

# JOURNAL OF THE INSTITUTE OF PETROLEUM

~~2477/1202.~~

Honorary Editor:

F. H. GARNER, O.B.E., Ph.D., F.R.I.C., F.Inst.Pet.



VOLUME THIRTY-TWO

1946

Published by  
THE INSTITUTE OF PETROLEUM  
MANSON HOUSE,  
26, PORTLAND PLACE,  
LONDON, W. I.

# THE INSTITUTE OF PETROLEUM

(Founded 1913 as The Institution of Petroleum Technologists)

---

## Past-Presidents :

- 1914-1916 SIR BOVERTON REDWOOD, Bart., D.Sc., F.R.S.E. (died 1919.)  
1916-1917 THE RT. HON. LORD CADMAN OF SILVERDALE, G.C.M.G., Hon. LL.D., D.Sc., D.Eng.,  
M.Inst.M.M. (died 1941.)  
1917-1919 THE RT. HON. LORD GREENWAY OF STANBRIDGE EARLS. (died 1934.)  
1919-1921 SIR FREDERICK W. BLACK, K.C.B., B.A.(Lond.). (died 1930.)  
1921-1923 PROF. JOHN SAMUEL STRAFFORD BRAME, C.B.E., F.R.I.C., F.C.S.  
1923-1925 HERBERT BARRINGER, M.Inst.C.E., M.I.Mech.E., M.I.N.A., M.Inst.Mar.Eng. (died 1932.)  
1925-1927 SIR THOMAS H. HOLLAND, K.C.S.I., K.C.I.E., Hon. LL.D., D.Sc., F.R.S.  
1927-1929 ALFRED C. ADAMS.  
1929-1931 A. E. DUNSTAN, D.Sc., F.R.I.C., F.C.S.  
1931-1933 JAMES KEWLEY, M.A., F.R.I.C., F.C.S., M.I.Chem.E.  
1933-1935 T. DEWHURST, A.R.C.S., F.G.S.  
1935-1937 THE RT. HON. LORD CADMAN OF SILVERDALE, G.C.M.G., Hon. LL.D., D.Sc., D.Eng.  
M.Inst.M.M. (died 1941.)  
1937-1939 LT.-COL. S. J. M. AULD, O.B.E., M.C., D.Sc.  
1939-1942 PROF. A. W. NASH, M.Sc., M.I.Mech.E. (died 1942.)  
1942-1944 C. DALLEY, M.I.E.E. (died 1944.)  
1944-1946 F. H. GARNER, O.B.E., Ph.D., F.R.I.C.



Ф.102 / 46 / I

# COUNCIL

1946

---

## President :

SIR ANDREW AGNEW, C.B.E.

## Past-Presidents :

ALFRED C. ADAMS.

S. J. M. AULD, O.B.E., M.C., D.Sc.

J. S. S. BRAMB, C.B.E., F.R.I.C.

T. DEWHURST, A.R.C.S.

A. E. DUNSTAN, D.Sc., F.R.I.C.

F. H. GARNER, O.B.E., Ph.D., F.R.I.C.

Sir THOMAS H. HOLLAND, K.C.S.I., K.C.I.E.,  
D.Sc., F.R.S.

J. KEWLEY, M.A., F.R.I.C.

## Vice-Presidents :

G. H. COXON.

E. A. EVANS, M.I.A.E.

A. C. HARTLEY, C.B.E., F.C.G.I.

V. C. ILLING, M.A., F.R.S.

J. S. JACKSON, B.Sc., F.R.I.C.

J. A. ORIEL, M.C., M.A.

## Members of Council :

G. H. COXON (Chairman).

M. A. L. BANKS, B.Sc., F.R.I.C.

ASHLEY CARTER, A.M.I.Mech.E.

C. CHILVERS, B.Sc., F.R.I.C.

R. CRICHTON, J.P.

E. J. DUNSTAN, M.Sc.

E. B. EVANS, Ph.D., M.Sc., F.R.I.C.

F. L. GARTON, M.A., B.Sc.

J. E. HASLAM.

H. HYAMS.

R. I. LEWIS, B.Sc.

J. S. PARKER, M.A., B.Sc.

E. R. REDGROVE, Ph.D., B.Sc., F.R.I.C.

C. A. P. SOUTHWELL, M.C., B.Sc.

H. C. TETT, B.Sc., D.I.C.

F. B. THOLF, D.Sc., F.R.I.C.

A. BEEBY THOMPSON, O.B.E.

G. H. THORNLEY, M.Sc.

E. THORNTON, B.Sc., F.R.I.C.

R. R. TWEED.

W. J. WILSON, F.R.I.C., A.C.G.I.

C. W. WOOD, F.R.I.C.

---

## Chairmen of Branches :

*Burma Branch :*

*Iranian Branch :*

*Northern Branch :* G. H. THORNLEY.

*Rumanian Branch :*

*Scottish Branch :* R. CRICHTON.

*South Wales Branch :* R. B. SOUTHALL.

*Stanlow Branch :* H. E. F. PRACY.

*Trinidad Branch :* H. C. H. THOMAS.

*United States Branch :* Dr. G. EGGLEFF.

*Students' Section : Birmingham Branch :* G. K. ASHPORTH.

*London Branch :*

## LIST OF OFFICERS

### Joint Honorary Secretaries :

ARTHUR W. EASTLAKE, M.I.Min.E., A.M.I.Mech.E.  
C. CHILVERS, B.Sc., F.R.I.C.

### Honorary Editor :

F. H. GARNER, O.B.E., Ph.D., F.R.I.C.

### General Secretary :

F. H. COE.

### Publications Secretary :

GEORGE SELL.

### Technical Secretary :

PETER KERR, M.A., B.Sc., F.R.I.C.

*Solicitors :* Messrs. ASHURST, MORRIS, CRISP & Co.

*Auditors :* Messrs. PRICE WATERHOUSE & Co.

*Bankers :* WESTMINSTER BANK LIMITED, 115 Old Brompton Road, London, S.W.7.

*Offices :* Manson House, 26 Portland Place, W.1.

*Telephone :* LANgham 2250.

*Telegraphic Address :* Instpetech, Westdo, London.

---

## COMMITTEES OF COUNCIL

The President, Chairman of Council, and the Joint Honorary Secretaries are ex-officio Members of all Committees.

### Awards Committee.

E. A. EVANS (Chairman).  
S. J. M. AULD.  
A. E. DUNSTAN.

A. C. HARTLEY.  
F. B. THOLE.

### Benevolent Fund Committee.

A. E. DUNSTAN (Chairman).  
S. J. M. AULD.

J. A. ORIEL.

### Branches Committee.

J. A. ORIEL (Chairman).  
R. I. LEWIS.

E. THORNTON.  
W. J. WILSON.

#### *Northern Branch :*

G. H. THORNLEY, *Branch Chairman.*  
V. M. FARRANT, *Branch Hon. Secretary.*

#### *S. Wales Branch :*

R. B. SOUTHALL, *Branch Chairman.*  
E. J. HORLEY, *Branch Hon. Secretary.*

#### *Scottish Branch :*

R. CRICHTON, *Branch Chairman.*  
W. R. GUY, *Branch Hon. Secretary.*

#### *Stanlow Branch :*

H. E. F. PRACY, *Branch Chairman.*  
J. G. HANCOCK, *Branch Hon. Secretary.*

Also representatives of Overseas Branches when available.

### By-Laws Committee.

H. HYAMS (Chairman).  
S. J. M. AULD.  
G. H. COXON.  
T. DEWHURST.

F. B. THOLE.  
E. THORNTON.  
C. W. WOOD.

### Education Committee.

E. THORNTON (Chairman).	F. H. GARNER.
S. J. M. AULD.	V. C. ILLING.
A. E. DUNSTAN.	J. S. JACKSON.
E. B. EVANS.	J. S. PARKER.
PERCY EVANS.	G. D. THACKER.

### Election Committee.

M. A. L. BANKS (Chairman).	E. R. REDGROVE.
J. S. JACKSON.	C. W. WOOD.
R. I. LEWIS.	

### Engineering Committee.

A. C. HARTLEY (Chairman).

The Chairmen of the following Panels :

Exploitation	Electrical
Drilling	Storage
Production	Transportation

Refining

and other members to be nominated.

### Finance Committee.

G. H. COXON (Chairman).	R. R. TWEED.
J. A. ORIEL.	W. J. WILSON.
E. R. REDGROVE.	C. W. WOOD.
H. C. TETT.	

### House Committee.

C. A. P. SOUTHWELL (Chairman).	E. LEQ. HERBERT.
S. J. M. AULD.	SIR THOMAS HOLLAND.

### Publication Committee.

F. H. GARNER (Chairman).	H. HYAMS.
J. R. G. BARTER.	L. IVANOVSKY.
W. H. CADMAN.	J. S. PARKER.
A. E. DUNSTAN.	E. COOPER SCOTT.
E. A. EVANS.	F. B. THOLE.
E. B. EVANS.	A. BEEBY THOMPSON.
F. L. GARTON.	G. H. THORNLEY.
C. L. GILBERT.	E. THORNTON.
E. W. HARDIMAN.	C. W. WOOD.

### Correspondent Members :

<i>Northern Branch :</i>	<i>S. Wales Branch :</i> E. J. HORLEY.
<i>Scottish Branch :</i> A. FLEMING.	<i>Stanlow Branch :</i> V. BISKE.

### Research Committee.

H. C. TETT (Chairman).	D. A. HOWES.
S. J. M. AULD.	J. S. JACKSON.
S. M. BLAIR.	R. I. LEWIS.
E. J. DUNSTAN.	J. A. ORIEL.
E. A. EVANS.	E. R. REDGROVE.
F. H. GARNER.	C. S. WINDEBANK.

### Standardization Committee.

J. S. JACKSON (Chairman).	R. G. MITCHELL.
S. J. M. AULD.	J. A. ORIEL.
W. E. J. BROOM.	A. OSBORN.
G. H. COXON.	J. S. PARKER.
A. E. DUNSTAN.	E. R. REDGROVE.
E. A. EVANS.	A. R. STARK.
E. B. EVANS.	F. B. THOLE.
F. H. GARNER.	W. H. THOMAS.
F. L. GARTON.	G. H. THORNLEY.
D. A. HOWES.	W. J. WILSON.
H. HYAMS.	C. S. WINDEBANK.
H. F. JONES.	

*Co-opted Members.*

- |  |  |
|--|--|
| O. A. BELL ( <i>Representing the War Office</i> ).                           | J. MASON ( <i>Representing the Ministry of Supply</i> ).             |
| D. CLAYTON ( <i>Representing the Admiralty and the Ministry of Supply</i> ). | K. E. W. RIDLER ( <i>Representing the Ministry of Supply</i> ).      |
| J. M. DRINKWATER ( <i>Representing the Ministry of Supply</i> ).             | T. R. THOMAS ( <i>Representing the Ministry of Supply</i> ).         |
| C. D. LAWRENCE ( <i>Representing the Admiralty</i> ).                        | D. WYLLIE ( <i>Representing the Admiralty</i> ).                     |
| R. J. W. LE FÈVRE ( <i>Representing the Royal Aircraft Establishment</i> ).  | W. F. K. WYNNE-JONES ( <i>Representing the Ministry of Supply</i> ). |

*Honorary Members.*

- |                 |                  |
|-----------------|------------------|
| R. P. ANDERSON. | T. G. DELBRIDGE. |
| T. A. BOYD.     | J. G. DETWILER.  |
| E. W. DEAN.     | F. D. TUENMLER.  |

## HON. SECRETARIES OF BRANCHES

*Northern Branch* : V. M. FARRANT, Manchester Oil Refinery Ltd., Twining Road, Trafford Park, Manchester, 17.

*Scottish Branch* : W. ROBERT GUY, F.R.I.C., Scottish Oils Ltd., Middleton Hall, Uphall, Broxburn.

*South Wales Branch* : E. J. HORLEY, National Oil Refineries Ltd., Llandarcy, Glam.

*Stanlow Branch* : J. G. HANCOCK, "Shell" Refining & Marketing Co. Ltd., Stanlow Refinery, Ellesmere Port, Cheshire.

*Trinidad Branch* : H. C. H. THOMAS, M.A., A.R.S.M., Trinidad Leaseholds Ltd., Point-à-Pierre, Trinidad.

*Students' Section* : *Birmingham Branch* : D. S. PETTY.

## CONTENTS.

	PAGE
Some Notable Wartime Oil Fires. V. J. Wilmoth . . . . .	1
Clay Research and Oil Development Problems. J. C. Griffiths. . . . .	18
The Development and Lubrication of the Automotive Hypoid Gear. F. F. Musgrave . . . . .	32
Annual Report of Council, 1944 . . . . .	45
Annual General Meeting . . . . .	55
Investigation of Piston-Ring Sticking in High-Duty Aero-Engines. A. Lahiri and E. Mikolajewski . . . . .	59
Mechanism of Action of Organic Chlorine and Sulphur Compounds in Extreme-Pressure Lubricants. C. F. Prutton, David Turnbull, and George Dlouhy . . . . .	90
Some Problems Encountered During Well Shooting Operations in the Nottinghamshire Oilfields. J. F. Waters . . . . .	119
Molecular Weights of Viscous Hydrocarbon Oils : Correlation of Density with Viscosities. Alfred E. Hirschler. . . . .	133
The Blending Octane Numbers of 2 : 5-Dimethylfuran. Hugh B. Nisbet. . . . .	162
Process Development and Production of Isohexane and Isoheptane as Aviation Fuel Components. S. F. Birch, P. Docksey, and J. H. Dove . . . . .	167
The Mechanical Testing of Extreme Pressure Lubricants (with Special Reference to Hypoid Oils). H. L. West . . . . .	206
Metals and Alloys in the Petroleum Industry. John H. Wilson . . . . .	230
Obituary : John H. Wilson. . . . .	240
First Cadman Memorial Lecture. Sir William Fraser . . . . .	241
Petroleum in Wartime. F. H. Garner . . . . .	256
The Char Value of Kerosine. F. W. H. Matthews and W. H. Thomas . . . . .	269
Third List of Definitions. Standardization Sub-Committee No. 11 . . . . .	289
Annual General Meeting . . . . .	292
Developments in Fluid Catalytic Cracking. J. F. Walter . . . . .	295
The Development of Improved Turbine Oils. C. N. Smith and G. H. S. Snyder . . . . .	313
Mineral Oil Films in Relation to Mosquito Control. A. Crossfield and G. F. Hazzard . . . . .	323
The Determination of Organic Peroxides in Hydrocarbons. E. M. Tanner and T. F. Brown . . . . .	341
Obituary : William Sutton . . . . .	351
Edward Hubert Cunningham Craig . . . . .	351
<b>General Discussion on Transformer Oils :</b>	
The Contribution of the E.R.A. to International Research on Transformer Oils. P. W. L. Gossling and A. C. Michie . . . . .	356
Some Developments in the Refining of Transformer Oils. J. C. Wood-Mallock . . . . .	365
A Review of the Mechanism of the Oxidation of Liquid Hydrocarbons. Philip George and Alan Robertson . . . . .	382
Oxidation and Anti-Oxidation. E. A. Evans . . . . .	392
The Influence of Structure on the Oxidation Reactivity of Hydrocarbons. Philip George and Alan Robertson. . . . .	400
The Sludge Test for Transformer Oils. C. H. Barton . . . . .	408

	PAGE
Oxidation Tests for Transformer Oil. A. A. Pollitt . . . . .	414
Sludging Value of Transformer Oil. Influence of Condenser Water Temperature. P. W. L. Gossling and J. Romney. . . . .	424
The Application of Variance Analysis to Some Problems of Petroleum Technology. H. M. Davies . . . . .	465
The Geology of the Guayaquil Estuary, Ecuador. George Sheppard. . . . .	492
On the Course of the Reaction at 100° C. in the System Aromatic-free Mineral Oil-Oxygen. D. J. W. Kreulen . . . . .	515
On the Course of the Reaction at 100° C. in the Systems Xylene-Oxygen and Aromatic-free Mineral Oil-Xylene-Oxygen. D. J. W. Kreulen . . . . .	525
Gasoline Loss Control and Molecular Weight Determinations. H. G. Koefoed . . . . .	529
Some Observations on the Development of Extreme Pressure (E.P.) Properties by Chlorine and Sulphur Additives in Mineral Oil, as Assessed by the Four Ball Machine. W. Davy . . . . .	575
Researches on Asphaltenes. Part II. Radical Reactions. F. J. Nollensteyn and J. Dorleyn . . . . .	582
The Application of Spreading Measurements on Oil Tests. N. E. M. Hagethorn and F. H. Stieltjes . . . . .	587
Fractional Distillation of Ternary Mixtures. Part II. A. J. V. Underwood . . . . .	598
Fractional Distillation of Multi-Component Mixtures—Calculation of Minimum Reflex Ratio. A. J. V. Underwood . . . . .	614
The Tendency to Smoke of Organic Substances on Burning. Part I. A. E. Clarke, T. G. Hunter, and F. H. Garner . . . . .	627
The Tendency to Smoke of Organic Substances on Burning. Part II. Smoke Production and Burning Characteristics of Hydrocarbon Gels. F. H. Garner, T. G. Hunter, and A. E. Clarke . . . . .	643
On the Course of the Reaction at 100° C. in the System Paraffin-Oxygen. D. J. W. Kreulen . . . . .	656
Experiments on the Production of Toluene from Coal Tar Products and other Sources. C. M. Cawley, J. H. G. Carlile, H. E. Newell, and F. E. T. Kingman . . . . .	660
Obituary: John Falconer Taylor . . . . .	684
Review of the Chemical Structure of Fuels and their Detonation in Engines. A. G. Mazurkiewicz and V. G. Oberholzer . . . . .	685
The Vaporization of Fuels for Gas Turbines. Part I. The Bubble-Points and Dew-Points of Liquid Hydrocarbon Fuels. B. P. Mullins. . . . .	703
Obituary: Frederick Edward Cherry . . . . .	738
Author Index . . . . .	739
Name Index . . . . .	742
Subject Index . . . . .	745