

ABSTRACTS.

	PAGE		PAGE
OILFIELD EXPLORATION AND EXPLOITATION.		Special Processes	209 A
Geology	201 A	Safety Precautions	209 A
Production	202 A	PRODUCTS.	
Development	202 A	Chemistry and Physics	210 A
REFINERY OPERATIONS.		Analysis and Testing	211 A
Refineries and Auxiliary Refinery Plant	205 A	Crude Oil	213 A
Distillation	205 A	Gas	214 A
Solvent Refining and Dewaxing	206 A	Lubricants	214 A
Cracking	206 A	Bitumen, Asphalt and Tar	215 A
Polymerization	208 A	Special Hydrocarbon Products	216 A
Alkylation	208 A	Derived Chemical Products	217 A
Isomerization	208 A	Coal, Shale and Peat	217 A
Chemical and Physical Refining	208 A	Miscellaneous Products	219 A
		MISCELLANEOUS	220 A
		BOOK REVIEW	220 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.

Alekseevskii, E. V., 642	Fragen, N., 634	Lubman, N. M., 674	Rossini, F. D., 639, 640
Back, R. C., 661	Frej, F. E., 637	McGrane, F. B., 660	Rouy, A. L. M. A., 662
Backoff, W. T., 657	Gaffney, B. T., 624	McNamara, T. L., 636	Senin, P. I., 658
Baranovskaya, N. V., 648	Gerling, R. K., 648	Moir, H. L., 657	Schmerling, L., 657
Barnes, H., 646	Gilmont, R., 639	Nameikin, S. S., 629, 665, 675	Schoch, E. P., 664
Barron, T. M., 631	Gorchakov, N. D., 642	Nelson, W. L., 654	Schwint, I. A., 635
Bashkirov, A. N., 666	Gorokholinskaya, M. S., 669	Nickle, C. O., 618, 620	Serebrennikova, A. G., 665
Beare, I. R., 657	Grib, A. A., 641	O'Loughlin, T. P., 657	Sheinman, A. B., 628
Beckman, A. O., 644	Hale, A. B., 657	Owen, T. A., 633	Shiras, R. N., 625
Bloch, H. S., 654	Henderson, L. M., 636	Parsons, P. W., 624	Shuikin, N. I., 643
Cheng, Fa-Wu, 655	Hepp, H. T., 637	Patrick, G., 649	Skipton, T. K., 638
Chemishev, A. B., 670	Hockenyo, G. L., 665	Patton, B. L., 663	Sonders, M., 625
Clayton, J. O., 657	Hoefelman, T. M., 660	Paul, P. L., 635	Stahly, E. E., 633
Conn, A. L., 637	Holt, B. C., 650, 651	Pines, H., 634	Tananaev, I. V., 647
Coulson, R. A., 650, 651	Huffaker, C. B., 661	Pronina, M. V., 667	Tannich, R. E., 626
Day, B. B., 637	Ipatieff, V. N., 637	Prosen, E. T., 639, 640	Thacker, C. M., 631
Dehmonte, J., 673	Kanhofer, E. R., 637	Putzillo, V. G., 655	Titov, N. G., 645
D'yakova, M. K., 659	Kantorovich, B. V., 671	Reiff, O. M., 657	Tuttle, B. E., 637
Edel'shtain, N. G., 669	Karavaev, N. M., 666	Reuter, R., 657	Tyson, C. W., 631
Ernolin, G. M., 643	Kilmov, B. K., 669, 675	Rice, P. L., 661	Tziron, I. L., 659
Etzler, D. E., 657	Knsakov, M. M., 636	Richardson, R. B., 672	Tziba, A. N., 628
Farberov, I. L., 670	Larin, V. A., 667, 669	Ridgway, O. M., 631	Wagner, C. B., 631
Farrington, B. B., 657	Larin, A. Ya., 630	Remy, T. P., 632	Williams, N. D., 657
Fanst, J., 657	Levina, M. I., 647	Rosenberg, L. M., 629	Zaks, S. L., 619
Folkins, H. O., 631			

OILFIELD EXPLORATION AND EXPLOITATION.

Geology.

617. *Control of World Oil Reserves Certain to be Important Post-war Factor.* Anon., *Oil Wkly.*, 11.12.44, 116 (2), 68.—World oil reserves are variously estimated at 50,000,000,000 to 81,000,000,000 brl., a mean of four estimates giving 54,000,000,000 brl. U.S.A. is credited with 39.6% of the total, Mexico with 1.2%, and Canada

with 0.3%. Intensive exploration is responsible for U.S.A.'s large contribution, and in 1943 it gave 66.1% of the world's production. Asia has 32.8% of the world reserves, 30% being in Iran, Iraq, Kuwait, Saudi Arabia, Bahrein, and Qatar. This area could supply much of Europe and Africa's needs.

Russia is credited with 11.3% of the world oil reserves, mostly in Europe, though there are great possibilities in her Asiatic territory, which is little explored. Undoubtedly Russia will be able to supply her own needs. Reserves in the rest of Europe are less than 1,000,000,000 brl., about half being in Roumania.

South America has reserves of 6,500,000,000-7,680,000,000 brl. Most of this is in Venezuela.

Tables give various estimates of oil reserves by countries, and an indication of the countries future prospects.
G. D. H.

618. Maritime Provinces Favoured in East Canada Prospecting. C. O. Nickle, *Oil Wkly*, 11.12.44, 116 (2), 100.—Maritime provinces of Canada have numerous seeps, but only one small oilfield. Much exploration is being undertaken here and in the Gaspé Peninsula, Southern Quebec, in Southern Ontario, and the Moose River basin and James Bay district of northern Ontario. Large areas have been leased, and geological and geophysical work is in progress.

A wildcat being drilled in Hillsborough Bay may go to 14,000 ft. to reach the potential oil-zones of the Horton Series (Lower Carboniferous) and the Upper Devonian. The well is on the indicated crest of the structure. South of Mabou Inlet, Cape Breton Island, Nova Scotia, a well was abandoned at 5579 ft. without reaching its objective. A second well has been started in the same area, to test the Ainslee sand at the top of the Horton series, which sand is expected at 6300 ft. The Horton series is to be tested by a well near Kennetcook Corners, central Nova Scotia, 40 ml. north of Halifax.

The Stony Creek oilfield of New Brunswick has produced about 344,000 brl. of oil and 20,000 million cu. ft. of gas. Producing depths range 1900-3100 ft., in six sands of the Albert Series (Lower Carboniferous).

A test on the Gaspé Peninsula has bailed oil from shale at 1920-1958 ft., and at 2036 ft. Another well 4 ml. to the east showed oil and gas near the surface and in a fracture zone at 833 ft.

In 1944, as in 1943, emphasis on drilling in Southern Ontario was for gas. Five exploratory wells were drilled, one giving gas.

There are notes on the various concessions in Eastern Canada. Tables give drilling and production data.
G. D. H.

Production.

619.* Influence of Temperature on Oil Yield of Uncemented Sands under Gravitational Flow. S. L. Zaks. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 729-733.—Main forces retaining oil within sand are surface tension, viscosity, and adhesive effects. All these diminish with increase in temperature, the main effect of which is on viscosity (in the case of crudes containing gas in solution, however, viscosity fall due to a rise in temperature is offset by rise in viscosity due to loss of gas). A laboratory set-up is described for measuring flow of crude through sand under various conditions. Sand used (porosity 42%) was of two sizes, 0.01-0.10 mm. and 0.10-0.25 mm. Temperature interval studied was 20-100° C. and angle of slope varied from 5° to 40°. Crude employed was a light Maikop crude (sp. gr. 0.832). Maximum rise in oil recovery was observed for increases in temperature from 20° to 60° C. Effect of temperature and slope was more marked for the finer sand. Temperature effect decreased with increasing slope. It is suggested that heating oil-sands (method not stated), particularly those retaining viscous crudes and in areas where the ground is permanently frozen, would be of value. Results are presented tabularly and graphically.
V. B.

Development.

620. Third of Canada is Rated as Potential Oil Area. C. O. Nickle. *Oil Wkly*, 11.12.44, 116 (2), 82.—Canada has produced 110,000,000 brl. of oil, more than 70,000,000 brl.

from Turner Valley. 1944 production will exceed 10,000,000 brl., while the consumption is likely to be nearly 60,000,000 brl.

Canada's potential oil land covers Nova Scotia, Prince Edward Island, New Brunswick, the Gaspé Peninsula of Quebec, southwestern Ontario, northwest Ontario and Manitoba, the interior plains, northeast British Columbia, the Mackenzie River Basin and part of the Wind River Basin of the Yukon Territory.

Turner Valley gives 8,000,000 brl./year from depths of 2700-10,000 ft. It is 22 ml. long and 1-3 ml. wide. The Norman Wells field covers 4500 acres. Its potential is 10,000 brl./day and its reserves are estimated at 35,000,000 brl. It is producing 3500 brl./day. Of the small oilfields in southwest Ontario, Oil Springs is the best, and has produced some 8,000,000 brl. of oil. The group of fields yields about 150,000 brl./year. There are new and relatively undeveloped fields in the Plains of Alberta (Taber, Vermilion, Princess, Conrad, Wainwright, Red Coulee, Lloydminster, and others). These have given about 1,300,000 brl. The Stony Creek field of New Brunswick produces about 25,000 brl./year.

During last five years there has been a widespread search for oil in Canada, about 70% of the activity being centred in Alberta. The Maritimes Provinces are the second most active area. In New Brunswick and Western Ontario current development is largely concerned with meeting needs for natural gas. On the Gaspé Peninsula a well is being acidized to develop commercial production from three porous sands in the Lower Devonian. Eight wildcats in Saskatchewan have only shown promising oil- and gas-shows. Geophysical and geological work is going on in northeastern British Columbia.

In September the Princess discovery was made in Alberta. The well came in at 1000 brl./day, from 3965 to 3983 ft., with formation pressure of 1300 lb./sq. in. In July the Conrad discovery was made at 2960-2972 ft. in the Ellis. This well is 23 ml. southeast of the Taber pool, which produces from the Lower Cretaceous. The Vermilion pool produces from the Lower Cretaceous at 1800 ft. About 25 ml. to the east and south a Lower Cretaceous oil discovery has been made which is similar to Vermilion.

The Turner Valley field has been extended to the north and south, and wells have been completed on a fault-block east of the main block. In the latter area the oil-water line is 1200-1500 ft. lower than elsewhere. A second test has been drilled on the Jumping Pound structure, and this found the Madison limestone 400 ft. higher.

The Highwood Uplift west of Turner Valley has Madison limestone on a series of narrow anticlines. This area is being tested. 25 ml. southwest of Turner Valley the Devonian and Madison are to be tested on the shallow Sullivan Creek anticline, while the Moose Dome 30 ml. northwest of Turner Valley is also being tested. On this structure the Devonian has produced a little oil. 100 ml. farther north along the foothills the Ram River and Shunda Creek anticlines are being tested. Light oil has been found. The Devonian and Madison are being tested in the Folding Mountain and Coalspur areas, respectively.

Tables give production and drilling data.

G. D. H.

621. Venezuela Production at Peak but Still Short of Objective. Anon. *Oil Wkly*, 11.12.44, 116 (2), 116.—Venezuela's 1944 production will be about 267,000,000 brl., 87,000,000 brl. more than in 1943, and 50,000,000 brl. more than the peak of 1941. In the third quarter of 1944 the production rose to 790,000 brl./day, and is expected to be 830,000 brl./day in the fourth quarter. The P.A.W. goal of 1,000,000 brl./day would have been attained if there had been sufficient supplies.

At present the Maracaibo area produces over two-thirds of the oil output. This is roughly the region's optimum capacity. Eastern Venezuela is producing well below its potential, but at the rate equivalent to the existing pipe-line capacities. A new 16-in. pipe-line from Puerto La Cruz to the Jusepin-Mulata fields is being constructed. Completion of this line will result in the testing of promising areas west of the Santa Barbara-Mulata-Muri-Jusepin producing districts. In the Greater Oficina area various fields are being extended.

Further development in Eastern Venezuela is most likely to be concentrated along the two main trend lines marked by present producing fields in Monagas and Anzoategui, which extend west through Guarico. The region farther south is less accessible, and discoveries so far have proved only heavy oil.

Texas has a producer at Caritos and four dry holes. A dry wildcat has been drilled in Delta Amacuro. The Mercedes field has six closed-in producing wells, and it is unlikely to have a pipe-line for some time unless its potential is greatly enhanced. It is 130 ml. from the nearest production to the east.

A deep test, Rincon Largo 3, is being drilled by Texas, between producing areas in the Santa Ana district.

A test is being drilled 2 ml. east of the Lagunillas field. The Pando wildcat was abandoned at 6900 ft. It lies 5 ml. southeast of the limits of Oficina proper.

In Western Venezuela concessions are being sought in the Apure Basin of Apure and Zamora. Geological and geophysical surveys have been in progress.

G. D. H.

622. Russian Developments in Both Producing and Refining are Important Despite War. Anon. *Oil Wkly*, 11.12.44, 116 (2), 108.—U.S.S.R. production for 1944 will probably be 275,000,000 bbl. In recent years greatest concentration of oilfield effort and greatest return from such effort, has been in the area lying between the Ural Mountains in the east and the Volga, running from the Caspian to the Pechora region in the north. The most important finds have been in a 500-ml. strip in the centre. This area has produced considerable amounts of oil since the discovery of Ishimbaevo in 1932, and 1944 output is estimated at 200,000 bbl./day, compared with 75,400 bbl./day in 1941. The Baku fields are now giving 59% of the Russian output. Since 1932 100 new producing areas have been found in the Ural-Volga area, and this area has reserves estimated by the Russians at more than 20,000,000,000 bbl., or 32% of the U.S.S.R. total. Most Ural-Volga crudes have 2-3% of sulphur, and this has called for special refinery equipment. Total gasoline yields run as high as 52%, and some crudes are said to be good for making high-octane gasolines.

Most of the important new producing fields are in the Kuibyshev Combine area, extending from the Middle Volga east to the Urals. The oil is at depths of 300-1000 ft. in most of the fields, and so Syzran, Yablonovoy, Kraznyar, Kinel, Buguraslan, Sterlitamak and Ishimbaevo are being developed rapidly.

Various methods of stimulating production from wells have been applied. In some cases soluble compounds are inserted in wells to increase flow. Some bottom-hole electrical pumps have capacities of 700 bbl./day.

Among the Ural-Volga fields discovered since the war began are Sabor, Krasnoyar, Ammonak, Elshan, and Karlinsk. Much gas has been found in the Buguruslan and Saratov regions. This gas is being used industrially. On the Kama river major oilfields have been developed during the war at Polazna and Krasnokamsk. The Uchta field of the Pechora basin, discovered in 1931, is reported to have been extensively developed in recent years.

In the Ural-Emba region the fields of Narmundanak, Galdybay, Kulsary, Sagiz, and Iskine have been developed, and new discoveries are reported at Altykul, Bek-Beke and Ispulay. The Emba region is dominantly a salt dome area with great possibilities; present productive capacity may be 25,000,000 bbl./year.

In Turkestan oil and gas discoveries are reported at Palvontash and Kokayta, Samarkand, Andejon (Ferghana) and Bukhara. This area is rather isolated.

Sakhalin production is said to have been raised in 1944, and development has been started on several discoveries on the Kamchatka Peninsula. Sakhalin is estimated to produce 15,000 bbl./day.

A field is reported to have been found recently at Kashkara, a few miles west of Astrakhan in the Volga delta region. Five producers have been completed at depths of 750 ft. Some development has been done on new fields between the Araxes and Kur rivers of the Caucasus region. Three major fields are said to have been found near Kirovobad and in the Khilin and Talyanov districts. A number of favourable structures are reported in the southern Khilin region along the Araxes river. This potential producing region extends southward into Persian territory and east to the shore of the Caspian.

G. D. H.

623. World Oil Industry Looks Ahead to a Busy Future. Anon. *Oil Wkly*, 11.12.44, 116 (2), 66.—World oil production in 1944 is higher than ever before, and further increase is expected in 1945, for apart from war needs oil will play a leading part in

post-war reconstruction. Many regions hitherto unexplored or superficially tested will be explored thoroughly. Both the Caribbean and the Middle East have large oil reserves and will be large exporters. The Caribbean region has the largest established facilities for production and refining, and Venezuela, which produces 800,000 brl./day, will rise to 1,000,000 brl./day, while Colombia expects to produce 80,000 brl./day in 1945. Middle East production is expected to be increased to about 500,000 brl./day through the additional refining facilities being completed, and plans are being considered for raising the production to 1,000,000 brl./day after the war, such a producing potential already being available. In 1944 U.S.A. produced about 4,500,000 brl./day.

U.S.A. has pushed production to the limits of efficient recovery, and must now build up reserves. While drilling has been subnormal for three years, the country's production has been increased. It is believed that reserves can be expanded, although oil-finding possibilities are less attractive than those of the Middle East, etc.

Russia has had a notable success in establishing new reserves in the Ural-Volga area. Currently Russia holds 11% of the world's reserves, and produces about 11%. The position is similar in South America, while the Middle East, with nearly a third of the reserves, gives only 6% of the output, and U.S.A. with 40% of the reserves provides 65% of the oil.

Argentina and Bolivia still require to import oil despite some war-time development of their Government-operated oil industries. Peru's production has risen to a new high; oil is exported. Ecuador produces about 5000 brl./day. Mexico's output has risen. Canada has extensive areas in which oil may be found, and much prospecting is going on.

New Zealand has one field with a few wells, but commercial production has not yet been obtained in Australia. Japan has been able to re-develop some of the Far East fields.

The world production for 1944 is probably 2,621,734,000 brl., 14.7% more than in 1943, and 31.5% more than in 1938.

A table gives the annual production by countries from 1938, and the cumulative production up to the end of 1944. G. D. H.

REFINERY OPERATIONS.

Refineries and Auxiliary Refinery Plant.

624. New Basis Developed for Comparing Heat Transfer Fluids. P. W. Parsons and B. J. Gaffney. *Chem. Met. Eng.*, 1945, 52, 100.—A new approach to the problem of heat exchange on the basis of the relationship of film co-efficient to energy consumed in circulating the fluid per unit H.E. surface.

Flow inside tubes only is considered, equations being derived for both viscous and turbulent flow. The behaviour of 19 fluids at 86° F. is shown graphically. These include Dowtherm, water, glycerol, ethanol, hydrogen, mercury, and lubricating oil. The manner in which the relationship is affected by temperature is also illustrated.

It is concluded that operation in region of turbulent flow is to be recommended; that in apparatus of equal surface, film coefficient in turbulent region decreases as diameter increases, provided energy input is constant. For streamline flow, the reverse is true. L. B.

Distillation.

625. Patent on Distillation. R. N. Shiras and M. Sonders (Shell Development Co.), U.S.P. 2,350,256, 30.5.44. Appl. 8.6.42. A process is described for separating a relatively narrow boiling range mixture comprising two components, *A* and *B*. *A* has a relatively lower vapour pressure in presence of a relatively high-boiling selective solvent than component *B*. Original mixture is distilled in a first distillation zone in presence of the solvent under conditions designed to produce a first overhead vapour fraction rich in *B* and leave a first bottom fraction comprising solvent plus dissolved *A* and a minor portion of *B*. First bottom product is further distilled in a second zone in presence of additional solvent and under conditions designed to

produce a second overhead product, comprising vapours of *A* and *B*, and to leave a second bottom product comprising solvent rich in dissolved *A*. This product is distilled in a third zone to separate *A* from solvent. At least part of recovered solvent is returned to first and second distillation zones and some of second overhead product is returned to first distillation zone.

H. B. M.

Solvent Refining and Dewaxing.

626. Patent on Solvent Extraction. R. E. Tannich (Standard Oil Development Co.). U.S.P. 2,349,473, 23.5.44. Appl. 14.9.42. An oxidation inhibitor is added to a petroleum fraction containing olefins before extraction with sulphur dioxide. Inhibitor is maintained in the mixture until sulphur dioxide is separated from the hydrocarbons.

H. B. M.

Cracking.

627. Houdry Cycle-Timing System. R. B. Tuttle. *Oil Gas J.*, 24.2.45, 43 (42), 120.—Along with usual devices for automatically controlling process variables is the variable cycle timer. This can be used in any process which depends upon a fixed cycle. This timing device resulted in the Houdry process developing into the first continuous catalytic cracking installation in commercial use.

Socony Vacuum Oil Co., at its Lubrite refinery, East St. Louis, Ill., operates a six-case Houdry installation. These cases are interposed between a continuous throughput vapour heater and a system of fractionators. Each case is connected into the system through two valve manifolds, each of which mounts four motor-operated valves; and in addition there are six more motor-operated valves, the operation of which is common to all the cases. Thus a considerable number of valves are involved, and the opening and closing of all except three is controlled by the variable cycle-timer.

All valves are electrically interlocked, and limit-switch contacts are also used to operate the valve-position indicating lights, auxiliary equipment, and to furnish test contacts so that the cycle-timer can check all valve operations after they have been initiated. Two identical linear motion timers are installed, one being maintained for emergency service. Total cycle time can be varied from 30 to 60 minutes as desired. A set of signal lights is connected into the various operating circuits, indicating to the operator the position of all motor-operated valves.

A systematic identification scheme renders any work with the leads and terminals an orderly procedure, a chart being provided which includes terminal and timer segment identification codes. An illustration of sequences is that two cases are always on regeneration at a time; one of the cases will be on stream and the fourth will be on oil or air evacuation, oil or air repressure, depending on the particular instant that the sequence is checked.

The Lubrite cycle-timers have been wired for more than 25 different operating sequences.

G. A. C.

628.* Vapour Phase Oxidative Cracking of Gas Oil and Naphtha in Presence of Air Enriched with Oxygen. I. A. B. Sheinman and A. N. Tzuiba, *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 716-723.—The process of oxidative cracking has been proved effective, but has hitherto only been applied using air. Industrial availability of cheap O₂ (Kapitza process) makes use of air/O₂ mixtures feasible. Laboratory scale experiments were undertaken using enriched air, so that the O₂ content was 37-40%. Cracking was carried out, over a charcoal contact, at 540-560° C., using 60-70 litres of air/O₂ mixture per kg. of charge. Reaction time was 28-41 sec. As charging stocks, there were employed a naphtha (*d*₂₀ 0.788, 105-218° C.) and a gas oil (*d*₂₀ 0.858, I.B.P. 203° C., 95% at 360° C.). Once-through cracking yielded 30-35% of 150° C. end-point gasoline; the total yield of liquid products, including gasoline, recovered by gas-stripping, was 63-86%. Inspections of charging stocks and products are given. Of the O₂ entering the reaction 37% is accounted for as CO₂ and CO (mainly the former), 34% by H₂O and excess O₂, and 29% by O-containing liquid products, and loss. Advantages claimed for this process include absence of coke formation (below 0.1%), thus permitting continuous operation

without need for regenerating the catalyst, a calorific value of 7000 cal./m.³ for the gas produced, as compared to 4000 when air is used, and an increase in aromatic content of the gasoline. Combustion or explosion do not occur in the reaction space, and the process is smooth and controllable. Use of air enriched with O₂ enables the plant volume to be reduced by 50%, with consequent improvement in heat balance.

V. B.

629.* Data Regarding Problem of Chemistry of Oxidative Cracking of Hydrocarbons in Vapour Phase. III. S. S. Nametkin and L. M. Rosenberg. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 709-715.—The cracking of pure *n*-octane was examined in N₂ and in N₂/O₂ mixtures containing up to 40% O₂; a higher content of O₂ leads to combustion. Reaction conditions were a temperature of 575° C. and a duration of 24-29 sec. Analyses are given of liquid and gaseous reaction products, among which were hexane, hexene, heptane, heptene, benzene, toluene, and formaldehyde. Increase in O₂ concentration leads to increasing formation of aromatics, unsaturateds, and O-containing bodies. Whilst peroxides could not be identified in the cracked material, it is nevertheless suggested that they are the initial reaction products. O₂ concentrations >20% retard decomposition of octane to hydrocarbons and favour production of aldehydes and acids. Most critical condition of reaction is temperature. It is concluded that primary decomposition of the *n*-octane, both in presence and absence of O₂, is to heptene + methane and to hexene + ethane. Probable further reactions are suggested.

V. B.

630.* Cracking of Fuel Oils over Alumino-Silicate Catalyst. A. Ya. Larin. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 724-728.—Laboratory cracking experiments at 300-350° C. (at atmospheric pressure) showed that the new type of alumino-silicate catalyst employed had considerable activity at these comparatively low temperatures. Catalyst was regenerated by steaming and air-blowing at 450-475° C.; activity was still very marked after 37 cycles. General action of the catalyst is of a similar nature to that of AlCl₃. Cracking of various fuels (S.G. at 20° C, 0.900-0.930, I.B.P. 220-300° C.) yielded up to 80% of cracked distillate. Average gasoline yields were, 150° C. end-point (O.N. with 3 ml. T.E.L./Kg. = 89) 15%; 200° C. end-point 26%. Iodine values (Margaroches) of the cracked gasolines were 17-29.

V. B.

631. Patents on Cracking. C. W. Tyson and C. O. Tongberg (Standard Oil Development Co.). U.S.P. 2,349,478, 23.5.44. Appl. 12.6.40. During the catalytic cracking of hydrocarbon oil it has been found advantageous to maintain both cracking and regenerating zones under a total pressure in excess of two atms., and to keep a partial pressure of oil vapours within the cracking zone at not substantially greater than one atmosphere.

J. M. Barron (Texas Oil Co.). U.S.P. 2,349,603, 23.5.44. Appl. 2.7.43. In a combined thermal and catalytic cracking process, hydrocarbon oil is passed through a heating zone and thermally cracked. Resultant heated products are introduced into lower portion of a vertically disposed reaction chamber in which separation of vapours from liquid residue takes place. A residual stock is passed to upper portion of the chamber to flow countercurrently to upward rising vapours. A cracking temperature is maintained in reaction chamber and thermal cracking takes place. Liquid residue is withdrawn and subjected to coking. Vapours are fractionated to separate lower from higher-boiling fractions, and higher-boiling fractions are recycled to heating zone. Lower-boiling fractions are withdrawn from fractionating zone and combined with a straight-run condensate stock. The mixture is then catalytically cracked. Resultant products of catalytic cracking and a petroleum stock are combined with vapours from the coking operation and admixed constituents are fractionated to obtain a condensate fraction and a residual fraction. Residual fraction is used as stock introduced to upper portion of the vertically disposed reaction chamber, and condensate fraction is passed to fractionating zone.

H. O. Folkins and C. M. Thacker (Pure Oil Co.). U.S.P. 2,350,159, 30.5.44. Appl. 19.10.42. In a conversion process, hydrocarbons are cracked in presence of mercury and an aliphatic halide under conditions of temperature and pressure at which mercury and aliphatic halide are in vaporized state.

C. R. Wagner and C. M. Ridgeway (Pure Oil Co.). U.S.P. 2,350,204, 30.5.44. Appl. 18.3.39. In a process for converting hydrocarbon oil to gasoline boiling hydrocarbons, oil vapours are rapidly heated in a restricted stream in the absence of a catalyst by means of high temperature gases to approximately desired cracking temperature. Heated vapours are passed to a catalytic cracking zone substantially full of solid, comminuted catalyst. Vapours are passed through this cracking zone at a lower velocity than in heating zone. Catalyst in cracking zone is moved mechanically from inlet to outlet in a horizontal direction, and is continuously agitated. The zone is maintained at cracking temperature by means of combustion gases having a lower temperature than gases used to heat the vapour stream in absence of catalyst. Movement of catalyst is regulated in cracking zone so that its stay therein does not substantially exceed its efficient life. H. B. M.

Polymerization.

632. Patent on Polymerization. T. P. Remy, U.S.P. 2,350,330, 6.6.44. Appl. 28.9.38. A hydrocarbon mixture rich in olefins and aromatics is maintained in contact with a finely divided radio-active material at a high, non-cracking temperature. In this way polymerization and condensation are effected. H. B. M.

Alkylation.

633. Patent on Alkylation. J. A. Owen and E. E. Stahly (Standard Oil Development Co.). U.S.P. 2,349,458, 23.5.44. Appl. 26.11.38. To prepare a mixture consisting predominantly of saturated, branched chain, normally liquid hydrocarbons boiling in the gasoline range, at least one low boiling *isoparaffin* is reacted with at least one normally liquid paraffin of different molecular weight. Reaction is carried out under alkylation conditions in presence of a metal halide-aluminium halide double salt complex in which the metal is other than aluminium. H. B. M.

Isomerization.

634. Patents on Isomerization. H. Pines and H. S. Bloch. U.S.P. 2,349,516, 23.5.44. Appl. 31.5.41. Paraffins are passed in series through a number of solid masses comprising an isomerizing catalyst, the masses being maintained at successively lower isomerizing temperatures in direction of flow of the paraffins. Masses increase in volume as temperature decreases to provide a longer period of contact in the last than in the first mass of the series.

N. Fragen (Standard Oil Co. Chicago). U.S.P. 2,349,821, 30.5.44. Appl. 15.12.41. In an isomerization process for conversion of straight-chain hydrocarbons to branched-chain hydrocarbons, the aluminium halide-paraffinic hydrocarbon complex employed as catalyst increases substantially in viscosity with use. To regenerate the complex it is contacted with at least one *isoparaffin* hydrocarbon in presence of an activator affording a hydrogen halide under the reaction conditions. In this way its viscosity is substantially reduced and it can be returned to the isomerization process. H. B. M.

Chemical and Physical Refining.

635. Application of Contact Filtration in Refining High-Quality Lubricating Oils. P. L. Paul and I. A. Schwint. *Oil Gas J.*, 3.2.45, 43 (39), 38.—British-American's new refinery at Clarkson has a contact filtration unit using activated clay for processing motor and aviation lubricating oils. Continuous operation, flexibility in switching from one stock to another, low over-all process losses, and low labour cost in operating the 1000-brl.-per-day unit are features.

Basic equipment for contacting with activated clay consists of a mix tank, heater, contact, and stripping tower and filtering equipment to separate the clay from the oil.

The super-petrol fine-mesh clay is discharged into a 200-ton bulk clay storage bin and gravitated from a secondary 10-ton bin to a Syntron weight-feeder which discharges the clay from an endless belt into the mixing tank, the amount being

automatically controlled. Charge oil at the rate of 1000–1500 bbl. per day is pumped to the mix-tank with the required clay and mixed at a temperature of 180° F. The slurry is continuously pumped through a heat-exchanger to the Lummus radiant-type heater and thence to the vacuum contact tower, where the oil is stripped to remove volatile impurities, improve the emulsion characteristics, and ensure a colour stable and odour-free product.

The clay is removed from the oil in a continuous Oliver vacuum precoat filter by means of a knife-blade operating against a revolving drum. Hot flue gases from an inert gas generator blankets the filter shell to prevent oxidation and reduce fire hazards.

Oil flows from the filter through a heat exchanger to a blotter press for secondary filtration and then through a final cooler to the finished oil rundown tank.

G. A. C.

636. Patent on Chemical and Physical Refining. T. L. McNamara and L. M. Henderson (Pure Oil Co.). U.S.P. 2,350,176, 30.5.44. Appl. 30.12.40. Weakly acidic substances are removed from hydrocarbon liquids by contacting the liquids with aqueous alkali metal hydroxide solution to which has been added material selected from the group consisting of acid oil and the reaction product of alkali metal hydroxide and acid oil. Constituents soluble in aqueous alkali solution having a pH between 7 and 9 are removed from the acid oil prior to contact with the hydrocarbon liquids.

H. B. M.

Special Processes.

637. Patents on Special Processes. A. L. Conn (Standard Oil Co., Chicago), U.S.P. 2,349,574, 23.5.44. Appl. 21.8.40. In a conversion process, hydrocarbon oil vapours are contacted with a powdered catalyst in a number of stages, employing different grades and particle sizes of catalyst. In at least two stages enlarged reaction zones are employed and upward flow of vapours is procured through these zones. Conditions of catalyst sedimentation are regulated to provide a different time of exposure of catalyst to oil vapours in the different zones.

R. B. Day and E. R. Kanhofer (Universal Oil Products Co.). U.S.P. 2,349,812, 30.5.44. Appl. 14.4.41. To improve a gasoline fraction of relatively low anti-knock value it is introduced into a reaction chamber containing (a) a paraffin dehydrogenation catalyst and (b) an olefin isomerizing catalyst. Fraction is passed through (a) at a space velocity sufficient to effect substantial dehydrogenation and afterwards through (b) at a space velocity designed to isomerize olefins formed by dehydrogenation.

L. Schmerling and V. N. Ipatieff (Universal Oil Products Co.). U.S.P. 2,349,834, 30.5.44. Appl. 12.4.41. To produce a substantial yield of mono-alkyl aromatic hydrocarbon from a poly-alkyl aromatic hydrocarbon, the latter is subjected, together with a non-alkylated aromatic hydrocarbon, hydrogen and hydrogen chloride, to contact with a zinc chloride-containing catalyst. Process is carried out at a dealkylating temperature between 100° and 500° C.

F. E. Frey and H. J. Hepp (Phillips Petroleum Co.). U.S.P. 2,350,501, 6.6.41. Appl. 19.10.36. Synthetic, predominantly branched paraffins within the motor-fuel boiling range are produced from paraffins and olefins of lower molecular weight as follows. A stream of paraffins is maintained at a pressure above 1000 lb./sq. in. and at a reaction temperature at which only slight cracking occurs. A low-boiling olefin hydrocarbon material is dispersed in the stream in such a way that concentration of unreacted olefin does not exceed 10% by weight. Afterwards a second and different low-boiling olefin material is dispersed in the stream in such a way that the concentration of unreacted olefin does not exceed 10% by weight. Synthetic paraffins are thus formed by reaction of olefins with paraffins, and these can be separated from the reaction mixture.

H. B. M.

Safety Precautions.

638. Safety in the Refinery. J. K. Skipton. *Petrol. Engr.*, January, 1945, 16 (4), 190.—Despite the continuing interest of managements in the prevention of accidents,

the stress of war conditions has caused an increase in mishaps, with consequent injury and deaths.

A safety engineer in whatever organisational set-up used should work closely with all departmental heads, learn their problems, and contribute to the solution of same. Safety cannot be established by special campaigns from outside the department, but must be supplemented by a programme within each section. New problems are always arising. For example, the employment of substitute materials with less resistance to corrosion than those formerly employed should give rise to intensification of inspection and replacement activities. Constant checks are required where materials are used which have never been employed previously under the conditions now faced.

Precautions taken to prevent and combat fires are, in the main, effective. Where a fire is caused by carelessness there is also evidence of management failure. Safety training must be constant, and a plant environment created in which carelessness has the least chance to cause serious fires. Static charges and electrical equipment can cause fires, and steps must be taken to prevent these. Hazards caused by sparks from steel tools must be studied.

Good housekeeping—that is, cleanliness in the refinery, use of correct cleaning materials, and clearance of passage-ways—must be insisted upon. All leaky fittings should be promptly repaired. The conditions inside vessels should be visually inspected to determine whether they are really safe, even when the atmosphere has been found so by a gas indicator. Canister-type masks have a time limit on their effectiveness, depending on concentration of gas, and they provide no protection at all against an atmosphere deficient in oxygen. No man should enter a dangerous atmosphere unless help is at hand to remove him in case of accident, and life-lines should be worn.

Welding operations should be kept as much as possible away from danger spots, and no such job should be started without the permission of a safety official.

The hazards of steam-raising plant, walkways, and in the use of internal-combustion engines should be studied. All employees should be required to obtain first-aid treatment for even the slightest injury. The American Petroleum Institute and the National Safety Council publish much helpful information on the problems, which is available to safety officers.

G. A. C.

PRODUCTS.

Chemistry and Physics.

639. Heats of Combustion of Benzene, Toluene, Ethyl Benzene, *o*-Xylene, *m*-Xylene, *p*-Xylene, *n*-Propylbenzene, and Styrene. E. J. Prosen, R. Gilmont, and F. D. Rossini. *Bur. Stan. J. Res. Wash.*, January, 1945, **34** (1), 65.—Heats of combustion in kilocalories per mole at 25° C. and at constant pressure of the above liquid hydrocarbons in gaseous oxygen to form gaseous carbon dioxide and liquid water have been determined as follows: benzene 780.98 ± 0.10 , toluene 934.50 ± 0.12 , ethyl benzene 1091.03 ± 0.17 , *o*-xylene 1088.16 ± 0.24 , *m*-xylene 1087.92 ± 0.15 , *p*-xylene 1088.16 ± 0.22 , *n*-propyl benzene 1247.19 ± 0.16 , and styrene 1050.40 ± 0.20 . C. L. G.

640. Heats of Formation and Combustion of 1 : 3-Butadiene and Styrene. E. J. Prosen and F. D. Rossini. *Bur. Stan. J. Res. Wash.*, January, 1945, **34** (1), 59.—Heats of formation and combustion of gaseous and liquid 1 : 3-butadiene and styrene at 25° C. in kg. cal./mole have been determined as follows:—

		Heat of combustion.	Heat of formation.
1 : 3-Butadiene	(gas).	607.907 ± 0.225	26.748 ± 0.233
"	(liquid)	602.788 ± 0.226	21.629 ± 0.234
Styrene	(gas).	1060.79 ± 0.22	35.106 ± 0.243
"	(liquid)	1050.40 ± 0.20	24.716 ± 0.221

C. L. G.

641.* Influence of Point of Initiation on Parameters of an Air Impact Wave on Detonation of Explosive Gaseous Mixtures. A. A. Grib. *Applied Maths and Mech.*, (*U.S.S.R.*), 1944, **8**, 273-286.—The paper deals with the unidimensional detonation

of an explosive gas mixture and with the air impact wave generated by detonation. Parameters considered are velocity of detonation, pressure, density, velocity of gaseous components and temperature. Mathematical discussion is divided into three parts, dealing with determination of parameters of the detonating wave, with air impact wave due to detonation, and with the case where an explosive mixture is initiated at the mid-point of the space it occupies. Actual examples are worked out, from experimental data obtained for mixtures of oxygen with methane, ethylene, and acetylene, both for initial pressures equal to atmospheric and to 600 atm. V. B.

642.* Investigations on Recovery of Vapours of Volatile Solvents on Solid Sorbents. VI. Heat Effects on the Sorption of Vapours of Volatile Solvents under Conditions of their Recovery. Sorption of Vapours of Benzene and Ethyl Alcohol on Charcoal. E. V. Alekseevskii and N. D. Gorchakov. *J. Appl. Chem. (U.S.S.R.)*, 1944, **17**, 289-298.—Experiments were made with layers of activated charcoal varying from 10 to 40 cm. in length and with vapour concentrations of 10.9 to 29 mg./litre. Charcoal used, dried at 120° C., had a diameter of 3 mm. and a density of 0.5. Velocity of vapour was 1.5 litres/min./cm.². Temperature rises of up to 40.5° C. were observed. Temperature distribution is uneven along the charcoal layer and temperature rise moves backwards from front layers. Rise of temperature is sufficient markedly to affect dynamic coefficients of the system and also degree of protection afforded; account of such "thermal errors" should therefore be taken in vapour-recovery plant design. Results are presented graphically. Rise in temperature is approximately linearly proportional to concentration of vapour when this latter exceeds about 15 mg./litre. V. B.

643. New Observations on Contact-Catalytic Transformations of Six-membered Rings into Five-membered. N. I. Shuikin. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Chim.*, 1944, 440-445.—It is known that isomerizing action of AlCl₃ increases in presence of traces of H₂O. This is probably due to nascent HCl formed by hydrolysis. Chlorocyclohexane, obtained by direct photochemical chlorination of cyclohexane, was passed, in a slight current of N₂ at 300° C., over a catalysts composed of 90% Al₂O₃ and 10% Fe₂O₃. (Chlorocyclohexane was also prepared from the 76-82° C. fraction of Surakhani and Maikop straight-run gasolines, which fractions were found to contain 42% and 30%, respectively, of cyclohexane.) Over 99% of the chlorocyclohexane loses HCl. Principal reaction product (app. 33%) was 1-methylcyclopentene-1, formed by isomerization of cyclohexene (app. 13%) which is also produced. A smaller quantity (app. 7%) of 1-methylcyclopentene-2 was also formed. It is concluded that isomerization is caused by nascent HCl split off from the chlorocyclohexane. V. B.

Analysis and Testing.

644. Hydrocarbon Analysis with Infra-red Spectrophotometer. A. O. Beckman. *Petrol. Engr.*, January, 1945, **16** (4), 173.—The spectrophotometer, an instrument designed to measure accurately radiant energy of a given spectral quality as defined by its wave-length, consists in its simplest form of a light-source, an entrance-slit, a concave mirror, a prism, an exit slit, a sample cell, and a phototube and amplifier circuit for measuring radiant energy. With the sample cell empty and the spectrophotometer set for the desired wave-length, the slit openings may be adjusted until a reading of 100% is obtained on the light-measuring scale, corresponding to no absorption or 100% transmission of the radiation. With a sample in the cell, the amount of light transmitted will be decreased if the sample absorbs some of the light, and absorption will vary with the wave-length. By plotting percentage transmission versus wave-length, the light-absorption pattern for the sample can be depicted. No two patterns are exactly alike; thus positive identification of chemical compounds is possible.

It is necessary to use an infra-red spectrophotometer for the analysis of most hydrocarbons, because saturated hydrocarbons and mono-olefins do not absorb in the ultra-violet region, and a visible spectrophotometer is of no value.

In conventional spectrophotometers the wave-length setting is adjusted continuously by the rotation of a screw mechanism, but in an instrument designed primarily

for routine hydrocarbon analysis the prism is set to a number of pre-selected wave-lengths by means of a turret-stop mechanism, which is a time-saving device.

A convenient gas-handling system is provided, the pressure being adjusted by a mercury piston. A radiation thermocouple is used to measure the infra-red radiation. To analyse a mixture of normal and *isobutanes* it is merely necessary to use a gas sample at a pressure corresponding to that used to produce curves of per cent. transmission versus per cent. *isobutane* for various total pressures of the gas sample in an absorption cell 15 cm. long. The per cent. transmission of the sample can be converted directly into per cent. *isobutane*.

A complete analysis requires about 15 min., and the accuracy is about 0.5% of the total sample.

For multi-component analysis, optical density is determined at different wave-lengths in place of per cent. transmission, substituting in equations, and solving them simultaneously for the mol fractions of each component. A typical analysis of a seven component C_4 hydrocarbon mixture can be made in about 40 min., including the time required for calculating.

The infra-red spectrophotometer has established itself as a practical instrument for process control in the refinery; in one butadiene plant alone, over 12,000 C_4 analyses were made in less than one year. Considerable progress has been made in analysing complex hydrocarbon mixtures entirely automatically, as is done with ultra-violet equipment used for butadiene plants.

G. A. C.

645.* Quantitative Removal of Tetra-ethyl Lead from Ethylized Motor Fuels. N. G. Titov. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 690-694.—Existing methods for removal of T.E.L. from gasolines tend to alter characteristics of the latter, either chemically as by action of the reagent (*e.g.*, Br) used or else physically by loss of light ends in handling. It is shown that T.E.L. may be totally removed from fuels by agitating the latter with 4 vols. of glacial acetic acid, in a sealed container at 75-80° C. for 3 hr. After cooling, the acetic acid, containing the Pb in solution, is removed by water-washing the gasoline. Estimation of Pb content of acid extract may be made either gravimetrically (as $PbSO_4$), or else volumetrically by titration with ammonium molybdate. For T.E.L. contents of about 3 gm. T.E.L./kg. it is sufficient to take 20 ml. gasoline for analysis. Results are given of analyses of gasolines of known T.E.L. content by this method and also demonstrating that gasoline characteristics are substantially unaffected by treatment with glacial acetic acid.

V. B.

646. Estimation of Small Quantities of Diphenylamine. H. Barnes. *Analyst*, 1944, 69, 344.—The amine is oxidized in acid solution to diphenylamine violet and coloration so produced is measured by a Spekker Absorptiometer.

C. F. M.

647.* New Method for Determining Dry Residue in Water, Brine, and other Saline Solutions. I. V. Tananaev and M. I. Levina. *J. Appl. Chem. (U.S.S.R.)*, 1944, 17, 356-361.—Determination of solids in waters containing chlorides of Mg and Ca is complicated by formation of hydrates, difficult to dry. Normal method of using Na_2CO_3 has certain disadvantages, such as hygroscopicity of the carbonate residue and sputtering on drying. A more rapid and convenient method is afforded by use of NaF, which does not form hydrates, loses all water at 120° C. and is stable to at least 200° C. Experiments with solutions of $MgCl_2$ and $CaCl_2$, of known strength, demonstrate reliability of the method. Analyses of 11 samples of waters, using both Na_2CO_3 and NaF methods, shows good agreement. The NaF method is also applicable to determination of H_2O in hydrated salts of heavy metals.

V. B.

648.* A Method for the Analysis of Nitrous Oxide in Natural Waters. E. K. Gerling, G. M. Ermolin, and N. V. Baranovskaya. *J. Appl. Chem. (U.S.S.R.)*, 1944, 17, 213-218.—By use of specially constructed apparatus, the presence of small amounts of N_2O in natural waters of Tataria region, U.S.S.R., was proved. It is pointed out that unless the presence of this gas is taken into consideration it may be mistaken for condensable hydrocarbons, particularly as it may occur in quantities considerably greater than do the latter.

V. B.

649. Improved Still-Head Designs for Laboratory Fractionating Columns. G. Patrick. *Chem. and Ind.*, 1945, 74-75.—A total condensation-variable take-off head suitable for use at atmospheric or reduced pressure is described. The take-off is regulated by mercury, and it is claimed that rates as slow as one drop in 2 min. are easily obtainable. C. F. M.

650. Use of Azeotropes in Separation of Aromatic, Saturated, and Unsaturated Constituents of Hydrocarbon Fractions from Carbonization of Coal. Part I. Separation of Benzene and Toluene from Vertical-retort Toluoles. E. A. Coulson and E. C. Holt. *J. Soc. Chem. Ind.*, 1944, 63, 329-333.—Benzene and toluene of purity 97-100% in yields between 80% and 90% of that present can be separated from crude benzole fractions which contain unsaturated, naphthene, and paraffin hydrocarbons in addition to the aromatics by combinations of straight fractionation and fractionation of suitable azeotropic mixtures. Of the azeotrope-formers used, ethyl alcohol and acetonitrile gave most favourable results, but methyl and isopropyl alcohols, acetone and methyl ethyl ketone, and acetic acid have also been examined. C. F. M.

651. Use of Azeotrope-forming Substances in Separation of Light Hydrocarbon Fractions from Carbonization of Coal into Aromatic, Saturated, and Unsaturated Constituents. II. Separation of Saturated Hydrocarbons and Styrene from Xylole Fractions. E. A. Coulson, E. C. Holt, and A. Sleven. *J. Soc. Chem. Ind.*, 1944, 63, 333-336.—Rich fractions containing about 50% of styrene can be separated from crude coal-tar naphthas by efficient fractional distillation at suitably reduced pressure. Pure monomeric styrene and xylene can be separated with fair completeness from these fractions by azeotropic fractional distillation at normal or reduced pressures using ethylene glycol mono-methyl ether as third component and a column equivalent to 36 theoretical plates. Amount of styrene isolated from typical crude naphthas was 1.5-1.8% and from a typical solvent naphtha 7.3%. Saturated hydrocarbons present in xylole fractions and of boiling points close to those of the xylenes can be separated with much greater ease by azeotropic fractionation using the same azeotrope-former. C. F. M.

652. Patent on Analysis and Testing. A. L. M. A. Rouy (Gyro-Balance Corp.), U.S.P. 2,349,563, 23.5.44. Appl. 30.8.41. To measure its lubricating characteristics, a lubricant is applied between a bearing and a balanced shaft supported therein. Rotation of the shaft is started and angular speed is gradually increased. During starting and rotation the force of friction caused is measured, also the speed of rotation at each measurement of force, to determine angular speed at which such force is least. In this way it is possible to find the angular speed at which the oil forms a continuous film between bearing and shaft. H. B. M.

Crude Oil.

653. China Produces Fuels from Vegetable Oils. Fa-Wu Cheng. *Chem. Met. Eng.*, 1945, 52, 99.—In 1937 China turned to tung and other vegetable oils as sources of petroleum products. The oils were cracked by high and atmospheric pressure processes, with and without catalysts. The fatty acids only suffered decomposition.

For pressure cracking, large direct-fired bombs were employed, the oil being pumped or sprayed through nozzles into the reaction chamber at such a rate as to maintain a constant level. When temperatures of 400-500° C. and pressures of 50-150 p.s.i. were attained, the release valve was opened into a distillate receiver. Cracking rate was controlled by heat input and regulation of the release valve. A 75% yield of "crude oil," characterized by an acid value of about 30, was obtained.

In the atmospheric pressure process, the raw vegetable oil was charged alone into the retort or admixed with 1-5% of $AlCl_3$. More often the oil was transformed into calcium soaps before cracking. The latter were subjected to high temperatures in 50-100-gallon cast-iron retorts, a 55% yield of neutral "crude oil" being obtained. The respective "crude oils" possessed the following average distillation characteristics:—

Fraction.	Boiling range.	Yield %.		Colour.
		Pressure cracking.	Soap cracking.	
Light oil (gasoline) . . .	Below 200° C.	50	20	Yellow
Medium „ (kerosine) . . .	„ 200–280° C.	30	20	„
Heavy „ (fuel oils) . . .	„ 280–350° C.	20	50	Brown
Residue (lubricants) . . .	Over 350° C.	—	10	Black
				L. B.

654. Yields from Crude Oil. W. L. Nelson. *Oil Gas J.*, 24.2.45, 43 (42), 151.—The Refiner's Notebook Nos. 24 and 26 on Crude Distillation and Evaluation Curves are continued, the evaluation curves of a 37° A.P.I. paraffin intermediate base crude being shown. One break-up of the crude oil is given and the yields and properties of raw aviation gasoline, naphtha, kerosine, diesel fuel, and topped crude estimated. By using the plant operations costs of Refiner's Notebook No. 27 (27th January, 1945) and current prices of products and crude oil it is possible to estimate profit per barrel of crude oil. G. A. C.

Gas.

655. More Industries Using Helium. Bureau of Mines Reports. Anon. *Petrol. Engr.*, January, 1945, 16 (4), 144.—Five Bureau of Mines plants annually produce more than twenty-five times the pre-war volume of helium.

The Bureau is the sole producer of this gas and state that despite the steady increase in commercial orders (about 250,000 cu. ft. now being diverted monthly to commercial distributors) and the millions of cubic feet used monthly by government agencies, even greater quantities are available for industrial and medical uses. G. A. C.

Lubricants.

656.* Variation of Viscosity with Temperature and Concentration, in Lubricating Oils Containing High- and Low-viscosity Additives. M. M. Kusakov. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 672–684.—Viscosity determinations on additive-containing oils were made in an Ubbelohde viscometer in a special thermostat capable of maintaining a wide range (–50° to 100° C.) of accurately controlled (0.2–0.3°) temperatures. High-viscosity additives used were “paraton,” “superol,” and “vinipol,” the two latter being polymerized vinyl esters; gasoline was used as low-viscosity additive. At low temperatures viscosity determinations were carried out with a small applied pressure; limiting value of viscosity attained (at pressures in region of 400 mm. H₂O) was taken as true value. Effect of additives may be expressed by the relationship $\eta = \eta_0 e^{ac}$, where c is the concentration (wt. %) of additive and a is a constant. In the case of viscous additives a is positive and characteristic of the additive, being independent of temperature. Relationship holds for such light products as gas oil and kerosine and for additive concentrations up to 15–20%. In the case of additives of low viscosity (*i.e.*, gasoline) constant a becomes negative and varies with temperature, increasing as the latter falls. Effect of gasoline in lowering viscosity is more marked the greater the original viscosity. C_n (the concentration of gasoline required to lower oil viscosity to 1/ n th of its original value) is found to be a linear function of temperature when the latter is positive. Above relationships are of considerable value in preparation of blends having required viscosity characteristics. Effect of both types of additives is to cause a flattening of the viscosity/temperature curve. In the case of simultaneous addition of viscous and non-viscous additives the effect of the former is independent of that of the latter. Results are presented graphically in numerous diagrams. V. B.

657. Patents on Lubricants. R. Reuter (Atlantic Refining Co.). U.S.P. 2,349,462, 23.5.44. Appl. 20.2.40. An addition agent for lubricating oils is prepared by reacting an ester of phosphorus acid with an alkyl roxy alkanol under controlled conditions of temperature and time.

J. Faust (L. Sonneborn Sons, Inc.). U.S.P. 2,349,785, 23.5.44. Appl. 15.7.43. A corrosion inhibitor for lubricating oils is prepared by reacting mahogany petroleum

sulphonate with phosphorus pentasulphine. The inhibitor is added to oil which is normally corrosive to cadmium-silver and copper-lead bearings.

B. B. Farrington, J. O. Clayton, and D. E. Etzler (Standard Oil Co. of California). U.S.P. 2,349,817, 30.5.44. Appl. 8.3.40. An addition agent for lubricating oil normally tending to deteriorate under operating conditions of internal-combustion engines comprises an oil-soluble metal salt of an acid of the type $\text{HOOC}-(\text{CH}_2)_n-\text{COOH}$, in which "n" is a whole number and in which hydrocarbon radicals may replace one or more hydrogen atoms of the $-\text{CH}_2-$ groups. At least two polar radicals have been substituted for hydrogen atoms carried by carbon atoms other than that of the salt-forming carboxylic acid group.

A. B. Hale (Gulf Oil Corp.). U.S.P. 2,349,861, 30.5.44. Appl. 12.2.42. A heavy lubricant is prepared by reacting 100 parts of a mixture of petroleum asphalt and petroleum lubricating oil with 5-15 parts of sulphur. The oil has a Saybolt-universal viscosity of 100-500 sec. at 100° F., and mixture contains not less than 35 nor more than 65 parts of either oil or asphalt. The reaction is carried out at a temperature of 350-350° F.

W. J. Backoff, N. D. Williams, J. F. O'Loughlin, and H. L. Moir (Pure Oil Co.). U.S.P. 2,350,145, 30.5.44. Appl. 10.10.40. A gum solvent for deposits in internal combustion engines comprises a major portion of mineral oil or pine oil boiling 350-380° F., 5% by volume of aliphatic alcohol boiling above 350° F., and 5% by volume of material boiling below 350° F. selected from the group consisting of esters of aliphatic acids, aliphatic ketones, and aliphatic alcohols.

O. M. Reiff (Socony-Vacuum Oil Co.). U.S.P. 2,350,368, 6.6.44. Appl. 23.4.40. A mineral oil lubricant has admixed with it a small amount of an oil-miscible, substantially stable monosulphide of an alkyl-substituted hydroxyaromatic hydrocarbon in which the hydroxyl hydrogen is substituted with the radical of an oxyacid which remains after removal of an acidic hydroxyl group.

L. E. Beare (Sinclair Refining Co.). U.S.P. 2,350,489, 6.6.44. Appl. 5.4.41. A lubricant is prepared from a mineral oil, a metal soap of an aromatic fatty acid, and a compound of the group consisting of alizarin and fatty acid esters thereof. The metal soap is present in sufficient quantity to impart corrosiveness to the oil, and the alizarin and fatty acid esters are in amount sufficient to inhibit said corrosiveness.

H. B. M.

Bitumen, Asphalt and Tar.

658.* **Investigation of Putilov Asphalt.** P. I. Sanin and V. G. Putzillo. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 734-739.—Asphalt obtained from Putilov (Leningrad area) had the following analysis (% on the organic portion): C 86.3, H 9.1, N 1.7, S 0.9, O (by difference) 2.0. Ash content of a sample free from visible impurities was 1.8%. Material soluble in successive extraction with solvents was: petroleum ether 7.0, benzol 14.0, CHCl_3 6.8%, leaving 72.2% insoluble. Analyses are given of various extracted portions and the residue. Genesis of the asphalt is discussed, particularly with reference to its possible migration and to relationship between chemical analysis and geological findings. Previous work of this nature is reviewed.

V. B.

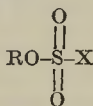
659.* **Thermal Solution of Sadkin Asphalt as a Method of Obtaining Synthetic Liquid Fuel.** M. K. D'yakova and I. L. Tzitron. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 740-744.—The Sadkin asphalt deposit is one of the largest in the U.S.S.R. The asphalt is friable, low in ash (1.1-1.3%), high in S (7.0%), and almost completely soluble in benzene. Ash contains 31.7% of V. The asphalt is now being used for road coating and other subsidiary uses. The most satisfactory way of utilizing it and of recovering the V would be to hydrogenate it. As this is not at present possible, tests were made to determine yields of different products obtainable by the process of thermal solution. From numerous experiments it is concluded that optimum conditions are: temp. 430-440° C., pressure 25-30 atm., and duration 15-30 min. A 1:1 asphalt:solvent ratio is employed, the latter being a 300-360° C. petroleum fraction, which is completely regenerated in the process. Yield of crude gasoline (end point 230° C.) is 30%, with 8-10% of gas and 56% of coke, both of which can be used as fuel. The coke is also a source of V.

V. B.

660. Patents on Bitumen, Asphalt and Tar. F. B. McGrane (Colprovia Roads), U.S.P. 2,349,445, 23.5.44. Appl. 8.5.40. In manufacture of paving composition a normally solid bituminous cement is employed, also powdered hard bitumen and a substantially non-volatile flux oil (viscosity Furol at 122° F., 100–2500 sec.). The bituminous cement is mixed in liquid state with the flux oil and particles of aggregate are coated with the mixture. Flux oil acts as a carrier for bituminous cement which is not amalgamated with it. Afterwards powdered hard bitumen is incorporated and distributed throughout the mass. The consolidated composition produces a pavement resistant to internal movement, in which aggregate particles are bonded both by bituminous cement and by cement resulting from amalgamation of flux oil and powdered bitumen.

F. B. McGrane (Colprovia Roads). U.S.P. 2,349,466, 23.5.44. Appl. 9.5.40. In preparation of bituminous paving composition, a first batch portion is prepared by mixing relatively coarse aggregate particles with bituminous cement in liquid form so that all particles are coated. A second batch portion is separately prepared by mixing relatively fine aggregate particles with fluxing oil and powdered hard bitumen adapted to amalgamate gradually with the fluxing oil. In this way particles become coated and flux and hard bitumen are distributed substantially evenly throughout. Finally the two batch portions are mixed together. Mixing is continued until they are distributed substantially evenly throughout each other.

J. M. Hoeffelman (Shell Development Co.). U.S.P. 2,350,279, 30.5.44. Appl. 1.11.40. A surfacing material consists of mineral aggregates which have been coated with a substantially asphalt-free mineral lubricating oil reacted with 0.2–5% by weight of a sulpho compound of formula



R is a primary alkyl group having up to 8 carbon atoms, and X is an organic radical of the class consisting of hydroxyl, primary alkoxy, and aryl radicals. H. B. M.

Special Hydrocarbon Products.

661. D.D.T. Thanite Sprays for Mosquitoes. P. L. Rice, C. B. Huffaker, and R. C. Back. *Soap*, March, 1945, **21** (3), 119.—Biological tests have been carried out in a Peet Grady chamber on the toxicity of sprays of D.D.T. Thanite, and pyrethrum to adult mosquitoes (*Anopheles quadrimaculatus* Say.) using half of the normal dosage for flies and a quarter of the usual exposure period, to simulate field conditions. With sprays containing (a) 1% Pyrethrol "20," (b) 1% D.D.T., (c) 0.2% D.D.T. + 0.8% Thanite, and (d) 0.4% D.D.T. + 0.6% Thanite, knockdowns of 97, 57, 92, and 86, respectively, were obtained. The kills after 24 hr. (including moribund insects) were 94, 100, 96, and 99. Thus 1% D.D.T. gives a complete kill, but knockdown is slow. Satisfactory replacement of 1% pyrethrum can be obtained with 0.2% D.D.T. and 0.8% Thanite, apart from a slightly lower knockdown. Similar high kills were also given with 0.5% solution. Field tests on mosquitoes in cages in the open air, using 1.5% solutions, gave results of a similar order, though kills and knockdown were generally lower. C. L. G.

662. Oil Types Used in Pest Control Work. Anon. *Soap*, March, 1945, **21** (3), 115.—Average analysis and trade names are given of a range of marketed grades of cleaners' naphtha, V.M. & P. naphtha, Stoddard solvent, kerosine (regular and refined), mineral seal oil, and furnace fuel oil, as used by pest control operators. Only the higher-boiling ranges of cleaners' naphtha and V.M. & P. naphtha are used, owing to fire risk, the uses being mainly for removing stains and mixing chemicals. Stoddard solvent is preferred to kerosine for bed-bug sprays and moth sprays, owing to more rapid evaporation, but in a closed room may have unpleasant effects. The regular and refined grades of kerosine differ mainly in the heaviness of the treatment given to improve odour. Straight kerosines are used in wood preservative sprays against powder-post beetle and termites, semi-refined grades for bed-bug sprays and some

fly-sprays, while the highly refined grades are used for sprays where odour is of primary importance—*e.g.*, around food materials. Mineral seal and fuel oils are used as diluents for termite soil poisons and to some extent as solvents for wood-treating chemicals such as pentachlorophenol, and for mosquito control. C. L. G.

663. Petroleum Oils used by Pest Control Operators : Specifications and Terminology of Base Oils for Bed-Bug Sprays. G. L. Hockenyos and B. L. Patton. *Soap and San. Chem.*, 1945, 21 (3), 109.—Suitable petroleum base oils have a boiling range of 350–530° F., a minimum flash point of 120° F. (closed Tagliabue), and are neutral to phenolphthalein. The question of odour is open to controversy, and is a matter to be agreed between buyer and seller. Staining, however, is important; the product should be light in colour, clear, and free from suspended matter. The most rigorous requirements in this respect can be met with an oil of Saybolt colour + 25.

The merits of a number of solvents—*e.g.*, cleaners' naphtha, varnish-makers' and painters' naphtha, Stoddard solvent, and kerosine—are considered in some detail.

L. B.

Derived Chemical Products.

664. New Products Developed from Natural Gas. E. P. Schoch. *Oil & Gas J.*, 10.3.45, 43 (43), 63.—An outline of researches undertaken by Texas University to develop methods for more efficient utilization of vast hydrocarbon reserves of that State. While the Fischer-Tropsch process can be based on methane, it is not really needed in the process, since the reagents can be made directly by the action of steam on coke.

A study has been made of the effect of an electrical discharge on natural gas, resulting in a process for making acetylene. Work is now in progress to determine the economic possibilities, it being suggested that butadiene could be produced from this acetylene for sale at 9½ cents per lb.

Acetylene is now very largely used for making plastics, rubber, and chemicals, and there is likely to be a large post-war demand. A production of 100,000 tons of acetylene from natural gas in Texas would result in products worth \$80,000,000 and bring \$2,000,000 to the gas-well owners, based on an average price of the plastic at about 40 cents per lb. Unfortunately the process was not far enough developed at the time of Pearl Harbour to have it included in the rubber programme. It is thought that the electric discharge could be adapted to produce ethylene, higher olefines, diolefines, aldehydes, ketones, and acids from methane. G. A. C.

665. Chlorination of Pentane from Petroleum and Obtention of Amyl Alcohol and Amyl Acetate. S. S. Nametkin and A. G. Serebrennikova. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 695–708.—The petroleum fraction used in these experiments was a Grozny casinghead gasoline containing 30–40% of C₅ cut (boiling range 20–40° C.), composed of 65% *iso*-pentane and 35% *n*-pentane. From numerous chlorination experiments it is concluded that to avoid excessive formation of higher chlorides it is necessary to use dry Cl, and that the pentane:Cl ratio should be < 6:1. An operating temperature of 200–250° C. is recommended. Use of Ag reaction vessels was unsuccessful, but Fe was satisfactory. Production of pentane polychlorides should not exceed 3–5%. Hydrolysis of pentane chlorides to alcohols is an easier problem than production of the chlorides. Best results are obtained by using caustic soda, with oleic acid as an emulsifying agent. Complete hydrolysis occurs at 170–180° C. in 1 hr. under 17–18 atm. pressure; these conditions result in minimum production of pentenes. Substitution of caustic soda by lime was not satisfactory. In place of oleic acid sodium naphthenates could be used; they, however, require a higher reaction temperature, a longer duration, and their use is not recommended. The mixed amyl alcohols produced may be esterified with 60% acetic acid using petroleum sulphonic acids as catalyst. V. B.

Coal, Shale and Peat.

666.* New Method for Separation of Styrene from Crude Benzol. A. N. Bashkirov and N. M. Karavaev. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 763–772.—Crude benzol from U.S.S.R. coke-ovens contains 0.7–1.6% of styrene, which is con-

contrated in the xylol (135–150° C.) fraction, of which it forms approximately 20%. The styrene can be separated by chlorination (at a temperature $>5^{\circ}$ C.), forming styrene dichloride which boils approximately 100° C. higher than xylol, and from which it may be separated by vacuum distillation. A 95% yield of the dichloro-compound is obtainable. The styrene may be regenerated by de-chlorination over a catalyst formed by reduction (at 500–550° C.) of bog-iron ore. De-chlorination, carried out in the vapour phase (15–20 mm. pressure) at 175–180° C., is strongly exothermic and cooling arrangements must be made. Yield of styrene from dichloro-compound is 90%. The product obtained is of high purity.

V. B.

667.* Organic Substances of Combustible Shales. V. A. Lanin and M. V. Pronina. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 745–751.—Two samples of shale (analyses given) from Gdovsk and Volzhsk, were oxidized by alkaline KMnO_4 (Bone's method, cf. *Proc. Roy. Soc.*, 1926, **110**, 537; 1935, **143**, 492). Composition of oxidation products varied with time of oxidation, 500 hr. being required for the completion of the reaction. Among oxidation products of Gdovsk shale there were identified CO_2 , acetic, oxalic, and succinic acids. Benzene-carboxylic acids were absent. Similar treatment of Volzhsk shale gave, in addition to above products, also adipic, phthalic, and benzene tri-tetra- and penta-carboxylic acids. Amount of aromatic acids present was small, accounting for only 1.72% of the C in the shale. These results classify Gdovsk shale as belonging to the purely sapropelite group, whilst presence of aromatic compounds puts Volzhsk shale amongst the sapropelite-humus type.

V. B.

668. Australian Shale Oil. Production and Plant Design at Glen Davis. Anon. *Chem. Age*, 1945, **52**, 177.—Australian oil-shale deposits, known since 1802, were exploited to a slight extent last century. Operations have been recently restarted at Glen Davis (N.S.W.), abandoned since production ceased in 1922. 108 retorts (48 of a new type) are in use or projected, and weekly output of oil is 100,000 gal. It is proposed to extract ammonia and gasoline from the 10 million ft.³ of gas produced daily. The oil is cracked in a Dubbs unit with which is associated a U.O.P. polymerization plant. Daily yield of finished gasoline is 1000 brl. Coke from the cracking plant (analysis given) is at present used for fuel, but its low ash content suggests possible employment for electrode manufacture.

S. J. L.

669.* Motor Fuel from Coals of Baikamov Seam of Lenin Deposit of Kuzbass and from Cheremkhovski Deposit of Irkutsk Basin. B. K. Klimov, V. A. Lanin, M. S. Gorokholinskaya, and N. G. Edel'shtein. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 752–762.—Aim of the investigation was to determine yields of motor fuels from humus coals of W. Siberia. Coals were semi-coked in revolving retorts and volatile products recovered by distillation of resulting tar, together with a small amount of gasoline recovered by stripping the gas produced. Baikamov coal yielded a total of 0.39% refined gasoline (d_4^{20} , 0.778, end point 182° C., 26% at 100° C.), 0.47% of naphtha (180–225° C.), and 2.23% of Diesel fuel (225–325° C.). Refining of the gasoline was carried out in vapour phase with activated clay and then with $\frac{1}{2}$ % of conc. H_2SO_4 . High losses were incurred, 11% and 13.5% respectively at each stage. Finished product had a low aromatic (4%) content and a large proportion of unsaturates (63%); iodine value was 111. Its O.N. (Motor) was 75. Cheremovski coal gave a somewhat higher (0.76%) yield of a similar gasoline. In view of low gasoline yields it is suggested that, from the point of view of motor-fuel production, it is preferable to use the semi-coke in producer-gas vehicles.

V. B.

670.* Distribution of Combustion Sites in the Stream Underground Gas-generator. A. B. Chernuishev and I. L. Ferberov. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 841–845.—In contrast to a gas-generator on the surface the only method of control applicable to an underground gas-generator (u.g.g.) is to alter the draught characteristics. An examination is made of the various zones in a u.g.g. (diagram given) and the temperature gradient is discussed. Experimental data regarding the latter, obtained from a model u.g.g., is presented. Site of combustion advances so as to meet the draught; unequal utilization of coal in the seam can be controlled by

alteration of draught, limited, however, by the necessity of maintaining gas quality. Direction of draught can be reversed. V. B.

671.* Part Played by Reaction of Combustion of Carbon Monoxide in Process of Gasification of Coal in Layers. B. V. Kantorovich. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 846-850.—Reaction of combustion of CO is proportional to active concentration of O₂, and also depends on initial content of the reacting gases in H₂O vapour. Kinetics of the reaction are discussed. Smaller pieces of coal favour production of a gas with a high CO content. It is concluded that mechanism of combustion and gasification is not altered by a change in the draught velocity. V. B.

Miscellaneous Products.

672. Properties and Uses of Polythene. Part II. R. B. Richards. *Brit. Plastics*, April, 1945, 17 (191), 146.—A table shows resistance at ordinary and high temperatures of Polythene to a variety of solvents, acids, alkalis, etc. Its stability in the presence of fluorine is of great importance. Polythene is not wetted by water, and its permeability to water vapour is extremely low, being similar to that of rubber hydrochloride and moisture-proofed regenerated cellulose film, and much lower than that of polystyrene, rubber, and cellulose esters. While insoluble in all organic liquids below 60° C., above this temperature it dissolves readily. (Data are given of the solubility and viscosity of solutions of Alkathene grades in xylene.) Polythene swells in organic liquids, thus Alkathene 20 absorbs 6%, 9%, 18%, and 35% of hydrocarbon oils at 20°, 40°, 60°, and 75° C., respectively, after prolonged contact, while the harder grades are more resistant. No loss of flexibility occurs, but tensile strength, surface hardness, stiffness, and tear resistance are reduced. Softer grades are not suitable for prolonged contact with polar solvents either in the liquid or vapour state, though their resistance is much greater than that of natural rubber, GR-S and GR-1, though certain Thiokol grades swell less than Polythene. C. L. G.

673. Furane Resins. J. Delmonte. *Brit. Plastics*, April, 1945, 17 (191), 140.—Furfural is now mainly used as a selective solvent for purification of butadiene, but has a useful place in the manufacture of furfural-phenol resins, an advantage being that the reaction is not carried out in an aqueous solution, as in the case of formaldehyde-phenol resins. Semi-polymerized furane resins are more fluid than phenol-formaldehyde resins, so that when used as glues no solvents are necessary, and laminates, etc., can be assembled immediately after glueing, all gaps being completely and permanently filled. With such a product, stability of glue to heating in the pot is short, so that a solvent-type product has also been produced. The furane adhesives are quite resistant to cold and boiling water and to acids, though less resistant to alkali than the phenolic type. They are useful for bonding composite products—synthetic rubber and other synthetic resins, metals, etc., and in view of their low viscosity, as impregnants for plaster of paris, etc. They also have promise as casting resins. C. L. G.

674.* Surface Activity of Neutralised Sulphonated Oils. N. M. Lubman. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 685-689.—Experiments were carried out with products obtained by neutralization (with NaOH) of sulphonated vegetable (cotton- and sunflower-seed) oils, consisting of Na salts of high molecular weight sulphonic acids and sulphonic esters. Figures are given showing interfacial tension between aqueous solutions of sulphonated oil (S.U.M.) and air, octane, crude oil (Ishimbaev), and with air after standing in contact with crude and with octane. Lowering of surface tension is much more marked with crude than with octane, standing in contact with the latter, however, diminishes the activity of S.U.M. more than contact with crude, showing greater solubility of surface active components of S.U.M. in octane. With crude, a maximum lowering of surface tension is obtained with a 0.1% solution, but for the air interface a 1% solution is required for maximum effect. Surface tension of aqueous solutions of S.U.M. containing excess alkali is markedly less than that of the neutral solution. This is thought to be due to the presence of fatty acid soaps, and this view is confirmed by the lesser efficacy of such excess alkali solutions as breakers of petroleum emulsions. S.U.M. is a better

breaker of the latter than Na salts of petroleum sulphonic acids; demulsifying action of both types of compounds is due to presence of strong hydrophilic sulphonic groups.
V. B.

MISCELLANEOUS.

675.* Some Achievements of the Institute of Combustible Minerals of the Academy of Sciences of the U.S.S.R. during 10 Years (1934-1944). S. S. Nametkin and B. K. Klimov. *Bull. Acad. Sci. U.R.S.S., Cl. Sci. Tech.*, 1944, 663-671.—The Institute of Combustible Minerals, founded in 1934, now comprises four main divisions with 20 laboratories as follows: I. origin of petroleum and petroleum deposits (director—Fedorov) with laboratories for petroleum geology, lithology, petrography and paleogeography, geochemistry and hydro-chemistry, bituminology; II. development and exploitation of petroleum deposits (Kapelyushnikov) with laboratories for physics of oil-seams and intensification of petroleum production; III. chemistry and technology of petroleum (Lavrovskii) having laboratories for chemistry, physical-chemistry, and technology of petroleum, vapour-phase oxidative cracking and the oxidation and combustion of motor fuels; IV. solid fuels (Klimov) with laboratories for semi-coking, coke chemistry, volatile pyrolysis products, chemistry and genesis of coal and hydrogenation. The remaining three laboratories of the Institute are those concerned with engine-testing, experimental mechanics and an analytical laboratory. A brief survey of the work of the divisions is given.
V. B.

BOOK REVIEW.

Thorpe's Dictionary of Applied Chemistry. 4th Edition, Volume VI (GLAU-INV).

By J. F. Thorpe and M. A. Whiteley. Pp. 611. Price 80s.

Thorpe's Dictionary needs no introduction to chemists, to whom it has for many years been a standard book of reference. Despite the regretted death of Sir Jocelyn, the revision and enlargement have continued under the able direction of his eminent colleague Dr. Whiteley, who has enlisted the services of many well-known contributors, all experts in their own fields of chemistry, for the production of the sixth volume of the 4th Edition of this Encyclopædia of Applied Chemistry.

Members of the Institute of Petroleum will naturally be particularly interested in those sections which deal with aspects of petroleum chemistry. The excellent articles on Gum Inhibitors (W. H. Hoffert, National Benzole Company), Hydrogenation of Coal (R. Holroyd, Imperial Chemical Industries), Hydrogen Manufacture (H. S. Coles and P. H. Sykes, Imperial Chemical Industries), and, on a more abstruse plane, Hydrogenation Mechanism (G. H. Twigg, University of Cambridge) will have immediate appeal. Other subjects related to petroleum chemistry such as Helium, Hydrogen-Ion Determination, and Interfacial Angles also come within the scope of this volume.

Any dictionary of any progressive science must inevitably suffer from two disabilities. In the first place, limitations of space restrict an author's natural desire to deal comprehensively with his subject. In this volume the editorship has been most efficient, and with hardly an exception each subject has been allocated space directly proportional to its importance. Secondly, many articles begin to be out-of-date even before they are printed. Naturally, a date line must be set, which for this volume appears to have been 1939. Only rarely has this had any noticeably detrimental effect, but there are one or two cases, such as the section on gum inhibitors, where knowledge has advanced considerably since that date, and current inhibitors and current methods of measuring oxidation stability differ considerably from those described.

Despite the very few minor and unavoidable weaknesses, however, Thorpe's Dictionary is a necessity for any chemical library.

The present volume contains, in addition, the Index covering Volumes I to VI compiled by Dr. J. N. Goldsmith.

F. B. T.



INSTITUTE NOTES.

JUNE, 1945.

APPLICATIONS FOR MEMBERSHIP OR TRANSFER.

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

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

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

Membership.

BARTER, James Richard Godfrey, Engineer, Asiatic Petroleum Co., Ltd.
(*J. A. Oriol ; E. LeQ. Herbert.*)

BURGESS, Ronald Stuart, Assistant Chemist, Anglo-Iranian Oil Co., Ltd.
(*S. J. Green ; M. F. Sawyer.*)

COULSON, Robert Leslie, Asst. Superintendent, Anglo-American Oil Co., Ltd.
(*F. Tipler ; E. Evans-Jones.*)

DAVEY, William, Senior Lecturer in Chemistry, Acton Technical College.
(*J. Parrish ; G. W. Dorrell.*)

GROSVENOR, Horace, Cargo Supervisor, Petroleum Board. (*G. M. Davies ;
F. Tipler.*)

HAMILTON, Frederick Charles, Exploitation Engineer, B.P.M. (*H. de Wilde ;
J. B. Kay.*)

JONES, Archibald Ernest, Director, Anglo-Scottish Petroleum Co., Ltd.
(*R. B. Hobson ; E. G. Grant.*)

LEAKE, George, Managing Director, United Oil Co., Ltd. (*P. H. Moore ;
W. Blackwell.*)

NASH, Lewis John Alfred Maurice, Foreman, Bahrein Petroleum Co., Ltd.
(*F. H. Garner ; A. E. Dunstan.*)

O'SULLIVAN, John, Supervisor, Cork Harbour Oil Wharves, Ltd. (*J. H.
Varley ; H. E. Brown.*)

ROMNEY, Judah, Research Chemist, W. B. Dick & Co. (*A. J. Sear ; P. W. L.
Gossling.*)

Transfers.

PENNEY, John Mortimer, Manager, Cannar Oils, Ltd. (*F. G. Rappoport ;
C. Dabell.*)

STEWART, John Malcolm, Chief Chemist, Moore & Barrett. (*H. Moore ;
J. Barrett.*)

NEW MEMBERS.

The following elections have been made by the Council in accordance with the By-Laws, Sect. IV, para. 7.

Elections are subject to confirmation in accordance with the By-Laws, Sect. IV, paras. 9 and 10.

As Fellows.

BRAYBROOK, Frederick Houghton.
BRUNNER, Christopher T.
LAURIE, Thomas Franklin.
MASON, John.
NETHERSOLE, Harrison J. H.
SEN, Apurba Kumar.
WILSON, George Noel.
WINNING, W. Carl.

Transfers to Fellow.

HODGSON, William Ronald P.
LEES, George Martin.
THOMPSON, Francis Eric A.

As Members.

AINSWORTH, John Alfred.
ARCHER, Frederick Stanley.
BARR, Kenneth William.
BRAYBROOK, William A. R.
GRIFFITHS, John Cedric.
GRIFFITHS, Reginald H. A.
HEILL, Ernest Albert.
HOLMES, Arthur Norman.
KLIMKIEWICZ, Wladyslaw J.
LAHARI, Adinath.
LANCASHIRE, Eric Peak.
MACKAY, William Mackenzie.
MASSEY, James.
MATTHEWS, Thomas H.
MURRAY, James Laidlaw.
OLLEY, Norman M.
PARK, William Hutcheson.
PERRY, Thomas Frederick.

RICHARDSON, George.
SMITH, Edward Archibald.
SMITH, John.
TAYLOR, Dudley C. C.
TAYLOR, Henry Browne.
THOMAS, Maelgwyn E.
TOMPKINS, Dennis G.
WILKINSON, Horace Elliot.
WILLIAMS, John.
WORSLEY, Frank Keyte.

Transfers to Member.

HARKNESS, John Mackay.
HAGGARD, Geoffrey Francis.
LISLE, Brian Orchard.

As Associate Members.

ALDERSON, James.
BROWN, Dorothy.
DAVIES, Edward S.
MACMILLAN, Richard Butler.
PRENTIS, William James.
QUAYLE, Joshua Creer.
TUFT, Theodore C.
WILLIAMS, Thomas L.
YATES, Harold.

Transfers to Associate Member.

HAWKES, John Cecil.
RALPH, Noel A.

As Students.

ADLINGTON, Dennis George.
BURGESS, Bruce Henry.
POTT, Anthony Fred D.

MEETINGS OF COUNCIL.

An Ordinary Meeting of Council was held at 26, Portland Place, W. 1, on Wednesday, 17th April, 1945, with Professor F. H. Garner, President, in the Chair. There were also present : M. A. L. Banks, T. Dewhurst, A. E. Dunstan, A. C. Hartley, J. E. Haslam, H. Hyams, J. S. Jackson, R. I. Lewis, J. S. Parker, E. R. Redgrove, C. A. P. Southwell, F. B. Thole, G. H. Thornley, E. Thornton, R. R. Tweed, W. J. Wilson and C. W. Wood.

Reports were received from the Election, Finance, House, Publication and Standardization Committees.

Two Fellows, seventeen Members, four Associate Members and three Students were elected; two transfers to Member were approved.

Mr. J. E. Haslam was elected to Council.

An Ordinary Meeting of Council was held at 26, Portland Place, W. 1, on Wednesday, 23rd May, 1945, with Professor F. H. Garner in the Chair. There were also present: S. J. M. Auld, M. A. L. Banks, G. H. Coxon, T. Dewhurst, A. E. Dunstan, E. J. Dunstan, E. A. Evans, A. C. Hartley, H. Hyams, J. S. Jackson, J. S. Parker, F. B. Thole, G. H. Thornley, E. Thornton, W. J. Wilson and C. W. Wood.

Reports were received from the Awards, Election, Engineering, Finance, House and Publication Committees.

Four Fellows, fifteen Members, thirteen Associate Members and three Students were elected; five transfers to Fellow, five to Member and three to Associate Member were approved.

BRANCH ACTIVITIES.

At a meeting of the Stanlow Branch Committee held on the 18th May, 1945, the following officers were elected for the forthcoming session:—

Chairman	H. E. F. Pracy.
Hon. Secretary	F. L. Garton.
Hon. Treasurer	V. Biske.

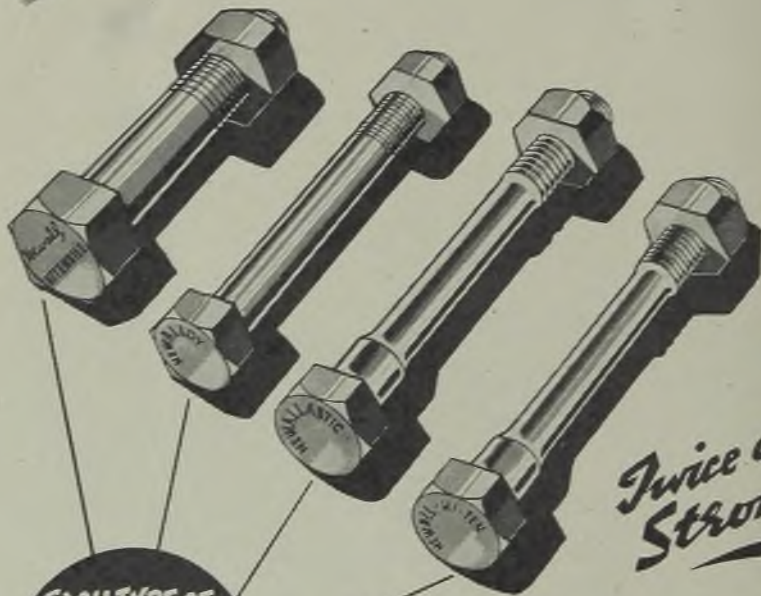
The other members of Committee are:—

J. L. Black, J. Cantor, J. S. Parker, J. C. Wood-Mallock.

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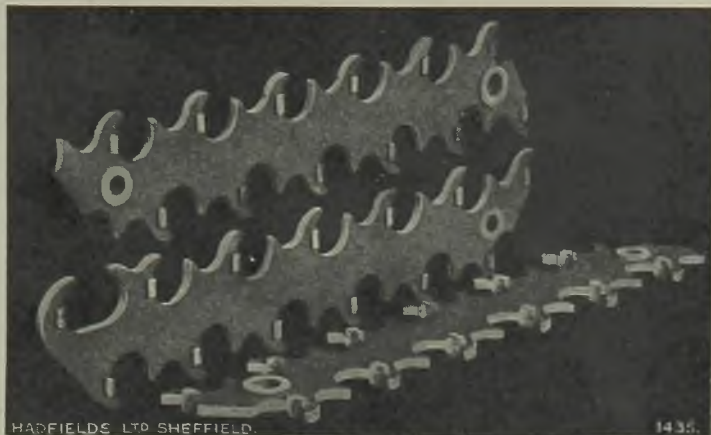
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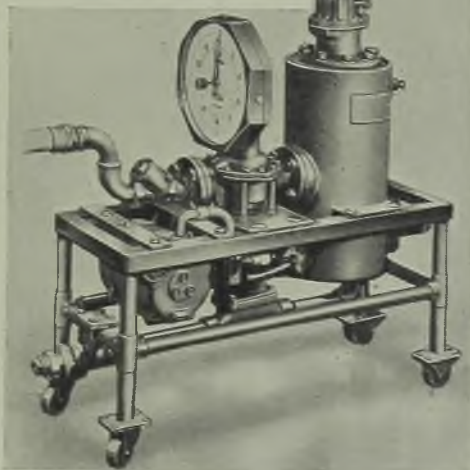


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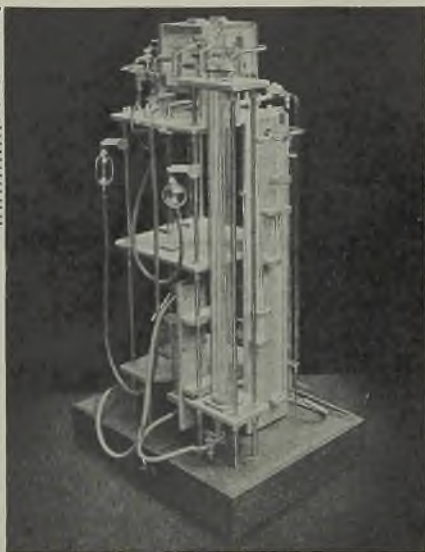
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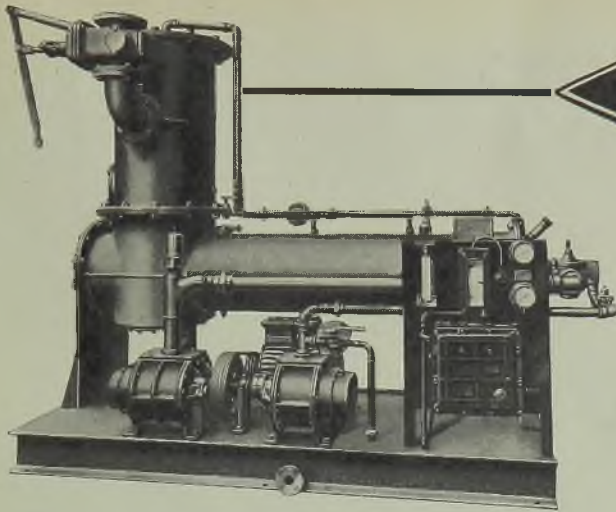
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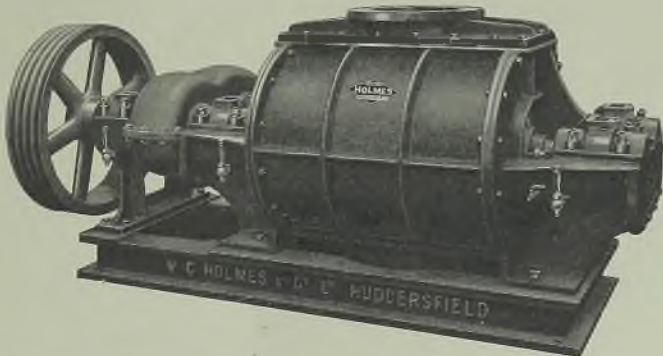
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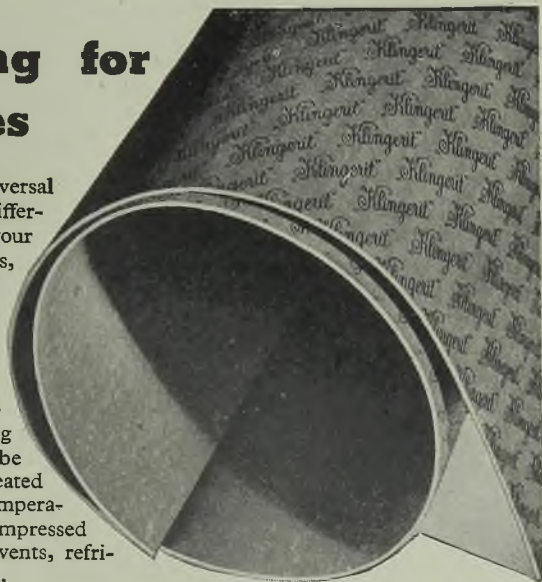
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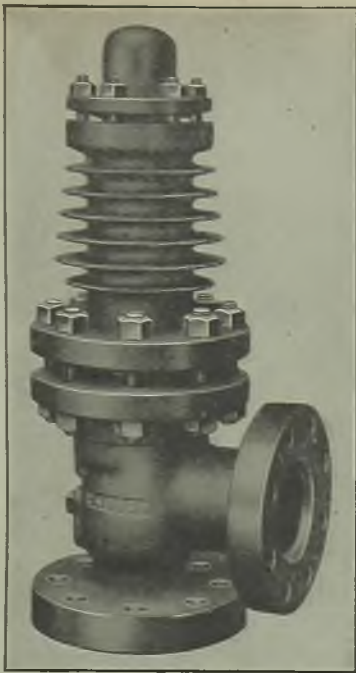


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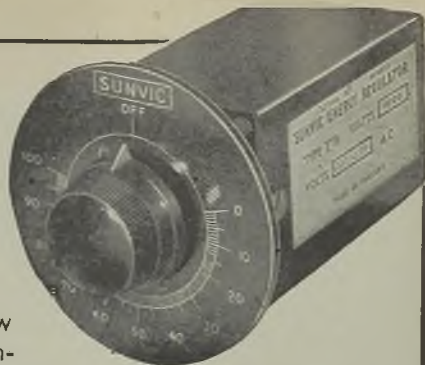
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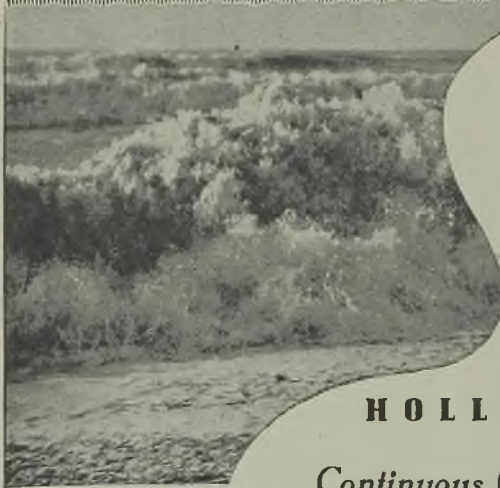
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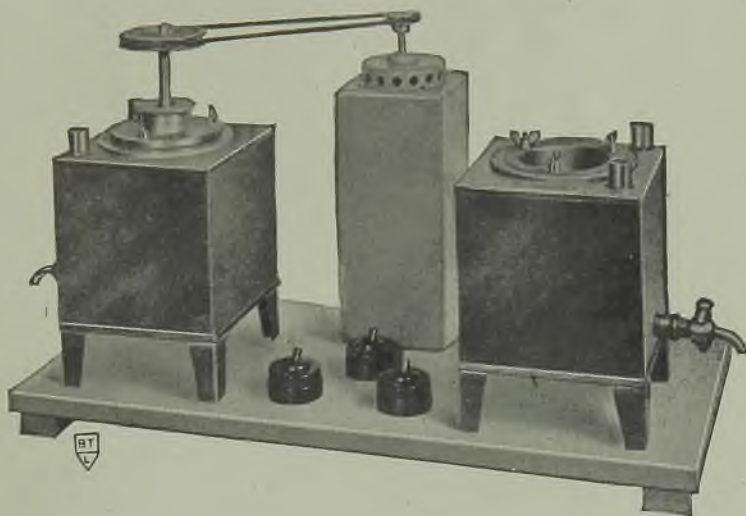
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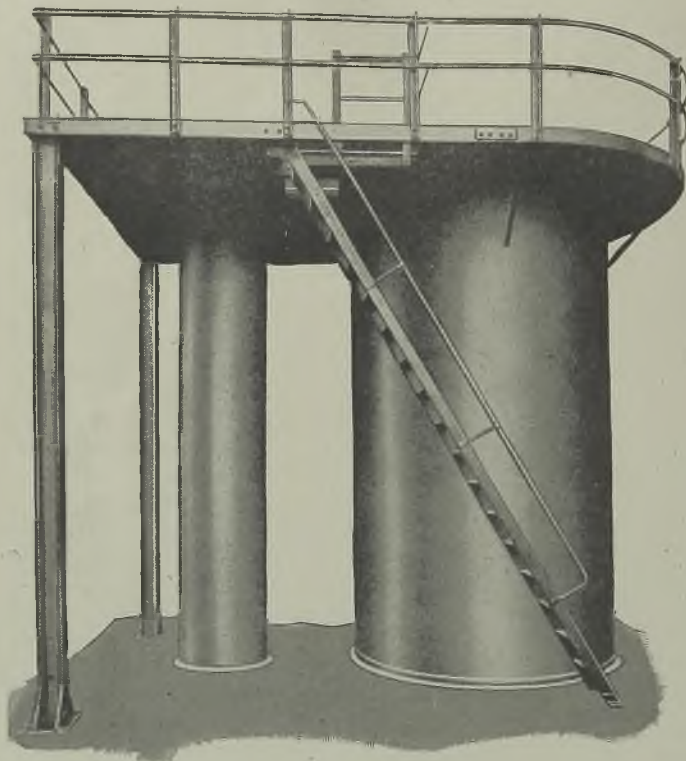
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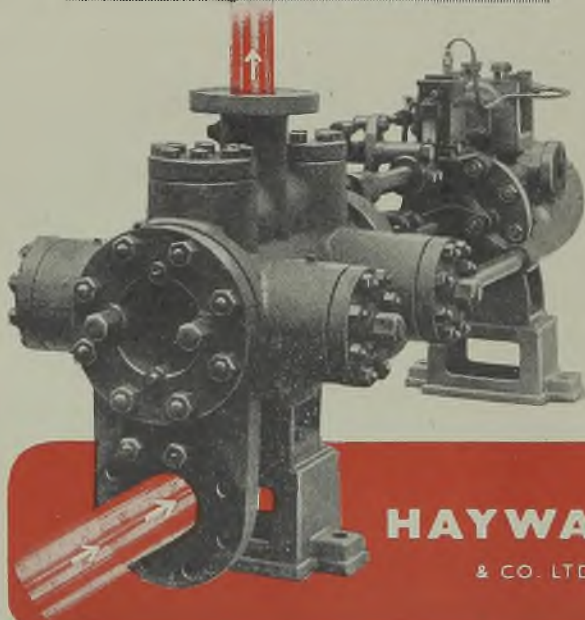
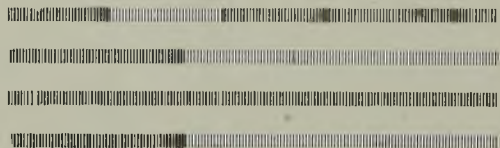


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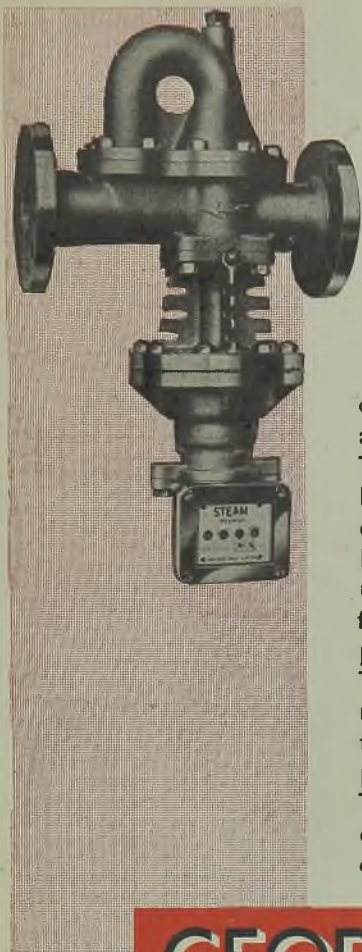
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