ABSTRACTS.

	PAGE
OILFIELD EXPLORATION AND EXPLOITATION.	
Geology	53 A
Geophysics and Geochemical Prospecting	67 A
Drilling	67 A
Production	67 A
Development	70 A
TRANSPORT AND STORAGE ...	72 A
REFINERY OPERATIONS.	
Refineries and Auxiliary Refinery Plant	72 A
Distillation	73 A
Chemical and Physical Refining	73 A
Safety Precautions	74 A
PRODUCTS.	
Chemistry and Physics ...	74 A
Analysis and Testing	74 A
Crude Oils	74 A
Engine Fuels	75 A
Bitumen, Asphalt and Tar ...	75 A
Derived Chemical Products ...	76 A
Coal, Shale and Peat	76 A
Miscellaneous Products ...	78 A
MISCELLANEOUS	78 A
Book Reviews	79 A

AUTHOR INDEX.

The numbers refer to the Abstract Number.

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

Alexander, C. I., 211
Appalachian Geological Society, 211

Barr, K. W., 232
Baurrnschmidt, A. J., 177
Bell, A. H., 211
Bennett, J. G., 237
Blanpied, B. W., 210
Borden, J. L., 211
Bourne, A. I., 235
Burnett, T. J., 211

Clark, S. K., 204
Cole, C. L., 205
Crawford, F. W., 231
Curran, J. F., 160

Daly, J. W., 198
Decker, C. E., 162
Desjardins, L., 164
Donnelly, A. S., 211
Dott, R. H., 170

Ehlers, A., 168
Elliott, G. R., 203

Freeman, L. B., 181

Gregersen, A. I., 211

Ham, W. E., 170
Hardenberg, H. J., 211
Hazzard, R. T., 210
Heckman, L. E., 222
Hedberg, H. D., 173
Hennen, R. V., 167
Henny, F., 169
Hoyte, W. N., 233
Hughes, U. B., 211
Hume, G. S., 211
Huntington, R. L., 227

Imlay, R. W., 163

Kazarnovskaia, B. E., 202
Kellum, L. B., 178
King, J. G., 238
Kirkbride, C. G., 226
Koester, E. A., 211
Kunkel, J. H., 236

Lahee, F. H., 199
Landes, K. K., 176
Larsen, R. M., 211
Leavenworth, P. B., 211
Logan, L. J., 186
Longwell, C. R., 172
Love, F. H., 228
Lovell, R. G., 241

McFaddin, D. E., 225
McFarlan, A. C., 181
McGlothlin, T., 174
Martens, J. H. C., 165, 166
Meyer, W. G., 182
Miller, M. C., 221
Miser, H. D., 161
Morgan, T. D., 231
Morton, F., 232

Nelson, V. E., 181
North Texas Geological Society, 211

Paddleford, J. T., 191
Petrov, A. D., 230
Polonbarinova-Kochina, P. J., 201, 202
Porter, W. W., 211
Pryor, C. C., 207, 208
Pye, W. D., 175
Pyre, A., 173

Richards, A. R., 232
Rouse, J. T., 180
Royds, J. S., 204

Spice, W. H. Jr., 211
Stitt, J. R., 209
Sutton, C., 200
Swain, F. M., 183
Sweetman, H. L., 235

Taliaferro, N. L., 179
Thomson, G. H., 234
Tomlinson, C. W., 204

Vittikh, M. V., 230

Watkins, J. C., 229
Winter, N. B., 211
Wolcott, P. B., 171

OILFIELD EXPLORATION AND EXPLOITATION.

Geology.

160.* Eocene Stratigraphy of Chico Martinez Creek Area, Kern County, California. J. F. Curran. *Bull. Amer. Ass. Petrol. Geol.*, October 1943, **27** (10), 1361–1386.—The general strike is from north-west to south-east. The Carneros anticline pitches in this direction, and its crest is traversed by the Carneros pivotal or reverse fault, indicating compression from the north-east. To the south the overturned Chico Martinez anticline shows north-eastward thrusting along the Temblor thrust-fault. Both anticlines are cut across by the north–north-west–south–south-east Cardinal fault-zone, which is of Pleistocene date (Pasadenan orogeny of Stille). The main deformation was pre-McKittrick (late Kainozoic), but earlier local pre-Refugian movements can be traced.

The Oligo-Miocene geology is well known, especially the sandy, horizon-marking "*Phacoides*" (=*Lucinoma acutilineata*) reef, above which fossils have also been found in the Carneros sandstone—viz., *Ostrea titan*, *Pecten* spp., and *Balanus* sp. In the "Button beds" abundant *Echinarachnius merriami* is associated with *Pecten andersoni* and *Ostrea* sp. These all belong to the Temblor, and above them the Gould shale is assigned to the Monterey or Maricopa formation (Miocene).

The Eocene shale members are dealt with according to their abundant Foraminifera. Associations like that of *Bulimina pupula* Stache, *Cibicides* sp. *D* Cushman and McMasters, and *Uvigerina churchi* Cushman and Siegfus aid materially in mapping. All the Eocene samples contain Radiolaria of the legion Spumellaria, families Liosphærida and Placodiscida. These are accompanied by numerous *Globigerina triloculinoides* Plummer, and members of the Buliminidæ, Lagenidæ, etc., indicating open sea in sub-tropical to tropical conditions : a conclusion which is supported by the absence of Radiolaria legion Nassellaria. Rapid accumulation of detritus on a steeply sloping bottom, at or below the edge of the continental shelf, is also suggested. Most of the foraminiferal genera investigated have a wide bathymetrical range, but limiting factors seem to be provided by *Lenticulina*, which is not reported in present oceans at less than 45–50 fathoms, and by *Robulus* and *Gyroidina*, which are not found at less than 20 fathoms. Actually *Robulus* and *Lenticulina* attain their maximum development off tropical coasts in cold water at depths of 100–500 fathoms. Again, *Dorothia*, *Textularia*, and *Tritaxilina* have maximum depths up to 500 fathoms. As regards temperature, the limits appear to lie between 45° and 58° F., where the lower temperature is the minimum for *Tritaxilina* and the higher is the maximum for *Robulus*, *Ammobaculites*, and *Tritaxilina*. The assignment of 50° F. as the maximum for *Haplophragmoides* is inadequately based. In any case the story seems to be one of waters of medium depth which were cool but not cold.

Comparison of check lists of Foraminifera show that in downward sequence the members 1, 2, and top of 3 of the "Tejon" (Eocene) at Zemorra Creek are probably synchronous with the Sagasar shale member of the Kreyenhagen formation of Reef Ridge, and that the lower part of 3, as well as 4, 5, 6, and 7 are apparently equivalent to the Canoas siltstone. Thus while siliceous shales were being formed in the Reef Ridge district, coarse sandstones were being deposited in the Chico Martinez Creek–Carneros Creek region. Attempted correlation with the type Tejon formation and the type Devil's Den shale did not succeed.

A bibliography of 61 items, including 7 on the ecology of Foraminifera, is given.

A. L.

161.* Regional Geologic Studies for Oil and Natural Gas. H. D. Miser. *Bull. Amer. Ass. Petrol. Geol.*, October 1943, **27** (10), 1387–1388.—The type of work that is being undertaken is mainly regional stratigraphy, both sub-surface and surface, of large areas, such as basins or similar geological provinces. Data will be accumulated for maps and sections showing (*a*) thickness of oil-producing formations, (*b*) changes of facies or porosity in oil formations or potential oil formations, (*c*) margins of producing or possibly productive zones, (*d*) relations and extent of lenticular sands. These studies will have as their objective the delimitation of broad areas that are favourable for exploration. The determination of local structural features, whether by surface, sub-surface, or geophysical methods, will not be stressed.

The results will be released promptly through the Federal and State geological surveys and the American Association of Petroleum Geologists.

A. R. Denison of Tulsa comments that this new programme is designed to start where the average oil-company geologist leaves off, and to carry forward regional work of a scope possible in the past only where co-operative efforts were sponsored by local geological societies.

A. L.

162.* Three More Graptolites from the Simpson of Oklahoma. C. E. Decker. *Bull. Amer. Ass. Petrol. Geol.*, October 1943, **27** (10), 1388–1392.—Three new graptolites have been collected from the upper part of the Bromide, uppermost formation of the Simpson (Ordovician), in the Criner hills, 8 ml. south-west of Ardmore, Oklahoma. This is the same zone that yields *Diplograptus maxwelli* Decker, which permits correlation of the upper part of the Bromide with the middle of the Mifflin member of the Platteville of Wisconsin. The Zone is that of *Ampyx mcgeheei*.

Dictyonema francesiæ now described is from argillaceous limestone, in which the brownish-yellow colony has escaped darkening due to carbonization. Thecæ of three kinds are present: those for regular polyps, large gonothecæ for reproduction, and small elongate bithecæ, doubtless for stinging cells.

Dictyonema rockcrossingensis has less regular vertical stipes and meshes wider in proportion to length than the foregoing. It thus approaches the form of *Desmograptus*.

Dicellograptus gurleyi Lapworth, the third discovery, links the top of the Bromide with the Normanskill shale of New York and with the Womble shale of Arkansas; and, as 18 of the graptolite species found in these two formations occur in the lower part of the Viola limestone, Normanskill and Womble may be taken as bridging the brief hiatus between Bromide and Viola.

Keble and Benson list *D. gurleyi* from the Upper Ordovician of Australia.

Decker recognizes stinging bithecæ in *D. gurleyi*. Bulman illustrates the presence of these in profusely branched forms like *Clonograptus tenellus* and *Bryograptus hunnbergensis*, but Decker now adds that they also occur in *Dicellograptus*, *Diplograptus*, and *Didymograptus*. Ruedemann (*New York State Mus.*, *Mem.*, 11, 1908, 297–309) has shown these structures without comment on their connection with bithecæ. A. L.

163.* Jurassic Formations of Gulf Region. R. W. Imlay. *Bull. Amer. Ass. Petrol. Geol.*, November 1943, **27** (11), 1407–1533. Bibliography of 98 items.—Lower and Middle Jurassic rocks of the Gulf region have been identified only in southern Mexico and northern Central America. They consist of several thousand feet of green or darker marine beds and of vari-coloured continental beds which may derive their ferric oxide from earlier red beds or from contemporary laterization. Purely marine conditions were limited, and the ammonite facies of the Lower Jurassic has only been identified in north-west Veracruz, eastern Hidalgo, and northern Puebla. The continental facies has been recognized in western Oaxaca, southern Puebla, and northern Chiapas, but probably exists also in northern Guatemala, Salvador, Honduras, and Nicaragua. It contains some coal, and the shales are often carbonaceous, with excellent plant remains, which point to a climate at least seasonally hot and humid. The continental facies of the Lower Jurassic rests on schist, gneiss, and granite, or upon Upper Palæozoic sedimentary strata, and grades upwards into mixed continental and marine Middle Jurassic, in which marine bivalves may occur in sandstones and ammonites in nodules in shales. The Middle Jurassic of Chiapas and northern Central America is continental throughout and cannot yet be distinguished from Lower Jurassic. One regards the main geosyncline as lying north of a rising land mass which occupied the site of Honduras and southernmost Guatemala. Marine waters entered the region of Veracruz early in the Lower Jurassic, spread westwards and south-west in a narrow embayment, secured a beach-head in the region of north-eastern Guerrero by late Lower Jurassic, and fanned out more and more widely during Middle Jurassic time.

The Mexican faunal representatives of most of the English Lower Lias (excluding the Hettangian) are: *Coroniceras* aff. *bisulcatum*, *Arnioceras* aff. *geometricum*, *Euagassiceras* aff. *sauzeanum*, *Oxynoticeras* aff. *oxynotum*, *Vermiceras* aff. *bavaricum*, *Pleurechioceras* aff. *deciduum*, *Arnioceras james-danæ*, *Echioceras* aff. *raricostatum*, *Microderoceras* cf. *bispinatum*, and *Uptonia* cf. *jamesoni*. Upper and Middle Lias have not been identified. But covering part of Inferior and Great Oolite time we have *Teloceras* and *Strenoceras* aff. *bifurcatum*, and representing the Cornbrash there are *Strenoceras paracontrarium* and *Eurycephalites bœsi*. At the base of the Upper Jurassic the Mexican zonal equivalent of the Kellaways beds is *Subgrossouvria neogœa*, and synchronous with the lower part of the Oxford clay *Erymnoceras mixtecorum*. An interesting problem is presented by the question of to what extent these beds are present in Cuba, where the earliest identified Jurassic is the San Cayetano, which began to be deposited in Corallian time. It includes schist and marble, and phyllites which from contained nodules yield Corallian and perhaps early Kimmeridgian ammonites.

During the Divesian (upper part of Oxford Clay) conditions became very arid, and great deposits of salt and red beds were laid down, including the Eagle Mills formation of the Gulf Coast. The salt in these beds is the source of that in the salt domes. These red beds are absent in West Texas. During the succeeding Argovian (Corallian) the climate remained arid, but limestone deposition supervened. Then early in the

Lower Kimmeridgian the waters retreated basinwards for 50–100 ml., leaving lagoons in which anhydrite and red beds gathered. To the Corallian belong the black *Posidonia* shales which interfinger with the coral-brachiopod reefs of the Smackover.

The Lower Kimmeridgian orogeny followed. It built folded and metamorphic mountains in Cuba which remained as land till the deposition of the Viñales limestone (late Portlandian)—a formation which is believed to be the source of many oil-seeps and large asphalt deposits. It is from it that the small but commercially productive serpentine masses are impregnated in Havana and Santa Clara provinces.

This Lower Kimmeridgian diastrophism also found expression in block-faulting on both sides of the North Atlantic: in the Palisade disturbance, in boulder beds and tunamis of Helmsdale, Scotland; and in slumping in the Solenhofen lithographic limestone. The Nevadian orogeny is also of this time.

The Buckner red beds in the Gulf region, with their anhydrite deposits, are a product of erosion after uplift. They are followed by the important Cotton Valley shales and limestone, the lower part of which contains ammonites typical of American Middle Kimmeridgian—*Idoceras* cf. *durangense* Burckhardt and *Glochiceras* cf. *fialar* (Oppel). The upper part of the Cotton Valley has few fossils, but one—*Tancredia louisianensis* Imlay—belongs to the group of *T. axiniformis* (see L. R. Cox, *Ann. Mag. Nat. Hist.*, ser. 10, vol. 3, 1929), which is rare above the Jurassic. The Cotton Valley is regarded as equivalent to the La Casita formation of Mexico, and to the Morrison of the Western Interior. The climate was moister than that of the Argovian and Divesian stages, and near-shore deposits contain much conglomerate and sandstone.

The Jurassic ended with continued erosion of the highlands produced during the Palisade disturbance; the eventual product was the Fall Zone peneplain of the early Upper Cretaceous.

Upper Jurassic rocks in the southern U.S. have yielded oil and gas only in Arkansas and Louisiana. The Cotton Valley formation has been a minor source of oil from sand-lenses in a few fields near the Arkansas–Louisiana border. The Smackover has been a major producer of oil and gas in southern Arkansas and a minor source in northern Louisiana. Most of the output from the Smackover has come from porous oolitic limestone south of a fault-zone probably continuing the Balcones fault-zone; but similar limestone is also saturated with oil at the Midway field, northern Lafayette County, Arkansas, north of the fault-zone. The Midway discovery has stimulated search for shoreline traps in marginal areas of the Smackover limestone in Arkansas and eastern Texas, though present Smackover production is all from structural traps. The main areas within reach of the drill are in a zone 10–30 ml. wide extending from southern Arkansas and northern Louisiana south-westwards to the neighbourhood of Del Rio, Texas, roughly parallel to the Balcones fault-zone. East of Arkansas small areas of uplift in Mississippi, Alabama, and perhaps western Florida are worth testing, but throughout most of the region east of the Mississippi the Smackover lies at excessive depths for present-day drilling. Since so many fields in southern Arkansas and northern Louisiana are producing from the Jurassic, it would be a surprise if the corresponding Jurassic rocks elsewhere in the southern U.S., and in Mexico, were not also productive.

Many beds in the Lower, Middle, and Upper Jurassic of Mexico are highly bituminous; there are good showings of oil in late Upper Jurassic limestone in several wells near Tampico; and there is a seepage near Virgenes in southern Nuevo Leon. J. M. Muir first suggested the Jurassic as the oil-mother rock for part of the oil in the northern fields of the Tampico region. Best commercial prospects are probably in coastal areas where the Jurassic rocks are less strongly folded than on the Mexican Plateau.

The Upper Jurassic sequence of Colombia, Bolivia, and Peru is remarkably like that of the southern United States. A thick mass of salt at the base is overlain by limestone similar to the Smackover, and then by several thousand feet of red beds like the Schuler, which is a lateral northward variant of the marine Cotton Valley formation in southern Arkansas wells, or like the red Hosston formation, which succeeds the Cotton Valley beds.

Farther south in Argentina marine Callovian beds (lowest part of the Upper Jurassic) are covered by a thick mass of gypsum, which in turn is overlain by marine Kimmeridgian to Tithonian strata. The faunas are akin to those of Mexico, where the Kimmeridgian is characterized by, in ascending order, *Sutneria* aff. *platynota*, *Idoceras* aff. *balderum*, *Glochiceras fialar* associated with the *Idoceras durangense* group, *Waagenia*, and *Mazapilites.* The Portlandian includes *Subplanites* and *Kossmatia* and *Durangites* divisions, as well as *Aulacosphinctoides.* The Purbeck (Tithonian) equivalent has *Substeueroceras* and *Proniceras*, and in addition *Micranthoceras* and *Hildoglochiceras*, which persist upwards from the Portlandian. A. L.

164.* Measurement of Dip Angles on Aerial Photographs. L. Desjardins. *Bull. Amer. Ass. Petrol. Geol.*, November 1943, **27** (11), 1534–1538.—In mapping appreciably dipping beds on aerial photographs under the stereoscope directions of dip and strike may be readily determined. But attempts to assess angles of dip may miss the mark because of exaggerated relief and distortion in the stereoscopic view. It is difficult to estimate a dip slope, which one sees as 45°, at 15°, which it probably is. Formulæ are provided for making correct estimates. Louis Desjardins is also the author of "Contouring and Elevation Measurement on Vertical Aerial Photographs" in *Photogrammetric Engineering*, 1943. A. L.

165.* Stratigraphy of Deep Well in Harrison County, West Virginia. J. H. C. Martens. *Bull. Amer. Ass. Petrol. Geol.*, November 1943, **27** (11), 1539–1542.—The G. S. Gribble No. 1 Well, Harrison County, West Virginia, is the deepest (10,018 ft.) in the Appalachian area. In the Pennsylvanian system it penetrates, in descending order, the Conemaugh sandstones and shales, the Allegheny grey to green sandy shale and sandstone, and the Pottsville white to grey sandstone and dark shales. The Mississippian system is met with below 870 ft. It includes Mauch Chunk red, grey and green shales, and light green sandstone, with, near the base, 10 ft. of "Little Lime" with fossils, and farther down Greenbrier limestone, under which the Big Injun sand is missing, and at the base the Pocono grey and green shale whitish sandstone; a basal sand has not been definitely correlated with the Berea.

The Devonian extends downwards from 1618 ? ft. to 7785 ft. It includes Uppermost Devonian grey and green shale and white to green sandstone; Hampshire (Catskill) red, grey, and green shales and white, grey, and green sandstone; Chemung and Portage grey, green, and black shales, and white, grey, and green sandstones, becoming finer and darker towards the base; Tully fine-grained, brown limestone, and dark shale; Hamilton shale (including Marcellus if present), which is dark with small amounts of brown limestone; Huntersville chert (=Onondaga limestone), often silty and brown or grey-coloured with very small amounts of brown limestone; Oriskany sandstone, grey to brownish, calcareous, finer and darker towards the base, with a showing of gas (but shooting failed); and Helderberg brown limestones, with considerable chert, silt, and sand.

At 7785 ft. the Silurian Salina and Lockport formations were topped. They consist of brown to grey limestone and dolomite with small to large amounts of anhydrite and two beds of halite of 6 ft. and 67 ft., respectively. Under this the Clinton with greyish-red and greyish-green shales includes sandstone with a 20 ft. gas stratum and 5 ft. of red oolitic hæmatite. The Clinton of Ohio, it may be noted, is the stratigraphical equivalent of the Albion of New York, of the Tuscarora of western Pennsylvania, and of the White Medinan of eastern West Virginia. These beds are represented in the G. S. Gribble No. 1 well by the exceptionally thick development of 247 ft. of white, fine-grained quartzitic sandstone with some interstratification of black shale.

The well was discontinued after encountering 22 ft. of red, silty, and micaceous shale (Ordovician ?), which is correlated with the Juanita of Pennsylvania and with the Red Medinan of eastern West Virginia. A. L.

166.* Deep Well in Russell County, Virginia. J. H. C. Martens. *Bull. Amer. Ass. Petrol. Geol.*, November 1943, **27** (11), 1543–1547.—Clinchfield Coal Company No. 1 well reaches 6006 ft., in the Palæozoics of western Virginia. Under 25 ft. of surface gravel there are 1940 ft. of Pottsville (Pennsylvanian), including 19 coal seams which aggregate 50 ft. Other strata may be classified as siltstone, 33·3%; and sandstone, 64·1%. There is no evidence of marine beds.

The Pennington shale (Mississippian) is 2087 ft. thick, and corresponds with all or a great part of the Mauch Creek of southern West Virginia. Colours of the shale vary from red to grey, and there is white sandstone. In the lower part some grey limestone appears. The Newman limestone (Mississippian) occupies 585 ft. of the vertical sequence with light grey to dark brown, often oolitic beds, including some grey chert, as well as red shales with anhydrite at the base. The Maccrady formation, 31 ft., with anhydrite, red shale, and dolomitic silts, and the Pocono grey sands, shales and silts, amounting to 627 ft., are also Mississippian.

The Newman is equal to the Greenbrier of southern West Virginia, and it includes the outcrops classified as Gasper, Ste. Genevieve, and St. Louis limestones by H. P. Woodward (*Virginia Geol. Surv. Bull.*, 1938, 49). At the base of the Mississippian a thin white sandstone may represent the Berea, while a dark shale just above it may be the Sunbury.

The 731 ft. of Devonian grey shale, silt, and very fine sandstone are considered as being Brailler shale of the Portage group. A. L.

167.* Tertiary Geology and Oil and Gas Prospects in Dakota Basin of North Dakota. R. V. Hennen. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, **27** (12), 1567–1594.—The Dakota Basin contains sedimentary strata of about 12,000 ft. in thickness, ranging from Ordovician to Tertiary. The Ordovician has a thick section of porous zones with traces of oil as revealed in the Semling well in south-eastern Oliver County. This well is not a fair test of the potentialities, since it is situated in a syncline observed in a minor surface feature. Eastwards from a north–south line through the Semling well, the Ordovician, Devonian, and Mississippian feather out, successively against the eastward rise of the basement complex. This occurs towards the eastern boundary of North Dakota, but many wells are needed to fill in the outline of our knowledge. Borings here would of course be much less deep than those which have been put down west of the Missouri River. An area as large as West Virginia has so far had no test wells drilled.

The most prolific pools—as in the Big Horn basin of Wyoming, the Appalachian basin of Pennsylvania and West Virginia, and the Permian basin of Western Texas—are to be expected at relatively low structural levels, in local anticlinal or stratigraphical traps, within the basin, and not on the high outer margins. Such a structure is provided in the Nesson anticline, in northern McKenzie County. The surface structure in the Tertiary beds is accentuated, as is known from seismic evidence, at depth in a more pronounced Mississippian and Ordovician anticline.

Superimposed on the broad north-west-plunging anticline south-west of the Missouri River, postulated on top of the Dakota sandstone (Cretaceous), occur a number of north-west–south-east anticlines in the Tertiary. Some of these have closures of over 100 ft., and dips near the axis in excess of 50 ft./ml., as against a regional north-easterly dip of 7 ft./ml. Seismographical evidence will probably disprove the continuance at depth of some of these, but others probably reflect deep structures.

In mapping extensive use has been made of a "marker-bed" in the Fort Union (Paleocene) series. The datum horizon contains silicified plant stems, tree stumps, and volcanic ash from eruptions in the Rocky Mountains. The tree stumps are 3–5 ft. in diameter, and the greyish-white ash varies between 5 and 40 ft. thick. Other silicified tree-bearing zones occur in the Wasatch (Eocene). A persistent lignite bed, 280 ft. above the base of the Sentinel Butte, or lower division of the Wasatch, was used by Hudgens in his mapping; and the so-called *Sandstone 21* has also been employed.

A new structural feature of great importance introduced by Ray Hennen is a syncline of north-west–south-east trend, mainly along the valley of the Missouri River from Sanish to beyond Bismarck. Between this syncline and the north-north-west–south-south-east Lemmon syncline there is a roughly east–west syncline under the Fort Berthold Indian Reservation. A. L.

168.* Williston Basin Wildcat Test, Oliver County, North Dakota. A. Ehlers. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, **27** (12), 1618–1622.—This test was drilled approximately 25 ml. north-west of Bismarck, North Dakota. Drilling started at a ground elevation of 2025 ft. in beds of the Fort Union (Paleocene), which included Tongue River and Cannonball marine shales and Ludlow non-marine shale and lignite, giving in all 650 ft. of Tertiary.

The Cretaceous (3020 ft.) revealed, in descending order, Hell Creek shales (some bentonitic) and sharp sands and lignite, Fox Hills shales and sandstones with glauconite, Pierre marine shales with siderite and pyrites, Niobrara dark shales with yellow and white chalk inclusions, Carlile slightly sandy shale, Graneros dark shales, fine siltstone, and some hæmatite concretions, Dakota clear and frosted, well-rounded sands with some pyrites, Fuson dark micaceous shale and glauconitic partings, and Lakota clear to frosted, well-rounded sand with small intercalations of very pyritic, subangular, calcareous sandstone.

There are 710 ft. of Jurassic, of which 28 ft. is Morrison dark-grey terrestrial shale, and the remainder is Sundance comprising greyish-green sandy shale and fine muddy sand with occasional red and black shales, and at lower levels dolomitic beds with some red and green muds.

The dolomitic Jurassic beds shade downwards into the Spearfish (226 ft.), of which the upper two-thirds are fine-grained, red gypsiferous sandstone, and the lower third is of bright red, purple, green, grey, and black shales and sandy anhydrite.

1784 ft. of Mississippian are divided between the Amsden, consisting of dolomites separated by a middle member of splintery green shale, the Big Snowy, which includes Heath conodont black shale, Otter red, orange, etc., shale and anhydrite, Kibbey bright-coloured shale and muddy sand, Charles sandy and dolomitic limestone with dark grey and white anhydrite, Mission Canyon granular and oolitic buff limestone, Lodgepole flaky and fine dense dolomitic limestones, and Englewood fissile carbonaceous shales and silty dolomitic limestone.

Devonian (471 ft.) includes Amaranth calcareous red earthy shales, dolomite, and anhydrite with one rhynchonellid, Manitoba buff limestone with thin dolomite and anhydrite bands, and Winnepegosan crystalline grey and brown limestone and dolomite with traces of anhydrite and 45 ft. of extremely porous strata.

No Silurian is present, but the Ordovician (1970 ft.) is thicker than was expected. It is made up of Stony Mountain-Bighorn dolomite and limestone with highly coloured shales and a basal bed of white, well-rounded sand; Red River-Whitewood grey and tan limestones and dolomites and greenish shales; and Winnipeg splintery green shale with some orange-brown and black beds, sandstones with well-rounded grains, sometimes conglomeratic, and glauconitic limestone.

The base of the Palæozoic rests at 8831 ft. on pre-Cambrian amphibolite—an unconformable junction. A. L.

169.* Origin of Radiolarites, and Fracturing of "Fractured Shales" in Santa Maria Basin, California. G. Henny. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, 27 (12), 1622–1625.—Gerard Henny has examined the radiolarities (cherts with radiolarian remains) along the south border of the Alps in the "zone du Canavese," in the Island of Boeroe, Dutch East Indies, where the radiolarites (probably Jurassic) change laterally into conglomerates and are interbedded with globigerine limestones, and in California in the Franciscan formation (Jurassic), in which, as in the other cases, the radiolarites are associated with an abundance of basic igneous rocks. The silica, both chalcedonic and opaline in the radiolarites, is regarded as epigenetic—introduced into limy rocks by solutions of volcanic origin. These solutions, according to Henny, were poor in lime, and he uses this factor to account for the crumpling of "fractured beds" in the Monterey shale (Miocene). The lime in the shale, he says, went into solution faster than it was replaced by a smaller quantity of chert. The volume decreased, cavities were left, and the shale began to crumple and fold. The shrinkage made the shale a good reservoir rock for oil, as can be seen in the Santa Maria basin, Santa Barbara County, California, where the fracturing is not due to faulting or folding, since frequently the beds lie undisturbed by faults over long distances. In this instance, Henny wishes to derive the siliceous solutions from lavas and tuffs near the base of the Monterey, or from volcanic rocks of the Middle and Upper Miocene along the San Rafael uplift, or from Middle Miocene bentonite, etc. The "fractured beds" are Middle and Upper Miocene, and occur between competent layers of calcareous or dolomitic sandstone.

In connection with the production of silica solutions Henny quotes E. S. Bastin (*Scientific Monthly*, December 1939), who thinks that SiH_4, SiF_4 and H_2SiF_6 may be components of high-temperature solutions given off by crystallizing magmas, and Henny further refers to ores and gangue, etc., including quartz crystals produced in limestone at igneous contacts. It is of course also held that ores originate from deeper levels and that their release is the only thing effected by the disturbances accompanying volcanicity or intrusion (cf. Arthur Holmes, *Economic Geology*, 1937, **32**, 763–782; 1938, **33**, 829–867). A. L.

170.* Age of Spavinaw Granite, Oklahoma. W. E. Ham and R. H. Dott. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, **27** (12), 1626–1631.—Attempts have been made to prove the intrusion of the Spavinaw granite into the cherty Cotter dolomite (Ordovician) in post-Mississippian time when the ore bodies of the Tri-State lead-zinc district were emplaced. These and other views have been surveyed by H. A. Ireland (*Oklahoma Geol. Surv. Bull.*, 40, 1930, **3**, 473–481). In a shaft for pyrites-mining on the north-west side of the north-easterly trending Spavinaw granite outcrops, at Spavinaw Creek, Ham and Dott have now found arkose weathered from the granite and intercalated in the Cotter.

The dolomite contains a good deal of chert, and both dolomite and chert are cut across by pyrites veins.

One 7-in. boulder of granite was recovered showing marked signs of exfoliation, and with green chlorite on the outer curved surfaces. In the centre of this block the felspars are pink, as in fresh Spavinaw granite. In the arkosic layers a little frosted sand accompanies the granite fragments, bits of felspar, and green chlorite with shreds of sericite. The rounding of the quartz grains probably indicates that they have been through several cycles of erosion (*cf.* G. E. Anderson, *J. Geol.*, 1926, **34**, 157–158), and in any case its pronounced undulatory extinction excludes the possibility of its having come from the granite. The quartz grains are probably from Lower Ordovician or Cambrian sandstones of the Ozark region. The amount of material showing graphic intergrowth of orthoclase and quartz is, however, very high both in the granite debris and in the granite, so that there is no doubt the Spavinaw granite is pre-Cotter—and probably pre-Cambrian.

That the amount of arkose is small at other levels is accounted for by rapid overlaps of the original limestone on the granite. The dip off the granite is attributed mainly to folding prior to the late-Pennsylvanian (?) mineralization due to solutions migrating along the granite-dolomite contact. A. L.

171.* Fossils from Metamorphic Rocks of the Coast Range of Venezuela. P. B. Wolcott. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, **27** (12), 1632.—Boulders in the Quebrada de Cara, a south-flowing tributary of the Quebrada Guarenas which rises in the North Coast Range, Venezuela, are of a slightly metamorphosed, dark grey, hard, fossiliferous limestone of a type associated with graphitic schist, grey mica schist, sandy limestone, and quartzitic sandstone in the Las Mercedes division of the Caracas series. Fossils so far identified are *Pholadomya* ? sp., *Cardium* sp. or *Pecten* sp., *Meretrix* ? sp., *Lucina* ? sp., gastropod moulds and sections, *Plicatula* sp., *Pecten* (*Camponectes*) cf. *indidurœnsis* Jones (*Bull. Amer. geol. Soc.*, **49**, p. 108, Pl. 3) and *P.* (*Camponectes*) cf. *bubonis* Stephenson (*Univ. Texas Publ. 4101*, p. 731, Pl. 21). This means that the Las Mercedes series is probably Jurassic, less probably Cretaceous.
A. L.

172.* Classification of Faults. C. R. Longwell. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, **27** (12), 1633–1642.—Longwell discusses Stuart Clark's views on tensional faults. All faults, according to Longwell, are *shears*. In regard to the Kettleman Hills domes, Longwell points out that, as well as arching by lateral pressure and resultant tensional cracks on the crests one has to think of supporting cores which were squeezed up so as to provide a lifting force. He then goes on to cite Hans Cloos's experiment (*Einfuhrung in die Geologie*, 1936, p. 265, fig. 215), which showed how, in such a case of tension, shear-planes may be formed dipping towards the axis at about 60°. Along such planes slumping takes place.

Clark replies by referring to photographs from the Byrd Antarctic expedition in which sharply arched folds of ice have gaping radial tension fractures. He points out that an apparent graben on the arch of an anticline may actually be developed over a horst by intersection of the fault-planes bounding the sides of the horst—a phenomenon seen over many salt domes of the Gulf Coast, when there is a sufficient cover for faults originating on opposite sides of the dome to intersect. Clark maintains his view that on the convex side of an anticline tension cracks may become fault-planes. He continues to advocate a genetic classification of faults as against a geometrical one. A. L.

173.* Stratigraphy of North-Eastern Anzoátegui, Venezuela. H. D. Hedberg and A. Pyre. *Bull. Amer. Assoc. Petrol. Geol.*, January 1944, **28** (1) 1–28.—This paper forms a preliminary report on the stratigraphy of North-eastern Anzoátegui, but nevertheless contains a considerable amount of lithological detail, together with short discussions of the palæontological evidence. It is illustrated by a small-scale geological map and three pages of stratigraphical columns, besides having a bibliography.

Ten years ago a reference section was established on Rio Querecual for the 40,000 ft. of Cretaceous and Tertiary rocks. Since then additional evidence has been collected both east and west of the type area, and this has helped to give a better idea of the facies changes present.

The oldest rocks of the area consist almost entirely of metamorphosed sediments of the Caribbean Series and probably immediately underlie the Cretaceous. Since the contact is nowhere exposed and is in all probability a fault-zone, their Mesozoic age is not confirmed.

The Lower Cretaceous contains about 5000 ft. of laterally variable shallow-water sediments belonging to the Barranquín, El Cantil, and Chimana formations. It begins with non-marine sandstones and shales, and grades upwards into marine rocks that include glauconitic sandstones and reef limestones. The Guayuta group (Upper Cretaceous) follows with 3000–4000 ft. of deeper water, black bituminous limestone, and calcareous shales. There is then a conformable passage up into the Santa Anita formation (Cretaceous-Eocene), and the 2400 ft. of sediments include sandstones, shales, dolomitic siltstones, and glauconitic sandstones.

The overlying Merecure formation is 5500–7500 ft. thick, and has a locally developed foraminiferal limestone at the base (late Eocene), but most interesting is the upper non-marine facies (probably partly Oligocene) with productive coals. Transitional rocks lead upwards into the Santa Inés formation, which is essentially a flysch deposit consisting of 24,000 ft. of calcareous sandstone, grits, and conglomerates interbedded with shales (Oligocene, late Miocene). The marine character of this formation increases from west to east.

The Sacacual group overlaps the Santa Inés and older formations, and consists of non-marine, laterally variable siltstones and sandstones with several intraformational unconformities (probably Pliocene). The Mesa formation completes the sequence and unconformably overlies the Sacacual group. Its sediments range from coarse alluvial fan deposits in the north to finer-grain gravels in the south (probably Pleistocene).

The depositional history of the area is related to that of the eastern Venezuelan geosyncline, of which North-eastern Anzoátegui is but a part. The geosyncline is bounded on the south by the relatively stable Guayana shield, and to the north by the southward-thrust borderland of Paria. Communication with the open sea has been largely to the east. The thrusting in the north is responsible for the angular unconformities, while in the south deposition was essentially continuous during Cretaceous and Tertiary times. The axis of the geosyncline thus suffered a repeated shifting to the south. C. E. M.
W. G. H.

174.* General Geology of Mississippi. T. McGlothlin. *Bull. Amer. Ass. Petrol. Geol.*, January 1944, **28** (1), 29–62.—With evidence from well borings the author gives an outline of the underground stratigraphy in Mississippi, ranging from the top of the Palæozoic to Recent. The paper contains much local information illustrated by forty-nine well sections with electrical log correlations along specified directions, together with five horizontal sections. In addition there is a structure map contoured on the base of the Porter's Creek clay, and this brings out the relief of the underlying reef-like Jackson gas rock, and to some extent that of the Monroe. C. E. M.
W. G. H.

175.* Petrology of the Bethel Sandstone of South-Central Illinois. W. D. Pye. *Bull. Amer. Ass. Petrol. Geol.*, January 1944, **28** (1), 63–122.—The return of Illinois as a prominent oil-producing state prompted a detailed study of the Bethel sandstone, with special reference to mineralogy, cementation, and relationships of porosity and permeability to oil recovery.

At least forty mineral species containing few heavy minerals have been identified in the sandstone. The detailed study of quartz with regard to the origin and history of any deposit is considered to be superior to the more laborious heavy mineral examination, especially as many heavy minerals are liable to subsequent leaching out.

The petrographic study of the sandstone reveals considerable uniformity in its physical properties. The sand is very well sorted, while there are no significant variations in roundness and sphericity in the area as a whole. Silica is the chief cement, and is mostly primary, but calcite, dolomite, and chalcedony also occur, being deposited in the order given.

The relationship of these physical properties to porosity, permeability, and oil recovery suggests that the most important factor is cementation, followed in importance by size and sorting. Of subsidiary importance is the mineralogy, which determines behaviour towards oil and water, grain orientation and shape, bedding planes, and other films of clay.

The history of the Bethel sandstone is complex. Some of the grains have undergone at least three periods of erosion, deposition, and enlargement, with an early period of metamorphism, all prior to deposition in the Bethel formation. Both wind and water shaped the grains before their final deposition in shallow off-shore waters. Burial, compaction, and cementation, together with structural deformation and further cementation, have produced the Bethel sandstone.

It is concluded that most of the Bethel detritus came from Llanoria on the south-west, with only small amounts from Ozarkia, the Wisconsin highlands, and the Canadian Shield. C. E. M.
W. G. H.

176.* Porter Oil Field, Midland County, Michigan. K. K. Landes. *Bull. Amer. Ass. Petrol. Geol.*, February 1944, **28** (2), 173–196.—The Porter Oil-Field, since its discovery in November 1931, has produced 39 million barrels of oil and leads all Michigan fields in total production and recovery per acre.

The source rocks are Devonian, and have an overburden of about 2800 ft. of Devonian and Pennsylvanian strata, with about 280 ft. of glacial drift on the surface, and their relations are shown in a generalized stratigraphical column. Practically all the oil comes from the top of the Dundee limestone, with the remainder from the overlying Traverse limestone.

The Porter anticline controls the oil-pool, which measures 9 miles long by 3 miles wide, with a closure of about 50 ft. This structure, which lies on the south-west flank of the Michigan basin of sedimentation, was mainly folded in post-Parma times (Lower Pennsylvanian). The capacity of the field is chiefly dependent on a zone of secondary porosity in the uppermost Dundee beds, and varies considerably. Such porosity is due to irregular honeycomb-like aggregates of cavities formed during a mid-Devonian emergence, and it is this that accounts for the high oil recovery. C. E. M.
W. G. H.

177.* West Ranch Oil-Field, Jackson County, Texas. A. J. Baurrnschmidt, Jr. *Bull. Amer. Ass. Petrol. Geol.*, February 1944, **28** (2), 197–216.—The first successful well was sunk in August 1938, and struck oil at just over 5000 ft. Since then 390 producing wells have been drilled, which have yielded 10,238,794 brl. of oil and 12,790,905,000 cub. ft. of gas since October 1942.

Seven out of the nine producing zones are in the Frio formation (3100 ft. thick), while the other two are in the Lower Catahoula formation (270 ft. thick), which unconformably overlies the Frio. The source-rocks are sands interbedded with shales, and their relations are clearly shown by several sections with electric logs and palæontological markers. Their age, together with 1000 ft. of the overlying rocks, is either Oligocene or Miocene, confirmatory palæontological evidence being absent. For similar reasons the 4000 ft. of Miocene, Pliocene, and Pleistocene are also undifferentiated.

The field is one of several situated along a zone of crustal weakness, and the structure is probably due to the movement of deep salt masses, as in most Gulf Coast fields. The very gentle doming of the area is shown in sections constructed from wells lying along specified directions, while structure-contour maps are given for the tops of four of the oil-sands. An interesting feature is the lack of major faulting in a field of such size. No drilling difficulties are encountered in the field, and wells are completed in 12 to 15 days. C. E. M.
W. G. H.

178.* Geologic History of Northern Mexico and its Bearing on Petroleum Exploration. L. B. Kellum. *Bull. Amer. Ass. Petrol. Geol.*, March 1944, **28** (3), 301–325.—In areas of central and coastal United States and the coastal plain of Eastern Mexico there are several buried platforms which strongly influenced the later sediments in surrounding basins, besides controlling the distribution of oil and gas in many cases. The Coahuila Peninsula of north-central Mexico is a similar structure, and as it is partly uncovered, its study reveals certain criteria which should aid the discovery of other platforms, some of which may be petroliferous. Already the presence of several other platforms is suspected in the above-mentioned areas.

The paper is illustrated with a series of seven paleogeographic maps for intervals between the Permian and the Upper Cretaceous.

The Cretaceous section of the Coahuila Peninsula shows the influence of the underlying massif in three ways. Over long periods of time it controlled the lithology, thickness, and fauna of the overlying sediments, which are in marked contrast to the rocks of similar age in the Mexican geosyncline to the south. Again, the structure is simple, for the rocks are almost horizontal, whereas in the geosyncline they are highly disturbed. Furthermore, the physiography is distinctive. The peninsular area has a mature rolling topography which gives way abruptly at its margins to the youthful topography of the geosynclinal area. C. E. M.
W. G. H.

179.* Cretaceous and Paleocene of Santa Lucia Range, California. N. L. Taliaferro. *Bull. Amer. Ass. Petrol. Geol.*, April 1944, 28 (4), 449–521.—The study of the Cretaceous and Paleocene of the Santa Lucia Range, where the effects of post-Jurassic earth-movements are pronounced, not only adds to the knowledge of the Coast Ranges in general, but also helps the interpretation of areas that lie to the east, where unconformities are slight and sometimes obscure, as for instance on the west side of the San Joaquin Valley.

The stratigraphy is supported by a survey of the palæontological evidence so far available, and is illustrated by several useful sections and maps. Mineralogical and mechanical analyses of several sandstones are also given.

The Cretaceous of this area is represented by three formations, each separated by a marked unconformity. The Marmolejo formation (Lower Cretaceous) rests unconformably on Franciscan-Knoxville rocks (Jurassic) and consists of 4000–5000 ft. of dark shales, with lenses of sandstone and conglomerate. It is identical with the lower part of the Lower Cretaceous throughout the Coast Ranges, both faunally and lithologically.

Prior to the deposition of the Upper Cretaceous, the Marmolejo was strongly folded and eroded, only being preserved in a few deep synclines. Nevertheless it is believed that the Lower Cretaceous sea covered practically all the Coast Range area.

The Jack Creek formation (? Cenomanian-Turonian) follows with a very thin basal conglomerate, and then 2900 ft. of shales and silts, which suggests that the Upper Cretaceous sea spread quietly over a region of low relief. This formation is never seen to rest on rocks older than Mesozoic, like the ancient crystalline rocks. Another orogeny then occurred, and from evidence in the Diablo Range, it is late- or even post-Turonian in age. It exerted a profound effect on the subsequent history of the Coast Range by giving rise to widespread erosion of the earlier Mesozoic sediments, besides controlling Eocene faulting.

For a third time subsidence intervened, but this time there was a widespread and rapid marine transgression over an area of considerable relief. The resulting Asuncion formation (? pre Senonian-Danian) consists of at least 6000 ft. of arkose, sandstone, and conglomerate, although east and south it becomes finer. Derivation is from the west, and in the south part of the range there is a westward increase of both Franciscan and ancient crystalline debris. This formation is widespread in the Coast Range.

The Cretaceous was brought to a close by relatively mild earth-movements, as shown by the slight angular unconformity between the Dip Creek formation (Lower Eocene) and the Asuncion. The lithology and fauna of the Dip Creek are very similar to that of the Asuncion.

The area was finally affected by severe Paleocene-Lower Miocene earth-movements.
C. E. M.
W. G. H.

180.* Correlation of the Pecan Gap, Wolfe City, and Annona Formations in East Texas. J. T. Rouse. *Bull. Amer. Ass. Petrol. Geol.*, April 1944, 28 (4), 522–530.—Fresh field evidence no longer substantiates the correlation of the Pecan Gap chalk with the Annona chalk. Actually the Pecan Gap chalk thins and disappears when traced

both north and east, while the underlying Wolfe City sand is the lateral equivalent of the Annona chalk.
C. E. M.
W. G. H.

181.* "Corniferous" at Irvine, Estill County, Kentucky. A. C. McFarlan, L. B. Freeman, and V. E. Nelson. *Bull. Amer. Ass. Petrol. Geol.*, April 1944, **28** (4), 531–540.—The "Corniferous" is an important oil-zone in Kentucky, and the name covers a number of Silurian and Devonian limestones, which underlie the Ohio shale.

With the aid of several photographs of surface exposures near Irvine, the rather complicated unconformable relationship of these limestones is discussed. Further information comes from the examination of wells, and helps to substantiate the surface evidence.
C. E. M.
W. G. H.

182.* Grabens in Gulf Coast Anticlines and their Relation to Other Faulted Troughs. W. G. Meyer. *Bull. Amer. Ass. Petrol. Geol.*, April 1944, 28 (4), 541–553.—Taking advantage of the wealth of structural details available in oilfield areas of the Gulf Coast, the author presents an unusual explanation of grabens. The paper is illustrated with several good figures.

In the Gulf Coast region grabens overlie either salt domes or sharp upfolds, and such relations arouse speculation on the nature of their basal structure. Field evidence suggests that the faults of many grabens may cross and form a horst below, a condition which accounts for underground compensation other than by the usually accepted process of rock flow. This means that grabens and horsts are parts of a single graben-horst structure formed simultaneously by the same forces, and that the level of denudation determines which phase is exposed. In cases where a group of closely spaced grabens and horsts occur on the same erosion level, they may be segments of a single graben-horst structure.

Rift valleys outside the Gulf Coast area are considered, and it is noted that both their geophysical and geological data are consistent with their interpretation as the top parts of graben-horst structures.
C. E. M.
W. G. H.

183.* Stratigraphy of Cotton Valley Beds of Northern Gulf Coastal Plain. F. M. Swain. *Bull. Amer. Ass. Petrol. Geol.*, May 1944, **28** (5), 577–614.—In this area, the Upper Jurassic Cotton Valley sediments form an entirely subsurface sequence, and have produced much petroleum in southern Arkansas and northern Louisiana. The stratigraphical relations of these rocks are clearly summarized in a table of pre-Upper Cretaceous strata, which shows, among other things, lithology, maximum thickness, and European age equivalents, besides indicating the petroliferous members.

The Cotton Valley beds are regarded as a group composed of two subdivisions of formational rank. The lower of the two is the Bossier formation (Kimmeridgian), and it rests unconformably on the Buckner red shale and anhydrite, except for a local unconformity on the Smackover limestone in southern Arkansas. It consists of over 1600 ft. of fossiliferous shales and argillaceous limestones in the type area of northern Louisiana and southern Arkansas, but in the north and east the lower beds become sandy, while in the Munroe uplift they pass into red beds.

The Schuler formation (Portlandian-Tithonian) follows with a probable slight unconformity in the north, although in the south the two formations may be conformable. In the north it comprises over 2000 ft. of red shales and sandstones below (Shongaloo member), and vari-coloured shales and sandstones above (Dorcheat member), but southwards it passes into offshore shales, limestones, and sandstones with a basal conglomerate. In southern Arkansas and north-eastern Texas there is evidence of a minor unconformity between the lower and upper member.

The paper is well illustrated with correlated well sections, electric log sections, and several maps.
C. E. M.
W. G. H.

184. Exploration of Arctic Seepage Areas Urged. Anon. *Oil Wkly*, 16.10.44, **115** (7), 56.—Six separate areas with oil evidences in a belt extending 325 ml. along the northern coast of Alaska were examined in the late summer of 1943. There are three geological provinces in this belt. The coastal plain is low-lying; to the south is a plateau area extending to the Brooks Range; the third province is the Brooks Range. In the Dease Inlet and Cape Simpson areas of the coastal province, near Point Barrow, heavy oil residue is found, and pitch has been mined for fuel. There are pitch-like seeps at Fish River and Umiat Mountain.

About one-third of the area has been geologically mapped. The weather in this area is unfavourable, and food and fuel would have to be taken in. A pipe-line from Point Simpson to Fairbanks, Alaska, would be only about half as long as a pipe-line from Fort Norman to Fairbanks through Whitehorse. G. D. H.

185.* Wildcat Completions and Discoveries. Anon. *Oil Gas J.*, 21.10.44, **43** (24), 171.—During the week ended 14th October, 1944, 79 wildcats were completed in U.S.A., 12 giving oil, and 5 giving gas. The completion results are summarized by States and districts. G. D. H.

186. Exploration Rate Below Goal but Results Fair. L. J. Logan. *Oil Wkly*, 23.10.44, **115** (8), 53.—In the first nine months of 1944 the exploratory completions in U.S.A. have averaged 81 per week, compared with 68 per week in the same period of 1943. 18·6% of the tests have produced, whereas last year 17·7% produced. Exploratory completions averaged 86 per week in September against 97 per week in August. If the September rate is maintained to the end of the year, the 1944 total will be 4300 exploratory wells instead of the 5000 hoped for by P.A.W.

Discoveries of oilfields and pays are only 12·7 above the 1943 level, and oilfield extensions are up by 6%, but discoveries of gas and distillate fields and pays are almost double those of last year, while extensions are more than double.

In September, Mississippi had a new oilfield and a new condensate field, and the Heidelberg field was extended 1 ml. south. The Gilbertown field of Alabama was extended 4 ml. west. There were two oilfield extensions in Colorado, two gasfields were found in Montana, and a new pay-zone at Gebo, Wyoming. Two small oilfields were found in California. Substantial extensions were made to four oilfields in Illinois, new pays were found in two fields, and a small new oilfield was opened. Oklahoma had six small oilfields, and two gasfields.

Discoveries in the south-west were mainly in Texas, but there were a few discoveries in Louisiana and New Mexico. In West Texas, the Union and Fullerton fields may be joined, and the same may occur with the Snyder and Iatan fields.

A table lists the new oil and gasfields and new pay horizons and extensions discovered in the United States in August 1944. The main data for the discoveries are summarized. G. D. H.

187. Test at Western Tip of Cuba Reaches 2147 ft. Anon. *Oil Wkly*, 23.10.44, **115** (8), 71.—Seaboard-Standard Oil Company of Cuba's Guanal 1 had reached a depth of 2147 ft. on 10th October. This well is 15 ml. south-east of Pinar del Rio.

Atlantic Refining Company is drilling the second Maissade location, 30 ml. north-east of Port au Prince in Haiti. The first well was abandoned dry. Just across the border in the Dominican Republic a well is exploring the same area, and had reached a depth of 5735 ft. on 6th October. Farther east, near Azua, the Las Hormigas test has reached 4772 ft., and is 4 ml. west of the Maleno well, which flowed gas and distillate for a time in 1938, but was followed by five dry wells in the surrounding area.

G. D. H.

188. Tells of Well South-west of Comodoro Rivadavia. Anon. *Oil Wkly*, 23.10.44, **115** (8), 71.—Recently a wildcat 0–12, located 81 km. south-south-west of well No. 2 of the Comodoro Rivadavia field, flowed 1000 brl./day of 31-gravity oil at 2352 lb./in.^{2} bottom-hole pressure. The producing horizon is at 5251–5261 ft. Impregnation was observed at 4060–4123 ft. The total depth was 5291 ft., and ten oil-sands were encountered in an interval of 197 ft. Other wells within a radius of 76 km. had shown no oil.

This discovery opens the possibility of further important oilfinds in an extension of the south flank of the great sedimentary basin in the Gulf of St. George.

Two earlier wildcats were dry, and showed basalt intrusions and unfavourable structural conditions. They were probably not deep enough to find the new pay.

G. D. H.

189. Report of Wildcat Failures in Southern Chile Denied. Anon. *Oil Wkly*, 23.10.44, **115** (8), 71.—A spokesman of the Corporation de Fomento de la Produccion de Chile states that no wells have been started in the Punt Arenas area under the present exploratory programme, and that no wells have been drilled there in the past six years. Geological and geophysical mapping of the area have been in progress recently and have shown favourable possibilities. G. D. H.

190. Progress Reported on Wildcat in Nova Scotia. Anon. *Oil Wkly*, 23.10.44, **115** (8), 71.—Lion Oil Refining Co.'s Mary 1, its second wildcat in central Nova Scotia, was at 3457 ft. on 9th October.

Continental Petroleums, Ltd., has two uncompleted wells on the Gaspé peninsula. One has encountered three oil-saturated zones at depths less than 2440 ft.

G. D. H.

191. Kansas Operators Neglect Deep Arbuckle. J. T. Paddleford. *Oil Wkly*, 6.11.44, **115** (10), 174.—Drilling in Kansas during 1943–1944 has revealed more than a score of small oil and gaspools, but the additional reserves developed have been disappointing.

It has been a custom in Kansas to penetrate the Arbuckle only a few feet, and if no oil or gas is found in this small penetration, to abandon the hole as dry. The Arbuckle dolomite underlies the whole of Kansas, and varies in thickness to an extent depending on the amount of erosion it suffered, and on the position of the underlying granite. Porous and permeable horizons in the Arbuckle are erratic. When the Arbuckle occurs immediately below the Pennsylvanian unconformity, its surface is most irregular, and often has erosion holes or channels filled with Pennsylvanian and Ordovician debris. If water is found in the top of the Arbuckle there is probably an impervious zone beneath, with possible porous zones still deeper which may contain oil. Oil may be found in non-crestal positions in the Arbuckle, trapped by cementation.

In the Lansing and Viola limestones, water horizons occur above and between the oil horizons, and similar conditions may obtain in the Arbuckle. It is therefore justifiable to drill deeply into the Arbuckle, and even through it to test its oil possibilities. G. D. H.

192. Thorough Exploration for Oil in Saskatchewan. Anon. *Oil Wkly*, 6.11.44, **115** (10), 202.—Geological work and core-drilling have been carried out over an area of more than 20½ million acres in Saskatchewan since 1939. Extensive drift cover makes geological mapping difficult, but structural conditions suitable for oil accumulation have been revealed at a number of places. Five test wells have been drilled by Norcanols Oil and Gas, Ltd., Radville 1 being abandoned at 7958 ft., since no promising oil horizon was found, although some oil saturation was encountered. Two other deep tests have been drilled.

Nearly 11,000,000 acres have been surveyed by gravity meter, and over 5,000,000, acres by seismograph. G. D. H.

193.* Crooks Gap Discovery Flowing 60 brl. per Hour. Anon. *Oil Gas J.*, 11.11.44, **43** (27), 69.—A well on the Crooks Gap structures of Fremont County, Wyoming, is flowing 60 brl./hr. of 37·6° oil from the Dakota at 5232–5248 ft. Some water is being produced, probably from drilling fluid which has not been completely cleared up.

G. D. H.

194.* Wildcat Completions and Discoveries. Anon. *Oil Gas J.*, 11.11.44, **43** (27), 135.—70 wildcats were completed in U.S.A. during the week ended 4th November, 1944. Four of the wildcats found oil; the rest were dry. The completion results are summarized by States and districts. G. D. H.

195. Four Producers Reported in Constancia Field, Peru. Anon. *Oil Wkly*, 13.11.44, **115** (11), 64.—Four wells are reported to be producing in the Government-owned Constancia field a few miles north of the Lobitos oilfield. The pay is less than 1000 ft. deep, and was discovered in December, 1943. G. D. H.

196. More Wells Being Drilled Near Dhulian Field, India. Anon. *Oil Wkly*, 13.11.44, **115** (11), 64.—A new field was discovered west of the Dhulian field, north-west Punjab in May 1944. Initially the discovery well flowed over 9000 brl./day of heavy asphaltic oil. It is stated that other wells are being drilled. G. D. H.

197. Shell Below 1500 Feet with Ecuador Wildcat. Anon. *Oil Wkly*, 13.11.44, **115** (11), 64.—At the end of October Shell's Arajuna 1 wildcat in Napo Pastaza province, Ecuador, was below 1500 ft. Detailed geological and geophysical surveys have been in progress in this area east of the Andes for two years. G. D. H.

Geophysics and Geochemical Prospecting.

198.* How to Make Velocity Corrections. J. W. Daly. *Bull. Amer. Ass. Petrol. Geol.*, May 1944, **28** (5), 615–628.—This paper discusses the fundamental assumptions used as a basis for computing reflection seismograph data, and gives simple methods for correcting for lateral variations in vertical velocity. Thirteen diagrams illustrate the principles discussed. C. E. M.
W. G. H.

Drilling.

199.* Classification of Exploratory Drilling and Statistics for 1943. Frederick H. Lahee. *Bull. Amer. Ass. Petrol. Geol.*, June 1944, **28** (6), 701–721.—See Abstract No. 1152, 1944. C. E. M.
W. G. H.

200. The Need of the Drilling Contractor in the Oil Industry. C. Sutton. *Petrol. Engr*, September 1944, **15** (13), 158. *Paper Presented before American Association of Oilwell Drilling Contractors.*—The functions of the drilling contractor in the oil industry are discussed. Advantages of using contract drilling over company drilling are studied. A. H. N.

Production.

201.* Hydraulics of Petroleum Strata, Correlation, "Direct" and "Reverse," between Output of Wells and Configuration of Strata. P. J. Poloubarinova-Kochina. *Appl. Math. Mech.* (*U.S.S.R.*), 1943, **7** (5), 361–374.—A mathematical analysis of the hydraulics of oil deposits. The so-called "Direct" analysis consists in calculating the output of a well where the geological structure of the oil-bearing zone is known. The main purpose is to determine the influence of the shape of the oil deposit (partly the influence of the degree of elongation of an oblong zone) on the output of a well, also, on the basis of results thus obtained, the solution of the so-called "Reverse Problem," which consists in the determination of the geological structure of an oil deposit, given the individual outputs of a number of wells.

Equations are developed for the output of a well in the cases of a circular oil-bearing zone, a zone of irregular shape, elliptical zones of varying degrees of ellipticity, and for a well in an oil deposit with infinite boundaries.

Solutions of the "Reverse Problem" are outlined for the cases of a circular oil deposit, the case where the output of several wells is known, and of a partly discontinuous oil deposit. A graphical method is described, and the case of oil-bearing zones having two liquid phases is also considered. D. A.

202.* Movement of Water in Oil Deposits. B. E. Kazarnovskaia and P. J. Poloubarinova-Kochina. *Appl. Math. Mech.* (*U.S.S.R.*), 1943, **7** (6), 439–454.—A mathematical analysis of the motion of the interface separating oil and water in curved oil deposits (cylindrical and spherical). For the sake of simplicity, the viscosities and densities of oil and water are assumed to be equal. For practical purposes, in the case of dome-shaped deposits, the problem may be considered as planar instead of spatial with a satisfactory degree of accuracy, by projecting the interface on to a horizontal plane. A ring-formed zone limited by the lines L_1 and L_2 is thus obtained. A well begins to flood in its lower part when the line L_1 reaches it, and a well begins to be flooded along its whole length when the line L_2 reaches it. D. A.

203.* Geologic Factors in Unitized Pressure Maintenance, Jones Sand Reservoir, Schuler Field, Arkansas. G. R. Elliott. *Bull. Amer. Ass. Petrol. Geol.*, February 1944, **28** (2), 217–230.—The Jones sand was discovered in 1937, and up to the end of 1942 had produced 25,550,000 brl. of oil. The field came under unitized operation in February 1941, and in July gas injection was commenced. Calculations show that with unitized injection of 90% of the produced gas volume, the ultimate recovery will be 20,000,000 brl. of oil over primary production, even though the secondary operations were not commenced until half the primary production had been recovered.

Core-graphs, which include core analysis data, electric logs, and drilling time, were constructed primarily for the completion of each well, but were found to be of great value in reservoir calculations, reconditioning, and pressure maintenance operation. Two of the graphs, for instance, bring out the lack of correlation between wells in respect of permeability of zones of equivalent stratigraphical position.

The degree of continuity of permeability is probably the most important reservoir factor in the pressure maintenance programme of gas injection. Lack of continuity of impermeable beds in the Schuler field is a definite advantage, for it allows the injected gas to be dispersed in various directions, instead of being confined to certain bedding planes, and this results in a more uniform and effective moving of oil to the well-bore.

It is found that the permeability profile does not necessarily reflect the capacity of the reservoir to accept gas through that bore. A low permeability well may connect with channels of high capacity beyond the well-bore, and thus behave as a better gas-injection well than another well of higher permeability. C. E. M.
W. G. H.

204.* Well Spacing—Its Effect on Recoveries and Profits. Stuart K. Clark, C. W. Tomlinson, and J. S. Royds. *Bull. Amer. Ass. Petrol. Geol.*, February 1944, **28** (2), 231–256.—See Abstracts No. 751, 963 and 972, 1944. C. E. M.
W. G. H.

205. Heat Provides For Efficient Handling of Six Gravity Oil. C. L. Cole. *Petrol. Engr*, Sept. 1944, **15** (13), 57–58.—In order to facilitate the handling of an oil that is unpumpable at atmospheric temperatures, the Exeter Oil Co., Ltd., has installed equipment that produces the oil from its well Lenox No. 2 at Oxnard, California, at high temperature and maintains it at elevated temperatures until it is delivered to its refinery in Long Beach. The method employed is not only more economical than the customary methods used for the production and handling of oil of this character, but also provides for the delivery of a better raw product for refining. Other wells in the Oxnard area are produced by the injection of gas oil into the well and then pumping this mixture to the surface. From 10 to 12% of gas oil is used in this procedure, and the actual gravity of the heavy oil being produced is not known. After the mixed oil is brought to the surface it is heated for shipping to a temperature of approximately 175° F. It has been found that if the mixed oil is heated above this temperature it will foam. No thinning agent of any kind is used with the oil being produced by the Exeter well. The production is kept in condition for ready handling by the oil-well pump by the circulation of hot water. Present production of the well is 380 brl./day, with less than 1% of water.

Total depth of the well is 2812 ft., a string of 13⅜-in. surface casing being cemented at 160 ft. and a string of 8⅝-in. at 2480 ft. A 7-in. slotted liner (16 rows, 187 mesh, 6-in. centres) is supported by a lead seal liner hanger with its top at 2472 ft. Sketches show the down-hole equipment and general surface lay-out used. A. H. N.

206. Salt Water Disposal in East Texas. Anon. *Petrol. Engr*, September 1944, **15** (13), 64.—Development of methods for the disposal of salt water produced with crude oil has been rapid in the petroleum industry. One of the largest and most important systems of disposal is now in the final stages of development and construction in the East Texas field. The value of the programme to the field even at this early stage of its existence is evidenced in a reduced rate of pressure drop in the field, increased production, and an ultimate high reservoir depletion percentage. A distinct shortage in technically and practically trained personnel in the salt-water-disposal field has resulted in the holding of classes in salt-water disposal in the East Texas field. These classes were organized through the co-operative efforts of the East Texas chapter of the American Petroleum Institute, the public schools of the East Texas area, the State Board for vocational education, and the engineers engaged in salt-water disposal work of various companies in the field. The first part of the article describes the organization of the classes and presents an outline of the material used in the class work. Following the introduction is Section A of Chapter I of the course, complete with illustrations. Succeeding instalments will be published in subsequent issues of the *Petroleum Engineer* as presented to the classes. A. H. N.

207. Plastic Plugback in East Texas. C. C. Pryor. *Petrol. Engr*, September 1944, **15** (13), 72.—The paper describes plugging methods using plastics in East Texas. The positive displacement dump bailer has provided the best method of placing the plastic on bottom in the well. After the material has hardened and an insufficient quantity has been used, additional plastic is dumped until the desired height is reached. Preparation of a well for plugging with plastic includes cleaning the exposed surfaces to which the plastic must bond to accomplish satisfactory results. The bonding property of plastic to steel renders it an ideal plug for liners and casing. Drilling mud or filter cake not only prevents the plastic entering the sand, but causes an increase in setting time and formation of small unconsolidated globules of polymerized plastic. Plugging back with plastic through liners and perforated casing, which is being done in increasing numbers of wells in East Texas, requires that the mud and filter lake be removed from behind the liner by one of the several methods in common use, including reverse circulation, acidizing the liner section, hydrostatic bailing, or washing through an inverted swab. The most popular of these methods is the hydrostatic bailer. In plugging jobs requiring that the plastic be drilled out before perforating for production, the chisel-nosed hydrostatic bailer, which drills the plastic at the rate of about 1 ft./hr., has been in wide use. Generally recommended for drilling out plastic is the rock-bit, due to its smoother and easier cutting action. Usually the rock-bit is run on the tubing string, and the short section filled by plastic drilled out. The rotary method drills the plastic at the rate of 1–5 min./ft. Tabulated results of plugging through liners and perforated casings are shown. Details of properties of plastics and of technique are given.

Improvements and changes in the physical properties of plastics have been continuous, but one of the major problems faced by operators has been the setting temperatures of the plastic. In wells with high temperature, no difficulty with setting of the plastic has been experienced, but in wells with low bottom-hole temperatures some difficulty has been reported. Among the recent developments in plastics for use in wells are those that will set at temperatures ranging from 80° to 280° F. Varying amounts of catalyst also aid in the control of setting time. The high-temperature plastic, specific gravity 1·18 or 9·82 lb./gal., has a viscosity of 850 centipoises at 82° F., whereas the medium temperature plastic developed, specific gravity 1·2 or 9·99 lb./gal., has a viscosity of 188 centipoises. As a means of comparison the viscosity of No. 40 motor oil is 285 centipoises. The results obtained from dump bailer and squeeze methods are given. A. H. N.

208. Dual Completions in the New Hope Field. C. C. Pryor. *Petrol. Engr*, September 1944, **15** (13), 105.—The ideal field for dually completed wells is one in which there is sufficient reservoir pressure to cause the wells to flow, little or no water production, a low gas–oil ratio, and production of a reasonably high gravity crude oil. These ideal conditions exist in the New Hope field in Franklin County, Texas. Operated by a major oil company, all wells in the field are dual completions. Production is obtained from four widely separated sands containing four distinctly different crude oils ranging in gravity from 43° to 52° A.P.I. Separator gas was barely sufficient to use as fuel for 6 power rigs and 1 steam rig from 12 wells that were dually completed. There is no water present in the production, and wellhead pressures range from 500 to 800 lb. The producing formations are found at depths from 7280 to 8200 ft. as follows: Bacon lime, 7280 ft.; Hill sand, 7400 ft.; Pittsburgh zone, 7925 ft.; and the Elledge sand, 8200 ft. Production from the Bacon lime has a gravity of 43°, and is a dark-brown-coloured oil; the Hill Sand oil, 45° gravity, is a black oil; the Pittsburgh is a dark-green oil having a gravity of 49°, and the Elledge is a cream-coloured oil of 52° gravity. Where possible, the operator completes the dual wells in the Hill sand and Pittsburgh zone.

Details of drilling procedure adopted, the special packer used and its method of setting, and of the production manifold are given, together with drawings and illustrations. A. H. N.

209. Optimum Time to Bail and Wash Wells Producing Silt. J. R. Stitt. *Petrol. Engr*, September 1944, **15** (13), 166. *Paper Presented before American Institute of Mining and Metallurgical Engineers.*—Curves are given for determining the optimum time to bail and wash wells producing silt, in the Fruitvale Field, near Bakersfield, California. In this particular field the producing horizons are composed of unconsolidated sands containing considerable fine silt or clay. The silt is carried with the flow of oil, which is of low gravity and particularly viscous, through the formation into the vicinity of the well-bore, where a portion of the silt accumulates, progressively plugging the formation and liner perforations. This deposition causes a decrease in the productivity of the wells and results in apparent well declines as high as 50% a month. Under curtailment, this condition was not particularly serious, because the wells were produced at reduced rates or shut down from a quarter to a third of each month. Also, after these shutdown periods a natural washing action probably occurred, due to the flush production or higher rates of flow immediately after a well was placed on production. However, with the gradual increase in oil allotment to the field and the final removal of all curtailment, it became necessary to produce the wells continuously at maximum rates. This resulted in high well declines, due to silting, which in turn resulted in a serious overall loss in field production.

The method of determining the most economic schedules for pulling the well, which depends on the individual characteristics of the well, is given. A. H. N.

Development.

210.* Developments in North Louisiana and South Arkansas in 1942. B. W. Blanpied and R. T. Hazzard. *Bull. Amer. Ass. Petrol. Geol.*, February 1944, **28** (2), 257–277.—This paper is essentially one of statistics, although it contains a map showing the location of both old and new oil-fields in the area.

The 1942 production of North Louisiana was 32,491,304 brl. of oil and distillate, an increase of nearly 6 million brl. over 1941. This was due to routine developments.

During the same period South Arkansas produced 26,474,610 brl., a figure only slightly in excess of 1941. Thus the newly discovered Smackover limestone production of the Midway field in Lafayette County more than offsets the normal production decline of the older fields. C. E. M.
W. G. H.

211.* Developments in 1943. *Bull. Amer. Ass. Petrol. Geol.*, June 1944, **28** (6), 722–872.—The following fourteen papers give development statistics for 1943 :—

Developments in Appalachian Area in 1943. Appalachian Geological Society, 722–742.

Developments in California in 1943. A. I. Gregersen and W. W. Porter. II, 743–750.

Developments in Eastern Basin in 1943. A. H. Bell. 751–759.

Developments in Michigan in 1943. H. J. Hardenberg. 760–766.

Developments in North Mid-Continent in 1943. E. A. Koester. 767–773.

Development in Oklahoma in 1943. J. L. Borden. 774–788.

Developments in Rocky Mountain Region in 1943. R. M. Larsen. 789–800.

Developments in South-eastern United States in 1943. U. B. Hughes. 801–805.

Developments in West Texas and South-eastern New Mexico in 1943. N. B. Winter and A. S. Donnelly. 806–833.

Developments in North and West-Central Texas in 1943. North Texas Geological Society. 834–840.

Developments in East Texas in 1943. C. I. Alexander and T. J. Burnett. 841–852.

Developments in Gulf Coast of Upper Texas and Louisiana in 1943. P. B. Leavenworth. 853–857.

Developments in South Texas in 1943. W. H. Spice, Jr. 858–863.

Petroleum Developments in Canada in 1943. G. S. Hume. 864–872. C. E. M.
W. G. H.

212. Wells Completed in United States in Week Ended October 14, 1944. Anon. *Oil Wkly*, 16.10.44, **115** (7), 79.—403 field wells (253 producing oil and 65 producing gas) and 70 wildcats (13 producing oil and two producing gas) were completed in

U.S.A. during the week ended 14th October, 1944. The completion results are summarized by States and districts. G. D. H.

213. Wells Completed in United States in Week Ended October 21, 1944. Anon. *Oil Wkly*, 23.10.44, **115** (8), 73.—During the week ended 21st October, 1944, 390 field wells and 80 wildcats were completed in U.S.A. 275 of the former and 12 of the latter found oil, while 44 of the former and 2 of the latter found gas. The completions are analysed by States and districts. G. D. H.

214.* British Oil Production. Anon. *World Petrol.*, November 1944, **15** (12), 55.—An oilfield with more than 200 wells has been developed in England. It is producing at the rate of 100,000 tons per year. G. D. H.

215. Four Areas Developed in England's New Oilfield. Anon. *Oil Wkly*, 6.11.44, **115** (10), 188.—Four areas are under development in England's oilfield. They total nearly 1½ sq. ml. of proven acreage. 242 producers have been drilled, the average depth being 3050 ft. G. D. H.

216. South American Production Is Fourth of U.S. Total. Anon. *Oil Wkly*, 6.11.44, **115** (10), 188.—In October the oil production of South America averaged 1,150,000 brl./day, 78% of it coming from Venezuela. In the week ended 21st October the U.S. production averaged 4,740,000 brl./day. G. D. H.

217. Wells Completed in United States in Week Ended November 4, 1944. Anon. *Oil Wkly*, 6.11.44, **115** (10), 191.—376 field wells (262 oil-producers and 40 gas producers) and 83 wildcats (10 oil-producers and 3 gas-producers) were completed in U.S.A. in the week ended 4th November, 1944. The completion results are summarized by States and districts. G. D. H.

218.* New Companies Acquire Venezuelan Concessions. Anon. *Oil Gas J.*, 11.11.44, **43** (27), 69.—American oil companies have taken up millions of acres of new oil concessions in Venezuela. The principal new concessionaires are the Standard Oil Co. of California and the Atlantic Refining Co.

Socony-Vacuum is completing Guario No. 8 at 10,737 ft. Guario No. 11 is fishing, and No. 2 Guico is fishing at 5941 ft.

On the Barco Concession in Colombia Socony-Vacuum and Texas are active in the Tibu area. There is activity in the Magdalena Valley area and the Sinu area.

G. D. H.

219. Brisk Rate of Completions Maintained in October and More Rigs Put Into Use. Anon. *Oil Wkly*, 13.11.44, **115** (11), 56.—During the four weeks ended 29th October, 1944, U.S. well completions averaged 527 per week. In September, the average was 539 per week, the highest average in 1944. A record number of drilling rigs—4167—are now in operation. At the corresponding period of 1941, 3975 rigs were in operation.

20,042 wells have been completed in the first ten months of 1944. In the corresponding period of 1943 the figure was 15,718. Increases in numbers of completions have taken place in California (44%), Texas (44%), Kentucky (99%), South Louisiana (39%), Mississippi (102%), Montana (58%), New Mexico (48%), West Virginia (41%), Wyoming (41%). Arkansas, North Louisiana, Kansas, Nebraska, Iowa, and Florida are the only States or districts which have had fewer completions this year than last year.

A table summarizes by States and districts the completion results in U.S.A. during the first ten months of 1944, and gives some comparative figures for 1943.

G. D. H.

220. Wells Completed in United States in Week Ended November 11, 1944. Anon. *Oil Wkly*, 13.11.44, **115** (11), 66.—387 field wells (260 giving oil and 47 giving gas) and 69 wildcats (11 giving oil and two giving gas) were completed in U.S.A. during the week ended 11th November, 1944.

The completion results are summarized by States and districts. G. D. H.

Transport and Storage.

221.* Corrosion of Buried Metals and Cathodic Protection. Part IV. M. C. Miller. *Petrol. Engr*, June 1944, **15** (9), 103–105.—For pipe-lines the protective current is increased until the pipe-to-soil potential is lowered to at least −0·8 v. (some engineers prefer −0·85 v.) as measured to a copper sulphate reference electrode using a high-resistance voltmeter, vacuum tube, or potentiometer-type voltmeter. Experience during the last five years or more indicates that when this potential is maintained, corrosion and leaks have been greatly reduced. This does not apply to copper or brass pipes. To protect galvanized metal structures a metal-to-soil potential of about −1·3 v. to copper sulphate electrode may be required. For lead-sheathed cables, methods for determining whether the sheath is corroding or is cathodically protected include (*a*) ascertaining whether current flow is from sheath to soil or vice versa, by placing a lead electrode in the adjacent soil, connecting it to the sheath through a low-resistance milliammeter or millivoltmeter, and observing deflection of the meter. (*b*) Measurement of the potential between sheath and lead electrode. This method coupled with (*a*) enables approximate earth resistivity to be calculated and a corrosion index obtained. Effects of electrode size, slight dissimilarity of metals, surface conditions, etc., on the results of such tests are discussed.

The types of instruments most suited for this work and the degree of accuracy required by them are discussed, and the construction of copper sulphate electrodes, suitable for field and city work respectively, described. R. A. E.

222. Gas Transmission Practice. L. E. Heckman. *Refiner*, Sept. 1944, **23** (9), 359–362.—A review of gas-pipe-line practice is given, showing increasing skill and confidence. The art of transmitting the large volumes of natural gas has changed from an initial stage in the period from 1926 to 1931, during which suitable high-strength pipe was being developed and methods of construction were changing, to the present period in which improved materials are available, workmanship is of high calibre, and the maximum use is being made of pipe strength. The trends to minimum cost during this time are characterized by the use of maximum working pressures which will stress pipe to about 70% of the yield strength, by the installation of medium-speed angle-type compressing units, and by capacity factors of at least 80%. This is compared with the use in 1926 of a factor of safety of 4–5 on the ultimate strength. A. H. N.

Refinery Operations.

Refineries and Auxiliary Refinery Plant.

223.* Corrosion Experiences in Chemical Process Industries. Anon. *Chem. Met. Eng.*, September 1944, **51** (9), 94–100.—This is a report on the results of a questionnaire put forward by the Editors of *Chemical and Metallurgical Engineering.* The report also contains a large table on materials of constructions used for many chemical engineering plants and equipments, such as absorbers, acetylators, agitators, autoclaves, bins and hoppers, centrifuges, classifiers, fractionating columns, condensers, condenser tubes, conveyors, cookers, crushers and grinders, crystallizers, dryers, drying towers, evaporators, filter presses, heat exchangers, kettles, piping, pumps, reaction vessels, retorts, screens, scrubbers, shipping containers, stills, settling tanks, storage tanks, wash tanks, thickeners, tower packing, valves and fittings. For each equipment, materials are recommended for service with acetic acid; acetic anhydride; alcohol; anhydrous aluminium chloride; ammonia soda alkalis; ammonium nitrate; ammonium sulphate; bromine; cane sugar refining; cellulose acetate; dry chlorine; wet chlorine; chromic acid; dyes; ethyl acetate; formaldehyde; formic acid; glycerine; hydrochloric acid; hydrofluoric acid; lactic acid; magnesium chloride; magnesium sulphate; methylene chloride; naphthalene; strong nitric acid; weak nitric acid; paint and varnish; phenol; phosphoric acid; potassium chloride; potassium hydroxide; soap; sodium chloride; sodium chromate and bichromate; sodium hydroxide; sodium hypochlorite; sulphate pulp; sulphide pulp; sulphuric acid. A. H. N.

224. Three Hours of Training Improve Pump Efficiency at Baytown. Anon. *Refiner*, September 1944, **23** (9), 337–342.—The methods adopted to train refinery operators in pumping technique is described. These are mostly visual demonstrations of wrong and correct procedures and photographs illustrate some of the points. A. H. N.

225. Engineering and Construction of the Santa Maria Valley Absorption Plant. D. E. McFaddin. *Refiner*, September 1944, **23** (9), 347–350.—*Paper Presented Before California Natural Gasoline Association.*—This is a shortened version of the paper, which described the absorption plant assembled from several sources, and gave tabulation of the source and condition of the principal units. A. H. N.

Distillation.

226. Process Design Procedure for Multicomponent Fractionators. C. G. Kirkbride. *Refiner*, September 1944, **23** (9), 321–336.—A recommended process design procedure for multi-component fractionators is presented. Two methods are given for the estimation of the number of theoretical trays required for a specified separation. A method for estimating tray efficiency to determine the actual number of trays to be installed is presented. Also a method is described for calculating the size of tower required to handle the specified feed rate. An example design problem is solved which demonstrates the application of the recommended process design procedure. The two methods for calculating the number of theoretical trays are the Brown, and the Brown and Martin methods. The Brown method was developed on a fundamental basis with a few simplifying assumptions. The Brown and Martin method is based on an empirical correlation. The Brown method is more fundamental, and therefore more generally applicable than the Brown and Martin method. Nevertheless, the Brown and Martin method is more rapid, and seems to be as reliable for multi-component fractionator designs which involve the separation of hydrocarbons. The method of Drickamer and Bradford is recommended for calculation of tray efficiency. The actual number of trays to be installed should be based on 85% of the efficiency predicted by their method. This provides for inaccuracies in the design methods and for flexibility in operation. The recommended procedure for calculating the size tower to handle the specified feed rate is predicated upon fixing the tower diameter so that liquid entrainment is negligible, and then fixing the tray spacing to handle the liquid load. Tower diameter is calculated on the basis of a maximum allowable vapour velocity. The maximum allowable vapour velocity is a function of the tower pressure, tower temperature, and molecular weight of the vapour. The tray spacing is calculated on the basis of the liquid back-up in the down-spouts. Liquid back-up in the down-spouts is due to the pressure drop through the trays, and is equal to twice the depth of liquid on the tray plus the friction head of the vapour through the risers and caps plus the head required to induce the flow of liquid through the down-spout on to the tray below. The methods for estimating the number of trays required are reliable within desired limits (10%); but the methods available for estimating the capacity of a column are not as reliable as desired. It is believed that more effort should be directed towards improving the accuracy of the design methods for column capacity. A. H. N.

227. Application of Unit Operations to Fractionation and Other Vaporization Processes. Part 8. R. L. Huntington, *Refiner*, September 1944, **23** (9), 351–355.—This part of the series deals with the pressure-temperature-composition relationship of binary mixtures which are (*a*) totally miscible; (*b*) immiscible liquids; (*c*) mixtures giving azeotropes; (*d*) mixtures of partial miscibility. Diagrams are given for each system.

A. H. N.

Chemical and Physical Refining.

228.* Desulphurization of Gas in the McKamie Field, Arkansas. F. H. Love. *Petrol. Engr*, June 1944, **15** (9), 55–58.—The McKamie Gas Cleaning Co. has recently put into operation a plant capable of handling approximately 25 million cu. ft. per day of sour gas produced from the 18 wells comprising the McKamie field. Gas from the high-pressure separators arrives at a pressure of 640 lb. per sq. in. and from the low pressure separators at 40 lb. per sq. in. The low-pressure gas is compressed and mixed with the high-pressure gas after the latter has passed through an inlet scrubber and absorber. The mixed gases are then treated with a 20–25% solution of M.E.A. in a Girbitol Unit for removal of H_2S and Co_2. The acid gas, amounting to 2½–3 mill. cu. ft. per day goes to the Southern Acid and Sulphur Company plant where approximately 50–60 tons of elementary sulphur are recovered per day. The purified gas is then contacted with mineral seal oil in an absorber and passes to low-pressure and high-pressure stills, the overhead vapours passing to a fractionating system for removal of propane, *iso*butane, butane, and natural gasoline of 16 lb. Reid vapour pressure. The propane, after purification, is used as boiler fuel. Approximately 8000 gals. of *iso*butane, 9000 gals. of butane, and 15,000 gals. of natural gasoline are recovered daily. The residue gas from the absorbers is discharged to the purification plant at a pressure of 600 lb. per sq. in., and is treated with amine-glycol in a Girbotol unit for removal of the remaining H_2S and CO_2 and dehydrated to the degree required.

Analyses of the sour gas show that one stream contains 6·80 and the other 19·80 mol. % of H_2S.

The operation of the 3 units is described, and constructional details of the units and auxiliary plant given. R. A. E.

Safety Precautions.

229. How to Organize and Conduct a Refinery Fire School. J. C. Watkins. *Refiner*, September 1944, 23 (9), 356–358.—Instructions in the use of water, carbon dioxide, soda acid, for nozzles and foam, are given and demonstrated to refinery employees. A. H. N.

Products.

Chemistry and Physics.

230. Synthesis and Properties of *iso*-Paraffin Hydrocarbons in the C_{13}–C_{24} Range. A. D. Petrov and M. V. Vittikh. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1944, 238–242.—Investigations were carried out on six synthesized hydrocarbons in the C_{13}–C_{24} range, having an unsymmetrical structure with one side-chain in the centre of the molecule. With the exception of 5-butyl-nonane this is the first synthesis of these products. As can be seen from the results, high cetene numbers are not incompatible with adequately low setting points.

Hydrocarbon.	B. P., °C.	d_4^{20}.	n_D^{20}.	Sett. Pt., °C.	Cetene No.
4-Propyldecane	215–757 mm.	0·7703	1·4354	<-65	45
5-Butylnonane	213–753 mm.	0·7587	1·4248	<-70	61
7-Butyltridecane	147–12 mm.	0·7779	1·4355	−70	80
9-Methylheptadecane	173–10 mm.	0·7870	1·4388	− 8	—
7-Hexylpentadecane	183–9·5 mm.	0·7909	1·4419	−61	95–97
9-Heptylheptadecane	210–8 mm.	0·7995	1·4465	−27	100

Viscosity-temperature figures (13·1 cs. at 20° C., 1·7 cs. at 90° C.) on the last-named compound show a high V.I. V. B.

Analysis and Testing.

231. Time-Saving Computing Instruments For Spectroscopic Analysis. T. D. Morgan and F. W. Crawford. *Refiner*, September 1944, 23 (9), 343–346.—See Abstract No. 1494, 1944. A. H. N.

Crude Oils.

232.* Crude Oils of Forest Sands of Bernstein Field, Trinidad, B.W.I. K. W. Barr, F. Morton, and A. R. Richards. *Bull. Amer. Ass. Petrol. Geol.*, December 1943, 27 (12), 1595–1617.—The Bernstein field lies on the south side of the elongated domal Fyzabad anticline, which has an axial trend of N. 70° E., and an average flank dip of 35° S. There is an important east–west strike fault displaced by north-north-westerly and north-north-easterly dip faults. There are also north-westerly faults. In general these serve as barriers to migration of oil and oil-field waters, but there is evidence of the rise of a toluene-rich oil along the intersections of faults after the formation of a benzine type in the lenticular Forest " D " sand (Miocene). The benzine type of oil is regarded as coming from underlying shales of the Forest.

Preliminary examination of the crude oils of South Trinidad has shown that the naphthas from these oils can be classified into two basic types : the paraffin-aromatic type and the naphthenic type. The former is identified with Type 1, class 2 naphtha as defined by M. R. Fenske (cf. *Ind. Eng. Chem.*, 1938, **30**, 166–169), and contains large amounts of normal paraffins and moderately large amounts of aromatic hydrocarbons. The naphthenic type of naphtha is characterized by almost complete absence of aromatic hydrocarbons and shows only traces of normal paraffins. Essentially the naphtha consists of derivatives of *cyclo*hexane, but also contains derivatives of *cyclo*pentane and some branched-chain paraffins. These naphthas are characteristic of their parent crude oils, and variations in the naptha composition are significant of incidents in the history of the crude oil.

The paraffin-aromatic type of crude oil occurs in the Guayaguayare, Lizard Springs, Morne Diable areas, and in the Middle Cruse sands (Miocene) of the Forest Reserve field. The oil is characterized by low crude-oil gravity, high percentage light fractions, and low-gravity residue. It is commonly waxy, and contains only traces of asphaltic bodies. It is believed to be uniformly of Cretaceous origin and to have migrated.

The naphthenic type of crude oil occurs in South-west Trinidad in the Forest sands, the Upper Cruse sands (Miocene, older than the Forest), and the Lower Cruse sands. It is recognized by low percentage of light fractions, the residues being of medium gravity, and commonly asphaltic. G. H. Scott (*Colorado School of Mines Quar.*, April 1941, **36**, 31 *et seq.*) suggests that these naphthenic crude oils are of Cretaceous derivation, and that oils in the Forest and Cruse have been differentiated by migrational transformation. The present authors, however, agree with V. C. Illing that this type is probably indigenous to underlying shales and that minor variations may be due to local changes of environment. On the analogy of other areas in South Trinidad and in Eastern Venezuela, the migrating oil is of Cretaceous provenance and migrated up faults. Research continues. A. L.

Engine Fuels.

233.* Sub-Committee on Synthetic Liquid Fuels. W. N. Hoyte. *Petrol. Times*, 9.12.44, **48** (1236), 824.—The main points from evidence given by 78 experts before a United States Senate sub-committee on synthetic fuels are given ; estimates of reserves and consumption in the U.S.A. and the World for Petroleum, Natural Gas, Shale Oil, Oil Sands, and Coal being quoted.

Certain extracts from the 1938 Falmouth Report on Oil from Coal are incorporated. A table of estimated mineral-fuel reserves of the United States is shown ; and types of existing plants for manufacturing synthetic fuels, with estimated capacities of the German and British commercial-scale plants and of the U.S. pilot plants are given. It is estimated that 50% of Germany's liquid fuels are produced synthetically.

G. A. C.

Bitumen, Asphalt and Tar.

234.* Recent Work on Coal Tar. G. H. Thomson. *Inst. Fuel, War Time Bull.*, June 1944, 171.—Developments in the chemistry, processing, and utilization of coal tar since 1940 are reviewed. An investigation into the cracking of tar and tar oils has been carried out on a pilot-plant ; and a works' scale study of the thermal decomposition of tar in carbonization retorts made. Bench and road tests on the use of coal-tar creosote as a diesel fuel oil were studied. Methods of separation of close fractions have been applied industrially ; and work done on recovery and methods of determination of phenols, and new phenols isolated. G. A. C.

235. The Protective Value of Asphalt Laminated Paper Against Certain Insects. H. L. Sweetman and A. I. Bourne. *J. Econ. Ent.*, October 1944, **37** (5), 605.—Tests have been carried out to determine the resistance to various insects (four varieties of roaches, silverfish, firebrat, and termite) of a wrapping material consisting of a two-ply asphalt laminated kraft paper, the seams of which are sealed with an adhesive tape consisting of the laminated paper coated with a bone glue/asphalt emulsion adhesive. The adhesive is moistened with a solvent (dialdehyde and chrome alum) before application to the wrapping paper. It may also contain an organic fungicide. The laminated paper was found to offer considerable resistance to penetration and feeding of most of the insects, the American roach, firebrat, and termite doing the most damage. The adhesive formed an attractive food in the raw state, but was less attractive after treatment with the solvent. The addition of a fungicide, Dowicide G. (pentachlorophenol) to the adhesive did not prevent fungus attack in moist atmospheres, but 1% reduced the attractiveness to roaches, though not to firebrat and silverfish, while termites did not damage paper in contact with the adhesive containing this fungicide. C. L. G.

Derived Chemical Products.

236.* Chemicals from Natural Gas and Natural Gasoline. J. H. Kunkel. *Petrol. Engr*, June 1944, **15** (9), 70–74.—Consideration is given to the composition of the various types of natural gas, natural gasoline, liquefied gases, and refinery gases. The products which can be obtained by cracking, oxidation, chlorination, and nitration of the lower hydrocarbons up to C_4 are outlined.

The industrial value of these products either for direct application or as base material for further synthesis is considered. The application of alkylation and aromatization processes to natural gas hydrocarbons and their derivatives is also briefly outlined. Reference is also made to the preparation of amyl acetate from *n*-pentane and to the value of *iso*pentane in aviation fuel production. R. A. E.

Coal, Shale and Peat.

237.* Coal and Chemical Industry. J. G. Bennet. *J. Inst. Fuel* (*War Time Bulletin*), August 1944, **17** (97), 185–192.—The significant position occupied by carbon in human life is demonstrated by tables giving its distribution and consumption in various forms; as coal, petroleum foodstuffs, timber and textiles, etc. Turning to its history, the Coal Age covers about 200 years, as compared with 300 generations of recorded history. More than half of the coal produced is consumed in heating, and more than one-third in steam-raising. Coal utilization processes can be grouped under six heads.

In the first group are means of separation of bituminous coal into its petrological constituents which will leave the carbon structure to a great extent unattacked. Coal has remarkable plastic properties, and research into low-temperature processes should be made to develop these.

In the second group of processes the coal is attacked and modified by means which do not bring about its complete destruction. A scheme of separation by solvent extraction is tabulated; and the oxidation of bituminous coals to give mixtures of alkali-soluble and alkali-insoluble compounds is cited; but no successful commercial processes are yet available.

The third group comprises mainly high-temperature coal modification processes; and include those at atmospheric, low, and high pressures; and also organic solvent processes. Some 40 million tons are carbonized annually at atmospheric pressure, 98% of the coal being used in high-temperature processes under atmospheric pressure. The products are mainly aromatic hydrocarbons, phenols, and bases, and although 200 different compounds have been identified in coal tar, the great majority play no significant part in chemical industry. A chart is given of the carbon compounds isolated from coal-tar. Comparison of coal-carbonization processes with oil-refining shows that 80–90% of valuable products are obtained from modern petroleum refining, whereas less than 1% of non-gaseous products of coal carbonization are worth more than £3 per ton at 1938 prices. Hence there is room for extensive research. So far, carbonization at moderate and reduced pressure has not been seriously developed.

The fourth group of processes involves chemical action, such as hydrogenation by the Bergius method. This was an immense technical achievement, but not economic in competition with petroleum as a method of producing liquid fuels. There are possibilities in the processes involving oxidation of coal by permanganates.

In the fifth group the coal is completely broken down, such a process being that due to Fischer and Tropsch. These processes are wasteful of the basic substance. A table is provided showing reaction temperatures, catalysts, and products obtained.

The sixth group is devoted to those in which the whole of the coal substance is discarded as carbon dioxide, water vapour, and other oxides, and only the heat of combustion turned to account. Such utilizations include generation of steam for chemical and heating processes, and for generation of electrical and mechanical energy. Coal used in generating stations is not economically utilized, as only 25% of the energy of combustion is converted to electrical power.

It is concluded that coal may well become a source of synthetic fibres, resins, fertilizers, etc., and that although methods so far developed do not produce organic chemicals other than aromatics at prices competitive with petroleum derivatives, there is a need for intensive research. G. A. C.

238.* **The Better Utilization of Coal for the Production of Oil and Petrol.** J. G. King. *J. Inst. Fuel*, August 1944, **17** (97), 192–196.—The two main carbonizing industries of gas and coke manufacture each consume about 18 million tons of coal annually; and in 1938, 600,000 tons of coal were utilized in the production of smokeless fuel. In the same year 38·7 million tons of coal were carbonized to yield 1·85 million tons of tar, 0·39 million tons of benzole, and 0·59 million tons of pitch; whilst 10·3 million tons of petroleum were imported. Fuel oil from tar is made by blending pitch with creosote in equal proportions; and an alternative way of using pitch is to carry the distillation of tar further by blowing with air and/or steam to give more heavy oils. The residual pitch is readily pulverized and fired in the same way as pulverized coal. Surplus coal-tar distillates can be refined for use in the diesel engine. By hydrogenation processes surplus creosote could replace imported diesel oil and motor spirit to the volume of 90 million gallons per annum; and by maintaining the present efficiency in the gas industry the carbonizing industries could produce 120 million gallons of benzole annually. There are indications of considerable expansion in the demand for gas, electricity, and smokeless fuel after the war. From the carbonization of 40 million tons of coal annually should be obtained half a million tons of benzole and 2 million tons of tar. The tar might be used to produce creosote, pitch hydrogenation spirit, pitch fuel oil, and hard pitch; or hydrogenation spirit, diesel oil and pulverized pitch. Coal-oil suspensions ("Colloidal Fuel") should account for 800,000 tons, and the experience of the practical sea-going trials should suggest even wider use in coast-wise shipping.

Hydrogenation processes should require 35 million tons annually, or about 17% of the coal mined. A modern hydrogenation process directly converts coal to oil by two main stages of liquid and vapour-phase treatment under a pressure of 250 atmospheres and a temperature of 400–480° C.

Hydrogen is made to react with pulverized coal mixed with heavy oil, the catalyst being a tin salt. A crude condensate is separated into spirit, middle oil, and heavy oil fractions. The middle oil is again processed, and finally distilled to yield a spirit. From 1 ton of coal and 48,000 cu. ft. of hydrogen are obtained 170 gallons of motor spirit. To replace imported petroleum, 16 million tons of process coal and 35 million tons of coal altogether—that is, about 17% of the total coal won—would have to be consumed. Hydrogenation of tars and tar oils would give either chemicals or fuels, 1 ton of tar yielding about 0·6 tons of spirit.

Oil can be indirectly produced from coal, involving complete gasification of the coal or coke and subsequent conversion of the gas to oils. A variation of the method is that known as the Fischer and Tropsch process, using nickel or cobalt oxides as catalyst, whereby liquid hydrocarbons are produced from mixtures of hydrogen and carbon monoxide derived from the gasification of coal or coke. Production in Germany is several million tons per annum. The olefines produced in this process form the starting point of many chemical syntheses, such as alcohols, solvents, synthetic rubber, plastics, detergents, etc. The thermal efficiency of the process is higher than the 25% usually quoted, but for the production of chemicals rather than fuels high thermal efficiency is not necessary. Lubricating oil of high quality can also be obtained by the Fischer–Tropsch process; and a plant of quite moderate size could produce a fair proportion of the half-million tons of lubricating oil imported in 1938. New processes using coal gas as a basic material for ethylene, propylene, and methane, and of the latter from coal measures, are envisaged. The distillation of 5 million tons of cannel should give 80,000 tons of motor spirit, 160,000 tons of diesel oil, 200,000 tons of fuel oil, and 50,000 tons of paraffin wax. Transport producers, steam wagons, and coal-dust engines should account for more coal, although engine design would have to be modified to change over from fuels used at present. G. A. C.

Miscellaneous Products.

239.* Low Cost Crude Rubber Doubtful Until 2 Years after Liberation. Anon. *Nat. Petrol. News*, 20.10.44, **36** (38), 18.—Appendix A to Rubber Director's Report (Part 2) by E. G. Holt gives a detailed analysis of the cost of production of crude rubber in pre-war years in the main producing areas. Depreciation, office expenses, profit sharing arrangements, estate amortization, currency values, and freight rates are taken into account. Costs of production on Malayan estates varied from 12·33 down to 2·46 pence per pound over the period 1921–33. The trend of costs on Dutch estates was similar, and native producers received less than 4 cents U.S. per pound for the 1931–36 output. It is concluded that at least two years will elapse before average cost of rubber production can regain former low levels in occupied estates even if trees are undamaged. G. A. C.

240. Contact Pressure Resins. Anon. *Chem. Tr. J.*, 22.12.44, **115**, 664.—A new type of synthetic resin has been produced in the U.S. from a variety of different products, one of the most useful being allyl alcohol. These materials are liquids which may be partially thickened or hardened by heating to a thermoplastic state, but on further heating at 100° C. in the presence of a catalyst will harden to an infusible state under contact pressures (0–5 lb. per sq. in.). They are unique among the thermo-setting plastics in not giving off gaseous or liquid by-products on curing, thus simplifying moulding operations. The cured resins are hard, infusible, clear, and colourless, and have good resistance to abrasion, heat, water, ageing, and chemicals. They are produced in the form of castings or laminates, in the latter of which the resin is used to impregnate and bond layers of fibrous materials, particularly fibre-glass. At present cost is high, but reduction in time of cure and developments in moulding methods may reduce this to moderate limits. The resins are used in the construction of aeroplane fuselages, and have possibilities in decorative laminates and electrical insulation. C. L. G.

Miscellaneous.

241.* The Refinery of the Future—A Survey of Possible Post-War Market Demands and Processes. Part I. R. G. Lovell. *Petrol. Engr*, June 1944, **15** (9), 77–78.—Fuel and lubricants for land vehicles will probably continue to be the refiner's chief source of revenue. Improvements which have been effected in the manufacture of gasoline and the methods adopted for overcoming difficulties which have arisen in the past, due to increase in fuel quality required by improved engines are discussed. The improved efficiency of engines which may be expected is more likely to result in an increased rather than a reduced gasoline demand.

Consideration is given to the effects of developments on the demand for products and to possibilities in construction and design of refinery equipment, with a view to ensuring profitable methods of plant operation. One branch of industry which will be profoundly affected by recent developments in aviation gasoline, synthetic rubber, and toluene manufacture, is the natural gasoline industry. The demand for potential products from wet natural gas has now become greater than conventional refining methods can supply. Improved fractionation facilities, isomerization processes, etc., thus become of prime importance. The utilization of propane, butane, and pentane fractions is discussed, and mention made of the merits of repressuring producing structures with surplus dry gas.

A composite diagram of the refinery of the future and a table of physical constants of a variety of materials useful in petroleum refining are included. R. A. E.

BOOK REVIEWS.

Peace, Plenty and Petroleum. By Benjamin T. Brooks. The Jacques Cattell Press, Lancaster, Pennsylvania, U.S.A. Price $2·50.

The author of this work is our well-known American member, Dr. B. T. Brooks of New York. He has a widespread practice in chemical matters in the States, and has been called upon from time to time to advise the Government in petroleum matters. He was recently stationed in South America on matters of national importance. Furthermore, he is the American editor of the "Science of Petroleum."

A man of high integrity and knowledge, coupled with the wisdom of long experience in oil affairs, his views should be regarded with all seriousness.

It is pointed out in his preface to the volume on "Peace, Plenty and Petroleum" that oil-fuel–oil for the Navy, gasoline for aviation, motor fuel for the Army—is an absolute essential for all service requirements.

The book gives an adequate picture of the background and causes of the present oil situation. Though there is no need for alarm in regard to the supply of petroleum in the United States, there has been since 1935 a considerable and progressive decrease in the rate of finding new oil. It is inevitable, therefore, that the nation will become more and more dependent on imported oil, for, apart from war-time needs, sufficient oil for peace-time industrial economy cannot be found in the United States, which consumes more oil products than the rest of the world combined. A series of international conferences regarding the world's oil supply and a congressional investigation of the problem are planned.

The subject of the book, therefore, is of vital importance. It discusses the past, present, and future of oil production, and emphasizes the necessity for a serious study of the problems that will confront not only the U.S.A., but all oil-producing countries.

The chapter headings are suggestive: Petroleum for the Chemist and the Engineer; Petroleum Substitutes; Petroleum in Peace; Petroleum in War; the World Oil Map; Oil in World Power Politics; Oil in the Post War World.

It is of some importance that an eminent scientist and technologist should feel it necessary, and indeed essential, to embark on a study of the political and economic aspects of the oil industry, and this little book can confidently be recommended to all who are concerned in the further development and application of what is to-day the world's most vital source of energy. A. E. D.

Science and Salvage. By Claus Ungewitter. Pp. 176. Crosby Lockwood & Sons, 1944. Price 12*s*. 6*d*.

This very interesting book is a translation, by L. A. Ferney and G. Haim, of a German book "Verwertung des Wertlosen" (Making the Worthless Valuable), which was published in 1938.

In a short preface to the original work Field-Marshal Goring says: "Chemistry and technology are the pathfinders of German industry and efficiency." In the introduction to the English edition, Dr. F. E. Armstrong points out that money spent by the nation on the extraction and recovery of materials in small concentration in ores or metallurgical residues, or from vegetable and animal waste products, or from salvaged scrap, would be better used in that way than by keeping men in idleness on a dole. There is certainly employment and also wealth to be obtained by making the worthless valuable. Twelve chapters deal with: Wealth from the air, the sea as primary raw material, the utilization of low-grade mineral residues, problems of peat utilization, forestal products, agricultural wastes, the utilization of scrap and worn materials, municipal refuse, raw materials from sewage, the utilization of by-products from chemical manufacturing, and coal ash.

The book is full of interest and suggests many products which will be new to many readers. Parts of the book deal with problems already solved and of new processes in use, such as the extraction of bromine and magnesium from sea-water, that vast storehouse of every element in very small concentration.

The scheme for the recovery of used lubricating oil, which was initiated in 1937, is given as an example of success. About 30% of the total issue of lubricating oil is recovered in certain areas. From this they claim to obtain 20% of petrol (which certainly seems very high), 30% of kerosine and 35% of lubricating oil.

Much attention has been paid to the working up of low-grade ores. Old mines of low-grade ores have been reopened, and produce copper, nickel, tin, cobalt and mercury. Coal dust is briquetted by finely broken quartz, pitch, or asphalt being saved for more useful purposes. Much attention is being paid to the products of the soil and two processes are in use for making sugar from wood. Attention was given prior to 1938 to the production of cellulose fibres from such vegetable wastes as potato haulms, runner beans, bulrushes, hop-vines, and even lupins and ivy. Useful oils are made from tomato skins and pips from the canning factories, cork substitute from potato peelings; in fact the claim of the canning factory in Chicago, that nothing was lost except the squeaks, seems to be approached. The salvage of scrap material has had the attention which it deserves. No less than forty towns recover and use sewage gas.

The last chapter, perhaps the most interesting, deals with the utilization of by-products from the chemical industries.

" Not only the chemical industry and the producers of goods, but also the last consumer should exercise economy in all the valuable raw materials and try to avoid every source of waste "—a piece of good advice which should be taken seriously in all countries especially those such as Britain whose mineral resources other than coal and iron are so meagre.

J. K.

INSTITUTE NOTES.

FEBRUARY, 1945.

FORTHCOMING MEETINGS.

Wednesday, 14th March, 1945, at 5.30 p.m. **Original Papers by Sub-Committees of the Standardization Committee.** (Further particulars to be announced.)

Wednesday, 18th April, 1945. **Joint Meeting with the British Rheologists' Club.** (Further particulars to be announced.)

Wednesday, 9th May, 1945, at 5.30 p.m. "**Code of Electrical Practice for the Petroleum Industry,**" by Alan D. Maclean, A.I.E.E. (Fellow).

Wednesday, 13th June, 1945, at 5.30 p.m. "**H.D. Lubricating Oils,**" by Special Sub-Committee of the Standardization Committee.

All the above meetings will be held at 26, Portland Place, W.1.

STANLOW BRANCH.

Wednesday, 7th March, 1945. "**Spectrographic Methods applied to the Petroleum Industry,**" by G. B. B. M. Sutherland, Ph.D., and H. W. Thompson, D.Phil.

*Wednesday, 28th March, 1945. **Film Show.**

*Wednesday, 18th April, 1945. **Annual General Meeting,** followed by "**Education for the Industry,**" by F. H. Garner, O.B.E., Ph.D.

* Details of these meetings were incorrectly given in the December, 1944, *Journal*.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

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

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

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

Membership.

ALDERSON, James, Laboratory Assistant, Lobitos Oilfields, Ltd. (*V. Biske ; J. M. Harkess.*)

LAHIRI, Adinath, Assistant Director, Fuel Research Station, Dhanbad, India. (*E. A. Evans ; F. H. Garner.*)

MASSEY, James, Director and General Manager, Burtonwood Motor & Aircraft Eng. Co., Ltd. (*F. E. Cherry ; N. Matheson.*)

Murray, James Laidlaw, Administrative Assistant, National Oil Refineries, Ltd. (*R. B. Southall ; E. Thornton.*)

Perry, Thomas Frederick, Installation Superintendent, Anglo-Iranian Oil Co., Ltd. (*R. B. Southall ; E. Thornton.*)

Prentis, William James, Technical Assistant, Anglo-Iranian Oil Co., Ltd. (*D. A. Howes ; P. Fleming.*)

Richardson, George, Fuel Oils Technologist, Petroleum Board. (*R. J. Bressey ; V. C. Illing.*)

Sen, Apurba Kumar, Joint Chief Inspector of Explosives, Simla, India. (*E. Evans-Jones ; R. A. Thomas.*)

Taylor, Dudley Clifford Carr, Accounting Officer, Refinery Dept., Petroleum Board. (*H. Hyams ; J. W. Vincent.*)

Transfers.

Lisle, Brian Orchard, Lieutenant, U.S. Army Air Corps (Associate Member). (*Cecil W. Wood ; George Sell.*)

Ralph, Noel Albert, Works Chemist. (Student.) (*F. J. S. Hall ; R. F. Hurt.*)

SIR JOHN CASS TECHNICAL INSTITUTE.

A course of ten lectures on "General Technology of Petroleum" commenced at The Sir John Cass Technical Institute, Jewry Street, London, E.C.3, on January 11th, 1945.

The lectures (details of which are listed below) are given on Thursday afternoon at 3 p.m. and last for one hour.

Thursday, 11th January, 1945. "**Geology, Exploration and the Drilling of Wells,**" by C. A. P. Southwell, F.G.S.

Thursday, 18th January, 1945. "**The General Management of Oilfields, including the Separation of Gas and Water,**" by J. B. Kay, B.Sc., A.R.S.M., F.Inst.Pet.

Thursday, 25th January, 1945. "**The Bulk Storage of Oil and its Transport by Pipelines and Tankers,**" by E. J. Sturgess, B.Sc., A.C.G.I., A.M.I.Mech.E.

Thursday, 1st February, 1945. "**The Work of the Refineries,**" by E. Le Q. Herbert, B.Sc., F.R.I.C., F.Inst.Pet.

Thursday, 8th February, 1945. "**Gasolines and Aviation Spirits and their Test Engines,**" by W. A. Wilson, A.M.I.A.E.

Thursday, 15th February, 1945. "**White Spirits, Solvents and Kerosine,**" by W. H. Thomas, A.R.S.M., F.R.I.C., F.Inst.Pet.

Thursday, 22nd February, 1945. "**Diesel Oils and their Testing Engines,**" by T. K. Hanson, B.A., Ph.D.

Thursday, 1st March, 1945. "**Lubricating Oils and their Testing,**" by E. A. Evans, M.I.A.E., C.I.Mech.E., F.Inst.Pet.

Thursday, 8th March, 1945. "**Fuel Oils and Bitumens,**" by R. G. Mitchell. B.Sc., F.C.G.I., M.Inst.C.E., M.I.Mech.E.

Thursday, 15th March, 1945. "**Chemical Products from Petroleum, their Uses and Possibilities,**" by A. E. Dunstan, D.Sc., F.R.I.C., M.Inst.Pet.

ARTHUR W. EASTLAKE,
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The Institute as a body is not responsible for the statements of opinion expressed in any of its publications.

Papers and Articles.—The Council invites Papers and Articles both for reading at Ordinary Meetings of the Institute and for publication in the Journal. All Papers, whether for reading or publication, will be submitted to a referee appointed by the Publication Committee.

Pre-Prints.—If available, advance proofs of Papers to be read at Ordinary Meetings can generally be obtained about a week before the Meeting. Members wishing to be supplied with these pre-prints are requested to notify the Secretary.

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Issue of Journal.—Members whose subscription is not in arrears receive the Journal free of cost. A member whose subscription is not paid by March 31st of the year for which it is due is considered to be in arrears.

Changes of Address.—Members are requested to notify any change of address to the Secretary.

Benevolent Fund.—The Benevolent Fund is intended to aid necessitous persons who are or have been members of the Institute, and their dependent relatives.

The Fund is raised by voluntary annual subscriptions, donations, and bequests, and all contributions should be sent to the Secretary of the Institute at 26, Portland Place, London, W.1. The Fund is administered by the Council through the Benevolent Fund Committee.

Library.—The Institute's Library may be consulted between the hours of 9.30 a.m. and 5 p.m. daily, excepting Saturdays.

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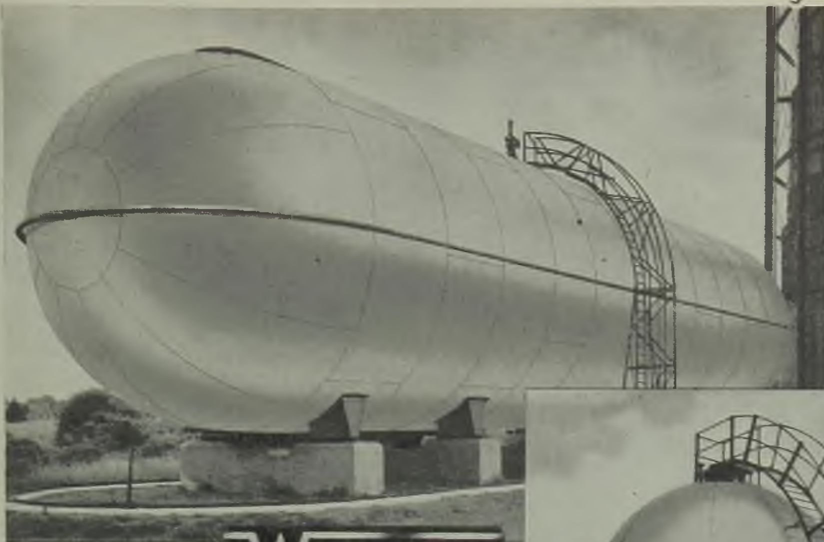

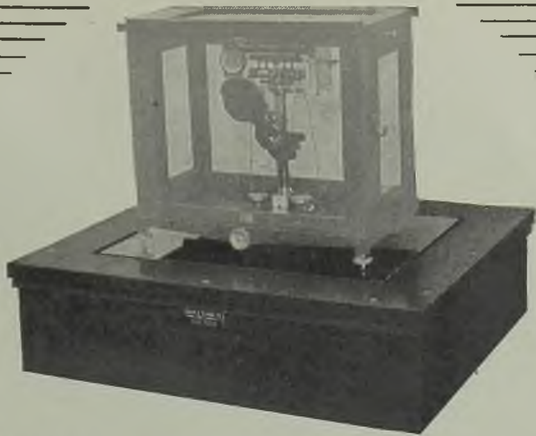

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