial lift equipment are discussed together with the comparative advantages and disadvantages of the following systems: (1) sucker-rod pump with conventional type pumping units; (2) hydraulic pumps; (3) submersible centrifugal pumps; (4) flow valves; (5) sucker-rod pumps with hydraulic head systems; and (6) sucker-rod pumps with rod-line power.
R. B. S.

1259. Recent Experiments in Air–Gas Drive Recovery. D. E. Menzie, R. F. Neilson, and S. T. Yuster. *Oil Wkly*, 28.4.47, **125** (9), 34. (*Paper presented at the 10th Annual Secondary Recovery Conference, School of Mineral Industries, Pennsylvania State College.*)—See Abstract No. 807 (1947).

1260. Inventory of Gas-Drive Projects in North Texas. L. F. Peterson. *Oil Gas J.*, 12.4.47, **45** (49), 91. (*Paper presented before Southwest District Division of Production, A.P.I., Fort Worth*, March 1947.)—A brief review is given of gas injection operations in the Panhandle and North Central Texas areas. R. B. S.

1261. Inventory of Gas-Drive Projects in West Texas and New Mexico. L. Flood. *Oil Gas J.*, 12.4.47, **45** (49), 94. (*Paper presented before Southwest District Division of Production, A.P.I., Fort Worth*, March 1947.)—Fifteen gas-injection projects in the West Texas–New Mexico area are reviewed. Brief mention is also made of proposed projects in nine other fields in the area. R. B. S.

1262. Casing-head Gas Conservation by Reinjection. Anon. *Oil Wkly*, 12.5.47, **125** (11), 39—An account is given of the Continental Oil Company's plant in the Rincon field, Starr County, Texas, which produces butane and gasoline from the casing-head gas and returns the dry gas back to the subsurface reservoir. R. B. S.

1263. Gas Well Back-Pressure Testing. E. Capshaw. *Oil Wkly*, 10.3.47, **125** (2), 56.—The fundamentals of back pressure testing are discussed and methods are shown for calculating the absolute open flow and the deliverability of gas wells. R. B. S.

1264. Efficient Continuous Flow Gas Lift. R. A. Bobo. *Oil Wkly*, 17.3.47, **125** (3), 34.—Continuous flow gas-lift operations are discussed from a quantitative standpoint. A method is devised for determining the amount of useful work that is accomplished by the injected gas in a steady flow gas-lift system, and which is independent of that performed by the reservoir energy. A means of calculating the efficiency of gas lift from well inlet to well discharge is also shown, and the manner in which overall efficiencies in a closed, rotative recompression system may be computed is discussed. Finally, the theoretical sources of energy waste in lift operations are outlined and various factors warranting investigation are outlined. One reference is given.
R. B. S.

1265. Treating Artificial-Lift Wells with Mud Acid. E. N. Jones. *Oil Gas J.*, 12.4.47, **45** (49), 105. (*Engineering Fundamentals*, No. 281.)—The treatment of pumping and gas-lift wells with mud acid is briefly discussed. An example is given of a squeeze method which can be used on several types of wells without removal of any surface or subsurface equipment. R. B. S.

1266. Action of Mud Acids on Well Equipment. E. N. Jones. *Oil Gas J.*, 19.4.47, **45** (50), 137. (*Engineering Fundamentals*, No. 282.)—The effect of mud acid on cement behind the casing or in the hole, and on packer elements or liners is discussed.
R. B. S.

1267. Mud Acidization Before Squeeze Cementing. E. N. Jones. *Oil Gas J.*, 26.4.47, **45** (51), 185. (*Engineering Fundamentals*, No. 283.)—A method is suggested for cleaning the formation to remove mud prior to squeeze cementing for a water shut-off. The method consists of an acid treatment using a tail pipe installation. R. B. S.

1268. Thermo-Setting Plastics Effective in Well Repair. O. O. Dale. *Petrol. Engr*, May 1947, **18** (8), 90.—The advantages of plastics for selective plugging of wells is

reviewed : the procedure which should be adopted in these repairing operations is also outlined. R. B. S.

1269. Selective Shooting. F. R. Cozzens. *Oil Wkly*, 28.4.47, **125** (9), 53.—The advantages of selective shooting for increasing oil production are briefly discussed. R. B. S.

1270. New Oil-Well Shooting Method. Anon. *Oil Gas J.*, 12.4.47, **45** (49), 86.—A new oil-well shooting method which utilizes the " shaped charge " principle is briefly explained. Applying the basic principle that an explosive acts perpendicular to its surface, a shell was designed using cones as the shape for the shot. This design produces a breaking and shattering effect, rather than a pulverizing action as is experienced with a conventional shot. R. B. S.

1271. British Well Shooting Problems. J. F. Waters. *Oil Wkly*, 5.5.47, **125** (10), 26 (*International Section*). (*Paper presented before Institute of Petroleum, London*, Dec. 1945.)—See Abstract No. 539 (1946).

1272. Design and Operation of Swabs for Oil Wells. J. A. Wilson. *Petrol. Engr*, May 1947, **18** (8), 72.—The desirable characteristics of a swab are : (1) that it will fall as fast as the line is unreeled ; (2) that it will pull a full load and give a maximum number of trips before requiring a change of cups ; (3) that cups can be changed easily and speedily ; (4) that it will pull both light and heavy loads without loss of fluid or disintegration of the cups ; and (5) that it is unlikely to lose any of its parts in the well.

Four types of swabs are described and compared insofar as the above requirements are concerned. These four types are : (1) the fixed-ball swab ; (2) the split-ball swab ; (3) the expanding cup swab ; and (4) the balloon-type swab. The procedures to be adopted in swabbing through casing and bringing in a well are also discussed. Finally, the cost of swabbing wells is outlined and swabbing practices which should be avoided are mentioned. R. B. S.

1273. Some Observations on the Problems of Cleaning Out Stripper Oil Wells. C. E. Stout. *Producers' Monthly*, May 1947, **11** (7), 13.—The decreases in well productivities are often due to many causes besides the fundamental cause of loss of reservoir energy. In the Pennsylvania Grade region some of the major causes are : (1) the accumulation of paraffin in the shot-hole and on the sand face ; (2) the sloughing off of sand from the walls which gradually fouls the pumping equipment ; (3) the caving and accumulation in the shot-hole of material from the open hole above the sand ; (4) the failure of casing, allowing water to enter the well and the producing sand ; and (5) the accumulation of salt on the walls of the well bore. Owing to this variety of causes of decreased productivity, no one method of cleaning out will work satisfactorily in all cases.

Tabulated data are presented which summarize the information obtained from 116 clean-out jobs in the Pennsylvania Grade region : these data are used as a basis of analysing the cost of cleaning out by various methods. The methods considered are : (1) open-shot methods ; (2) tamped-shot methods ; (3) heating methods—further subdivided into (*a*) carbide treatment ; (*b*) steam treatment, and (*c*) electrical heating ; and (4) cleaning out only.

The author concludes that owing to the high cost of cleaning out jobs, great care should be taken to select for cleaning only those wells which are likely to respond readily to treatment. This can be done by a careful study of a well's production history. R. B. S.

1274. Oil Production by Water. Part 18. Three Producing Units. P. J. Jones. *Oil Gas J.*, 19.4.47, **45** (50), 124.—The considerations involved in splitting reservoirs, as described in Part 17, are further discussed. The numbers of producing units into which a linear reservoir should be split depends on the ratio of strike to dip distances. If the reservoir is split into a series of comparatively small producing units large volumes of water will have to be produced to displace the recoverable oil and the system will be uneconomic. The considerations involved in determining the required number of wells are also discussed. R. B. S.

1275. Importance of Clay Studies in Water-Flood Operations. Part III. Some Problems Created by Clays. R. V. Hughes. *Producers' Monthly*, April 1947, **11** (6), 10.—The effect of the properties of clays on secondary recovery operations are discussed insofar as they affect each of the following: (1) drilling; (2) sand interpretations; (3) selective shooting; (4) cleaning out; and (5) input water supply. Sixteen references are appended.

This paper concludes the series of three articles to which have been appended a total of 40 references. R. B. S.

1276. Practical Aspects of Water Flooding Outlined in Three Successful Projects. H. M. McClain. *Oil Gas J.*, 26.4.47, **45** (51), 152; *Petrol. Engr*, April 1947, **18** (7), 128; *Producers' Monthly*, April 1947, **11** (6), 31. (*Abridged version of paper presented at Annual Secondary Recovery Meeting, North Texas Oil and Gas Assoc, Wichita Falls*, March 1947.)—Details are given of the preliminary investigations and development of successful water-flood projects in North- and West-Central Texas. R. B. S.

1277. Selective Exclusion of Water in Input Wells. D. Martin, K. H. Andresen, and F. W. Ellenberger. *Oil Gas J.*, 19.4.47, **45** (50), 106; *Producers' Monthly*, April 1947, **11** (6), 18. (*Paper presented before Eastern District Division of Production, A.P.I., Pittsburgh*, April 1947.)—Water by-passing in secondary recovery operations can be caused by (1) variable permeability in sands giving rise to streaks of low oil saturation which will show a high relative permeability to water; and (2) cracks or fissures throughout the sand body which may be due to various natural and artificial causes. Recent advances in selective plugging of wells to prevent by-passing of the first type are reviewed.

Laboratory and field experiments on the use of colloidal dispersions (emulsions) of paraffin wax and of rosin as plugging agents are briefly discussed. They show that: (1) the emulsion must be stable: no coagulation due to pressure variations, aeration, or the presence of electrolytes must occur; (2) the emulsified material should be insoluble in petroleum hydrocarbons; (3) the solids content must be readily soluble in some inexpensive chemical; and (4) the particles must have sufficient hardness to withstand high-pressure gradients. The ability of wax and rosin emulsions to meet these requirements and the technique employed for their introduction into the input wells are discussed. Eight references are appended. R. B. S.

1278. Water-Flood Tests on Long Cores. R. A. Morse and S. T. Yuster. *Oil Wkly*, 7.4.47, **125** (6), 36. (*Paper presented at the Tenth Annual Secondary Recovery Conference, School of Mineral Industries, Pennsylvania State College.*)—See Abstract No. 825 (1947). R. B. S.

1279. Water Flooding in Throckmorton County, Texas. P. C. Dean. *Oil Gas J.*, 12.4.47, **45** (49), 78. (*Paper presented before Southwest District Division of Production, A.P.I., Fort Worth*, March 1947.)—Details are given of the geology, development, and production history of the Woodson shallow field in Throckmorton County, Texas. The completion of the input wells, the disposition of the water injection plant, and the various water-flooding patterns in use are also described. Prior to the commencement of water flooding in March 1941 the cumulative production was 39,795 brl; between March 1941 and December 1946 78,807 brl of crude were produced. One section of the field has been flooded with closely spaced input wells whilst another has been flooded with widely spaced inputs. The results obtained in the two cases support the conclusion that wider spacing permits the accumulation of a greater bank of oil ahead of the flood: the growing oil saturation increases the permeability to oil and delays channelling, thereby increasing the efficiency of the flood. R. B. S.

1280. Effect of Increase in Water Pressure on Water Flood Oil Production. H. M. Ryder. *Producers' Monthly*, May 1947, **11** (7), 18. (*Paper presented before Eastern District Division of Production, A.P.I.*, April 1947.)—Some details are given of the sand properties, production, and flooding history of four oil-producing properties in the Bradford area. The results show that the use of high input pressures results in increased ultimate recoveries, other conditions remaining the same. The significance of these results is discussed and the author concludes that great care should be taken in the selection of specifications for input water pressures. R. B. S.

1281. Top Water Control in East Texas. J. O. Crouch. *Oil Wkly*, 28.4.47, **125** (9), 49.—The methods employed in detecting and locating sources of top and intermediate water are briefly reviewed. The use of plastics, which are normally used to control bottom water, for the control of top water, is also discussed. Six references are appended. R. B. S.

Oilfield Development.

1282. Survey of World Oilfields. Anon. *Oil Gas J.*, 28.12.46, **45** (34), 187.—A table gives data on the world's oilfields with the exception of Russia. The data are grouped by countries and include the discovery year, the numbers of flowing and pumping wells, the producing depths, daily average production, cumulative production, number of wells, drilling, name and type of formation, and oil gravity. G. D. H.

1283. U.S.S.R. Needs Equipment. W. W. Burns. *Oil Gas J.*, 28.12.46, **45** (34), 179.—Available information suggests that Russian crude output fell from 620,000 brl/day in 1940 to 406,000 brl/day in 1945. It is believed that there was a slow rise in output in 1946.

During the war about 3000 wells with an output of 37,000,000 brl/day may have been destroyed. According to Perejda the Baku area gave 61% of the 1945 output, Grozny, 6·35%, and Maikop 0·48%. The Sakhalin production was almost doubled during the war, being 6,300,000 brl in 1945. In Sakhalin there are seven fields and six prospects on the east coast, while there are oil and gas seeps on the west coast, one being in the Langary valley and another near N'chaichai.

It is hoped that the U.S.S.R. production will be 261,960,000 brl in 1950 and 435,000,000 brl in 1960. These figures will require much new equipment for their attainment. Great expansion is expected in the Volga area and in the Ural area.

During 1945 Russia imported 4,787,584 brl of products from U.S. alone.

A commercial field has been developed at Tuimazy, and a new field has been found at Buzovny. There are three flowing wells at Tash-Kala.

Gubkin originally estimated Russia's reserves at 18,037,000,000 brl.

Russia's total refining capacity is estimated at 275,000,000 brl/year, and the cracking capacity 85,000,000 brl/year. G. D. H.

1284. Saudi Arabia and Kuwait Expansion Features Middle East Development. Anon. *Oil Gas J.*, 28.12.46, **45** (34), 171.—At the end of 1946 the Middle East output was 779,000 brl/day. During the year there was much expansion of production and refinery output in Saudi Arabia. Rehabilitation in the Far East is slow, and this area which in pre-war days had an output of 225,000 brl/day now gives only 50,000 brl/day. The Middle East now supplies much of the oil formerly provided by the Far East.

Plans are under consideration for laying pipelines to the Mediterranean. It is hoped to raise the Kirkuk output from 90,000 brl/day to 300,000 brl/day by 1949. This output may be provided by twenty wells from a reserve estimated to be 5,000,000,000 brl. Additional pipelines will be laid from Iraq.

The Dukhan field of Qatar is believed to have a large reserve. The Burgan field of Kuwait may have a proved reserve of 5000–10,000 million brl. At present five wells are together providing 40,000 brl/day.

The Sudr wildcat 40 miles south of Suez has found oil.

Bahrein produces 23,000 brl/day, and deeper pays have been tested. No. 10 Abqaiq produces 10,000 brl/day and is believed to raise the reserve to 3,000,000,000 brl. The Qatif discovery well is producing. Abu Hadriza produces from 10,200 ft. Altogether Saudi Arabia produces over 200,000 brl/day and at Ras Tanura 95,000 brl/day is refined. G. D. H.

1285. Anglo-Iranian's July Production is Down. Anon. *Oil Gas J.*, 16.11.46, **45** (28), 161.—Iran produced 12,285,000 brl in May, 11,501,000 brl in June, and 8,778,000 brl in July 1946. G. D. H.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

1286. Gulf Coast Refiners in Greatest Building Programme in History. A. L. Foster. *Oil Gas J.*, 31.5.47, **46** (4), 47.—The Gulf Coast refining industry, active and projected is reviewed.

Of a total cracking capacity of about 1,100,000 brl per day, 400,000 brl is catalytic and 700,000 brl thermal cracking. An additional 100,000 brl capacity of catalytic cracking is planned.

Extensive areas for building are available, close to vast crude-producing areas in Texas and Louisiana, with economical water transportation to the world at large.

The active Gulf Coast refineries are listed, as at January 1, 1947; a second table gives refinery building, new projected and recently completed. Table 3 gives petroleum statistics for January and February 1947 and shows trends in refining outputs and operations, about 30% of total U.S. motor-fuel, and about half the nation's total kerosine output being supplied from the area. G. A. C.

Cracking.

1287. The Kinetics of Catalytic Disproportionation of Hydrogen in Gasoline in the Presence of Activated Clay. G. M. Panchenkov *et al.* *Comptes Rend. (Doklady) Acad. Sci. URSS*, 1947, **55**, 319 (in English).—The kinetics of hydrogen disproportion were studied with a thermally cracked gasoline with a final b.p. of 150° C and iodine value of 102, using a pelleted clay catalyst which was analysed in detail. The extent of reaction was determined from the iodine value of the products up to a b.p. of 150° C, the results being used to calculate a first-order type rate equation for various combinations of feed space velocity (F.S.V.), temperature and length of catalyst operating cycle between successive regenerations.

The iodine value of the products increased with increasing F.S.V. at fixed temperatures and operating cycles and also with increasing cycle duration, due to the deposition of polymerization products of low hydrogen content "described inappropriately as coke."

At a given F.S.V. the rate is practically independent of temperature over the range 280–400°. It is concluded that the rate of the reaction on the surface of the catalyst is greater than the rate of diffusion of the reactants to the catalyst surface. The first-order rate equation used to express the experimental results is ascribed to the slow diffusion process. G. H. B.

Metering and Control.

1288. Steam Consumption—Part I. Regular Reciprocating Pumps. W. L. Nelson. *Oil Gas J.*, 31.5.47, **46** (4), 273.—No. 146 in the *Refiner's Notebook* series concerns steam consumption of regular reciprocating pumps. A chart is given showing steam required—pounds per hour, capacity of pump—gal per min, and approximate boiler horse-power required. G. A. C.

Refining Patents.

1289. Patents on Refining Processes and Products. Standard Oil Development Co. B.P. 589,546, 9.7.47. Hydrogenation of hydrocarbons.

Shell Development Co. B.P. 589,650, 9.7.47. Synthetic drying oils.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,588, 9.7.47. Gum inhibitors for gasoline.

R. Pool. B.P. 589,691, 9.7.47. Apparatus for the detection of explosive and other dangerous gases.

Auto-Combustions, Ltd., and T. P. Brian. B.P. 589,692–3, 9.7.47. Oil-fuel burners of the atomizer type.

Usines de Melle. B.P. 589,709, 9.7.47. Manufacture of olefins and diolefins by catalytic dehydration.

Smith Bros. & Co. (Oil Distillers), Ltd., and E. J. Kelly. B.P. 589,747, 9.7.47. Liquid lubricants.

J. C. Arnold (S.O. Dev. Co.). B.P. 589,779, 9.7.47. Processes and apparatus employing fluidized solids.

I.C.I. Ltd., and others. B.P. 589,795–6, 9.7.47. Activation of catalysts.

E. C. Hughes, assr to S.O.C. Ohio. U.S.P. 2,411,160, 19.11.46. The reaction product of cashew nut shell oil and phosphorus pentasulphide is used as a lub. oil additive.

D. W. Young and E. Lieber, assrs to S.O. Dev. Co. U.S.P. 2,411,178, 19.11.46. A dicarboxylic-glycol polyester is used as a lub. oil additive.

H. O. Falkins and C. M. Thacker, assrs to The Pure Oil Co. U.S.P. 2,411,200, 19.11.46. Hydrocarbons are cracked in the presence of a brominated ester.

H. J. Hall and J. C. Munday, assrs to S.O. Dev. Co. U.S.P. 2,411,208, 19.11.46. A granular catalyst is employed to remove powdered catalyst from gases after the purification stage of the process.

C. M. Thacker, assr to The Pure Oil Co. U.S.P. 2,411,236, 19.11.46. Mercaptans are obtained from the reaction of paraffin gases and sulphur in the presence of metal sulphide catalysts.

F. E. Frey, assr to Phillips Petroleum Co. U.S.P. 2,411,256, 19.11.46. A process for making butadiene from an ethylene–acetylene mixture.

K. H. Hachmuth, assr to Phillips Petroleum Co. U.S.P. 2,411,264, 19.11.46. Fractionation by distillation of butenes-2 concentrates.

I. H. Kinneberg and C. L. Thomas, assrs to U.O.P. Co. U.S.P. 2,411,275–6, 19.11.46. A rubber-like material is obtained when the reaction product of propylene and a conjugated diolefin with sulphur monochloride is treated with an aqueous solution of a polysulphide.

E. L. Walters, assr to Shell Dev. Co. U.S.P. 2,411,307, 19.11.46. 2 : 4-Dimethyl-6-*tert.*-butylphenol is used to stabilize the amine of an aromatic hydrocarbon.

J. W. Teter and W. J. Merwin, assrs to Sinclair Refining Co. U.S.P. 2,411,346, 19.11.46. Acetonitrile is used as the azeotrope in the separation by distillation of hydrocarbon nitriles and the parent hydrocarbons.

G. R. Lake, assr to Union Oil Co. U.S.P. 2,411,437, 19.11.46. A method of purifying an azeotrope involving dehydration, distillation, and solvent extraction.

A. Wachter and R. S. Treseder, assrs to Shell Dev. Co. U.S.P. 2,411,483, 19.11.46. Antimony halide is used as a corrosion inhibitor in catalytic hydrocarbon conversion.

B. R. Wingrove, assr to Socony-Vacuum Oil Co., Inc. U.S.P. 2,411,492, 19.11.46. A method of removing ash-forming constituents from the wax cake obtained in a solvent dewaxing operation.

L. A. Burrows, assr to du Pont de Nemours & Co. U.S.P. 2,411,502, 26.11.46. Solvent extraction of mineral oils using nitrocyclohexane as the solvent.

T. W. Evans, assr to Shell Dev. Co. U.S.P. 2,411,566, 26.11.46. 1 : 1-Dihalopropene-2 or the 2-alkyl homologues are used to eradicate soil pests.

E. Lieber and M. E. Thorner, assrs to S.O. Dev. Co. U.S.P. 2,411,578–9, 26.11.46. Manufacture of condensation products which act as pour-point depressants.

T. B. McCulloch, assr to S.O. Dev. Co. U.S.P. 2,411,582, 26.11.46. An aviation fuel composition that contains spiropentane.

J. G. McNab and C. Winning, assrs to S.O. Dev. Co. U.S.P. 2,411,583, 26.11.46. A complex organic sulphur compound used to stabilize a lub. oil.

J. R. Morris, assr to The Texas Co. U.S.P. 2,411,586, 26.11.46. Preparation of the barium salts of cyclic-aliphatic ether alcohols.

A. J. Morway and A. Beerbower, assrs to S.O. Dev. Co. U.S.P. 2,411,587, 26.11.46. A mixture of soda and zinc soaps used in making an antifriction bearing lubricant.

J. W. Packie and W. S. Craft, assrs to S.O. Dev. Co. U.S.P. 2,411,588, 26.11.46. Concentration of diolefins by absorption and distillation.

E. D. Reeves, assr to S.O. Dev. Co. U.S.P. 2,411,592, 26.11.46. Design of a fluid catalyst reactor for the dehydrogenation of olefins.

W. G. Routson, assr to Shell Dev. Co. U.S.P. 2,411,593, 26.11.46. A corrosion-preventive composition obtained by dispersing an organic monobasic acid containing a nitroso, nitrile, or nitro group, in mineral oil.

W. J. Sparks and A. H. Gleason, assrs to S.O. Dev. Co. U.S.P. 2,411,599, 26.11.46. A high mol. wt. polymer is obtained by the action of ultra-violet light on methyl acrylate and an alpha olefin.

C. W. Tyson, assr to S.O. Dev. Co. U.S.P. 2,411,603, 26.11.46. A catalytic cracking process on the fluid catalyst principle.

H. G. Smith and T. L. Cantrell, assrs to Gulf Oil Corpn. U.S.P. 2,411,671, 26.11.46. A salt of an alkyl alkylene diphosphate is added to a mineral oil to increase its resistance to foaming.

R. Holroyd and D. H. P. Peel, assrs to I.C.I. Ltd. U.S.P. 2,411,726, 26.11.46. The catalytic dehydrogenation of naphthenes to the corresponding aromatics in the presence of hydrogen.

E. E. Sensel, assr to The Texas Co. U.S.P. 2,411,760, 26.11.46. Conversion of carbon monoxide and hydrogen into compounds of higher mol. wt.

K. H. Hachmuth, assr to Phillips Petroleum Co. U.S.P. 2,411,785, 26.11.46. Furfural and water are used to extract an aliphatic olefin from its mixture with saturated hydrocarbons of the same boiling range.

W. J. Mattox, assr to U.O.P. Co. U.S.P. 2,411,799, 26.11.46. Alumina as catalyst and a hydrogen halide are used to dealkylate a mono-alkyl cyclic compound.

W. H. Rupp and R. O. Wright, assrs to S.O. Dev. Co. U.S.P. 2,411,808–9, 26.11.46. Process and apparatus for separating *iso*butylene from water miscible liquids by distillation and washing.

R. B. Thompson and J. A. Chenicek, assrs to U.O.P. Co. U.S.P. 2,411,817, 26.11.46. The alkylation of *iso*butane with ethylene using $AlCl_3$ catalyst.

E. Amott, assr to Union Oil Co. U.S.P. 2,411,819, 26.11.46. The production of dry metal sulphonates of improved oil solubility.

T. F. Doumani, assr to Union Oil Co. U.S.P. 2,411,822, 26.11.46. The dimerization of a conjugated diolefin in the liquid phase.

T. F. Doumani, assr to Union Oil Co. U.S.P. 2,411,823, 26.11.46. Unsaturated ketones are prepared from an olefin and an acid anhydride using acetyl sulphoacetic acid as catalyst.

H. C. Huffman, assr to Union Oil Co. U.S.P. 2,411,829, 26.11.46. A catalyst consisting of activated alumina, beryllium oxide, and chromium oxide.

H. Linford and W. J. Baral, assrs to Union Oil Co. U.S.P. 2,411,832, 26.11.46. Manufacture of water insoluble soaps.

W. E. Ross and G. J. Carlson, assrs to Shell Dev. Co. U.S.P. 2,411,835, 26.11.46. The isomerization of *n*-pentane to *iso*pentane.

M. De Groote and B. Keeser, assrs to Petrolite Corpn., Ltd. U.S.P. 2,411,957, 3.12.46. Preparation of sub-resinous esteramides.

M. A. Dietrich and C. J. Pedersen, assrs to du Pont de Nemours & Co. U.S.P. 2,411,958–9, 3.12.46. Catalytically active compounds of copper, iron, etc., are removed from petroleum products by washing with aqueous solutions of sodium thioglycolate, thiourea, etc.

T. W. Evans, W. E. Vaughan, and F. F. Rust, assrs to Shell Dev. Co. U.S.P. 2,411,961, 2,411,983, 3.12.46. Process for catalysed abnormal addition reactions.

A. V. Grosse and C. B. Linn, assrs to U.O.P. Co. U.S.P. 2,411,992, 3.12.46. Alkylation of paraffin hydrocarbons using hydrogen fluoride-boron fluoride catalyst.

L. S. Kussel, assr to U.O.P. Co. U.S.P. 2,411,996, 3.12.46. A catalytic cracking process on the fluid catalyst principle.

W. L. Rippeteau, Jr., assr to Phillips Petroleum Co. U.S.P. 2,412,010, 3.12.46. Toluene is purified by distillation in the presence of $AlCl_3$ and metallic iron.

G. B. Zimmerman, assr to U.O.P. Co. U.S.P. 2,412,025, 3.12.46. A catalytic cracking process on the fluid catalyst principle.

W. W. Odell, assr to Lion Oil Co. U.S.P. 2,412,096, 3.12.46. A vapour-phase thermal cracking process employing a reaction chamber containing a porous bed of hot refractory solids.

T. W. Culmer, assr to The Ohio Oil Co. U.S.P. 2,412,131, 3.12.46. A chlorinated sulphurized sperm oil is inoculated with lecithin before use as a cutting oil.

L. P. Evans and F. E. Ray, assrs to Socony-Vacuum Oil Co., Inc. U.S.P. 2,412,135–6, 3.12.46. Method and apparatus for catalytic conversion of hydrocarbons.

M. H. Gorin and W. Swerdloff, assrs to Socony Vacuum Oil Co., Inc. U.S.P. 2,412,143, 3.12.46. Method and apparatus for separation and recovery of soluble catalyst in hydrocarbon conversion reactions.

L. C. Huff, assr to U.O.P. Co. U.S.P. 2,412,152, 3.12.46. A catalytic cracking process on the fluid catalyst principle.

G. A. Ibach and C. C. Tate, assrs to Phillips Petroleum Co. U.S.P. 2,412,220, 10.12.46. Bauxite containing siliceous material is used to extract minor amounts of fluorine compounds in hydrocarbon mixtures.

R. E. Schaad, assr to U.O.P. Co. U.S.P. 2,412,229–30, 10.12.46. A pyrophosphate is used as a catalyst in the alkylation of an aromatic by an olefin.

J. W. Teter, assr to Sinclair Refining Co. U.S.P. 2,412,371, 10.12.46. An oil is subjected to cracking temperature in the presence of aluminium fluoride containing combined water.

E. H. Records. U.S.P. 2,412,427, 10.12.46. Method and apparatus for heat treatment under pressure to refine low-grade hydrocarbon oils.

C. R. Wagner, assr to Phillips Petroleum Co. U.S.P. 2,412,437, 10.12.46. Preparation of unsaturated nitriles.

P. E. McCoy, assr to American Bitumuls Co. U.S.P. 2,412,526, 10.12.46. In coating aggregate with asphalt emulsions an alkali metal dichromate is added to the emulsion to increase its adhesivity.

D. C. Bond and M. Savoy, assrs to The Pure Oil Co. U.S.P. 2,412,550, 10.12.46. A zirconium salt is used as catalyst in the reaction between ethylene and a hydrogen halide.

C. M. Blau, Jr., assr to Petrolite Corpn., Ltd. U.S.P. 2,412,557, 17.12.46. An unsaturated amine-$\alpha\beta$-unsaturated carboxylic acid addition-condensation polymer is used as a lub. oil additive.

E. Lieber, assr to S.O. Dev. Co. U.S.P. 2,412,589, 17.12.46. A condensation product is obtained by the alkylation of an aldehyde resinified aromatic hydrocarbon.

W. N. Axie, assr to Phillips Petroleum Co. U.S.P. 2,412,595, 17.12.46. The alkylation of benzene with ethylene using boron fluoride–orthophosphoric acid as catalyst.

R. E. Burk and E. C. Hughes, assrs to S.O.C. Ohio. U.S.P. 2,412,600, 17.12.46. The hydro-forming of naphtha in the presence of a gel-type catalyst composed of oxides of aluminium, chromium, and molybdenum.

M. L. Schwartz, assr to S.O.C. Indiana. U.S.P. 2,412,633–4, 17.12.46. A corrosion inhibitor for lub. oil which is a mixture of a castor compound and a soap of an oil soluble petroleum sulphonic acid.

J. C. Munday, assr to S.O. Dev. Co. U.S.P. 2,412,645, 17.12.46. Manufacture of aviation gasoline by alkylation of a light fraction of a catalytically cracked naphtha plus catalytic cracking of the heavy fraction.

J. D. Danforth, assr to U.O.P. Co. U.S.P. 2,412,675, 17.12.46. Method and apparatus for isomerization of normal paraffins.

H. M. Grubb and E. B. Tucker, assrs to S.O.C. Indiana. U.S.P. 2,412,679, 17.12.46. Preparation of organic sulphonates and sulphonyl chlorides by treating hydrocarbons with a mixture of SO_2 and chlorine in the presence of a small amount of an organic peroxide.

J. R. Schonberg and D. L. Campbell, assrs to S.O. Dev. Co. U.S.P. 2,412,696, 17.12.46. Method of regeneration of powdered catalysts.

F. E. Frey, assr to Phillips Petroleum Co. U.S.P. 2,412,726, 17.12.46. A process to remove small amounts of dissolved hydrogen fluoride and high boiling organic fluorine compounds from liquid hydrocarbons.

A. R. Workman, assr to Cities Service Oil Co. U.S.P. 2,412,762, 17.12.46. The manufacture of butadiene from propene and formaldehyde using a zirconium chloride catalyst.

L. C. Waterman, assr to Petrolite Corpn., Ltd. U.S.P. 2,412,791, 17.12.46. A process of removing water-dispersible impurities from oil by addition of water followed by electrical separation of the emulsion.

B. J. Mayland, assr to Phillips Petroleum Co. U.S.P. 2,412,823, 17.12.46. Furfural is removed from hydrocarbons of the same boiling point by extraction with water in the presence of a low-boiling liquid hydrocarbon.

J. D. Morgan and A. P. Sullivan, assrs to Cities Service Oil Co. U.S.P. 2,412,827, 17.12.46. A method of detecting free hydrogen in the atmosphere of submarines in the presence of such catalyst poisons as stibene and arsine.

E. A. Naragon, assr to The Texas Co. U.S.P. 2,412,828, 17.12.46. Extraction of aromatics from a naphtha cut by use of an $AlCl_3$ complex and concentration of the aromatics by washing the extract with a paraffinic solvent.

J. R. Rose, assr to Potomac Hydrocarbon Process Corpn. U.S.P. 2,412,837, 17.12.46. A catalytic cracking process in which the catalyst tube is sited in the heater.

J. C. Bolenger and P. W. Prutzman, assrs to Socony-Vacuum Oil Co., Inc. U.S.P. 2,412,863, 17.12.46. A design of contactor for use with acid catalysts.

C. L. Brown, assr to S.O. Dev. Co. U.S.P. 2,412,868, 17.12.46. The activity of the catalyst is maintained in a cracking process using steam by the injection of ammonia at a suitable point.

H. G. M. Fischer, assr to S.O. Dev. Co. U.S.P. 2,412,879, 17.12.46. Thermal cracking of heavy petroleum residues mixed with cellulosic material with continuous removal of frangible, readily crushable coke.

F. E. Frey, assr to Phillips Petroleum Co. U.S.P. 2,412,880, 17.12.46. Azeotropic distillation of butadiene and 2-butene employing SO_2.

R. J. Miller and J. T. Rutherford, assrs to California Research Corpn. U.S.P. 2,412,903, 17.12.46. An oil soluble alkaline earth metal phenate and a zinc thiocarbamate are used as lub. oil additives.

H. W. Scheeline, assr to S.O. Dev. Co. U.S.P. 2,412,911, 17.12.46. Improved manufacture of butadiene from butene-2.

L. W. Schrader, assr to S.O. Dev. Co. U.S.P. 2,412,913, 17.12.46. Design of a high-temperature valve.

J. C. Showalter, assr to S.O. Dev. Co. U.S.P. 2,412,916, 17.12.46. Petroleum sulphonates are obtained by acid treatment of the extract of a naphthenic distillate.

T. P. Simpson, J. W. Payne, and J. A. Crowley, Jr., assrs to Socony-Vacuum Oil Co., Inc. U.S.P. 2,412,917, 17.12.46. A catalytic cracking process on the thermofor principle.

L. G. V. Bogart and R. W. Manuel, assrs to Crane Co. U.S.P. 2,412,929, 17.12.46. A grease-like lub. oil is obtained by mixing castor oil, petroleum oil, bentonite, and triethylphosphate.

H. J. Hepp, assr to Phillips Petroleum Co. U.S.P. 2,412,936, 17.12.46. Manufacture of *cyclo*pentene by catalytic dehydrogenation of *cyclo*pentane. G. R. N.

PRODUCTS.

Chemistry and Physics.

1290. Heats of Adsorption on Carbon Black. I. R. A. Beebe, J. Biscoe, W. R. Smith, and C. B. Wendell. *J. Amer. chem. Soc.*, 1947, **69**, 95–101.—The differential heats of adsorption of nitrogen and oxygen on a series of carbon blacks of varying rubber reinforcing ability were determined at — 195°. The differential heats undergo large variations as successive fractions of the bare surface are covered. Partial graphitization greatly reduces the activity of the more active sites on the surface. This activity as revealed by heat measurements appears to parallel the rubber reinforcing properties of the blacks studied. G. R. N.

1291. Decanes. G. C. Johnson. *J. Amer. chem. Soc.*, 1947, **69**, 147–149.—The decanes formed by hydrogenating the decenes made from *tert.*-amyl alcohol are a mixture of 2 : 2 : 3 : 4-tetramethylhexane, 3 : 3 : 5-trimethylheptane, 2 : 3 : 4 : 4-tetramethylhexane, 2 : 3 : 3 : 4-tetramethylhexane and a small amount of 2 : 3 : 4-trimethyl-3-ethylpentane. The decanes formed by hydrogenating the dimer of 2-methyl-2-butene are 3 : 3 : 5-trimethylheptane, with lesser amounts of 2 : 3 : 4 : 4-tetramethylhexane and 2 : 3 : 3 : 4-tetramethylhexane. The physical properties are given. G. R. N.

1292. An Improved Flow Calorimeter. G. Waddington, S. S. Todd, and H. M. Huffman. *J. Amer. chem. Soc.*, 1947, **69**, 22–30.—An improved constant flow calorimeter for vapours with a precision of $\pm$ 1% is described. The heat capacities of *n*-heptane and 2 : 2 : 3-trimethylbutane were measured at several pressures over the temperature range 330° to 465° K. G. R. N.

1293. Heats of Combustion of Cyclic Hydrocarbons. R. Spitzer and H. M. Huffman. *J. Amer. chem. Soc.*, 1947, **69**, 211–213.—The heats of combustion and formation at 25° C of *cyclo*pentane, *cyclo*hexane, *cyclo*heptane, and *cyclo*octane are given. They are interpreted on the assumption that *cyclo*hexane in the chair form has no strain energy while the other *cyclo*paraffins are strained either by having their C–C–C angles different from tetrahedral or by not having adjacent CH_2 groups rotated 60° with respect to each other. G. R. N.

1294. Heat Capacities, Heats of Fusion and Entropies. S. S. Todd, G. D. Oliver, and H. M. Huffman. *J. Amer. chem. Soc.*, 1947, **69**, 1519–1525.—In continuation of the Bureau of Mines programme on the thermodynamic properties of hydrocarbons the heat capacity data on the six pentenes was determined over the temperature range 12° to 300° K. Values of the triple points and heats of fusion were also recorded. Entropy values for the liquid state at 298·16° K. were also calculated. G. R. N.

1295. Heat Transfer between a Fluid and a Porous Solid Generating Heat. S. R. Brinkley, Jr. *J. appl. phys.*, 1947, **18**, 582.—The theory of heat transfer between a fluid flowing at a constant rate through a porous solid is extended to the case where the solid is a generator of heat. Assuming that the heat source function is a linear function of the temperature of the solid and that its coefficients are independent of position and time, expressions are evolved which give the temperatures of the fluid and solid as functions of position and time. J. T.

1296. High Pressure Hydrogenations with Adams Catalyst. R. H. Baker and R. D. Schuetz. *J. Amer. chem. Soc.*, 1947, **69**, 1250–1252.—Adams and Marshall's method for the reduction of aromatic compounds has been extended to hydrogen pressures as high as 3000 p.s.i. The reductions in acetic acid solution go rapidly at room temperature and it is possible to prepare the perhydro compounds on a preparative scale within a few minutes. The kinetics of the hydrogenation of the monocyclic compounds are consistent with a first order dependence on hydrogen pressure and a zero order dependence on the hydrogen acceptor. The stereochemistry of the reaction was investigated for *m*-xylene, *o*-cresol, naphthalene, and tetralin. The first of these produces a mixture of 77% *trans*- and 23% *cis*-1 : 3-dimethyl*cyclo*hexane. *o*-Cresol and tetralin give *cis*-derivatives, but naphthalene produces a mixture of 23% *trans*- and 77% *cis*-decalin. G. R. N.

1297. Higher Hydrocarbons. IV. F. C. Whitmore, R. W. Schussler, C. S. Rowland, and J. N. Cosby. *J. Amer. chem. Soc.*, 1947, **69**, 235–237.—The methods of preparation, yields, and five important properties of six phenyleicosanes and six *cyclo*hexyleicosanes are reported. G. R. N.

1298. Hydrogenolysis of Aliphatic Alcohols. V. I. Komarewsky, C. F. Price, and J. R. Coley. *J. Amer. chem. Soc.*, 1947, **69**, 238–239.—Primary aliphatic alcohols when subjected to the action of vanadium pentoxide catalyst at 380–400° C and atmospheric pressure were converted to paraffinic hydrocarbons with the same number of carbon atoms. The use of a co-precipitated vanadium pentoxide–aluminium oxide catalyst and superatmospheric pressure gave a substantially improved conversion. G. R. N.

1299. Addition of Hydrogen Bromide to Propylene. F. R. Mayo and M. G. Savoy. *J. Amer. chem. Soc.*, 1947, **69**, 1348–1351.—A preliminary study was made of the kinetics of the addition of hydrogen bromide to propylene in *n*-pentane as solvent. A major obstacle was the difficulty in repressing the abnormal addition of hydrogen bromide even in the presence of inhibitors. The rate of the uncatalyzed normal addition corresponds better to a fourth order reaction, third order with respect to hydrogen bromide, first order with respect to propylene, than to any other integral order. G. R. N.

1300. Addition of Hydrogen Chloride to *iso*Butylene. F. R. Mayo and J. J. Katz. *J. Amer. chem. Soc.*, 1947, **69**, 1339–1348.—The addition of hydrogen chloride to *iso*-butylene in heptane solution at 0° C was studied by a dilatometric method. *tert.*-Butylchloride was the only product found. The addition was greatly accelerated by traces of water, mercury, and phosphorus pentoxide. G. R. N.

1301. Isomeric Alkylbenzenes. A. W. Francis. *J. Amer. chem. Soc.*, 1947, **69**, 1536–1537.—The number of isomeric alkylbenzenes containing from 7 to 25 carbon atoms has been calculated and it is shown that these numbers increase more rapidly than in the case of the paraffin isomers. G. R. N.

1302. Mercaptan Vapours. H. M. Hill and M. L. Wolfrom. *J. Amer. chem. Soc.*, 1947, **69**, 1539.—The laboratory disposal of oderiferous vapours of ethyl mercaptan is accomplished by passage through a column of activated carbon impregnated with cupric chloride. G. R. N.

1303. Nitrogen Compounds in Petroleum Distillates. XXVI. P. L. Pickard and H. L. Lochte. *J. Amer. chem. Soc.*, 1947, **69**, 14–16.—3-Ethyl-5-methylpyridine has been synthesized and shown to be identical to the $C_8H_{11}N$ base isolated from petroleum. Ultra-violet absorption studies show that the natural $C_{11}H_{15}N$ base is an alkylated Bz-tetrahydroquinoline and not 3-*cyclo*pentyl-5-methylpyridine. G. R. N.

1304. Tetraethylbiphenyl. J. V. Karabinos and J. F. R. Kuck, Jr. *J. Amer. chem. Soc.*, 1947, **69**, 1223–1224.—In the synthesis of *s*-triethylbenzene by the ethylation of ethylbenzene with ethyl bromide and $AlCl_3$ it was found that the distillation residue from the preparation contained tetraethylbiphenyl, m.p. 290–291° C. G. R. N.

1305. Tetraethylmethane. A. W. Horton. *J. Amer. chem. Soc.*, 1947, **69**, 182–183.—This nonane was synthesized by the reaction of zinc diethyl with triethylcarbinyl chloride in tetralin solution. The usual physical properties were determined. G. R. N.

1306. Rate of Oxidation of Aromatic Hydrocarbons. L. F. Feiser and S. T. Putnam. *J. Amer. chem. Soc.*, 1947, **69**, 1041–1046.—The oxidation of anthracene by lead tetra-acetate in acetic acid solution is accelerated enormously by water, methanol, or potassium acetate, but is retarded by benzene. A study was made of the rate of oxidation of several polynuclear aromatic hydrocarbons by excess lead tetracetate in 99% acetic acid. Some correlation between rate of oxidation and carcinogenic activity was discernible in specific limited series of compounds. G. R. N.

1307. Structural Determination of Paraffin Boiling Points. H. Weiner. *J. Amer. chem. Soc.*, 1947, **69**, 17–20.—The boiling points of the paraffins may be correlated with structure by means of the equation $\Delta t = (98/n^2)\Delta w + 5{\cdot}5\Delta p$ where Δw and Δp are structural variables which provide simple numerical measures of the effect produced on all atoms simultaneously by a change in position of an atom or of a group. The average deviation between calculated and observed values is less than one degree for the 94 paraffins considered. G. R. N.

1308. Reaction of Propane with Carbon Monoxide. H. Pines and V. N. Ipatieff. *J. Amer. chem. Soc.*, 1947, **69**, 1337–1339.—When propane is condensed with carbon monoxide in the presence of $AlCl_3$ and hydrogen chloride the products obtained are *iso*butyric acid, *iso*butyl*iso*butyrate and 2 : 5-dimethyl-4-hexen-3-one; the respective yields of these compounds, based on carbon monoxide reacted were 5, 44, and 23 mol.-%. G. R. N.

1309. Solid Solution Studies. I. H. L. Fink, M. R. Anes, F. E. Frey, and J. A. Aston. *J. Amer. chem. Soc.*, 1947, **69**, 1501–1506.—Liquid–solid equilibrium phase diagrams have been determined for the systems 2 : 2-dimethylbutane-2 : 3-dimethylbutane and 2 : 2-dimethylbutane-*cyclo*pentane. Each system forms a series of continuous solid solutions containing a maximum in the diagram which has been called a complex. For the latter system the upper and lower transition temperatures have been determined over the range of composition where the transitions occurred as well as the heats of transition and fusion. The lower transition is found only for the pure components and mixtures having compositions between 70 and 100 mol-% *cyclo*pentane, while the heat of this transition per mol of mixture decreases from 1165 cal. at 100 mol-% *cyclo*pentane to 0 cal at approx. 68 mol-%. The upper transition is found only for the pure components and mixtures between 60 and 100 mol-% *cyclo*pentane. G. R. N.

1310. Sorption of Hydrogen on Alumina. A. S. Russell and J. J. Stokes, Jr., *J. Amer. chem. Soc.*, 1947, **69**. 1316–1319.—The sorption of hydrogen on various samples of alumina has been measured from 400° to 900° and from 9 to 620 mm. Sorption is in the range 0·05 to 0·2 ml S.T.P./g increases with decreasing temperature and increases proportional to the fourth root of pressure. Sorption equilibrium is slow and difficult to reproduce and there is evidence of an irreversible hydrogen reaction on alumina. The samples tested have sorption in the same range in spite of large differences in their surface areas and impurity contents. G. R. N.

1311. Vapour Pressures and Vapour Densities. W. B. Kay. *J. Amer. chem. Soc.*, 1947, **69**, 1273–1277.—The standard boiling points and the critical constants for *cyclo*pentane, methyl*cyclo*pentane, ethyl*cyclo*pentane, and methyl*cyclo*hexane were determined. The vapour pressures and saturated liquid and vapour densities of these compounds were determined from near their standard boiling points to their critical points. The data have been represented by empirical equations: (*a*) the vapour pressure data by equations of the type $\log p = A + B/T$ supplemented by deviation curves; (*b*) the density data by means of the equation of Fules and Shapiro together with the equation for the sum of the liquid and vapour densities. Values of the constants in the equations are given. G. R. N.

1312. Electron Diffraction Study of Oleophobic Films on Copper, Iron, and Aluminium. L. O. Brockway and J. Karle. *J. Coll. Sci.*, 1947, **2** (2), 277–287.—The formation of oleophobic films adsorbed from solutions on to metals (see Abstract No. 899, 1947) has been studied with the aid of electron diffraction. It was found that the metal surfaces must be very carefully prepared by polishing and cleaning, since the molecules of adsorbate normally stand perpendicular to the oil-film interface. That in many cases the molecules of the adsorbate have a tilt, as determined by electron diffraction, of 5° on the average is due to the submicroscopic unevenness of the surface, and, in fact, the degree of tilting is a measure of the unevenness of the surface.

Solutions of *n*-octadecylamine and of stearic acid in cetane, ranging in concentration from 0·1 to 0·001% are used. The films require less time to form from the more

concentrated solutions, and show no tendency to do so from the 0·001% solutions. The rate of film formation is also increased at lower temperatures.

The smooth surfaces of copper, iron, and aluminium consist of the oxides, and the similarity of all films, both as regards time of formation and structure, with each other and with those formed on platinum, indicates that chemical forces do not affect adsorption. H. C. E.

1313. Gels and Jellies of Aluminium Dilaurate in *cyclo*Hexane and Benzene Examined by X-Ray Diffraction. S. S. Marsden, K. J. Mysels, and G. H. Smith. *J. Coll. Sci.*, 1947, **2** (2), 265–269.—The systems formed by aluminium dilaurate (I) in solvents can be divided into gels or jellies according as crystallites of I appear or not. The systems are prepared in evacuated thin-walled soft-glass capillaries since they are sensitive to atmospheric moisture and are required in concentrated form. 30% of I in *cyclo*hexane, examined after cooling from 38, 80, and 150° C, shows that gel formation does not affect the structure of the bulk of the crystallites. 40% of I in benzene, after cooling from 150° C, gives a diffraction pattern which indicates the disappearance of the crystallites and the probable formation of micelles of oriented soap layers. H. C. E.

1314. Pressure and Oil Flow in Oil-filled Cables at Load Variations. H. L. Knudsen. *J. appl. Phys.*, 1947, **18**, 545.—A method is given for calculating pressure and oil flow in a section of an oil-filled cable at load variations. The hydraulic resistance of the oil canals and the elasticity of the sheath and the pressure armour and the compressibility of the oil have been taken into account.

Only those cable sections terminated with oil reservoirs in which the pressure is constant are dealt with. Curves and formulæ are given for the calculation of pressure and oil flow and the method is illustrated by numerical examples. J. T.

Analysis and Testing.

1315. Oxygen Boost Method of Rating the Engine Performance of Aviation Fuels. W. B. Heaton, T. K. Hanson, and R. C. Morris. *J. Inst. Petrol.*, 1947, **33**, 256.—By supercharging and employing fuel injection and by incorporating various modifications to a standard Motor Method (F.2) C.F.R. engine a method is developed where, as an alternative to supercharging with compressed air, oxygen is directly used from a cylinder. The modifications and operational conditions are given. The performance numbers are obtained from a knowledge of the rich-mixture response curves of two reference fuels, where the response curves are obtained by plotting oxygen flow against the fuel flow. The engines thus evolved correlated well with Pegasus and Hercules single-cylinder engines. J. T.

1316. Melting Point Calorimeter. J. G. Aston, H. L. Fink, J. W. Tooke, and M. R. Anes. *Anal. Chem.*, 1947, **19**, 218–221.—A melting point calorimeter to determine the purity of organic compounds which are liquid at or below room temperature is described. Its design follows that developed in precision low temperature adiabatic calorimetry. Modifications have reduced the time of a melting point determination to 8 hours. Results indicate a precision for heat capacities of about 3%, for heats of fusion about 5%, and for triple points about 0·03° C. G. R. N.

1317. Rapid Determination of Small Amounts of Carbon Monoxide. M. Shepherd. *Anal. Chem.*, 1947, **19**, 77–81.—A condensed report that gives the minimum preliminary information necessary to make and use the National Bureau of Standards indicating gel for the rapid colorimetric determination of small or physiologically significant amounts of carbon monoxide in air in the field or laboratory. The gel will detect and estimate less than 1 part of carbon monoxide in 500 million parts of air. It will detect 0·001% by volume in less than 1 min. and determine physiologically significant amounts in approx. 1 min. Field use requires a small inexpensive apparatus without maintenance problems and involves procedures so simple that untrained personnel will obtain reliable results. G. R. N.

1318. Analysis of Silica-Alumina Cracking Catalysts. R. A. Burdett and L. C. Jones, Jr. *Anal. Chem.*, 1947, **19**, 238–241.—A spectrographic method for the determination

of iron, sodium, vanadium, nickel, chromium, and copper in silica–alumina cracking catalysts incorporating a novel photometric technique is described. The procedure is rapid and correlates well with the conventional chemical analysis. G. R. N.

1319. Microdetermination of Lead Tetraethyl in Gasoline. B. E. Gordon and R. A. Burdett. *Anal. Chem.*, 1947, **19**, 137–140.—The method is based on the decomposition of the lead tetraethyl with iodine, evaporation of the volatile constituents, destruction of the organic residue with mixed sulphuric, nitric, and perchloric acids, and subsequent volumetric microdetermination of precipitated lead chromate. The accuracy and reproducibility of the method conform to A.S.T.M. specifications. G. R. N.

1320. Determination of Aromatics and Naphthenes in Gasoline. R. M. Love, A. R. Padgett, W. D. Seyfried, and H. M. Singleton. *Anal. Chem.*, 1947, **19**, 37–42.—A rapid method was developed to determine the aromatics and naphthenes in gasolines boiling in the range 93° to 149° C and which may contain up to 40% olefins. The first step is to remove olefins and diolefins and this is accomplished by controlled bromination followed by steam distillation. The sample is then distilled into fractions and the aromatics in each fraction are removed by treatment with 93–94% sulphuric acid. The refractive index of the sample before and after acid treatment is used to calculate the aromatic content. With the aid of a chart the naphthene content is calculated from the refractive index and the average boiling point of each fraction. The method is accurate to about $\pm$ 0·3% on aromatics and about $\pm$ 1·0% on naphthenes. G. R. N.

1321. Determination of Paraffins and Naphthenes in Gasolines. S. C. Hinden and A. V. Grosse. *Anal. Chem.*, 1947, **19**, 42–47.—A weighed amount of gasoline (1 to 5 g) is burned in an A.S.T.M. sulphur lamp in a stream of dry air. The water formed is collected on a dessicant, $CaCl_2 + P_2O_5$ and weighed. From this the hydrogen/carbon ratio is calculated. With the aid of a graph relating boiling point and hydrogen/carbon ratio for paraffin hydrocarbons and the formulæ $\frac{x-2}{a-2} \times 100 =$ wt.-% paraffins and $\frac{a-x}{a-2} \times 100 =$ wt.-% naphthenes, where $x =$ the experimentally determined H/C ratio of the sample, *i.e.*, a paraffin–naphthene mixture and $a =$ the H/C ratio of the paraffins boiling in the same range, the paraffin and naphthene content of the gasoline can be calculated. The accuracy of the method is independent of the isomeric composition of the sample; it varies from $\pm$ 1·5% paraffin in the C_5 cut up to $\pm$ 3·0% in the C_{12} cut. G. R. N.

1322. Constant Delivery of Liquid at Constant Rate. A. R. Richards. *Anal. Chem.*, 1947, **19**, 281.—When a large quantity of liquid is to be delivered continuously it is common practice to provide two containers refilling one while liquid is being delivered from the other. The operation of the system is invariably disturbed while the delivery rate from the refilled container is being adjusted. A simple apparatus is described which overcomes this by maintaining a constant liquid head across the control valve. It also allows a reduction in the size of container. G. R. N.

1323. Vacuum Micromanometer. W. S. Young and R. C. Taylor. *Anal. Chem.*, 1947, **19**, 133–135.—A vacuum gauge particularly suited to the pressure range of 10^{-1} to 10^{-3} mm mercury is described. It is based on the movement of a bubble of gas trapped in a capillary tube connecting two large reservoirs of liquid. Movement is caused by pressure acting upon the liquid in one reservoir while the other is maintained at a constant reference vacuum. Readings are independent of both the physical properties of the gas and the presence of condensables in a gas mixture. At present the gauge is finding application in mass spectrometry and in the rapid mol. wt. determinations of volatile liquids. G. R. N.

1324. Molecular Weight Determination of Volatile Liquids. W. S. Young and R. C. Taylor. *Anal. Chem.*, 1947, **19**, 135–137.—The method is a modification of the Gay-Lussac vapour density procedure in which a small accurately measured quantity of liquid is transferred to an evacuated vessel at room temperature and the pressure is

measured with a vacuum micromanometer (cf. preceding abstract). Results in a number of organic compounds in the vapour pressure range from 750 to 0·3 mm mercury at room temperature indicate that an average accuracy of approx ± 2% may be realized in an elapsed time of 3 to 4 min. per determination. The method was developed primarily to obtain the mol. wt. of gasoline and its fractions, but it has a wider application. G. R. N.

1325. Determination of Mono- and Dialkylacetylenes. C. D. Wagner, T. Goldstein, and E. D. Peters. *Anal. Chem.*, 1947, **19**, 103–105.—A method is described for determining mono- and dialkylacetylenes of 4 and 5 carbon atoms, in the presence of related paraffins, olefins, or diolefins. The method is based on the reaction of the alkynes with methanol in the presence of a catalyst mercuric oxide–boron trifluoride to produce ketals which are subsequently hydrolyzed to ketones. Allenes and high concentrations of peroxides and *cyclo*pentadiene interfere. Interference by carbonyl compounds originally present is obviated by suitable blank tests omitting the catalyst. Although the method does not generally give stoicheiometric results recoveries of about 92% are consistently obtained making possible the use of 1·09 as an empirical correction factor. The time of analysis is 2 to 3 hours. G. R. N.

1326. Analysis of Naphthalene–Tetralin–Decalin Mixtures. W. J. Cerveny, J. A. Hinckley, Jr., and B. B. Corson. *Anal. Chem.*, 1947, **19**, 82–86.—A rapid method for analysing any mixture of naphthalene, tetralin, and decalin with an accuracy of ± 1% for each component consists of taking two measurements—the heat of the reaction of the mixture with nitrating acid and the temperature at which naphthalene begins to crystallize on cooling the mixture. An alternative method consists of separating the mixture by distillation into an overhead and residue fractions then measuring the specific dispersions of the fractions. G. R. N.

1327. Micro-Determination of Gaseous Olefins. R. Pyke, A. Kahn, and D. J. LeRoy. *Anal. Chem.*, 1947, **19**, 65–66.—The reaction between olefins and mercuric acetate is employed to separate gaseous olefins from the corresponding paraffins in micro samples. The method employs the Blacet–Leighton gas analyser, the absorbent being a paste of mercuric acetate boron trifluoride ethyl etherate and ethylene glycol. Another absorbent used was a paste of water, mercuric nitrate, and mercuric acetate. G. R. N.

1328. Infra-red Spectrometric Quantitative Analysis. J. W. Kent and J. Y. Beach. *Anal. Chem.*, 1947, **19**, 290–293.—A method is described for making rapid accurate analysis of liquid hydrocarbon mixtures for all components. The method is a combination of distillation, infra-red spectrometric and calculation procedures. It has been applied to a wide variety of mixtures containing paraffin and *iso*paraffin hydrocarbons boiling between 28° and 124° C. Tests of Beer's law and optical density additivity are presented for several synthetic mixtures. The accuracy of the method is shown to be approx. 1% for each component. G. R. N.

1329. Infra-red Spectrometric Analysis. J. J. Heigl, M. F. Bell, and J. U. White. *Anal. Chem.*, 1947, **19**, 293–298.—The application of infra-red spectroscopy to the analysis of hydrocarbon mixtures is described in detail. Emphasis is placed upon accuracy, rapidity, and simplicity of the " base line " technique which uses spectra superimposed on the radiant energy background. An analysis of an octane fraction illustrates development of the procedure. Instrumental requirements for satisfactory accuracy are listed. G. R. N.

1330. Short-Cut Methods of Infra-red Analysis. W. D. Seyfried and S. H. Hastings. *Anal. Chem.*, 1947, **19**, 298–304.—In connexion with commercial-scale and pilot-unit operations for the production of butadiene from butylenes, a number of short-cut infra-red procedures have been developed for the rapid, accurate determination of certain key components in samples containing other compounds whose measurement is not necessary or which can be determined readily by other means. Although some of the procedures are applicable only for specific purposes, others are general in nature and may be applied to a wide variety of purposes. The procedures may be divided into

three categories: base-line methods (*iso*butylene and *iso*butane in admixture with other C_4 hydrocarbons); procedures based upon measurements of optical density at unique wave lengths (methane, CO, and CO_2 in admixtures with hydrogen and small amounts of C_3 and lighter hydrocarbons); and comparison standard techniques (butadiene-1 : 3 product purity and butadiene-1 : 2 in admixture with other C_4-hydrocarbons). G. R. N.

1331. Mass Spectrometry. S. E. J. Johnsen. *Anal. Chem.*, 1947, **19**, 305–306.—A new method of mass spectrometric analysis is proposed in which the usual pressure measurement of the sample prior to expansion is not necessary. Peak ratios are used throughout and the method is claimed to be capable of general application except in the analysis of ternary isomeric mixtures. G. R. N.

1332. Constant Ratio Still Head. L. E. Lloyd and H. G. Hornbacher. *Anal. Chem.*, 1947, **19**, 120–123.—The still heads described are based on the principle of two condensing surfaces in parallel—one to give reflux, the other to give the product. A general discussion (with 44 references) of laboratory still heads is set out. G. R. N.

1333. Determination of Sulphur in Organic Compounds. E. C. Wagner and S. H. Miles. *Anal. Chem.*, 1947, **19**, 274–277.—A procedure for the volumetric semimicro-determination of sulphur depends on the combustion of the sample in the Parr oxygen bomb and determination of the resulting sulphuric acid by precipitation as benzidine sulphate and titration with standard alkali. G. R. N.

1334. Sudden Application of a Constant Shearing Motion to Anomalous Fluids. E. K. Carver and J. R. Van Wazer. *J. Phys. Colloid. Chem.*, 1947, **51**, 751.—A viscometer of rotating cup type which could be made to rotate suddenly at constant speed is fully described. Photographic recordings are made of the stress *v.* time when a given constant rate of shear is suddenly applied to the fluid contained between the concentric cylinders. Newtonian as well as a number of non-Newtonian fluids and, in particular, an aluminium soap dissolved in gasoline are studied. The graph of force *v.* time for this material shows a maximum near the time rotation is started. It is shown from these photographic traces that the gel has a cross-bonded structure which is partially destroyed under shear. The structure is reformed upon standing undisturbed for several hours, the activation energy responsible for this process being 9 kg.-cal. The activation energy for flow is zero. This is because the mechanism of flow is a combination of breaking bonds and the normal type of internal friction.

1335. Capillary Type Viscometer. D. P. Shoemaker, E. Hoerger, R. M. Noyes, and R. H. Blaker. *Anal. Chem.*, 1947, **19**, 131–132.—The viscometer was employed to the study of concentrated solutions of large molecules in volatile solvents and found to give more reproducible results than the Ostwald type. It is relatively free from errors due to concentration changes. G. R. N.

Lubricants.

1336. Graphited Lubricant for Modern Running-in. Anon. *Oil Engine and Gas Turbine*, June 1947, **15** (170), 59.—The addition of colloidal graphite to the lubricating oil during the bedding-in of opposed working faces will eliminate metal pick-up and reduce wear.

If nickel-chrome liners and chromium-plated rubbing surfaces are treated with colloidal graphite, a far better degree of oil spread is obtained, since the graphoid surface improves the oil-holding quality of the bearing surface. In addition, the microscopic particles of graphite interpose themselves between the high spots of opposed rubbing surfaces, and thus provide adequate lubrication if the oil film is ruptured.

A better protection is given to the working faces of a new engine if a mineral oil containing a relatively high percentage of colloidal graphite is applied to all rubbing surfaces during assembly. A running-in compound containing colloidal graphite should also be added to the crankcase oil. C. D. B.

Special Hydrocarbon Products.

1337. Most Outstanding U.S. Organic Chemical Development Now in High Gear. A. L. Foster. *Oil Gas J.*, 31.5.47, **46** (4), 205.—A review of the petroleum chemical manufacturing industry in the Gulf of Mexico is given.

An extensive range of organic chemicals are or will be produced in this area, which is ideally situated for water transport and has an abundance of petroleum products as raw materials and a third of U.S. refining capacity.

New and recent building activities and expansion in petroleum chemical manufacture are shown in a table; a second table shows rubber and rubber intermediate plants in the area.

Among the outstanding chemical plants on the Gulf Coast is the Deer Park refinery of the Shell Chemical Co. Large quantities of glycerin are synthesized in the plant by the hydration of propane or propylene to form propylene to which is added three hydroxyl groups with the aid of chlorine and caustic soda.

This company is also constructing a unit for synthesis of 18,000,000 gal ethyl alcohol annually.

The Carthage Hydrocol Company are building a plant to make 6000 brl/day of motor and other fuels from natural gas by an improved Fischer–Tropsch synthesis.

G. A. C.

Derived Chemical Products.

1338. The Petroleum-Chemicals Industry. R. F. Goldstein. *Petrol. Times*, 7.6.47, **51**, 524.—This is the first of a series of articles reviewing the trends and developments in the petroleum-chemicals field: a petroleum-chemical is taken as meaning a synthetic organic chemical manufactured from a petroleum starting material.

The main sources of petroleum-chemicals are the saturated or unsaturated hydrocarbons which under ordinary conditions are gases: thus one of the basic processes in the petroleum-chemicals industry is the separation of gases into their individual constituents. The standard methods of separation include fractional distillation, adsorption on active carbon, absorption by chemical reagents, and "Hypersorption"—a new process which is briefly discussed. The author also discusses the various methods of production of synthetic glycerol and newly discovered reactions of olefines, glycols, and olefine oxides.

R. B. S.

Miscellaneous Products.

1339. Secrets of German Fuel Technology Unearthed. Anon. *Petrol. Times*, 7.6.47, **51**, 550.—The following BIOS and FIAT reports are briefly reviewed:

BIOS Final Report No. 877. Oxidation of Hydrocarbons to Ethylene and of Methane to Acetylene, with Conversion of Acetylene to Acetone.

FIAT Final Report No. 299. Supplemental Report on the Ruhrol Hydrogenation Plant, Welheim, Ruhr.

R. B. S.

Engines and Automotive Equipment.

1340. 3500 H.P. Pratt and Whitney Wasp Major. Anon. *Flight*, July 1947, **52**, 12*a*.—Constructional and design features of this new high-power American engine are divulged. Major data include:—

Bore	5·75 in (146 mm)
Stroke	6·00 in (152·4 mm)
Total displacement	4363 cu. in. (71·5 litres)
Compression ratio	6·7 : 1
Maximum B.M.E.P.	200 p.s.i.
Airscrew reduction gear ratio	0·381 (or 0·425)
Airscrew shaft rotation (from rear)	Clockwise
Diameter: TSB3-G; VSB11-G	53·5 in; 52·5 in
Length	96·75 in
Dry weight (including torquemeter and accessories) TSB3-G; VSB11-G	3,490 lb; 3,410 lb
Maximum oil consumption at rated power	0·025 lb/b.h.p./hr

I. G. B.

1341. Modern Trends in Bearing Metals. P. T. Holligan. *Oil Engine and Gas Turbine*, May 1947, **15** (169), 28; June 1947, **15** (170), 44.—The real area of contact between two mating surfaces is extremely small, and is dependent mainly on the load; intense local pressures and high temperatures may be developed. Among other desirable properties, therefore, a bearing metal must have high load-carrying capacity, high fatigue strength, and a high thermal conductivity.

It is not yet certain whether the presence of hard crystallites in a soft matrix has any advantage for a bearing metal, but under practical running conditions, the hard constituents may play a small but significant rôle in imparting superior mechanical and physical properties to the oil.

Tin and lead-base white metals possess most of the properties necessary for a good bearing, but they have limitations owing to their low compressive and fatigue strength. These defects can be partly remedied by reducing the thickness of the lining to a minimum of about 0·010 in. If the lining is thinner than this, the bearing shell must be manufactured to closer tolerances, and severe scoring of the white metal may occur if particular attention is not paid to filtration.

Cadmium-base alloys, which have better mechanical properties than the white metals, have limitations in that (*a*) they are expensive to manufacture, owing to their loss by oxidation when in the molten state, and (*b*) they are susceptible to corrosion by oil acids.

Aluminium-base bearing metals have disadvantages in that, being relatively hard, they must be used with hardened shafts, and they also tend to lose interference fit in the engine owing to their low elastic limit.

It has been found that a thin film of lead (to a thickness of 0·004 in) on a copper base reduced friction to a minimum; with a harder metal base a thinner film was required. This is the basis of the lead-bronze bearing, which, however, is not suitable for main and big-end bearings as it is too hard. Softer shaft materials can be used if the lead content of the alloy is increased, but this results in decreased mechanical strength.

For this reason, copper–lead " alloys " must be bonded to steel shells, the resultant bearings having high load-carrying capacity and high fatigue strength at elevated temperatures. Under conditions of temporary oil shortage or excessive loading, a film of lead is extruded from the lining, and is " wiped " over the bearing surface, thus reducing friction. Coating the bearing surface with a thin film of pure lead will facilitate the running-in process.

For a high load-carrying-capacity bearing suitable for use with soft shafts, alloys are being developed with a higher lead content than the 70/30 copper–lead bearings at present in use. With these higher lead contents, lead plating of the copper–lead surface is no longer essential. C. D. B.

Miscellaneous.

1342. United Kingdom Petroleum Trade in 1947. (Details for May). Anon. *Petrol. Times*, 5.7.47, **51**, 663.—Tables are presented of U.K. imports and exports of crude oil and refined products for May and the first five months of 1947. Comparative figures for the corresponding periods of 1946 are also given. R. B. S.

1343. Fuel Oil Developments in the U.K. N. L. Hudson. *Petrol. Times*, 24.5.47, **51**, 475.—Fuel oil developments in the U.K. are briefly reviewed. R. B. S.

1344. Synthetic Oil in Japan. Anon. *Industr. Chem.*, 1947, **23**, 333–340.—The Japanese commenced research on oil from coal in 1921, but the Government did not give any assistance until 1936, when the production of oil from Japanese and Manchurian coals was stimulated. Both Fischer–Tropsch and low temperature carbonization processes have been investigated, but the latter are preferred. Descriptions of various installations are given. During the peak year (1944), only 100,000 tons of synthetic oil were produced in the Japanese Empire. In the last year for which reliable data are available (1936) Japan produced 330,000 tons of natural crude oil and the rest of the Empire 175,000 tons. In the same year the low temperature plant at Fushun in Manchuria produced 125,000 tons. Total output from the other four similar plants was under 4000 tons. Imports in the same year were 2·14 million tons of crude oil and 2·5 million tons of petroleum products. F. S. A.

BIBLIOTEKA POLITECHNIKI

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

September, 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.

Campbell, Donald, Sales Technical Adviser, Shell Petroleum Co., Ltd. (*R. I. Lewis ; G. D. Thacker*).

Crabbe, Edward Allen, Engineer, Technical Department, Shell Co. of Straits Settlement, Singapore. (*H. W. Stevenson ; R. I. Lewis*).

Davies, Howard Merrett, Research Chemist, Esso European Laboratories. (*C. S. Windebank ; E. B. Evans*).

Dutton-Forshaw, Richard, Managing Director, Burtonwood Motor & Aircraft Engineering Co., Ltd. (*H. de Wilde ; J. Massey*).

Ratcliffe, Douglas Henry, Operator, Anglo-Iranian Oil Co., Ltd., Abadan. (*B. D. Cauthery ; D. N. McKinlay*).

Stephinson, Pat Howard, Laboratory Assistant, "Shell" Refining & Marketing Co., Ltd. (*R. G. Kenzie ; D. H. Japes*).

Townend, Donald Thomas Alfred, Director, British Coal Utilisation Research Association. (*W. H. Cadman ; E. J. Dunstan*).

Winterbottom, John Edward, Laboratory Assistant, "Shell" Refining & Marketing Co., Ltd. (*R. G. Kenzie ; N. Cohen*).

Transfer.

Baskin, Leon, Prospecting Officer, Ministry of Fuel and Power. (*S. E. Coomber ; G. D. Hobson*). (*Student to Associate Member*).

Deller, Alan William, Petroleum Marketing Assistant, Shell Petroleum Co. Ltd. (*E. L. Bass ; R. I. Lewis*). (*Student to Associate Member*).

Henry, John, Production Superintendent, Lobitos Oilfields Ltd. (*A. T. Beazley ; C. Barrington Brown*). (*Member to Fellow*).

Le Blanc-Smith, William Leonard, Senior Sales & Technical Representative, Vizgol Oil Refining Co., Ltd. (*S. Elliman; L. Mills*).

McDermott, Lionel Roy, Junior Exploitation Engineer, Shell de Colombia. (*Student to Associate Member*).

Metcalf, Thomas John, Chemist, Lubricating & Fuel Oils Ltd. (*J. R. Smellie ; F. Dakin*). (*Associate Member to Fellow*).

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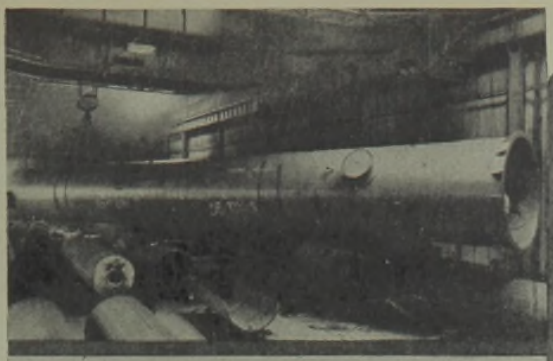

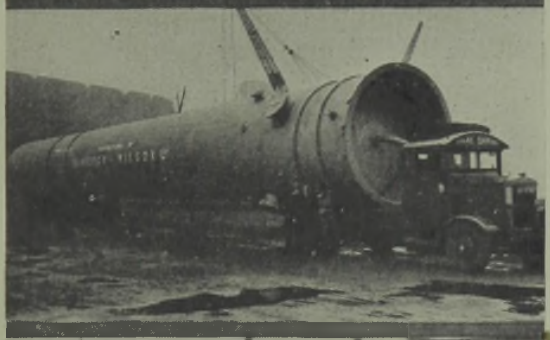

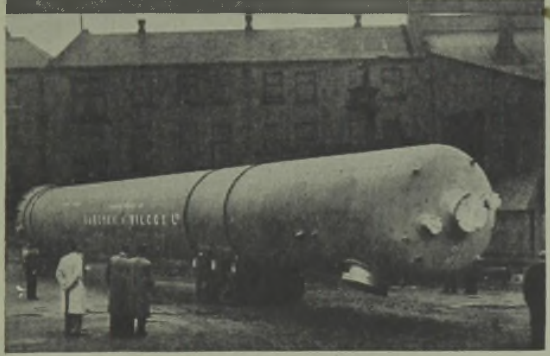

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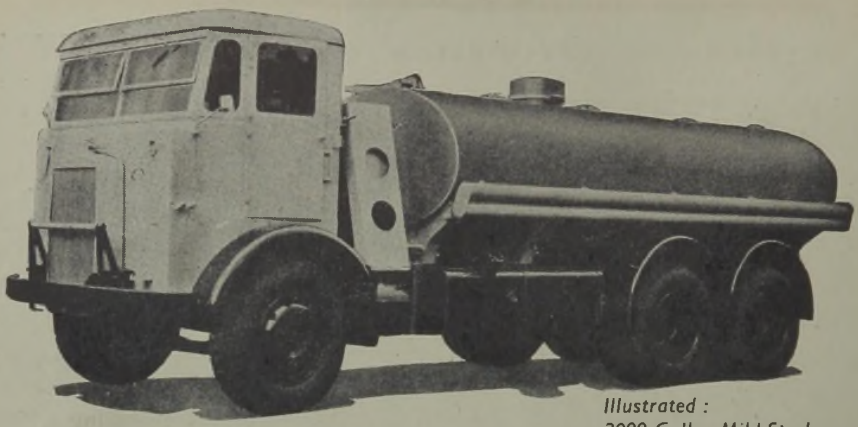

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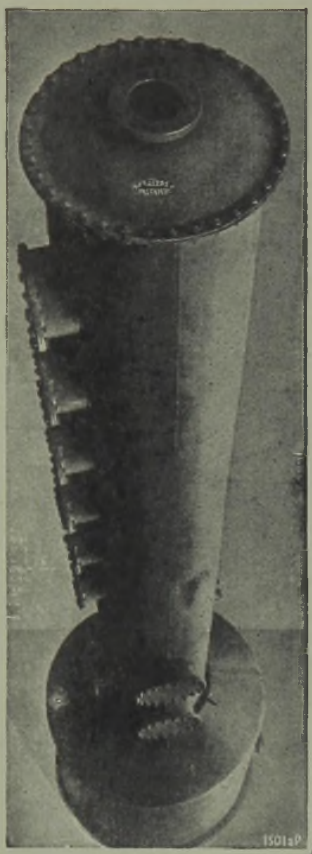

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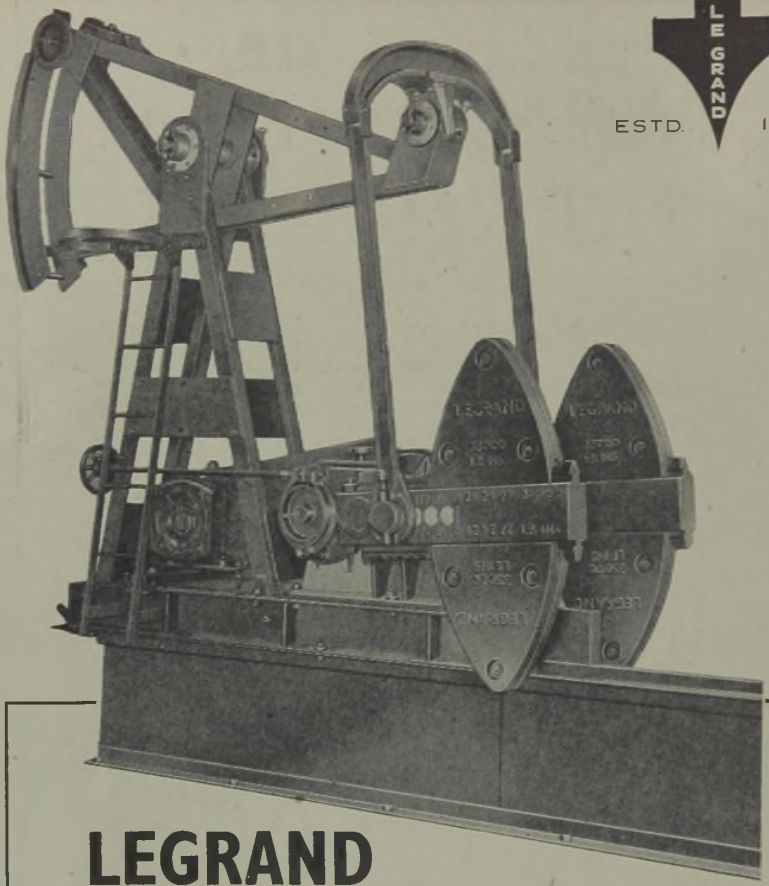

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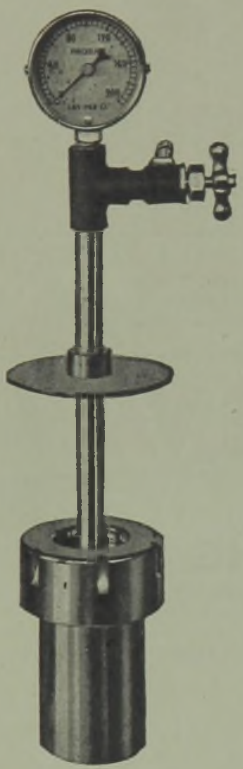

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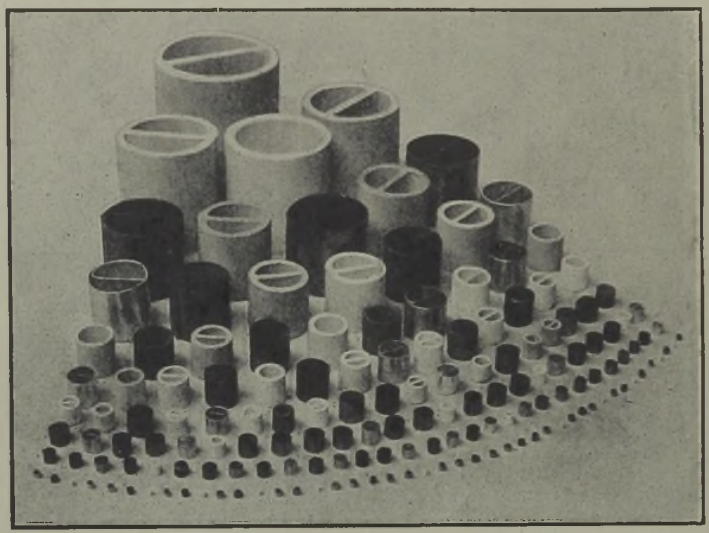

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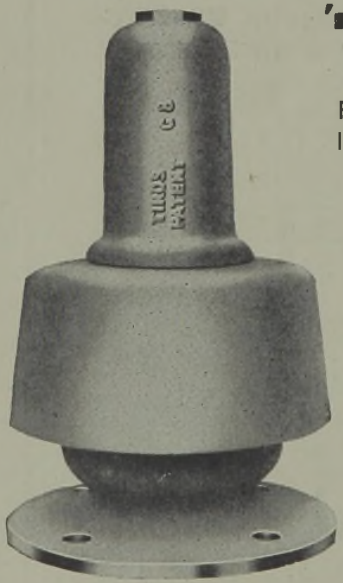

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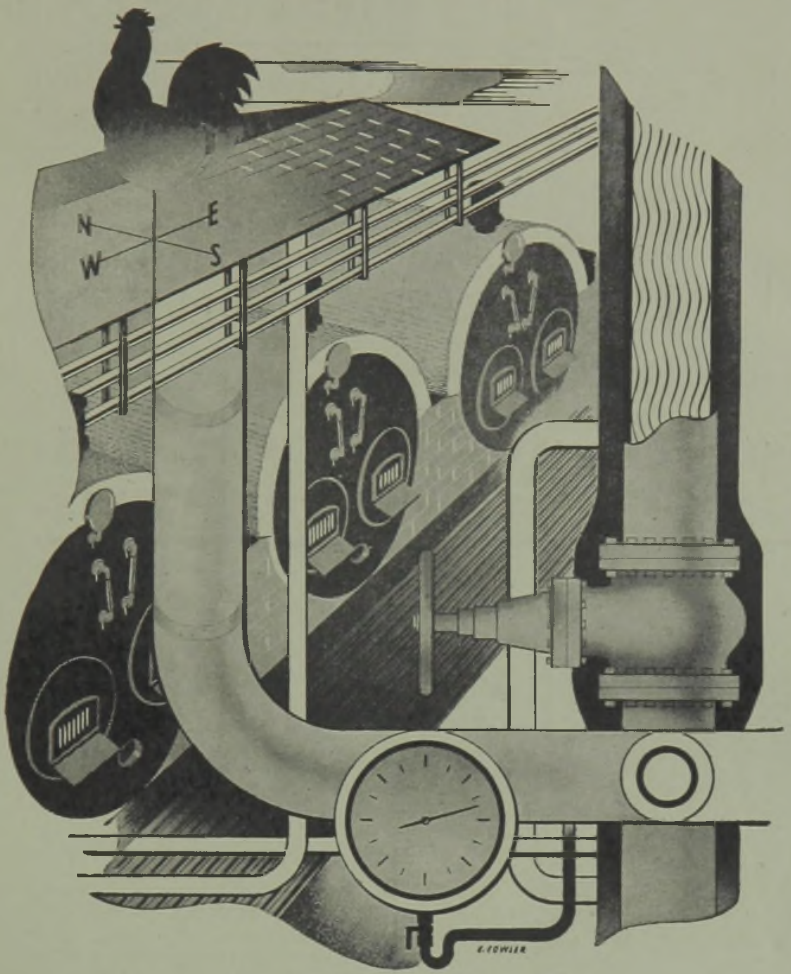

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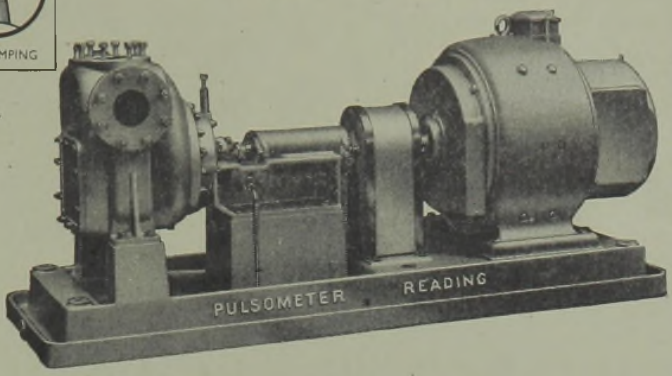

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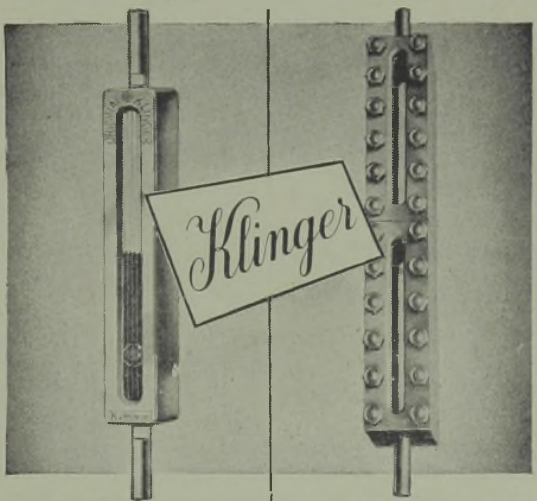

"K" Type Reflex Gauges for oil pressures up to 1,200 lbs. per square inch and steam pressures up to 500 lbs. per square inch. They are available in a full range as single or combined units and have forged steel bodies with stainless steel tightening nuts and end tubes. Reflex gauges are also made for higher pressures up to 6,000 lbs. per square inch.

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The need to condition mud so that it maintains a given consistency isn't everybody's difficulty; but it is one that faces the oil-well drilling engineer.

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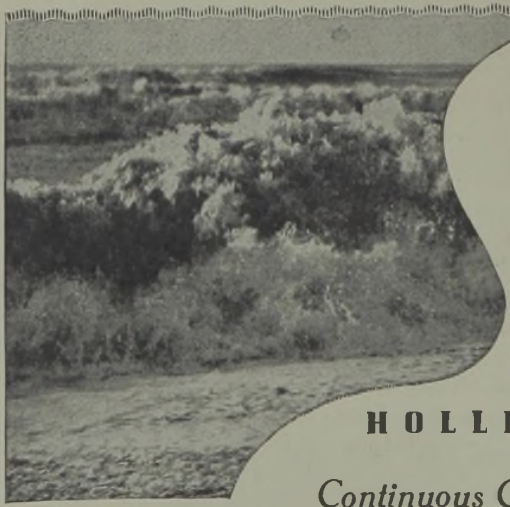

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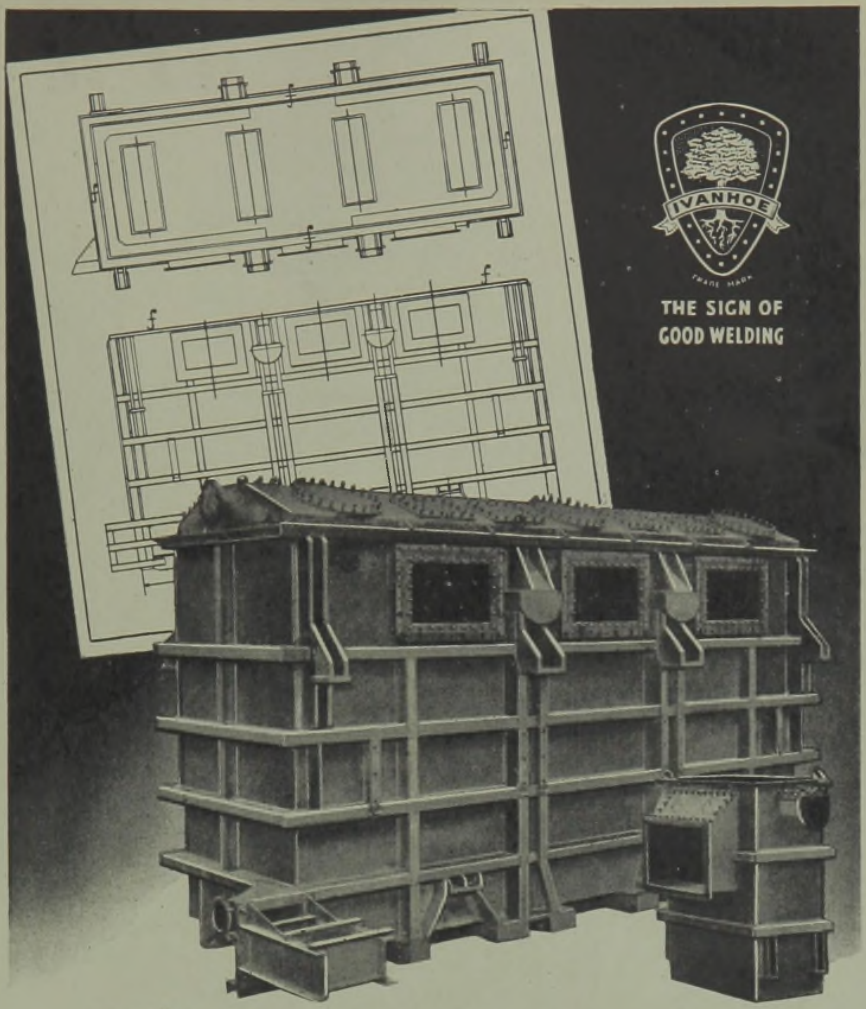

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Joint flanges on the largest tanks and similar units can be machined by Jenkins at one setting, if they are free of protuberances. This service solves a difficult problem in a highly economical manner. Tanks made weighing from a few hundredweights up to 20 tons.

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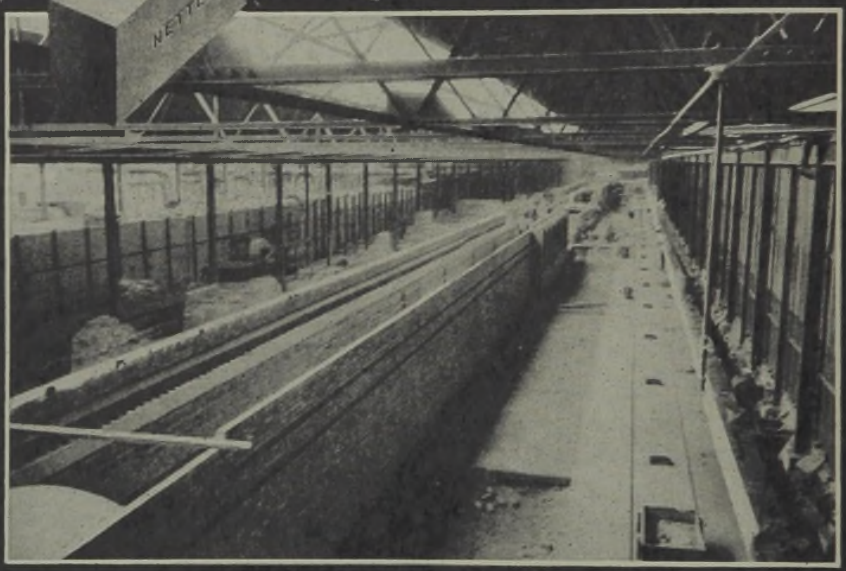

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THE importance of maximum production, more severe operating conditions and the requirements of reconstruction and extension programmes have brought about an exceptional increase in the demand for the better class of refractories.

The illustration shows the large new Tunnel Kiln at present under construction at our Manuel Works. When in production this kiln will give a substantial increase in the output of "Nettle" (42/44% Alumina) Firebricks.

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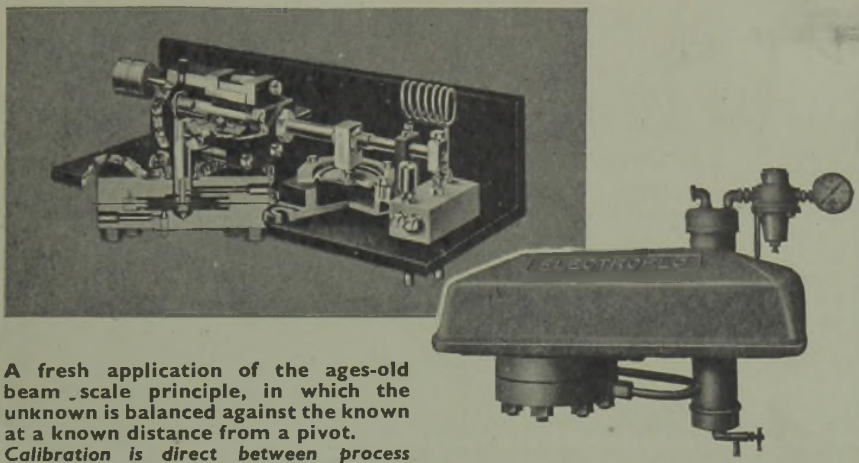
A NEW PRINCIPLE IN MEASUREMENT



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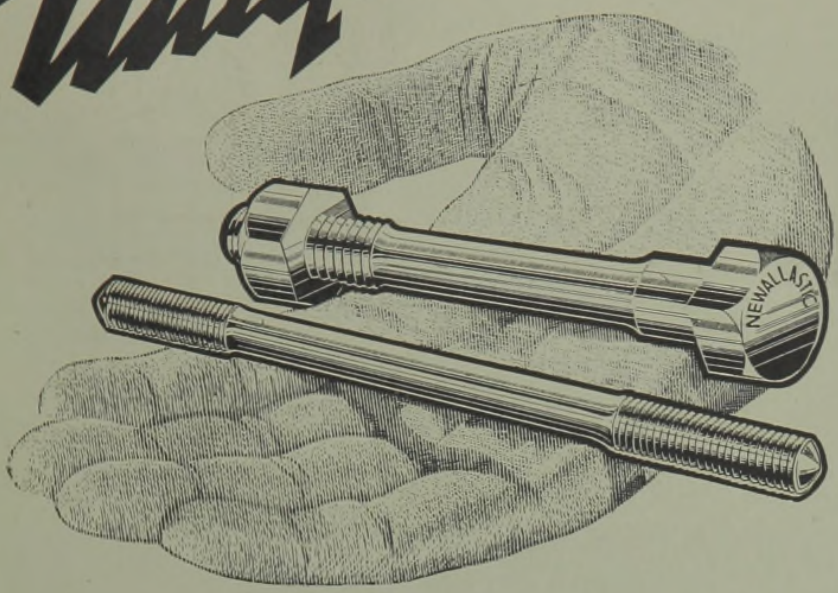

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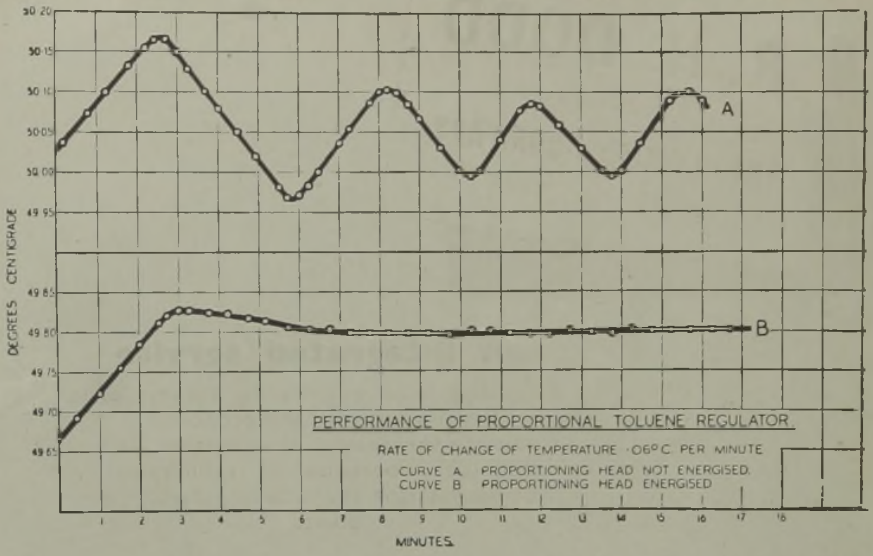

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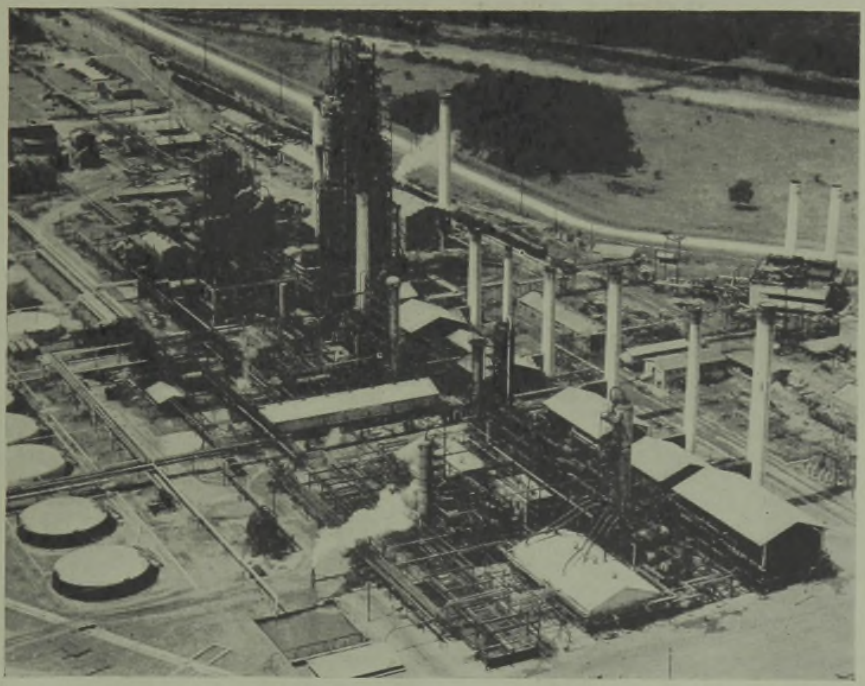

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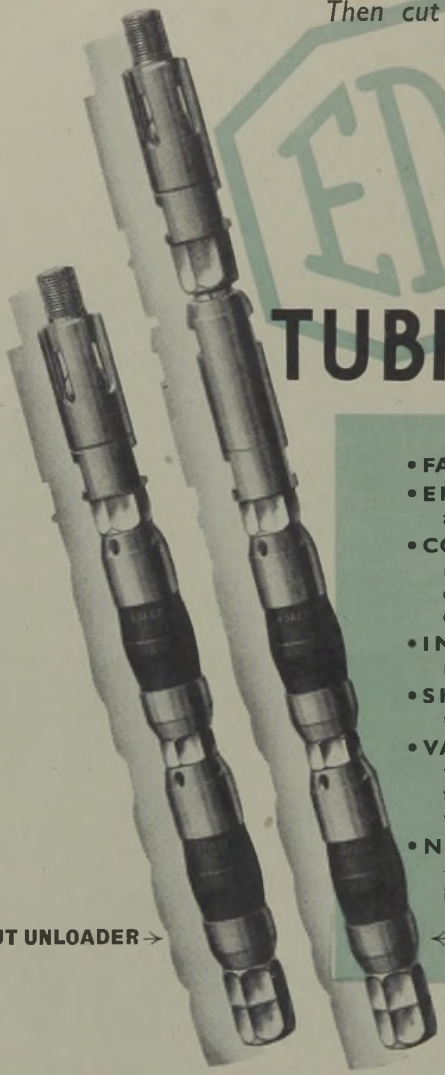

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- **VALVE CORRECTLY LOCATED**—at top of swab to minimize restriction of flow, avoid clogging, permit easy access and visual examination without dismantling.
- **NO SLIDING OR ROTATING PARTS**—nothing to jam or give trouble in the hole.

WITHOUT UNLOADER →

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