

149

PROCEEDINGS
of the
Twenty-First Convention
of the
**Association of Municipal
Electricity Undertakings**
of South Africa and Rhodesia
(Founded 1915)

MUNICIPALITY OF



DURBAN

held at

DURBAN

From Tuesday, May 6th, to
Friday, May 9th,

1947

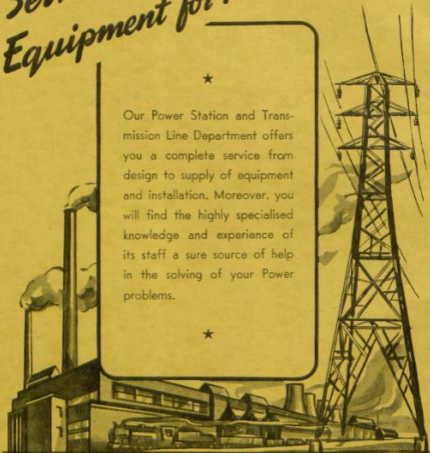
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Association of Municipal
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Twenty-First Convention
of the
Association of Municipal
Electricity Undertakings

Printed by
HAYNE & GIBSON (PTY.) LTD.
"The Press at Kingmead"
DURBAN

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DURBAN

DURBAN

1947

PRINTED AND PUBLISHED BY

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ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS
OF SOUTH AFRICA AND RHODESIA
FOUNDED 1915

EXECUTIVE COUNCIL, 1947/8.

PRESIDENT:

C. Kinsman (Durban).

VICE-PRESIDENT:

A. Foden (East London).

PAST PRESIDENTS:

I. J. Nicholas (Umtata)

G. J. Muller (Bloemfontein)

COUNCILLOR MEMBERS:

East London

Durban

Johannesburg (Alternate)

Pretoria (Alternate)

NOTE: The Town is elected and not the individual Councillors

OTHER MEMBERS:

D. J. Hugo (Pretoria)

H. A. Eastman (Cape Town)

J. C. Fraser (Johannesburg)

J. C. Downey (Springs)

SECRETARY AND TREASURER:

A. T. Taylor, P.O. Box 7462, Johannesburg

REPRESENTATIVES:

World Power Conference (Local Committee)

H. A. Eastman (Cape Town)

S.A. Standards Institution and S.A. Bureau

J. C. Downey (Springs)

of Standards

D. J. Hugo, Pretoria (Alternate)

Safety Precautions Committee

J. C. Downey, Springs.

J. C. Fraser, Johannesburg (Alternate).

Electrical Wiremen's Registration Board

J. C. Fraser, Johannesburg.

Overhead Lines Regulations

J. C. Fraser, Johannesburg.

G. J. Muller, Bloemfontein (Alternate).

SUB-COMMITTEES:

Tables-Statistics Generally

G. J. Muller, Bloemfontein.

C. Kinsman, Durban.

J. C. Fraser, Johannesburg.

C. Kinsman, Durban.

J. C. Fraser, Johannesburg.

H. A. Eastman, Cape Town.

A. Foden, East London.

D. A. Bradley, Port Elizabeth.

Freight Charges on Coal and Rural
Undertakings

PAST OFFICERS AND MEMBERS OF COUNCIL:

Past Presidents:	Secretary and Treasurer:
1915-17 J. H. Dobson, Johannesburg.	F. T. Stokes: E. T. Price.
1917-19 J. Roberts, Durban.	E. Poole.
1919-20 B. Sankey, Port Elizabeth.	E. Poole.
1920-22 T. C. W. Dod, Pretoria.	L. L. Horrell.
1922-24 G. H. Swingler, Cape Town.	H. A. Eastman.
1924-26 J. Roberts, Durban.	E. Poole.
1926-27 B. Sankey, Johannesburg.	R. G. Tresise.
1927-29 J. M. Lambe, East London.	P. Adkins.
1929-31 R. Macauley, Bloemfontein.	E. Poole.
1931-32 L. L. Horrell, Pretoria.	E. Poole.
1932-34 L. F. Bickell, Port Elizabeth.	F. A. P. Perrow.
1934-35 A. R. Metelerkamp, Bulawayo.	E. Poole.
1935-36 G. G. Ewer, Pietermaritzburg.	E. Poole.
1936-37 A. Rodwell, Johannesburg.	E. Poole.
1937-38 J. H. Gyles, Durban.	E. Poole.
1938-39 H. A. Eastman, Cape Town.	E. Poole.
1939-44 I. J. Nicholas, Umtata.	E. Poole until Dec., 1940.
	L. L. Horrell, Jan., 1941.
1944-45 A. Rodwell, Johannesburg.	L. L. Horrell.
1945-46 J. S. Clinton, Salisbury.	L. L. Horrell to Nov. 1945.
J. W. Phillips, Bulawayo.	A. T. Taylor, December, 1945.
1946-47 G. J. Muller, Bloemfontein.	A. T. Taylor.

PAST ORDINARY MEMBERS OF COUNCIL:

1915-17 J. Roberts; W. Bellad Ellis; B. Sankey.
1917-19 W. Bellad Ellis; G. Stewart; T. C. W. Dod; T. Jagger.
1919-20 W. Bellad Ellis; G. Stewart; E. T. Price; A. S. Munro.
1920-22 L. F. Bickell; T. Millar; L. B. Proctor; E. Poole.
1921-24 L. F. Bickell; T. Millar; R. W. Fletcher; J. Roberts.
1924-26 T. Jagger; A. S. Munro; T. Millar; L. F. Bickell.
1926-27 L. F. Bickell; T. C. W. Dod; T. Millar; E. Poole.
1927-29 L. F. Bickell; R. A. Young; T. Millar; E. Poole.
1929-30 L. F. Bickell; T. Millar; F. C. D. Mann; G. H. Swingler; A. Rodwell.
1931-32 T. Millar; F. C. D. Mann; G. H. Swingler; A. Rodwell.
1932-34 T. Millar; J. H. Gyles; G. H. Swingler; A. Rodwell.
1934-35 T. Millar; J. H. Gyles; G. H. Swingler; A. Rodwell.

Councillors:	Alternate Councillors:	Engineers:
	1935-36:	
T. P. Gray, Johannesburg. J. McLean, Port Elizabeth	H. W. Dely, Pretoria.	G. H. Swingler, C. Town. J. H. Gyles, Durban. T. Millar, Harrismith. E. H. Behrens, P.E.
	1936-37:	
H. Middlebrook, Durban. T. P. Gray, Johannesburg.	F. Morrell, Cape Town. J. McLean, Port Elizabeth.	G. H. Swingler, C. Town. T. Jagger, Ladysmith. E. A. Behrens, P.E. G. M. Pirie, Bloemfontein
	1937-38:	
H. G. Capell, Durban. W. James, Cape Town.	H. Middlebrook, Durban. L. Hofmeyr, Stellenbosch.	L. L. Horrell, Pretoria. J. S. Clinton, Salisbury. A. Q. Harvey, Springs. G. M. Pirie, Bloemfontein.
	1938-39:	
E. Spilkin, Umtata. W. James, Cape Town.	G. C. Starkey, E. London. W. Fowkes, Cape Town.	D. J. Hugo, Pretoria. J. S. Clinton, Salisbury. A. Q. Harvey, Springs. G. M. Pirie, Bloemfontein.
	1939-44:	
E. Spilkin, Umtata C. Olley, Salisbury.	G. C. Starkey, E. London. W. Fowkes, Cape Town.	D. J. Hugo, Pretoria. C. Kinsman, Durban. A. Q. Harvey, Springs. G. M. Pirie, Bloemfontein. W. M. Powell, Bloemfontein.
	1944-45:	
H. H. Verity, Johannesburg C. Olley, Salisbury.	H. E. Gearing, Cape Town. R. M. Thomas, Durban.	D. J. Hugo, Pretoria. C. Kinsman, Durban. J. C. Fraser, J'burg. G. R. E. Wright, Benoni.
	1945-46:	
J. Ohlsen, Bulawayo. J. W. du Plessis, Bfn.	M. Jaffray, Salisbury. E. Boylan, M.P.C., J'burg.	D. J. Hugo, Pretoria. C. Kinsman, Durban. J. C. Fraser, J'burg. G. R. E. Wright, Benoni.
	1946-47:	
P. J. C. du Plessis, M.P.C. (Bloemfontein) Major J. Raftery, J.P., M.P.C. (Durban).	A. Immink, Johannesburg. A. Z. Berman, Cape Town.	D. J. Hugo, Pretoria. J. C. Fraser, J'burg. J. C. Downey, Springs. D. A. Bradley, Pt. Elizabeth

THE ASSOCIATION OF MUNICIPAL
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RULES AND CONSTITUTION

ASSOCIATION OF

Municipal Electricity Undertakings

OF SOUTH AFRICA AND RHODESIA.

1. TITLE.

The name of the Association shall be "The Association of Municipal Electricity Undertakings of South Africa and Rhodesia."

2. OBJECTS.

The objects for which the Association is formed are:—

- (a) To promote the interests of Municipal Electricity Undertakings
- (b) To bring Municipal Electrical Engineers and Chairmen and Members of Municipal Electricity Committees together.
- (c) To arrange and hold periodical meetings for the reading of papers and discussions of subjects appertaining to Municipal Electricity Undertakings.
- (d) To take such action as may be lawful and expedient for the protection and defence of the rights or interests of Municipal Electricity Undertakings.

3. MEMBERSHIP.

The Association shall consist of

- (a) Honorary Members.
- (b) Councillor Members.
- (c) Engineer Members.
- (d) Associate Members.
- (e) Associates.

All Hon Members and Members of the Association of Municipal Electrical Engineers shall ipso facto become Hon. Members and Engineer Members of the Association of Municipal Electricity Undertakings and existing Associate Members shall be eligible to transfer to the class of Associate.

4. QUALIFICATIONS.

The qualifications for admission to the Association shall be as follows:

- (a) **Honorary Members** shall be distinguished persons who are or who have been intimately connected with Municipal Electricity Undertakings and whom the Association especially desires to honour for exceptionally important services in connection therewith.
- (b) **Councillor Members.** The Member whose Chief Electrical Engineer shall have qualifications acceptable to the Council shall be the Committee appointed by the Municipality or Local Authority to have control over its Electricity Undertakings and shall be represented as regards its qualifications to vote by one member of such Committee.
- (c) **Engineer Members.** The Member shall be the Chief Electrical Engineer engaged on the permanent staff of an Electricity Undertaking owned by a Municipality or Local Authority and who has

had a thorough training in electrical engineering and is otherwise acceptable by the Council of the Association. After 1st June, 1947, one only duly qualified assistant in an undertaking with sales of over 20,000,000 units per annum may also be admitted to this class on the recommendation of the Chief Electrical Engineer.

- (d) **Associate Members.** The member shall be a Technical Assistant engaged on the permanent staff of any Electricity Undertaking represented by its Councillor Member and/or Engineer Member.
- (e) **Associates.** Any Member resigning from the class of Engineer Member or Associate Member shall be entitled to apply for transfer to the class of Associate.

An Associate may also be an Engineer in the employ of the Victoria Falls and Transvaal Power Company or the Electricity Supply Commission, who may be engaged in the public supply of electricity to municipalities.

5. ADMISSION OF MEMBERS.

- (a) The election of Honorary Members and other classes shall be vested in the Council.
- (b) Councillor Members may be admitted on an application signed by the Town Clerk of the Municipality or Local Authority concerned.
- (c) Every candidate for election into the Association as Engineer Member shall make application on the prescribed form suitably endorsed by two supporters who shall be either Engineer Members, Councillor Members or Members of the Committee of the Municipal or Local Authority in charge of the Electricity Undertaking of which the applicant is Chief Electrical Engineer.

(d) Every candidate for election into the Association as Associate Member or Associate shall make application on the prescribed form suitably endorsed by the Engineer Member on whose staff he is engaged.

- (e) Every candidate for transfer to the class of Associate shall make application in writing for transfer.

6. CONTRIBUTIONS.

Contributions shall become due and payable annually on the 1st day of September which shall constitute the new financial year of the Association.

- (a) **Honorary Members** shall not be required to pay any contribution.
- (b) **Councillor Members.** In the case of the Committee appointed by a Municipality or Local Authority to have control over the Electricity Undertaking, the undermentioned scale of contributions shall apply:

SCALE OF CONTRIBUTIONS.

Up to	$\frac{1}{2}$ million units	—	4 guineas
$\frac{1}{2}$	1	—	6
1	10	—	8
10	50	—	12
50	100	—	14
100	200	—	16
200	300	—	18
Over	300	—	20

- (c) **Engineer Members.** The contribution of an Engineer Member in the service of a Committee making a contribution shall merge into and form part of such contribution. When a Committee is not a Member or resigns from membership, the Engineer Membership contribution shall be two (2) guineas.

- (d) **Associate Members and Associates.** The contribution of Associate Members or Associates shall be one (1) guinea.

Part Year Contribution. All Members shall pay the contribution for the year in which they are elected without reference to the period of the year at which their election takes place and they shall be entitled to receive a copy of the Proceedings or any other publication issued during such year.

Arrear Contributions. No class of member whose contribution is six months in arrear shall be entitled to attend or take part in any of the meetings of the Association or to receive any of the Association's publications.

Any class of member whose contribution is in arrear at any Convention shall deem to have forfeited claim to membership and his name may, by the Council, be removed from the register of the Association, but he shall, nevertheless be liable for such arrears up to the date of his name being removed.

7. COUNCIL.

Management. The affairs of the Association shall be managed by the Council, who shall have power to incur any expenditure necessary for the objects of the Association.

Members of the Council. The Council shall consist of a President, Vice-President, two Immediate Past Presidents, all of whom shall be Engineer Members and six other Members, two of whom may be Councillor Members.

Officers of Council. The officers of the Council shall be President, Vice-President, Secretary & Treasurer.

Election of Council. The officers and Members of the Council (other than the Secretary & Treasurer) shall be elected by nomination and ballot at the Convention, and shall hold office until the next Convention. In the event of a vacancy occurring during the year the remaining Members shall have

power to appoint a Member to fill the vacancy.

Co-option. The Council shall have power to co-opt any members of the Association or other persons for any special purpose whose services in their opinion may advance the objects of the Association.

Election of Secretary & Treasurer. The Council shall appoint and from time to time determine the remuneration (if any) and prescribe the duties of the Secretary & Treasurer who shall hold office during the pleasure of the Council.

8. MEETINGS.

Council. The Council shall meet as often as the business of the Association may require and at any meeting three shall constitute a quorum.

Convention. The Association shall hold Conventions yearly (of which the local Press of the town in which the Convention is held shall be given full particulars) as far as may be conveniently arranged, and at that meeting the Secretary & Treasurer shall present the Report and Balance Sheet of the Association for the immediate past period.

Quorum. At any meeting of the Association 15 shall form a quorum.

Chairman. The President shall take the chair at all meetings of the Association, the Council and the Committees, at which he is present, and shall regulate and keep order in the proceedings.

In the absence of the President, it shall be the duty of the Vice-President to preside at the meetings of the Association, and to regulate and keep order in the proceedings. But in the case of the absence of the President, and of the Vice-President, the meeting may elect any member of the Council or, in the case of their absence, any member present to take the chair at the meeting.

Resolve into Committee. The Association shall reserve to itself the right to resolve itself into Committee at any time during its proceedings; moreover,

it shall be competent for any member to have his paper read and discussed in committee if he so desires.

Sectional Voting. When a motion is before any Convention or meeting of the Association it shall be competent for any member of either the Councillor or Engineer sections to apply to the

Chairman for a "Vote by Section." This application shall be granted by the Chairman, whereupon each of these sections shall vote separately on the motion and unless a majority shall be obtained in each section, the motion shall be lost. On a sectional vote being called for, Associate Members and Associates shall not be entitled to vote.

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LOCOMOTIVES, Etc., Etc.

MEMBERS DELEGATES AND VISITORS ATTENDING CONVENTION
COUNCILLORS AND ENGINEERS

- ALBERTON.
C. E. Gregor.
- BENONI.
Cr. A. A. Webb.
R. Tarran.
- BETHLEHEM.
K. M. Fisher.
- BLOEMFONTEIN.
Cr. P. J. C. du Plessis, M.P.C.
G. J. Muller.
- BOKSBURG.
Cr. S. R. van Jaarsveld.
E. L. Smith.
- BRANDFORT.
D. v. S. Dreyer.
- BULAWAYO.
Cr. G. W. Liddell.
A. R. Sibson.
- CAPE TOWN.
Cr. A. Z. Berman, M.P.C.
H. A. Eastman.
C. G. Downie.
- CRADOCK.
Cr. G. L. E. Venter.
A. Rossler.
- DURBAN.
H. W. the Mayor,
Cr. R. Ellis Brown, J.P.
Cr. Major J. Raftery, J.P., M.P.C.
C. Kinsman.
- EAST LONDON.
Cr. L. Laden.
A. Foden.
- ESHOWE.
J. R. Cherry.
- FORT VICTORIA.
H. M. Strover.
G. G. Heasman.
- GEORGE.
Cr. G. O'Connell.
P. H. Newcombe.
- GREYTOWN.
J. S. Craig.
- GRAHAMSTOWN.
J. Iverach.
- GWELO.
A. Hadfield.
- HERCULES.
G. C. Theron.
- JOHANNESBURG.
Cr. A. Immink.
Cr. H. Miller.
J. C. Fraser.
- KIMBERLEY.
Cr. J. D. Baxter.
C. R. Burton.
- KINGWILLIAMSTOWN.
W. M. Andrew.
- KLERKSDORP.
Cr. W. G. Aldred.
J. M. Gericke.
- KOKSTAD.
W. G. Thackwray.
- KROONSTAD.
Cr. H. G. Schonborn.
W. Rossler.
- KLERKSDORP.
Cr. W. B. Jackson.
W. Theron.
- LADYSMITH (NATAL).
Cr. H. Quick.
F. Stevens.
- LOUIS TRICHARDT.
R. J. S. Wylie.
- MAFEKING.
Cr. K. C. Rowe.
G. E. H. Jones.
- NIGEL.
Cr. C. A. Zeelie.
H. Bickley.
- OUDTSHOORN.
C. H. E. Adams.
- PAARL.
Cr. E. du Preez.
H. J. Relihan.

PIETERSBURG.

Cr. R. T. K. Baker.
J. I. Inglis.

PIET RETIEF.

T. H. Mocke.

PIETERMARITZBURG.

Cr. A. E. Hirst.
C. R. Halle.

POTCHEFSTROOM.

Cr. H. Holtzhausen.
T. Kramer.

POTGIETERSRUST.

W. Rush.

PORT ELIZABETH.

D. A. Bradley.

PRETORIA.

Cr. D. P. van Heerden (Mayor).
Cr. L. H. Fourie.
D. J. Hugo.
J. Wilson.
P. C. Cowie.

QUEENSTOWN.

T. P. Ashley.

ROBERTSON.

Cr. R. L. Barry.
G. Aalbers.

ROODEPOORT-MARAISBURG.

Cr. B. J. v. d. Vyver.
H. L. Groom.

RUSTENBURG.

Cr. J. H. B. Trichardt.
P. A. Meintjes.

SALISBURY.

Cr. M. Jaffray.
B. H. J. Tubb.

SPRINGS.

Cr. T. Butler.
J. C. Downey.

SOMERSET EAST.

Cr. W. G. Meaker.
H. A. Prevost.

STANGER.

Cr. R. Stone.
C. H. Dwyer.

STELLENBOSCH.

Cr. L. Hofmeyr.
R. W. Ritson.

UITENHAGE.

A. Elliott.

UMTALI.

H. T. Turner.

UPINGTON.

Cr. J. J. Louw.
H. M. S. Muller.

VEREENIGING.

Cr. T. O. Warwick.
I. T. McPherson.
C. B. Foley.

VRYBURG.

P. C. Grandin.

WORCESTER.

Cr. A. N. Field.
H. J. Gripper.

OTHER MEMBERS

A. R. Campbell, Johannesburg.
J. S. Clinton, Johannesburg.
C. Dawson, Durban.
J. H. Gyles, Gilletts, Natal.
W. H. Milton, Johannesburg.
W. Mortimer-Mail, Kokstad.
W. N. Powell, Johannesburg.
J. A. West, St. Michael's, Natal.
G. R. E. Wright, Benoni.

DELEGATES

GOVERNMENT DEPARTMENTS.

H. H. Jagger, Electricity Supply Commission, Cape Town.
E. L. Damant, Electricity Supply Commission, Durban.

C. Dawson, Electricity Supply Commission, Durban.
 P. Furness, Electricity Supply Commission, Johannesburg.
 C. Mullins, Electricity Control Board, Pretoria.
 F. W. Joubert, Chief Inspector of Factories, Pretoria.
 H. O. Smith, Inspector of Factories (Engineering), Durban.
 G. A. Dalton, Chief Electrical Engineer, S. A. R. & H., Johannesburg.
 W. W. Lehman, S. A. R. & H., Durban.
 C. H. Clutterbuck, Chairman, Wiremen's Registration Board, Pretoria.
 J. Ritchie, Director, S.A. Bureau of Standards, Pretoria.
 N. H. Roberts, S.A. Bureau of Standards, Pretoria.
 Dr. R. Guelke, Council for Scientific & Industrial Research, Pretoria.
 R. N. F. Smit, Inspector of Factories (Engineering), Durban.
 J. J. de Haas, Public Works Department, Pretoria.
 H. C. Schwartz, G.P.O., Pietermaritzburg.
 H. Collins, G.P.O., Durban.

OTHER REPRESENTATIVES.

W. H. Milton, President, S.A. Institute of Electrical Engineers,
 Johannesburg.
 F. A. Hanlon, Institute of Certificated Engineers, Durban.
 Dr. W. Cormack, Witwatersrand University, Johannesburg.

REPRESENTATIVES—ENGINEERING COMPANIES.

Aycliffe Industries, Ltd.	N. Gold.
Babcock & Wilcox	K. M. Johnston, J. C. Callie.
Barlow, Thos. & Co.	D. M. Gray.
British General Electric Co., Ltd.	S. G. Mortimer.
British Insulated Cables (S.A.) Ltd.	A. L. Sanders.
Cable Makers' Association	E. R. Smith.
Chloride Electric Storage Co., Ltd.	A. C. Tilley.
Enfield Cables (S.A.), (Pty.), Ltd.	A. E. Torrance, J. S. Eckbo.
English Electric Co., Ltd.	J. Nethersole, A. Dowd.
Fraser & Chalmers S.A., Ltd.	H. D. T. Harris.
Henley's (S.A.) Telegraph Works Co., Ltd.	R. W. Lord.
Hubert Davies & Co., Ltd.	W. N. Powell.
Metropolitan-Vickers Elec. Export Co., Ltd.	R. G. Hunter.
Parsons, C. A. & Co. (S.A.) (Pty.), Ltd.	G. Gelling.
Reunert & Lenz, Ltd.	R. A. E. Denton, A. Morcom.
Reyrolle A. & Co., Ltd.	J. G. Gibbons.
S. A. General Electric Co., Ltd.	H. A. Tinson.
Trevor Williams, Arthur (Pty.), Ltd.	C. L. de Beer.
Urquhart & Co. (Pty.), Ltd., R. T.	A. R. Campbell.
Wilson & Herd, Ltd.	H. N. Hancox.

VISITORS.

S. G. Redman, Merz & McLellan, Johannesburg.	E. J. McKechnie, Johannesburg.
B. E. Mahon, Durban.	A. Wilson, Henleys, Gravesend, Kent.
R. M. O. Simpson, Electricity Depart- ment, Durban.	G. Drewett, Johannesburg.
J. Lownie, Electricity Dept., Durban.	O. S. Chalmers, Johannesburg.
J. Williamson, Vacuum Oil Co., Durban.	F. B. King, Johannesburg.
	J. Rautenboch, Potchefstroom.
	A. D. Kinsman, Elect. Dept., Durban.

LADIES.

- Mrs. W. M. Andrew, Kingwilliamstown.
 Mrs. T. P. Ashley, Queenstown.
 Mrs. B. W. L. Baker, Pietersburg.
 Mrs. R. L. Barry, Robertson.
 Mrs. J. M. Baxter, Kimberley.
 Mrs. E. J. Bradley, Port Elizabeth.
 Miss Betty Bradley, Port Elizabeth.
 Mrs. A. J. Burton, Kimberley.
 Mrs. A. R. Campbell, Johannesburg.
 Mrs. C. H. Clutterbuck, Pretoria.
 Mrs. A. J. Cowie, Pretoria.
 Mrs. E. L. Damant, Durban.
 Mrs. C. L. de Beer, Johannesburg.
 Mrs. J. C. Downey, Springs.
 Mrs. A. N. Field, Worcester.
 Mrs. A. Foden, East London.
 Mrs. C. B. Foley, Vereeniging.
 Mrs. J. C. Fraser, Johannesburg.
 Mrs. M. Furness, Johannesburg.
 Miss E. Furness, Johannesburg.
 Mrs. H. J. Gripper, Worcester.
 Mrs. C. R. Halle, Pietermaritzburg.
 Mrs. F. Hanlon, Durban.
 Mrs. H. N. Hancox, Johannesburg.
 Mrs. H. D. T. Harris, Johannesburg.
 Mrs. A. E. Hirst, Pietermaritzburg.
 Mrs. H. Holtzhausen, Potchefstroom.
 Mrs. S. E. Hugo, Pretoria.
 Mrs. A. Immink, Johannesburg.
 Mrs. J. Iverach, Grahamstown.
 Mrs. H. H. Jagger, Cape Town.
 Mrs. G. E. H. Jones, Mafeking.
 Mrs. C. Kinsman, Durban.
 Mrs. A. D. Kinsman, Durban.
 Mrs. T. Kramer, Potchefstroom.
 Mrs. Leo. Laden, East London.
 Mrs. R. Levy, Johannesburg.
 Mrs. J. Lownie, Durban.
 Mrs. B. E. Mahon, Durban.
 Mrs. H. Miller, Johannesburg.
 Mrs. W. Mortimer-Mail, Kokstad.
 Mrs. G. J. Muller, Bloemfontein.
 Mrs. H. M. S. Muller, Upington.
 Mrs. C. Mullins, Lion's River.
 Mrs. A. A. Newcombe, George.
 Miss R. Newcombe, George.
 Mrs. D. O'Connell, George (Mayoress).
 Mrs. K. C. Rowe, Mafeking.
 Mrs. W. Rush, Potgietersrust.
 Mrs. A. R. Sibson, Bulawayo.
 Mrs. C. N. Sim, Aliwal North.
 Mrs. R. M. O. Simpson, Durban.
 Mrs. L. Tarran, Benoni.
 Mrs. W. G. Thackwray, Kokstad.
 Mrs. H. A. Tinson, Johannesburg.
 Mrs. H. T. Turner, Umtali.
 Mrs. B. J. v. d. Vyver, Roodepoort-
 Maraisburg.
 Miss v. d. Vyver, Roodepoort-
 Maraisburg.
 Mrs. T. Warwick, Vereeniging.
 Mrs. A. A. Webb, Benoni.
 Mrs. J. A. West, St. Michael's, Natal.
 Mrs. E. Wilson, Pretoria.
 Mrs. C. A. Zeelie, Nigel.

LIST OF MEMBERS AS AT 31st AUGUST, 1946.

HONORARY MEMBERS:

- Van der Bijl (Doctor) J. H., Electricity Supply Commission.
 Horrell, L. L., Johannesburg.
 Poole, E. Durban.
 Rodwell, A. T., Johannesburg.

COUNCIL MEMBERS:

Municipal Council of:—

Adelaide	Nelspruit
Alice	Nigel
Aliwal North	N'dola
Beaufort West	Oudtshoorn.
Benoni	Paarl
Bethlehem	Pietersburg
Bloemfontein	Pietermaritzburg
Boksburg	Piet Retief
Brandfort	Port Alfred
Bulawayo	Port Elizabeth
Cape Town	Port Shepstone
Cradock	Potgietersrust
Delmas	Pretoria
Durban	Queenstown
East London	Randfontein
Ermelo	Robertson
Eshowe	Roodepoort-Maraisburg
Fort Beaufort	Rustenburg
Fort Victoria	Salisbury
George	Somerset East
Grahamstown	Springs
Gwelo	Springfontein
Hercules	Stanger
Johannesburg	Stellenbosch
Kimberley	Uitenhage
Kingwilliamstown.	Umtata
Klerksdorp	Upington
Kokstad	Umtali
Kroonstad	Vereeniging
Krugersdorp	Victoria West
Kuruman	Vryburg
Ladysmith (Natal)	Walmer
Louis Trichardt	Willowmore
Mafeking	Winburg
Matatiele	Windhoek
Middelburg (C.P.)	Worcester.
Middelburg (Tvl.)	

ENGINEER MEMBERS :

Adams, C. H.	Oudtshoorn.
Anderson, F.	Port Alfred.
Andrew, W. M.	Kingwilliamstown.
Ashley, T. P.	Queenstown.
Baskerville, J. J.	Aliwal North
Bevington, H. R.	Middelburg (C.P.).
Bickley, H.	Nigel.
Bradley, D. A.	Port Elizabeth.
Burger, J. F.	Springfontein.
Burton, C. R.	Kimberley.
Craig, J. S.	Greytown.
Delpport, G. C.	Delmas.
De Wet, D. P.	Willowmore.
Downey, J. C.	Springs.
Dwyer, C. H.	Stanger.
Eastman, H. A.	Cape Town.
Elliott, A.	Uitenhage.
Fisher, K. M.	Bethlehem.
Foden, A.	East London.
Foley, C. B.	Vereeniging.
Ford, A. M.	Winburg.
Fraser, J. C.	Johannesburg.
Gericke, J. M.	Klerksdorp.
Giles, P. A.	East London.
Grandin, P. C.	Vryburg.
Gregor, C. E.	Alberton.
Gripper, H. J.	Worcester.
Groom, H. L.	Roodepoot-Maraisburg.
Hadfield, A. W. K.	Gwelo.
Halle, C. R.	Pietermaritzburg.
Heasman, G. G.	Fort Victoria.
Hourel, W.	Randfontein.
Hugo, D. J.	Pretoria.
Inglis, J. I.	Ermelo.
Iverach, J.	Grahamstown.
Jones, G. E. H.	Mafeking.
Kane, R. W.	Johannesburg.
Kinsman, C.	Durban.
Kramer, T.	Potchefstroom.
Kruger, J. J.	Adelaide.
Lategan, J. F.	Brandfort.
Leishman, R.	Johannesburg.
Lotter, G. A.	Ermelo.
Meintjes, P. A.	Rustenburg.
Milln, D. R.	Blantyre.
Mocke, T. H.	Piet Retief.
Mole, E. W.	Walmer
Muller, G. J.	Bloemfontein.
Muller, H. M. S.	Upington.
Newcombe, P. H.	George.
Nicholas, I. J.	Umtata (Transkei).
Prevost, H. A.	Somerset East.
Redman, R. H.	Bulawayo.

Relihan, H. J.	Paarl (C.P.).
Ritson, D. W.	Stellenbosch.
Rogers, J.	Fort Beaufort.
Rossler, A.	Cradock.
Rossler, W.	Kroonstad.
Rush, W.	Potgietersrust.
Sibson, A. R.	Bulawayo.
Sim, G. N.	The Strand.
Smith, E. L.	Boksburg.
Smith, M. M.	Adelaide.
Stevens, F.	Ladysmith (Natal).
Theron, G. C.	Hercules.
Theron, W. C.	Krugersdorp.
Tubb, B. H. J.	Salisbury.
Turner, H. T.	Umtali.
Vergottini, P. L.	Brakpan.
White, J. H.	N'dola.
Williams, V. E.	Windhoek.
Wilson, J.	Pretoria.
Wylie, R. J. S.	Louis Trichardt.

ASSOCIATE MEMBER:

McDonald, F. G.	P.O. Box 399, Pietermaritzburg.
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ASSOCIATES:

Behrens, E. A.	229 Vause Road, Durban.
Basherville, C. H.	P.O. Box 1094, Salisbury.
Coulthard, R. D.	Arcturus Road, Highlands, Salisbury.
Castle, F.	P.O. Box 303, Cape Town.
Campbell, A. R.	P.O. Box 584, Johannesburg.
Clinton, J. S.	34 Wanderers Street, Johannesburg.
Dawson, C.	Electric Supply Com., Congella, Durban.
Dobson, J. H. Dr.	P.O. Box 7764, Johannesburg.
Ewer, G. G. Col.	9th Floor, Surrey House, 39 Rissik St., Johannesburg.
Gyles, J. H.	Gillett's, Natal.
Lloyd, R. K.	P.O. Box 786, Bulawayo.
Mail, W. Mortimer-	P.O. Box 164, Kroonstad.
Marchand, B.	P.O. Box 223, Witbank.
Milton, W. H.	P.O. Box 1091, Johannesburg.
Mercier, G.	P.O. Box 377, Salisbury.
Pentz, J. O.	P.O. Box 4560, Johannesburg.
Phillips, J. W.	P.O. Box 1417, Salisbury.
Proctor, L. B. Major	P.O. Box 17, Newcastle.
Powell, W. N.	P.O. Box 1386, Johannesburg.
Stewart, G. A.	P.O. Box 6672, Johannesburg.
Stewart, M. C. D.	
Syers, F. E.	P.O. Box 55, Gatooma, S. Rhodesia.
West, J. A.	Box 24, St. Michael's, Natal.
Wright, G. R. E.	Box 465, Benoni.

PROGRAMME AND AGENDA

Twenty-First Convention held in the City Hall, Durban,
From 6th to 9th May, 1947.

MONDAY, MAY 5th, 1947.

9.00 a.m. Meeting of Council.

TUESDAY, MAY 6th, 1947.

- 9.00 a.m. Registration and issue of papers, etc.
- 10.00 a.m. Official opening of Convention by His Worship the Mayor of Durban (Councillor R. Ellis Brown, J.P.).
- 10.30 a.m. Refreshments.
- 10.45 a.m. Annual General Meeting (Visitors may attend, but only Members may vote).
- 12.30 p.m. Lunch interval.
- 2.30 p.m. Official Photograph.
- 3.00 p.m. Official opening of Electrical Exhibition by His Worship the Mayor of Durban (Councillor R. Ellis Brown, J.P.).
- 5.30 p.m. Informal Reception at Durban Country Club as guests of the City Council.

AGENDA.

1. Annual Report of Secretary and Treasurer.
2. Election of President.
3. Venue of next Convention.
4. Election of Officers.
 - (a) Vice-Chairman.
 - (b) Executive Council.
 - (c) Sub-Committees.
5. Presidential Address.
6. Reports of Sub-Committees:—
 - (i) World Power Conference.
 - (ii) Electrical Wiremen's Registration Board.
 - (iii) Safety Precautions.
 - (iv) Overhead Lines and Code of Practice.
 - (v) S.A. Standards Institution.
 - (vi) Statistical Tables.
 - (vii) Registration of Electrical Wiring Contractors.
 - (viii) Regulation of Profits in the Relief of Rates.
 - (ix) Freight Charges on Coal.
7. Proposed Duty on Electrical Machinery.
8. Salary Scales.
9. Plastic Insulated Wire.
10. Meter Testing Code.
11. Protection of Electrical Engineers.
12. Standardisation of Voltages.
13. Standard Wiring Regulations — House Service Connections.
14. Auditors—Appointment of.
15. Amendments to Rules and Constitution.
16. Letter from Controller of Building Materials (Electrical).
17. Controls.
18. General.

RETIRING OFFICERS.

President: G. J. MULLER, Bloemfontein.

Vice-President: C. KINSMAN, Durban.

Past Presidents: I. J. NICHOLAS, Umtata; H. A. EASTMAN, Cape Town.

Councillor Members, One representative each from Bloemfontein and Durban.

Alternates: One representative each from Johannesburg and Cape Town.

Engineer Members: J. C. FRASER, Johannesburg; D. J. HUGO, Pretoria; J. C. DOWNEY, SPRINGS; D. A. BRADLEY, Port Elizabeth.

MEMBERS OF COMMITTEES

1. S.A. Standards Institution: D. J. HUGO, J. C. DOWNEY (Alternate).
2. World Power Conference (Local Committee): H. A. EASTMAN.
3. Electrical Wiremen's Registration Board: J. C. FRASER.
4. Safety Precautions: J. C. DOWNEY, J. C. FRASER (Alternate).
5. Overhead Lines Regulations: J. C. FRASER, J. G. MULLER (Alternate).

WEDNESDAY, MAY 7th, 1947.

- 8.30 a.m. Meeting of Council.
 9.30 a.m. Convention resumes.
 10.30 a.m. Refreshments.
 11.00 a.m. Paper by Mr. J. Ritchie on the "Establishment and Organisation of the South African Bureau of Standards."
 12.30 p.m. Lunch interval.
 2.30 p.m. Convention resumes.
 3.45 p.m. Refreshments.

- 4.00 p.m. Convention resumes.
 5.00 p.m. Adjourn.
 8.00 p.m. Cinema Show as Guests of City Council.

THURSDAY, MAY 8th, 1947.

- 8.30 a.m. Meeting of Council.
 9.30 a.m. Convention resumes.
 10.30 a.m. Refreshments.
 11.00 a.m. Paper by Mr. J. Wilson on "Modern Power Station Practice in America and Britain and other Supply Matters."
 12.30 p.m. Lunch interval.
 3.00 p.m. Trip around the Harbour (weather and other circumstances permitting) by kind permission of the System Manager, S.A. Railways and Harbours.

FRIDAY, MAY 9th, 1947.

- 8.30 a.m. Meeting of Council.
 9.30 a.m. Convention resumes.
 10.30 a.m. Refreshments.
 11.00 a.m. Paper by Mr. C. G. Downie on "Some Factors in the Economic and Commercial Development of Municipal Electricity Undertakings."
 12.30 p.m. Lunch interval.
 2.30 p.m. Convention resumes.
 3.45 p.m. Refreshments.
 4.00 p.m. Convention resumes.
 5.00 p.m. Convention closes.

THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA AND RHODESIA.

Proceedings of the Twenty-First Convention

The Twenty-First Convention of the Association of Municipal Electricity Undertakings of South Africa and Rhodesia was opened in the City Hall, Durban, by His Worship the Mayor, COUNCILLOR R. ELLIS BROWN, J.P., at 10 a.m. on Tuesday, 6th May, 1947.

Representatives of 53 Municipalities were present at the Convention, including 37 Councillor Members, 54 Engineer Members, 9 Associates, 20 Delegates from Government Departments, other Power Supply Authorities and Engineering Institutions, etc., 4 other Engineer visitors, 28 Trade Representatives and 62 Ladies—a total of 214.

THE PRESIDENT (Mr. G. J. Muller, Bloemfontein): Ladies and Gentlemen, it affords me very much pleasure to introduce to you His Worship the Mayor, Councillor Ellis Brown. Mr. Mayor, we are indeed indebted to you for asking us to celebrate our twenty-first anniversary in this fair city of yours, and I have now the pleasant duty of asking you to open the proceedings of this Convention.

CIVIC WELCOME

HIS WORSHIP THE MAYOR (Councillor R. Ellis Brown, J.P.): Mr. President, Ladies, and gentlemen; thank you for your words of welcome this morning. I note that you indicate that it is your twenty-first anniversary. Of course it is the 50th anniversary of the electricity undertaking of this city, and on behalf of my fellow Councillors, and on my own behalf, it is my privilege and pleasure to-day to welcome the delegates from other parts of the Union and from Rhodesia to this very important Convention. Need I say that I do that with very great heartiness. Last year your Convention was held in Bloemfontein and was eminently successful. This year we are glad to have you with us and we are glad to know that you have felt impelled to turn your steps to the direction of Durban, and I can assure you,

ladies and gentlemen, that we shall do our very best to make your visit to this City not only pleasant but profitable and pleasurable as well.

There are something like two hundred delegates at this Convention this morning, representing Municipalities and Municipal undertakings throughout the Union and in Rhodesia. I have had the pleasure of welcoming many delegates to this City, but, from the point of view of numbers, I think this is the most impressive that it has been my pleasure to welcome here, and considering the fact that these two are young countries—South Africa and Rhodesia— young in years and young in Municipal experience, the numbers that turn up makes that position quite remarkable, as less than 70 years ago the use of electricity for industrial purposes was virtually unknown, and its potentialities were unrealised. It was just beginning to be recognised as a new and somewhat speculative illuminant, and the gas companies of those days were beginning to be a little apprehensive as to its possible and probable effects on their enterprises, but beyond that, the new and extensive field that was opening up to electricity users remained unexplored, and had not impressed itself on the general consciousness. Now electricity is a commonplace and rules practically in all directions. We ride to-day in electric trains. Our buses are driven by electricity. We warm ourselves at electrical fires. We cook our meat—when we can get any—in electric ovens. We cool ourselves by electric fans. We undertake the curing or prevention of disease by electric means. We examine our internal organs and literally look through one another by electric rays. We fire guns, explode bombs, bore holes, drive rivets, detect submarines, launch battleships, transmit messages by land and sea, and do virtually half the things which it falls to us to do by electricity. Lately I see that tired men, or shall I say men who have a passion for

novelties, have begun to shave with electric razors. What some of our forefathers would say if they could come back to us for a few hours and view developments in electrical directions I cannot think, but it is safe to say they would be greatly astonished. We protect men, we even kill men, by electricity, and we come very near, in some cases, of bringing them back to life by the same means.

Our Municipal undertakings have, of course, assumed new aspects by reason of electrical developments. Indeed, it is not too much to say that Municipal life as we know it would be impossible without electricity. If things go on as they have been going, the time is not far distant when the dreams of some of our novelists and playwrights will be realised. We shall have electric Mayors and electric Town Councillors and probably electrify our bourgeois. It may be that we shall have electric critics, journalists, editors and people who will be able to tell us even more emphatically and infallibly what we ought and ought not to do than at the present time.

The extraordinary thing is that at present there is no one who can tell us in very precise language just what electricity is. It used to be called fluid. To-day I believe it is called a force, an energy, or something of that kind. There are various names for it, but the names given to it do not affect its utility. Years ago two men were fishing in a stream. One of them was a staid old angler of the Izaak Walton type who liked to stand and whip the waters without any noise or chatter or interruption of any kind. The other was a garrulous youth, full of question and curiosity, who liked to know the why and wherefore of everything. Much to the annoyance of the older man he kept up an incessant stream of talk. "Isn't it remarkable," he said, "that this river keeps on flowing year after year, in heat and cold, in summer and winter, never varying to any appreciable degree, and yet no one knows with any great accuracy where the volume of its water comes from? A little spring away back in the hills is all that can be discovered. What is the explanation? How do you account for it? Exasperated beyond endurance, the old man rapped out at last, "I don't account for it, I just fish

in it!" That pretty well represents our attitude to this remarkable thing called electricity. We do not know very much about it, we cannot define it in any precise terms. We know it to be a cause or agent underlying certain natural phenomena. We are not sure what it is, so we don't account for it, we just use it; so much do we use it, and so much are we dependent upon it, that it is impossible to think of modern municipal life without it.

It is not my intention this morning to go into all the ramifications of municipal enterprise, or into the almost innumerable problems that arise in connection with the application of electricity to our municipal undertakings. You know something of them in your own municipalities and out of your experience you will be able to visualise some of the problems which the application of electricity presents in our City. The possibility of getting help from you, and it may even be of giving a little help to you as you and we together face up to these problems is one of the attractions of a convention of this kind, and I am hopeful that during the course of the deliberations at this Convention much good may accrue to us all as we study these problems together.

Production, conservation, distribution, salesmanship, the best method of bringing home to the householder the advantages of using electricity and of inducing them to employ it, the arrangement of terms whereby poor and less wealthy people may be brought within reach of it, or may have it brought within reach of them—these are only a few of the problems that present themselves, and you will bear me out that they are problems that are urgent from municipal points of view. No doubt the comparison of methods, the exchange of ideas, the recounting of experiences, of successes and disappointments, met with by this or that local authority, ideas that may prove fruitful and be productive of fresh enterprise in popularising this extremely important commodity, are some of the results that are likely to flow from a Convention of this kind, and these, in the end, will be the justification for your Convention.

We certainly have some of the best electrical brains in South Africa present this morning and are, therefore, entitled to be optimistic about the results of our Conven-

tion. We ought to be able to help one another very materially and I am confident that we shall.

I am not going to say any more, ladies and gentlemen; you have a long and important agenda before you and I will leave you to get on with it. Let me conclude, therefore, by saying once more how very glad we are to have you with us and how sincerely we hope that your convention will prove to be the great success that we anticipate. I have much pleasure in declaring the Convention open.

Just to indicate how Durban looks with pleasant eyes on this gathering, how glad we are to extend hospitality municipally and in any way that it is possible, my City Electrical Engineer indicates that his department has agreed to present to you for Convention purposes, for the use of your President in conducting this meeting a stand with a gavel on it. I hope, Mr. President, it won't be necessary for you to make any great use in a too significant manner of this gavel, but its intention is that it preserves I think a dignity of office when the gavel is available to the Chairman to help him keep a little order with the electricity which will be in the air at your Convention!

PRESIDENT (Mr. Muller): Mr. Mayor, I am sure I express the sentiments of everyone present here if I convey to you, sir, and to your city our most sincere thanks for the words of welcome spoken and the way you have impressed on us the importance of our industry. I don't know how many members of the Government are present—I hope there are quite a number, so that they can also be impressed and see that we get the coal this winter that we nearly missed last winter.

You spoke, sir, of the many things we do by electricity; amongst others, you mentioned the possibility of electrifying the burgesses—I notice there is the Chief Inspector of Factories with two other inspectors, present to see that we don't electrocute them.

Our Association has now come of age, and I trust, sir, that with the aid of this gavel which I had the opportunity of using a few moments ago, it will be possible for the President to maintain that dignity and

order which befits our new status, and I am afraid that in the past, while discussing such interesting subjects as the relief of rates, the unruly spirit of youth must have been only too apparent, and in thanking you for this very attractive addition to the implements of office, I trust that the deliberations of our Convention, which will include the commercial, social and technical side of our industry as well as the bread and butter lines such as scarcity of materials, will prove to you that at least we are inspired to live up to the responsibilities in keeping with our new seniority. Thank you, Mr. Mayor.

Ladies and gentlemen: We can now commence with the formal business of our Convention, and the first item will be the election of the new President. I therefore now have much pleasure in calling for nominations for the Presidency for the ensuing year.

ELECTION OF PRESIDENT.

COUNCILLOR IMMINK (Johannesburg): Mr. Mayor, Mr. Chairman, it gives me great pleasure this morning to nominate for the ensuing year for the position of President of this Association a Durban boy—a boy, ladies and gentlemen, who has served this city for no less than 36 years in its Electricity Department, and who has for eight years held the position of City Electrical Engineer. I have great pleasure in nominating Mr. C. Kinsman as President for the ensuing year.

Mr. H. A. EASTMAN (Cape Town): Mr. President, ladies and gentlemen, I have very much pleasure in seconding the proposal that Mr. Kinsman be our President for the ensuing year. I second that proposal with all the greater confidence that he will serve us well, having in mind the fact that he has already served us for a number of years on the Executive Council of our Association with very great benefit to the Association and it is for that reason, sir, that I suggest to the Association that Mr. Kinsman's name is well worthy of support as our President for the coming year.

THE PRESIDENT (Mr. Muller): If there are no further nomination, I have much pleasure in declaring Mr. Kinsman duly elected as President for the ensuing year.



C. KINSMAN, DURBAN
President, 1947-1948

Mr. KINSMAN: Mr. Mayor, ladies, and gentlemen: I am very conscious of the honour that the members of the Association have conferred upon me, and I want to thank Councillor Immink for his kindly words for my services in the Department. I will have more to say about the pleasure and privilege which I feel but at this stage I would like to make one or two references.

Unfortunately, one has to refer to the passing over of members during the preceding year and on this occasion I am sorry to have to express our regret at the passing of Mr. George Swinger, of Cape Town; Mr. A. J. Verryn, of Louis Trichardt; Mrs. Coulthard, the wife of one of our associate members; and Mrs. Ritson, wife of Mr. R. W. Ritson, of Stellenbosch. As a mark of respect and in sympathy with those who are bereaved I would ask you to stand for a moment or two.

Then, in a happier note, it gives me very great pleasure on behalf of the Association, in representing it as its President, to endorse His Worship the Mayor's welcome to all of you, and I hope that the fruits of it will be of benefit to all.

I would like to make reference to my pleasure in seeing Mr. Gyles, a Past President of this Association.

And, finally, I would like to express regret that both Mr. Rodwell and Mr. Horrell, who intended attending this Convention and on whose behalf accommodation had already been reserved, had to change their plans. Mr. Horrell is suffering some slight discomfort, but in the case of Mr. Rodwell, Mrs. Rodwell's health caused the change of plans, and I am sure you would join me in expressing the hope of the speedy restoration to health of Mrs. Rodwell and Mr. Horrell.

Then it is customary at this stage to refer to certain greetings and you will be pleased and not surprised to hear of Mr. Poole, who served this Association as its Secretary for many years. He is in England and sent me a cable from Penzance. Mr. Poole wishes the Convention well, congratulates the incoming President and the

department on its 50th Jubilee. He can well do that, having served the department for 35 years.

I will now refer to other messages. We have two apologies from Mr. Nicholas, of Umtata, one of our Past Presidents, and also a telegram from Mr. Frank Castle, who sends best wishes for a successful Conference.

GREETINGS AND APOLOGIES COMMUNICATED.

A. Rodwell, Past President; R. D. Coulthard, Associate).

Municipality of Randfontein.

T. G. Otley, General Manager, Victoria Falls and Transvaal Power Co., Ltd.

V. Pickles, Chief Engineer, Victoria Falls and Transvaal Power Co., Ltd.

Dr. H. J. van der Bijl, Chairman, Electricity Supply Commission.

G. R. Harding, Electricity Supply Commission, Johannesburg.

Provincial Administrator, Natal Province.

Provincial Administrator, Transvaal Province.

Provincial Administrator, Cape Province.

Chief Engineer, Rand Water Board.

Secretary, Fuel Research Institute of South Africa.

Secretary, Industrial Development Corporation of S.A., Ltd.

Controller of Building Materials (Electrical).

Chairman, National Federation of Building Trade Employers in S.A.

International Combustion S.A. (Pty.), Ltd.

Rice and Diethelm, Ltd.

Stewarts & Lloyds S.A. Ltd.

At a later stage I will present my Presidential Address, but at this stage I will ask Mr. Muller, the retiring President, to present his Valedictory Address.

RETIRING PRESIDENT'S VALEDICTORY ADDRESS

By G. J. MULLER, B.Sc.(Eng.),
A.M.(S.A.)I.E.E., City Electrical
Engineer, Bloemfontein.

Another year has been added to the past, and I have joined the honoured ranks of the Past Presidents of this Association. This past year has been one of extraordinary development for the City I represent, and it has not been possible for me to devote as much time to the affairs of the Association, as those important matters merited. At the end of my term I must, therefore, regretfully repeat the words of Rhodes—"So little done—so much to do!"

It has, however, been possible to do a considerable amount of useful work. To speed the business of the Association by holding a meeting of the Executive Council in Johannesburg. It was hoped to hold a second meeting early this year, but it was not found possible to get a full attendance until after the conclusion of the Royal Visit.

I would like to comment in general on the present position of the Municipal Electricity Supply industry and the factors affecting future policy, but before doing so, it affords me real pleasure to thank each member of the Executive Council, the sub-committees who did most of the hard work, and last, but not least, our Secretary and Treasurer for the wholehearted support and the friendly spirit which has characterised all our dealings and made my year of office a pleasant one in spite of adverse conditions.

Less pleasant is the need to apologise for not keeping our promise to have the proceedings printed by September or October of last year. The Secretary had all copy, including advertisements, ready in reasonable time for completion of the work, but I had the satisfaction of learning that there is at least one industry more hard pressed than our own, and that is the printing industry!

If an assured market for a product can be considered a sound basis for the future

of an industry, then we must conclude that the future of the Electricity Supply industry is as sound as anything can be in this fluid period of the world's history. There are, however, factors to-day which complicate the issue and cause some misgivings in the minds of at least some Councillors and Engineers.

Up to the present the Electricity Supply Industry whether as a private, semi-government or Municipal enterprise, has been a stable factor in our inflated economic structure. Tariffs have remained almost unchanged since 1938 and in some cases have actually been reduced in spite of the ever rising cost level. It will be very difficult if not impossible to maintain the present position much longer, as even the most rigorous economy and efficiency in the administration of an undertaking cannot indefinitely counteract the effects of rising costs of material and labour, and who would say that wages are too high in the light of the present cost of food, clothes and shelter. To me this is abundant proof that Municipal undertakings, in spite of what has been said so often about their rate relieving habits, have justified their existence and have proved the value of municipal institution, where the grievance of the man in the street can still be heard above the roar of national politics.

The case for and against the wholesale nationalisation of the industry is being hotly argued to-day in the British Technical Press, and it is perhaps too early to judge, but it is clear that under State control very serious conditions may arise in which any individual community is entirely powerless to fend for itself. It has, for instance, been argued that the loss in plant capacity due to allocation of unsuitable coal would have made up the load which had to be shed. This argument was forcibly brought home to me last winter, when in desperation I bought out some coal which on paper did not appear to differ so vastly from our usual contract coal—more ash, less volatile, the calorific value somewhat less, but it was simply impossible to keep up steam pressure and the only way it could be used at all was by mixing as best we could.

These remarks should, however, not be interpreted as an argument against a national

electricity undertaking, but only as emphasizing that there is room for both state as well as municipal enterprise. After all, we expect the State to run the Railways for the benefit of the country as a whole, but prefer to operate municipal transport undertakings even if they do not show a profit, because we consider it in the interests of our town to provide transport as and when required.

I notice from parliamentary reports that the Electricity Act is to be amended to empower the Electricity Supply Commission to supply areas which are not immediately payable, but have possibilities of development. This is a policy South Africa has been waiting for for a long time, as it would make possible the development of areas which up to now have been stagnant as local authorities are in the first instance only responsible for service within their town boundaries and in most cases would find it difficult to raise a loan for a station of sufficient size to supply reasonable industrial and rural loads.

I personally welcome this move, as I look upon the supply of electric energy to large national industries such as mines, steelworks etc., and large scale rural electrification as essentially the function of the State while the larger towns and cities who are financially strong enough and can supply energy at competitive rates generally prefer to generate for themselves. My Council is enthusiastic about the scheme and as constituted at the time of writing would be prepared to co-operate with the E.S.C. to the extent of saving heavy initial cost on long distance transmission lines by supplying energy over E.S.C. lines from its own station until the rural load has been sufficiently developed to warrant further expenditure by the E.S.C. on lines or possibly a regional station.

In this way they would not only have assisted the E.S.C. in the national interests but would also have had an extra load in the initial stages of the next extension which could be shed in the later stages when their own requirements called for the full output.

If Municipal Electricity undertakings are, therefore, to survive and continue to render

the service which I make bold to say they have done very satisfactorily so far, they will have to probe to the roots of the trouble which has as a major symptom a steadily rising spiral of cost.

To get a bird's eye view of the position the following cost analysis of a medium sized generating and distributing undertaking for 1945 may be useful.

CAPITAL COSTS.

Redemption .....	.117	pence/unit
Interest .....	.240	" "
Renewals and Reserve	.117	" " .474d

OPERATING COSTS.

Wages .....	.071	" "
Materials .....	.222	" " .293d

REPAIRS AND MAINTENANCE

Wages .....	.036	" "
Materials .....	.045	" " .081d

ADMINISTRATION.

Sal. and Wages .....	.063	" "
Stationery & Sundries	.001	" "
Establishment Charges	.037	" " .101d

RELIEF OF RATES		.278d
		<hr/> 1.227d

As materials and wages are not normally segregated in this way individual figures are essentially approximate, but sufficiently representative for the purpose.

Reducing still further, we get:

Costs attributable to—	
Plants and Materials .....	.742d. per unit
Salaries and Wages, etc .....	.207d. " "
Relief of Rates .....	.278d. " "

Relief of rates in this case amounted to about 6 per cent. on uncovered capital and more than balanced out the whole cost of salaries, wages, allowance, etc. Against this the cost the financial obligation for loans and direct purchases of material for current use amounts to about 55 per cent. more than the sum of the other two factors of cost. Granted that once the plant has been pur-

chased the financial charges are fixed and granted further that under the present system of controlled and ring prices the local authority has little control over the cost of materials purchased it would appear assuming no waste, that the local authority has practically no control over 60 per cent. of its current expenditure in the supply of electricity, except in so far as this can be effected by improved load factor, and this explains occasional cuts in salaries and the annual grievance about relief of rates. It is about all a Council can do without having to take a plunge in the technicalities of probable effects of changes in tariffs on load factor. Taking the major cost of plant and materials we find that there is a continuous rise in cost of everything except water, which is supplied by the Council itself. Even the Government have added their quota to the spiral with their 20 per cent. surcharge on railway rates for coal.

Unfortunately this disease is not peculiar to South Africa. It is felt throughout the world and is so complicated that economists in every country have so far been powerless to stem its course in spite of their knowledge that it must bring disaster in the end.

The warning by the president of the S.A.I.E.E. that the exercise of good judgment is required in planning for future development, should be heeded by every Municipal undertaking, and it will require good judgment indeed to strike the balance between hampering development on the one hand by inadequate provision for expansion and over capitalisation on the other hand with its crippling effects for the next 10 or 20 years.

Mr. Milton also gives some sound advice on the approach to the subject. To my mind the position is, however, complicated for the whole of South Africa by world politics and for the Free State in particular by the uncertainty at this stage of the probable extent of the development of gold mining and consequent industrialisation. It is true that estimate figures can be corrected in the light of experience as time goes on, but deliveries are becoming so impossible that conditions in the present fluid state may have radically changed between the date of re-

ceipt of the consulting engineers' report on a scheme and the date of handing over the plant in working order.

World politics may effect our country in two diametrically opposite directions which must have a profound effect on its future. In the first place there is a remote possibility that pressure through U.N.O. may force universal franchise on South Africa. In the present stage of development this would lead to such general dislocation that the future of our undertakings would be one of the least of our worries. From the planning point of view this factor may, therefore be disregarded.

On the other hand, the "peace making" efforts of the great powers may bring about industrialisation out of all proportion to the requirements of this sub-continent for strategic rather than economic considerations. And for obvious reasons the change may come about rather rapidly.

The future as I see it is complicated and it will require nothing less than genius on the part of our government and the leaders of the industry to guide us through the next ten years.

Capital expenditure on plant and materials responsible for the bulk of the cost of production of electricity, must receive a proportionate share of our attention. Unfortunately for us the bulk of our requirements must be imported and there is little we can do at present, but accept an offer and pray for delivery.

Through the ruling high prices we are helping to bear the cost of the last war, and opinions may differ on the matter, but it has one effect worth noting and that is, the world price level is making overseas competition daily less formidable, and brings local production of many lines more and more within the sphere of economic possibility. High prices paid for local production have at least the redeeming feature that it creates wealth within our borders and strengthens the country economically. Whether imported or not, prices are likely to remain far above the 1939 level for years to come and we can only offset

its effect on the future cost of electricity by judicious planning.

As it is difficult to see too far ahead, it would seem reasonable that while it is essential to see development as a long term whole, the work should be undertaken in short term plans, so that advantage may be taken of any possible return to more normal prices while saving in the meanwhile on unnecessarily heavy capital expenditure.

It is true up to a point that thermal efficiency drops and cost per k.w. rises with decrease in the size of sets, but in units of 15,000 to 20,000 k.w. these factors are not very serious and it may be argued that the price advantage of the large set installed now may be offset in a few years by a general reduction in cost, and capital is still more expensive than coal.

The design of all plant and buildings should be planned on a utility basis. The cost of efficiency must be carefully balanced against the extra cost of fuel. Simplicity in plant and buildings for both generation and distribution should be aimed at as far as this is compatible with safety and continuity of service, unnecessary size and elaboration being avoided.

Certain aesthetic requirements will have to be complied with but beauty should be sought in simplicity rather than detail.

If we could rid ourselves of the "what has prosperity done for us" complex by the thought that posterity will in turn have to provide for their posterity, the drag of capital could also be reduced by financing development from revenue to some extent. The practice to-day is not to provide for depreciation as distinct from reserves where the life of the plant equals or exceeds the period of the loan. At the end of this term the loan is repaid and the plant is obsolete and we start from scratch after paying about as much in interest as the redeemed capital. If we paid part of our development from revenue we would also be in a theoretical position of no assets or liabilities at the end of the economic life of that part of the plant but with this difference that we would have earned a considerable

amount of interest which can be capitalised instead of paying out interest which is therefore lost as far as we are concerned. A reduction in the demand on the money market would also result in a drop in interest rates which would make the capital which must be borrowed cheaper. £30,000 per annum for relief of rates, if paid into a development fund would have amounted to about £360,000 in 10 years. The municipality would have had to find £300,000 from some other source and loans would not have improved the overall position of the council, while the burden would have to be borne by the property owners only, so why not obtain powers and devise a form of rating which will affect every citizen equally, to cover those non revenue producing amenities which are enjoyed by all citizens alike.

Borrowing, or glorified hire purchase may be a necessary adjunct to our economic system, but spending from savings or revenue, instead of borrowing and paying interest on a pound worth 10s., seems to be an effective way of reducing the after effect of a period of inflation.

In dealing with capital, I have touched on the subject of relief of rates, without wishing to express a view on the corrections of the practice, my object being only to express the view that revenue could be usefully employed to prevent our children complaining with the prophet of old that "Our fathers have eaten sour grapes and our teeth have become blunt."

Turning to labour as the remaining factor of cost, it would appear that its effect on costs is not so severe, i.e., an all round reduction of 10 per cent. in salaries, wages and allowances would only reduce the cost of current 2 per cent. in the particular undertaking cited, but one should not lose sight of the fact that the wages paid form part and parcel of the national and international wage structure and the value of all plant or materials can ultimately be reduced to human income whether it be profit or wages. A rising tendency in the general wage level usually nullifies itself by increasing the cost of living. To maintain costs unchanged an increase in wages of the lower

levels should take place at the expense of the higher, but as the higher levels are represented by a small percentage of the total, a substantial decrease in income of these levels can only effect a negligible improvement in the lower levels, and a point would soon be reached where there would not be sufficient incentive for higher education, extra effort or responsibility, and a collapse of the economic system must result.

Apart from increased wages due to increased production, both the state, provincial and municipal authorities would do well to follow the stabilising policy of keeping wages firm as far as this is possible and reducing the cost of living by every means within their power.

Wages can hardly be discussed without mention of the Factories Act. This Act was no doubt intended to ensure decent working conditions for certain classes of workers, and in common with other allied Acts has certainly succeeded in some respects but has no doubt contributed to increased cost of living by necessitating increased staffs and increased incomes.

To my mind a more serious effect is the moral one. It has turned many reasonably satisfied workers, I do not say all, into a bunch of over dissatisfied grabbers, by providing an endless number of situations which if judiciously exploited yield a very handsome return in overtime. These people poison the morale of the rest of the workers and it is about time this Act was revised with a view to stabilising wages and discouraging these "workers of points" who gain nothing in happiness for themselves and reduce efficiency by undermining the morale of workers generally.

Discounting the negative possibility of a collapse of European Supremacy in South Africa, the future appears to hold great possibilities for development, but is saturated with uncertainty socially, economically and politically, like a marsh if properly handled and drained will yield a good harvest but will take its toll if recklessly rushed into.

Our country is at the cross-roads and I sincerely trust that we, as engineers, will be able by sincere and friendly exchange of views, to assist our councils to formu-

late a uniform policy which will promote economic stabilisation and give us the satisfaction of handing over the industry to our successors, economically sound and unfettered by the hampering after effects of our inflated times.

THE PRESIDENT (Mr. Kinsman): Mr. Mayor, ladies and gentlemen: I will ask Mr. Eastman to express the thanks of the Association to Mr. Muller and, when Mr. Eastman has discharged that duty, I propose to call a tea interval and to present the Presidential Address on the resumption.

Mr. EASTMAN: Mr. President, and Members of our Association; I am very pleased to have the opportunity of expressing on your behalf our appreciation of the services rendered to us by our immediate Past President, Mr. Muller during the last twelve months. The services which a President of our Association renders are largely taken for granted and their value is not sufficiently appreciated. The amount of work involved is not known except to a few. The work of a President of our Association starts a few months before the convention is held. It is largely his duty to arrange the date and the management of the Convention. It is his duty to conduct the Convention and during the year he conducts the Executive Council meetings, is behind all the correspondence — and there is a large amount of it — dealing with the affairs of the Association, and last, but not least, he gives us a Valedictory Address, reviewing the progress of the industry and the associate electricity undertakings during his year of office.

Those who were at the Bloemfontein Convention will have very happy memories of that Convention, entirely due to the efforts of our President, who was elected at that time. Those who have had contact with the working affairs of the Association will know the amount of work that devolved upon our outgoing President at a time of extreme difficulty in running the affair of any electricity undertaking, apart from running an Association such as ours, and our thanks are due to him for the review he has given us of the difficulties experienced in the past so that we can anticipate them in the future in carrying out

our expansion of electricity in this country and I am sure I am speaking on your behalf too when I suggest to Mr. Muller that he will carry with him for many years pleasant memories of his occupancy of this office.

PRESIDENT: The Convention now stands adjourned.

(Adjourned at 11 a.m.)

The Convention resumed at 11.30 a.m.

PRESIDENT: Before I hand control of the meeting over to the Past President for me to deliver my Presidential Address, I want to make it clear that the number of visitors we are so pleased to see is so extensive that it is difficult to enumerate, but I am pleased to mention Mr. Milton, whose representation is on behalf of the S.A. Institute of Electrical Engineers. We welcome the officials of Government departments; we are pleased to have them with us today, and also the representatives of the business interests.

I will now ask Mr. Muller to take control of the meeting.

Mr. MULLER: Ladies and gentlemen, Mr. Kinsman will now address the meeting with his Presidential Address.

C. KINSMAN, M.I.E.E., M.(S.A.)I.E.E.,

I have made my Presidential Address very terse, and intentionally so, for two reasons—to make it longer would encroach on the time available and you will have heard enough of me by the time Friday is reached.

Gentlemen: To be elected President of this Association is a high honour and one I naturally appreciate deeply. The position carries with it not only high honour but also great responsibility. The first object of the Association—as laid down in our Constitution—is to promote the interests of Municipal Electricity Undertakings. As each President takes office he assumes with it the responsibility for leadership in pro-

moting the interests of our undertakings. The proven value of our Association and its effectiveness during thirty-two years are evidence of the vision, energy and ability of those who have occupied this chair in the past. With a full appreciation of the responsibilities of my office and of the quality of my predecessors, I take over with some trepidation, but resolved to do my best for our Association.

Perhaps the earliest of the responsibilities is that of selecting a subject for the Presidential Address. From a very wide field of choice I have elected to speak on several different subjects all of which directly concern our interests and demand our attention. To my mind one of the most important matters affecting our undertakings is that concerning personnel. Apropos of personnel I would recall the remark made some years ago by a leading British industrialist during a visit to Durban. The late Mr. John Roberts suggested to him a tour of the Durban undertaking. The visitor's reply was to this effect:

"I am always being shown substations nicely cleaned down and polished up—I would prefer to have a talk with some of the Engineers running your show."

In their earliest days our undertakings recruited their skilled personnel—of all ranks—from men who had been trained overseas. I would take this opportunity to pay tribute to them if that were necessary; the development and present standard of our undertakings, however, are a lasting tribute to them.

In the course of time, the growth of a national consciousness, the development of facilities for technical training and the adequacy of the number of youths offering themselves for training brought about a change. The present tendency—if it is not yet the rule—is for undertakings to train their own personnel or to recruit from men trained in this country. In many undertakings promotion is almost exclusive to the particular undertaking. Far from criticising such a policy, I would say there is much to commend it because the recipient of such promotion will have an extensive and

valuable local knowledge as well as a sense of pride in and loyalty towards the organisation in which he has served for a number of years and which has extended to him the opportunity for promotion. With such a policy, however, there is the danger of the growth of a sense of self sufficiency or what I may call technical parochialism. It is possible that one particular undertaking may have evolved improvements in craft practice or technical policy in one branch of its work while another may have evolved improvements in some other branch. With the great distances separating centres in this country there is not much opportunity of exchanges of experience. To meet the position and to avoid the dangers, undertakings must ensure careful selection of entrants, soundly planned and supervised training, means of the exchange of experience and finally, in the absence of outside competition, strict internal competition in the matter of promotions.

In regard to the selection of entrants, I shall confine my remarks to the class coming into our undertakings through the avenue of apprenticeship. Every lad selected as an apprentice must be considered as a future artisan—and perhaps engineer—upon whom the efficiency of the undertaking will depend. The report of the Government Inter-Departmental Committee on Technical Education is awaited with interest but pending the issue of that report I should like to express some views on the subject generally. In Great Britain, where the labour supply cannot at present meet the demand the Government is raising the school leaving age to 15 years. This step will have the effect of holding back from the labour market this year several hundred thousand young people. How much more necessary it is in this country, where the white population is so heavily outnumbered by the coloured population—many groups of which are very avid for education—that our young people should attain a higher standard of education before leaving school. I am of the opinion that entrants into our undertakings should be at least 16 years of age with a minimum educational standard equivalent to the Junior Certificate. Up to this standard I do not think that there should be a vocational bias in a lad's education. Rather should his school years be devoted to the

acquiring of a broad education, the cultivation of reasoning powers and the training of the mind as distinct from the cramming of his brain with facts. In this connection you may recall the seemingly paradoxical statement by a noted educationalist—"Education is what is left when you have forgotten all that you learnt at school." With a sound school education a lad should not encounter very great difficulty in pursuing his part-time technical studies during his apprenticeship and immediate post-apprenticeship years.

I will not presume to enlarge upon the vital necessity for carefully planned and supervised training because I think all engineers to-day recognise the fact so well expressed by an overseas Committee in these words: "The training of apprentices must be a specific function of industry and not one simply incidental to it."

I would suggest, however, that informal talks to apprentices by a senior official or by the Head of Department might bear fruit. I have been gratified by the interest shown by a group of fifth year apprentices in a simple talk on the financial structure of an undertaking, particularly the point that uneconomical planning by the engineer or inefficient work by the artisan acted to the financial detriment of the consumers, i.e., their relatives and neighbours, and not to that ogre of the agitator—the capitalist class.

In order to counteract any tendency to what I have called technical parochialism and to provide for exchanges of craft and technical practice, our Association might consider a scheme whereby promising young men on the completion of their apprenticeship or graduates after a few years' service might be given the opportunity of serving for say six months in another undertaking. Such a scheme would have a two-fold result:

(a) It would create an incentive for apprentices to apply themselves to their studies and their training with a view to their being selected for exchange.

(b) It would eventually result in a valuable exchange of experience and technical practice between undertakings.

I commend this suggestion to the Convention; if the principle finds favour, delegates may wish to appoint a Committee to formulate draft proposals for detailed consideration at the next Convention.

One further point on the question of personnel—a higher standard of intelligence and education in our artisan staffs must induce a greater tendency to restlessness and boredom with monotonous work in unattractive surroundings. To counteract this tendency there must be a gradual improvement in working conditions and an encouragement of interest in the work being performed.

Our undertakings have made an inestimable contribution to the economic and industrial development of this country. They are equally competent to make a further contribution in improving even further, the technical efficiency of its personnel while at the same time making better citizens of them.

It is a far cry from personnel to profits, but the latter is the next question to which I wish to refer. I do so not with the intent to revive a topic which has been fully—and sometimes warmly—debated at previous Conventions. I think our Association's views may be fairly represented by saying, "Superior authority should ensure, by legislation, that profits shall not be appropriated in relief of rates unless and until the technical efficiency and financial stability of the undertaking is assured—in other words, that these two essentials shall not be sacrificed to budget expediency." I am prompted to make reference to the subject by the recent publication of the Social and Economic Planning Council's Report No. 8, entitled "Local Government Functions and Finances." In Section 119 this report says:

"Up to the present the Union Government has not taxed the profits of Municipal Trading Undertakings. This is, however, the practice in Great Britain. The Council has recommended the elimination of municipal trading profits (vide paragraphs 98-100) but if this recommendation is not given effect to, the Council considers that there is as little

reason for not making municipal trading profits liable to income tax as there is for exempting Government motor vehicles and property from licences and rating respectively. After all under the present policy of exempting from income tax profits from municipal trading does encroach upon the national taxation resources."

Should the Government introduce legislation to give effect to this recommendation, the matter is certain to be taken up by the United Municipal Executive as it concerns not only the profits of electricity undertakings but also those of other municipal trading undertakings. I do not think it proper to embark upon a controversial discussion in a Presidential Address but it may be that delegates may wish to discuss the subject during the business part of our agenda with a view to appointing a Committee to study this Report of the Social and Economic Planning Council.

What is probably a more immediately pressing problem is that of coal supplies. On behalf of our Association I appeared before the Coal Commission during its recent sitting in Durban when I presented a Memorandum endorsed by your Executive. I shall not enlarge upon the subject at this stage as delegates will have an opportunity to discuss it on the presentation of my formal report later in our proceedings. In the absence of some revolutionary and presently unforeseen development in our methods of generation, the conservation of our coal resources will become an increasingly important national problem and the Report of the Commission will be a document of vital interest to all authorities operating coal-fired generating plants.

The last subject to which I wish to refer is that relating to plant. At the present time undertakings are experiencing greater difficulties than at any time since 1939. Most, if not all, of our undertakings are still endeavouring to overtake the backlog of the war years when generating and distribution plant were more and more severely taxed.

Delay in deliveries of plant from overseas coupled with the increasing rate of

building in this country is accentuating the problem. Relief is being afforded in some directions by the production of electrical equipment in this country. The extent of this relief is not yet really appreciable, but is steadily increasing and this source of supply will ultimately be invaluable to our undertakings and will contribute materially to our national economy. In the meantime we shall need to contrive and improvise on semi-austerity lines for several years yet.

An opportunity will be afforded delegates to discuss certain aspects of the difficulties created by the shortage of plant. One question in particular is the enforcement of the Wiring Regulations in the present difficult situation. It has been the constant endeavour of this Association to create and maintain a high standard of installation work in this country. In happier times we would devote ourselves to the attainment of an even higher standard. In these days when rigid insistence upon the present regulations can only result in hampering building programmes we must give earnest consideration to such alleviation as is possible without increasing the risk to the consuming public.

In my address I have directed your attention to four factors of direct and immediate interest to our undertakings—they relate to personnel, profits, power production and plant. It is by coincidence rather than design that they are alliterative. May I conclude in similar alliterative vein by expressing the hope that our deliberations and decisions at this Convention will assist towards the continued progress and prosperity of our undertakings.

Mr. MULLER: Thank you, Mr. President. I have much pleasure in calling upon Mr. Foden, of East London, to reply to the Presidential Address.

Mr. FODEN: Mr. President, I am afforded the privilege and it is indeed a pleasure to thank you on behalf of the Convention for your very interesting address.

As you have stated, the office you have now assumed carries with it onerous duties and responsibilities and I am sure everyone here has the fullest confidence in your dis-

charging those duties with dignity and competence.

You touched upon the training of personnel and that subject is one in which I take a good deal of interest. Tribute was paid by you, Mr. President, to the pioneers of the industry that were recruited from overseas. Many of those men had a wonderful store of technical knowledge and practical training which they had derived from occupying positions on many undertakings. This wanderlust with which these men were imbued gave them that experience which is so desirable and even essential in our profession. I am leading up to the training of our youths of to-day, and I concur with you, sir, that it is desirable for apprentices to move around after serving their apprenticeship and so gain experience. It is, of course, possible that a young man in the course of his wanderings may not see a better way of doing certain work he has been trained to carry out, but he certainly will see the advantage of doing that work in the best possible manner. This alone is all to the good, as he then knows the reason why and does not become a mere copyist.

I agree with your remarks, Mr. President, that a youth's school years should be devoted to acquiring a broad education as distinct from the acquisition of such things as history dates, which presumably is one of the facts to which you refer. Present-day people are very matter of fact and are becoming less interested in the date when the Cape was discovered, Dick King's ride, and similar historical facts, and yet our educational system devotes a deal of time to them.

Your suggestion regarding the interchange of promising young men who have completed their apprenticeship is, in my opinion excellent and would undoubtedly give an ambitious young man something to aspire to as he would know that in this manner his work had been recognised by his employers and, further, he would be sponsored by them. He would feel that his better nature had been appealed to and I heartily support your idea, Mr. President, that, if time permits, this Convention considers the matter.

Members attending this Convention will no doubt be interested in your reference to the

publication of the Social and Economic Planning Council's Report No. 8, dealing with the profits of municipal trading departments but, like you, sir, I will not enter into this controversial subject.

I share the President's apprehension regarding shortage of generating plant and not only this but materials for extending our transmission and distributing systems, house wiring, etc., unless conditions improve quickly and materially, electricity undertakings may be faced with similar conditions to those which obtained in Great Britain and in this direction I refer to load shedding which occurred in England recently.

Your Address, Mr. President, gives, in my opinion, a true reflection of present-day conditions and consequently plenty of food for thought. I sincerely hope that we have been unduly pessimistic and trust our deliberations at this Convention may bring to light ideas which may assist in dissipating some of our pessimism.

I now have great pleasure in proposing a vote of thanks to our President for his instructive and thought-provoking address.

PRESIDENT: Thank you, Mr. Foden, and gentlemen.

VENUE FOR NEXT CONVENTION

The next item is the venue for the next Convention. It is usual at this stage to receive invitations from representatives of a particular town who wish the Convention to meet in that town next year, but your Executive have already had a formal invitation that the Convention should meet in East London next year, which is the centenary year of East London. Your Executive commends that to you but the decision rests in your hands. Are there any other invitations? Would Councillor Leo Laden care to supplement that written invitation?

COUNCILLOR LEO. LADEN: Yes, Mr. President and gentlemen, I have been authorised by the City Council of East London to invite the Association to hold its 1948 Convention in East London, and if you so desire, and I can assure you of a happy time. In support of this invitation, I

would say that the year 1948 will be East London's centenary year and we are looking forward to suitable celebrations. With due deference to Capetown, Port Elizabeth and Durban, we consider East London to be the premier coastal holiday resort and, not only a holiday resort, but a growing industrial centre.

Considering that 1948 is the centenary year and many sporting bodies propose to hold their championship games in May, I suggest that your visit takes place in May. We would like to see you there, we promise you a good time.

I would like to congratulate Mr. Kinsman on behalf of the City Council, East London, on being elected President, and I hope that his term of office will be happy and that everything will go according to plan.

PRESIDENT: Thank you for your personal congratulations Cr. Laden. It is usual that trade talk is not permitted but we will put Councillor Laden's remarks down to a very commendable local pride, and I think I am speaking for the other coastal towns when I say good luck to East London.

Is it agreed then we accept the invitation for 1948?

MEMBERS: Agreed.

PRESIDENT: Is it also agreed that we accept the suggestion of the period of the year—May?

MEMBERS: Agreed.

ELECTION OF VICE-PRESIDENT

PRESIDENT: Following on the selection of venue, we now come to the election of Vice-President, and it has been customary that the Vice-President is the Electrical Engineer of the town where the next Convention is to be held; then he automatically goes on to the Presidency.

Mr. FRASER: Mr. President, gentlemen, I have very much pleasure in nominating Mr. Foden, of East London, as our Vice-President.

Mr. DOWNEY seconded the nomination.

PRESIDENT: Is that agreed?

MEMBERS: Agreed.

PRESIDENT: Then it is my very great pleasure to declare Mr. Foden, City Electrical Engineer, of East London, duly elected as your Vice-President.

Mr. FODEN: I thank you very much for the honour you have bestowed upon me and I assure you I will do my best to assist you and look after the affairs of this Association during my period as Vice-President.

ELECTION OF OFFICERS AND COMMITTEES.

PRESIDENT: I now invite nominations for four positions as Engineer Members of the Executive.

The following nominations were received:

Mr. Fraser, proposed by Mr. Dreyer, Brandfort, seconded by Cr. Immink, Johannesburg.

Mr. Hugo, proposed by Mr. Dreyer, Brandfort, seconded by Mr. Fraser, Johannesburg.

Mr. Downey, proposed by Mr. Dreyer, Brandfort, seconded by Mr. Ritson, Stellenbosch.

Mr. Gripper, proposed by Mr. Dreyer, Brandfort, seconded by Cr. Warwick, Vereninging.

Mr. Eastman, proposed by Mr. Muller, Bloemfontein, seconded by Mr. Theron, Krugersdorp.

Mr. Theron, proposed by Cr. Jackson, Krugersdorp, seconded by Cr. Van Jaarsveld, Boksburg.

Mr. Bradley, proposed by Mr. Downey, Springs, seconded by Mr. Hugo, Pretoria.

PRESIDENT: Are there any other names before we proceed to ballot? Well, we proceed to ballot for the four Engineer Members. The nominations are: Mr. Fraser, Johannesburg; Mr. Hugo, Pretoria; Mr. Downey, Springs; Mr. Gripper, Worcester; Mr. Eastman, Cape Town; Mr. Theron, Krugersdorp; Mr. Bradley, Port Elizabeth.

It will be necessary to appoint Scrutineers.

Mr. George Wright and Mr. Powell were appointed as scrutineers.

PRESIDENT: While the scrutineers are dealing with the last ballot, may we proceed to elect the two Councillor Members of the Executive? The present Councillor Members are those representing Bloemfontein and Durban. It has been found advantageous to have one Councillor from the President's town and one from the Vice-President's. This is only a suggestion—the election is in your hands. I now call for nominations.

Cr. MEAKER (Somerset East): I move accordingly—one from Durban and one from East London.

Cr. MILLER (Johannesburg): I second that.

This was agreed to by the Members.

PRESIDENT: I declare representatives of those two Electricity Committees duly elected.

Alternates may be representatives of any local authority. At present they are the representatives of Johannesburg and Cape-town.

It has been suggested that we might defer the alternates until we see the result of the Engineer Members because the same circumstances might prevail as with the Engineers. Is it agreed that we delay the nominations until we see the decision?

Agreed.

Now the election of the various Sub-Committees. The first on our list is the S.A. Standards Institution and the S.A. Standards Bureau. There again it is suggested it would be wise to wait until we see the result of the ballot.

PRESIDENT: I have much pleasure in declaring the following elected as Engineer Members: Mr. Fraser, Johannesburg; Mr. Eastman, Cape Town; Mr. Downey, Springs; Mr. Hugo, Pretoria.

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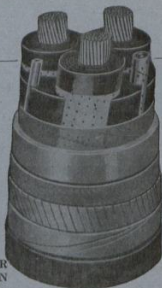
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With that news we can proceed with the election of the Alternate Councillor Members. The present Members are Johannesburg and Cape Town and, so far as the Engineers are concerned you have a representative of Johannesburg, Springs, Cape Town and Pretoria. What is the opinion of the Members with regard to the Alternate Councillor Members?

COUNCILLOR W. G. MEAKER (Somerset East): I propose Johannesburg and Pretoria.

Seconded by Councillor Jaffray, Bulawayo.

COUNCILLOR LADEN: I would like to propose Cape Town and Port Elizabeth.

Mr. RITSON, of Stellenbosch: I second that.

PRESIDENT: The proposals now before the meeting are: Johannesburg, Pretoria, Cape Town and Port Elizabeth. It will be necessary to proceed to ballot for two of those.

Will the same Scrutineers please officiate?

I think it would be as well if we disposed of the election of these Sub-Committees before the adjournment. We have the names of the Engineer Members which may guide you in the election of your representatives on these various bodies. We have Messrs. Fraser, Hugo, Downey and Eastman.

The South African Standards Institution and Bureau: Mr. Downey was unanimously elected with Mr. Hugo as alternate.

World Power Conference (Local Committee): Mr. H. A. Eastman was unanimously elected.

Electrical Wiremen's Registration Board: Mr. J. C. Fraser was unanimously elected.

Safety Precautions Committee: Mr. J. C. Downey, with Mr. J. C. Fraser as alternate were unanimously elected.

Overhead Lines Regulations: Mr. J. C. Fraser, with Mr. G. J. Muller as alternate were unanimously elected.

THE PRESIDENT: I declare those gentlemen elected to those various Committees.

We are just waiting for the result of the ballot for the Councillor Members and then we will adjourn, but I would like to take the opportunity of welcoming to the Executive the re-elected members and Mr. Eastman, elected in a different capacity. I should also like to take the opportunity of thanking Mr. Bradley for his services and to express the hope that it will not be long before he will be able to assist us in that capacity again.

I have to declare as elected as Councillor Alternate Members of the Executive representatives of the Pretoria and Johannesburg City Councils.

Just before we adjourn I would like to thank the scrutineers. The Convention is now adjourned.

(The Convention adjourned at 12.30 p.m.)

The Convention resumed at 9.35 a.m. on Wednesday, the 7th May, 1947.

THE PRESIDENT: Gentlemen, the Convention will now resume. We proceed with the first item, No. 6—Reports of Sub-Committees. The first is the World Power Conference, and I leave that in the hands of Mr. Eastman.

WORLD POWER CONFERENCE.

The work of the World Power Conference has been concentrated during the past twelve months on organising the Institution in preparation for carrying on its activities, which perforce had to be shelved during the war and its aftermath of confusion and difficulty by re-establishing heavy engineering industries on the footing needed for present day requirements and for those of the immediate future.

The central office of the Institution in London is now functioning fully and is in close touch with its Committees in numerous countries in arranging for conferences of engineers, technical experts, fuel experts and authorities on scientific and industrial

research, as well as dealing with technical education and the financial and economic aspects of industry internationally.

The activities of the Institution during the year will be marked by the holding of a Fuel Economy Conference at the Hague from 2nd to 9th September. It is open to our Association to recommend to the S.A. National Committee that one of our members be appointed a delegate to the Conference.

Mr. EASTMAN: Mr. Chairman and Gentlemen; I need not read my report, which has been circulated to members. The World Power Conference organisation is now resuming its activities. It has convened a Conference to be held at the Hague in September this year, and it is open to our Association to recommend to the South

African Committee a delegate to attend that Conference, and, naturally, I think that such a nomination should be made at such time as our Association knows that one of its members is likely to be in Europe and able to attend.

THE PRESIDENT: We thank Mr. Eastman for his report and notes in this matter and I would suggest that the better thing to do would be for this Conference to authorise the Executive to appoint as delegate of the Association any one of its members who might be going to Europe about that time. Agreed.

The next item is the Report of the Electrical Wiremen's Registration Board and I think it would be best for Mr. Clutterbuck to speak on the subject.



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Back Row—W. C. Theron (Krugersdorp), P. A. Mainelis (Rustenburg), R. M. O. Simpson (Durban), B. E. Mahan (Durban), H. D. T. Harris (Johannesburg), C. K. C. Ruse (Mafeking), A. C. Tilly (Johannesburg), G. D. Gelling (Johannesburg), G. Drestel (Johannesburg), P. C. Grendin (Vryburg), T. M. Macke (Pretoria), J. I. Inglis (Pietersburg), C. Desser (Durban), W. M. Andrew (Kingwilliamstown), G. H. Dwyer (Spring), C. R. Stone (Pietersburg), H. H. Jagger (Capetown), G. A. Dalton (Johannesburg), J. J. Louw, Deputy-Mayor (Uppington), F. Stevens (Ladysmith), W. Rush (Polgatiersrus), C. R. T. K. Baker (Pietersburg).

4th Row—R. G. Hunter (Johannesburg), W. J. Gibbons (Johannesburg), D. v. S. Druifler (Brandsfort), O. S. Chalmers (Johannesburg), F. B. King (Johannesburg), R. J. S. Wylie (Loutit Trichardt), H. C. Schwartz (Maritzburg), H. Collins (Durban), A. Hadfield (Gwelo), T. Kramer (Potchefstroom), G. Aulbars (Robertson), S. Clinton (Johannesburg), C. F. J. C. du Plessis, M.P.C. (Bloemfontein), D. M. Gray (Durban), W. Truckwer (Kokstad), H. M. S. Muller (Uppington), W. H. Milton (Johannesburg), H. A. Tisson (Johannesburg), S. G. Mortimer (Johannesburg).

5th Row—J. S. Craig (Greytown), R. Tarran (Benson), S. G. Radman (Johannesburg), Dr. W. Cormack (Johannesburg), G. C. Theron (Hercules), C. W. C. Alfred (Krugersdorp), J. M. Barlick (Krugersdorp), E. W. Lord (Johannesburg), A. L. Sanders (Johannesburg), J. Kautenback (Potchefstroom), C. H. Heifussness (Potchefstroom), C. H. M. Strover (Fort Victoria), G. G. Heaman (Fort Victoria), C. G. Downie (Capetown), C. W. G. Meaker (Somerset East), J. Natharole (Johannesburg), J. Ivarlach (Grahamstown), A. E. Torrance (Johannesburg).

6th Row—J. R. Charrs (Edhowe), C. A. N. Field (Worcester), H. A. Frowst (Somerset East), T. P. Ashley (Queenstown), F. A. Hanlon (Durban), C. S. R. van Jaarveld (Boksburg), E. L. Smith (Boksburg), H. L. Groom (Rodepoort-Maralsburg), C. R. E. J. van de Vyver (Rodepoort-Maralsburg), H. Miller (Johannesburg), C. R. A. Z. Berman (Johannesburg), J. S. Eckbo (Johannesburg), H. N. Hancox (Johannesburg), S. J. Wilson (London), C. E. Gregor (Alberton), J. J. de Haas (Pretoria), A. E. O'Dawd (Johannesburg).

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ELECTRICAL WIREMEN AND CONTRACTORS ACT, 1939.

REPORT BY MR. C. H. CLUTTERBUCK, Chairman, Electrical Wiremen's Registration Board.

In the following report I submit a brief record of the work carried out by the Electrical Wiremen's Registration Board during the year 1946.

The Board held 17 ordinary and one special meeting. With the exception that Mr. Fraser took the place of Mr. Rodwell as your representative, the personnel of the Board remained unchanged.

As you are aware, one of the principal functions of the Board is to deal with applications for registration as wiremen and to examine applicants when considered necessary.

The number of applications received exceeded that for any one year since the operation of the Act was in its initial stage. The actual number received was 721—compared with an average of 265 for the previous five years.

During the early months of the year applications poured in at an unprecedented rate from ex-servicemen, electricians who had been released from various forms of war work, and others in the service of gold mines and collieries who were anxious to seek other employment.

The capacity of the Board and the staff available was severely taxed and it became necessary to adopt a policy of discrimination in order to give priority to the more urgent cases.

In these circumstances delays in dealing with application were unavoidable and it has only been possible during recent months to reduce substantially the number of arrear applications which had accumulated.

It may be mentioned here that many municipalities in undetermined areas insist upon wiremen operating within their boundaries being in possession of certificates.

Statistical tables covering the work of the Board since its inception are attached to this report for publication in the Proceedings if considered desirable.

Following is a summary of the principal items with respect to the year 1946:

Number of Application received, 721; making a total of 4,705. Number of Application registered, 350; making a total of 2,682; Number of Applications accepted for examination, 418; Applications refused, 93.

EXAMINATIONS.

Number of written examinations held	2
Number of Candidates examined	512
Number of Candidates who obtained full passes	185 36%
Number of Candidates who passed one section only	194
Number of Candidates who failed both sections.	133

PRACTICAL EXAMINATION

Number of examinations held	7
Number of candidates examined	249
Number of candidates who passed	229

During the year the conditions under which the practical examinations are held were revised in the light of the experience gained. It was decided that the time occupied in this examination (5 hours) was too long and that an examination of shorter duration was sufficient to assess an applicant's practical ability. Furthermore, owing to the scarcity and high cost of electrical materials and apparatus it was desirable that the expenditure under this heading should be reduced. The length of the examination was therefore curtailed by eliminating one test job which has resulted in an improvement in the conditions referred to.

A number of applicants for registration who consider themselves fully qualified, represent being required to pass the Board's

examinations, and delay sitting as long as possible in the hope that they may be granted exemption. In this connection it is pleasing to note that in several instances, successful candidates have expressed their gratitude at having been forced to take the examinations for the reason that in the process of preparation they have acquired a wider knowledge of the theory and practice of their trade than they possessed before.

It may not be out of place in this report to refer to some of the difficulties with which the Board was faced in dealing with ex-servicemen, particularly those who have received training under the C.O.T.T. Scheme and others who have obtained Certificates of Competency under the Soldiers and War Workers' Act.

While the obligation to extend sympathetic treatment to these men is recognised, the Board has endeavoured to maintain the standard of qualifications it considers essential for registration.

In the electrical section of the C.O.T.T.'s Scheme, ex-volunteers with no previous experience of electrical work are enrolled for a course of intensive training with a view to their employment on installation work in the Building industry to relieve the shortage of fully qualified wiremen and if they are found suitable, to continue in the trade.

The Board was asked by the authorities concerned to determine the conditions under which trainees could be employed on such work, having regard to the provisions of the Electrical Wiremen and Contractor's Act.

The Board inspected the training centre, and after closely investigating all features of the instruction given, came to the conclusion that the course might be accepted as of equal value to that taken by a Trades School student prior to his entering into an apprenticeship.

In these circumstances it was decided that, in addition to the remission of one year allowed to all ex-volunteers, C.O.T.T.'s

trainees should be allowed a further remission of one year and their employment thereafter as third year apprentices was approved. On completion of this apprenticeship they would make application for registration and be considered eligible for the Board's examinations.

The other class of ex-servicemen which the Board was asked to make provision for are men who had a limited experience of electrical work prior to the war and during their service with the forces were engaged on electrical work in some form or other. Under the Soldiers and War Workers Act such men are entitled to apply to the Registrar of Apprenticeship for a trade test and if they succeed in passing it are issued with a certificate of competency. This certificate states that the holder has satisfied the Registrar of Apprenticeship that he has had experience in electrical work equal to that of a person who has served a regular apprenticeship and may hereafter be employed as an artisan. While there is some doubt as to the value of the trade test as evidence of a candidate's ability as a practical wireman, in view of the certificate referred to such men must be credited with a certain amount of experience. The Board therefore decided that an ex-volunteer who had been issued with a Certificate of Competency should be regarded as an improver for a period of twelve months from the date of his certificate on the expiration of this period he could make application for registration and his case would be treated on its merits.

Turning now to the position of immigrants under the Act:

Towards the end of the year a considerable number of electricians, chiefly from England arrived in the Union and submitted applications for registration as wiremen either through trades unions or other associations, or individually. Many of them expressed dissatisfaction at being unable to obtain employment without a certificate of registration and complained that they had not been informed that there were any restrictive laws in force in the Union. Although in several cases applicants could produce no evidence whatever confirming

their experience overseas, they expected to receive their certificates by return of post. On the other hand a limited number of new arrivals have submitted sufficient evidence of their experience in wiring work to entitle them to registration either provisional or permanent without delay. Applications from immigrants are judged by the same standards as those applied to Union Nationals and every applicant is required to produce documentary evidence of his experience in wiring work to the satisfaction of the Board before his application is considered.

To avoid any misunderstanding, full particulars of the requirements of the Act and of the classes of work to which the prohibitive sections apply have been supplied to the Immigration Council and the representatives of the Union Government at South Africa House, London, and the various embarkation centres in other European countries.

DETERMINATION OF AREAS.

The Determination of additional areas in terms of Section 18 of the Act has been deferred for the reasons stated in last year's report.

There is still a shortage of registered wiremen throughout the Union and to avoid the necessity of condoning contraventions of the Act it is considered desirable that the numerous applications still in hand should be disposed of in order that additional qualified men will be available.

A comprehensive list of additional areas will be recommended to the Minister for determination in the course of the next three or four months.

In conclusion, I may state that although the amount of work dealt with by the Board increased enormously during the year under review, its business proceeded smoothly and the decisions made were unanimous.

TABLE I.

DETAILS.	1940	1941	1942	1943	1944	1945	1946	Total
No. of applications for registration received.....	2668	172	120	281	260	444	721	4705
No. of applicants registered.....	725	780	193	178	208	218	350	2682
No. of applicants accepted for examination.....	127	282	148	182	159	179	418	1495
No. of applications refused.....	92	91	108	54	55	57	93	450
No. of applications not finally disposed of.....	1851	1152	971	1020	1056	1225	1473	

TABLE II.

PART A — WRITTEN EXAMINATION — DIVIDED INTO SECTIONS I. AND II.

DETAILS.	1941	1942	1943	1944	1945	1946	Total
No. of examinations held.....	2	2	2	2	2	2	12
No. of Candidates examined.....	93	164	247	296	332	512	1644
No. of Candidates who passed both Sections.....	19	65	68	96	101	185	534
No. of Candidates who passed Section I.....	6	48	45	77	14	135	325
No. of Candidates who passed Section II.....	6	43	62	47	28	59	245

PART B — PRACTICAL EXAMINATION.

	1942	1943	1944	1945	1946	Total
No. of Examinations held.....	2	2	3	4	7	18
No. of Candidates examined.....	50	73	130	158	249	660
No. of Candidates who passed.....	49	67	123	145	229	613

THE PRESIDENT: You will wish me to thank Mr. Clutterbuck for the very comprehensive report he has given and which has been an excellent introduction to the subject and now I throw the matter open for discussion. Any questions you may wish to raise I am sure Mr. Clutterbuck will be only too pleased to answer.

Mr. BRADLEY: I think we are all indebted to Mr. Clutterbuck for such an excellent report. But some of us are a little uneasy in mind with regard to some of our apprentices, who complete a full apprenticeship with the larger municipalities which embraces more or less all the branches of the electrical undertaking but, of course, does not permit of the three-year period of wiring. I submit, sir, that the apprentice who does his apprenticeship in a large undertaking would be a suitable person to be registered as a wireman, and the difficulty comes when our lads leave us without being able to get the certificate; perhaps the Chairman of the Board could give us a little enlightenment on that issue! He did mention in his report for some reason or other lots of men do not make application in time, thinking that the certificate would be given automatically at the close of their five-year apprenticeship, but I find there are some who experience great difficulty after they have submitted their applications. They are told they do not possess the necessary three years' experience and until such time as they have they cannot be considered. In my own case my apprentices are warned in their fifth year that they should take all steps possible to get that certificate, even if they don't require it, but nevertheless to get it for future use, and some have had difficulty. Would that condition pertain to all industries throughout the Union? Is it possible for us to assume that our apprentices in the larger centres in their fifth year could make application, sit their examination and the certificate be awarded before they left?

Mr. CLUTTERBUCK: At the outset I may state that in every instance an apprentice who has served a recognised apprenticeship in the trade either electrical fitting or wiring or an electrician is accepted for examination, and I thought it was generally known that an apprentice may take the

examination six months before the completion of his apprenticeship.

With regard to the examination, there are certain exemptions. For instance an applicant who is in possession of the National Technical certificate in electrical wiring—in the syllabus in force up to 1945 is granted exemption from the Theoretical portion. The syllabus for the N.T.C. Electrical Wiring II Certificate was revised at the instance of the Board in 1945 for the reason that it was not considered sufficiently comprehensive, particularly with regard to the regulations. The 1945 syllabus is an improvement on the former one and the Board now accepts success in that examination as exempting the candidate from the whole written examination.

Mr. Bradley mentioned that apprentices in Municipal service could not always show three years' experience in wiring. I may say the Board does not lay down three years as a definite period. When an applicant is asked to state or confirm his experience, he is asked to give his experience, which should be confirmed by testimonials, for a period of five years, with a reasonable proportion of wiring. No definite provision is stated and each case is dealt with on its merits.

Mr. ADAMS (Oudtshoorn): Have we the power to insist on this?

Mr. CLUTTERBUCK: I doubt very much in the case of taking the matter to Court whether the bye-law of the local authority would be supported if that authority is in an undetermined area.

Mr. GRIPPER (Worcester): I would like on this occasion to thank our friend Mr. Clutterbuck for his explanation of the work of the Board in the past year. We know, in fact we heard last year, what hard work the Board did to get through the applications that year. I am glad to see Mr. Clutterbuck is still persevering and enduring the strain, but he mentions 721 applicants during the year of which a large number were priority applications, yet there were 138 failures. I know a number of electricians who have come to me with their troubles and say

"I have heard nothing and so and so has had his advice to sit for his examination". We must realise that there is a great deal of work to be done by the Board in selecting and I think we can say if 721 applications were received and 138 were failures, the Board has made a reasonably sound selection, but if we hear from year to year that the Board is overburdened with applications, is it not time that the Board had greater facilities and increased staff to deal with it? Admittedly they may have to be temporary staff.

Mr. CLUTTERBUCK: I understand that Mr. Gripper's comments refer generally to delays in dealing with applications. As I mentioned in the report, a policy of discrimination was resorted to, by that I mean that ex-servicemen, persons out of employment and cases in which the man's continuation in his employment depended upon the certificate, were given priority. The cases which were deferred were persons who were in employment either on gold mines, municipal service or on a class of work in which the certificate was not required and also those in undetermined areas, so perhaps in Mr. Gripper's area, being undetermined, that accounts for a little dissatisfaction which may have been shown among applicants.

Another point raised by Mr. Gripper, the action which should be taken by the Board to deal with the increasing number of applications. Well personally I cannot see the present rate being continued and in fact they are decreasing already and if we battle with them as we have these last few months we will have things up to date.

The matter of increasing the staff is a very difficult one. I might say that seven years ago when the Act was first enforced the Treasury agreed to its promulgation on the condition that it was self-supporting, that is that the whole of its expenditure must be kept down at least to its present level, so I am afraid there is very little hope of increasing the staff.

Mr. POWELL (Johannesburg): I have listened to Mr. Clutterbuck's report and it is very interesting, especially as today

I view the subject at a different angle from which I viewed it a few years ago. The Act is somewhat of an obstruction to building. There is a considerable shortage of licensed wiremen, with the result that when we are trying to get hold of wiremen to carry out contract work we probably have 20 applicants and only one who is registered under the Act.

I would like to ask Mr. Clutterbuck, in assessing the qualifications of the various electricians who do make application for registration, whether they are discriminating between the man who does the ordinary house wiring as against the man on the mines or municipal electricians? We would be very diffident about putting a municipal electrician on multi-flat work; on the other hand we would feel diffident about putting a man who has done house wiring on a heavy power job. It brings us back to the old question of is the Board prepared to endorse licences of the electricians for the type of work they are capable of carrying out or are they giving licences indiscriminately to all classes who can show they have been trained as electricians?

I would like to say how very pleased I was to hear Mr. Clutterbuck refer to immigrants because we are getting about two immigrants a week making application for jobs as electricians and we have to tell them of the requirements of this country and these men show complete ignorance of the requirements.

Mr. CLUTTERBUCK: In reply to Mr. Powell's comments, I may say I have already stated in considering an application the Board requires documentary evidence of an applicant's experience in wiring. There appears to be an erroneous impression as to the class of work covered by the term "wiring work" under the Act and it is generally thought to refer to house wiring only, but it means all the electrical work from the point at which the supply authority's cables or mains enter the building to the point of consumption and includes distribution boards, cable wiring, meters and any other parts, connected with the building; it refers to houses, factories and workshops, so I think in considering a man's experience the

Board does not limit itself to his experience in house wiring work by any means. I think that more or less answers your query Mr. Powell.

Mr. BRADLEY: If I may rise for the second time, has the Board ever considered the aspect of the so-called repairer who is not a qualified man, the man who will undertake the repair of articles, having removed them from the store or factory to do it in the back yard. Let us take a kettle, it may be dangerous, it may be all right, but repairs should only be permissible by a qualified person.

Mr. FRASER: Before Mr. Clutterbuck replies to that, may I suggest for your consideration that Mr. Bradley's question comes under the next item, which Mr. Clutterbuck will probably deal with.

THE PRESIDENT: Yes, I think that would probably be better.

COUNCILLOR MILLER (Johannesburg): I want to ask a question with the object of clarifying something which has been worrying me and a number of my colleagues in Johannesburg with regard to the treatment meted out to men who were carrying on the work of wiremen electricians before the war and after spending five or six years in the army and because of the new regulations were compelled to obtain a ticket and sit for an examination to obtain that. I understood from them that they had to spend six months or a year in some practical work or studying for an examination which had to be written and that this caused some of them to actually leave their pre-war occupation, I must say that we have all been very alive to the importance which has been attached to proper need of the protection of the public by the issue of a proper certificate. If Mr. Clutterbuck could give us some of his experiences in regard to these men I think it would help the situation considerably.

Mr. CLUTTERBUCK: Regarding the position of ex-servicemen, I thought I had made it clear that a man who was employed on electrical work or wiring work before the war and who had a reasonable experience

was accepted for the Board's examination and issued with a provisional licence on his discharge. The second case of a man who had had very indifferent experience before the war, it may have been one or two years, was dealt with under the War Workers' Act and obtained a certificate of competency which entitled him to spend a further year as improver before taking the examination; and the third class is the C.O.T.T. trainee with no previous experience. I explained the method of dealing with that class of man. It must not be forgotten that the electrical trade is not comparable with that of a mason, bricklayer or carpenter who have none of the dangers involved in his occupation. It is essential that any man doing electrical work must have a knowledge of the theory as well as practice and therefore to compare it with other trades is not equitable to say the least of it.

COUNCILLOR FIELD (Worcester): The point that appeals to me as a Councillor member is that the present position may very well be hindering immigration into this country at a time when construction work is being delayed through shortage of sufficient qualified men. Would it not be possible to arrange that some competent authority in Britain should be able to issue a provisional certificate which would at least enable a man arriving in this country to get work immediately and with some reasonable assurance that he will be able to continue with that work when he comes into the country? It can easily hamper immigration by the fact that a fully qualified man, before he leaves England will pay his fare out without any assurance that he will be able to carry on his occupation—that may be keeping men away. Would it not help things considerably if some competent authority in Britain could issue the certificate there?

Mr. CLUTTERBUCK: I mentioned in connection with immigration that full particulars of the requirements of the Act and the classes of work to which the prohibitive sections applied had been circulated to the authorities concerned with immigration and the Union's representative. I may add to that that it was suggested that persons con-

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templating immigrating should obtain application forms and submit their applications before embarkation in order that they could be informed by the Board what their prospects were of obtaining registration.

Mr. FRASER: If there is nobody else about to speak, I would like to take this opportunity, as your representative on the Electrical Wiremen's Registration Board, to pay my tribute and thanks to Mr. Clutterbuck as Chairman of the Board.

It may not be generally known, so I take this opportunity to enlighten our members that the Chairman is a part-time servant of the Board, and I find that with the numerous applications that have come forward recently, our part-time Chairman must be doing a full-time job. He has a certain number of applications to prepare before the Board sits, he relieves the Board of all the duties he possibly can, all of which entails a tremendous amount of work in between the sittings of the Board. When I became a member of this Board I thought it would probably be once a month, and half a day at that, but my experience has been that it is every three weeks and a full day's sitting. That is an indication of the work the Chairman of the Board puts in and I think members will realise that it is no mean job being a Chairman of the Wiring Board.

While I am on my feet I would like to make an appeal to all engineers who have the training of electrical apprentices at heart, to encourage them to prepare and, if possible, to make application to the Board for permission to sit for the examination for an Electrical Wireman's Certificate before they have completed their apprenticeship. If this practise was universal, it would lighten the task of the Board and what is more important is that gradually all electrical apprentices would possess the Electrical Wiremen's Certificate.

I am sure this would obviate the bitterness which seems to exist at present between the boy who serves his apprenticeship in the industrial field and the boy who serves

his apprenticeship with a wiring firm only. Most of the Municipal engineers appreciate the value of the Electrical Wiremen's Act and, without a doubt, it has increased the standard of work and the amount of safety in house wiring.

PRESIDENT: If there is no other question to be raised on that, I think we are grateful to Mr. Fraser for having given us an opportunity to place on record our appreciation of Mr. Clutterbuck's work on the Board and we record our deep appreciation of Mr. Clutterbuck's services as Chairman of that Board and his attendance at this Convention and, coupled with that, the Association's thanks to Mr. Fraser as the Association's representative on that Board.

REGISTRATION OF ELECTRICAL WIRING CONTRACTORS

REPORT BY MR. C. H. CLUTTERBUCK
(Chairman, Electrical Wiremen's Registration Board.

At the last Convention the principal features of a proposed Bill to amend the Electrical Wiremen and Contractors' Act, to provide for the registration of Electrical Contractors on a national basis, were placed before you.

Agreement was reached on the major points and it was decided to proceed with the preparation of a suitable Bill.

In accordance with the established practice it is necessary to obtain the approval of the Minister concerned with respect to the principles involved before a draft Bill is framed.

In July of last year a request was made to the Secretary for Labour that an amending Bill be prepared to provide for—

1. The Registration of Electrical Contractors in a manner similar to that which applied to electrical wiremen.
2. Specific requirements with respect to the qualifications of Contractors, the

premises they occupy, and the equipment considered necessary to carry out the work.

3. The payment of fees for registration.

The reasons given for the proposed amendments were, that experience has shown that to ensure a good quality of work it is necessary that a uniform system of registration should be enforced throughout the Union and definite standards with respect to qualifications, premises, equipment, etc., established with which all Contractors must comply and which will not be subject to varying interpretations by different supply authorities as is the case at present. Once a contractor is registered he would be at liberty to carry out work in any area and the difficulties now experienced by contractors who operate in various parts of the country, and have to comply with local regulations will be removed.

In its reply, the Department expressed a doubt as to the necessity for such amendments and intimated that the purpose of registering Contractors was not clear. It pointed out that the registration of wiremen was in the interests of safety, but no such argument could be used with respect to contractors. Furthermore, contractors work was performed chiefly at places away from their business centre and if workshops of any appreciable size were required they would be controlled under the Factories Act.

The Board was informed that it would be impossible to introduce a Bill of this nature during the 1947 Session of Parliament, but if so desired the matter would be reviewed during this year.

The present position is, therefore, that more convincing reasons should be advanced in favour of the proposals in order that further representations can be made to the Minister in time for the next Parliamentary Session.

THE PRESIDENT: Thank you, Mr. Clutterbuck, and it seems that this would be an opportune occasion for the Association as such to express, if it so desires, reasons for the registration of contractors

and that those reasons on behalf of the Association be submitted to the Minister. I would appreciate Mr. Clutterbuck's views on such action by us. If the Convention sees fit to pass a resolution for submission to the Minister asking for the registration of contractors, would that help?

MR. CLUTTERBUCK: I think that action Mr. President, is most desirable and it should also be stated I think that your Association would be prepared to take part in a deputation to the Minister on the subject. Apart from your Association, there is the Association of Contractors and even the Trades Unions who support it. Further reasons might be submitted to the Minister and, failing his acceptance, I think the obvious course would be to appoint representatives on a deputation to meet him but some action must be taken before arrangements are made for the coming session of Parliament.

THE PRESIDENT: I don't know whether members want to discuss that at length, but apparently most of us realise the difficulties as they exist to-day; they vary from one municipality to another. Can I put it this way, that we agree that this matter be left to the Executive with instructions from this meeting that it is desirable that some form of National Registration of Electrical Contractors should be brought into force?

MEMBERS: Agreed.

THE PRESIDENT: Again thanking Mr. Clutterbuck for his report, and the action his Board has taken in the matter, we might adjourn for tea and reassemble sharply at 11 o'clock.

(The Convention adjourned at 10.35 a.m.)

The Convention resumed at 11 a.m.

THE PRESIDENT: Gentlemen, before asking Mr. Ritchie to present his paper, some of you might notice that Item No. 1 has not been given attention, but that will be given attention after lunch.

Just before we adjourned Mr. Bradley raised a question and it may appear that

I had not given him an opportunity to have it answered; that matter may be considered by the Executive and will be put forward to the Department. Is that acceptable?

MEMBERS: Agreed.

THE PRESIDENT: We are very fortunate in these Conventions that we get representatives of Government bodies and departments to come here and address us, to listen to our complaints and to provide us with information, and we are very fortunate in having with us today Mr. Ritchie, a representative of the Standards Bureau, who will address the Convention on the work of that Bureau.

PAPER ON THE "ESTABLISHMENT" AND ORGANISATION OF THE SOUTH AFRICAN BUREAU OF STANDARDS.

J. RITCHIE, Director South African Bureau of Standards:

Mr. Chairman, and gentlemen, I wish firstly to express the thanks of the Bureau of Standards for the opportunity which your invitation has afforded me of explaining in outline the purposes for which the Bureau has been established and the scope of the Bureau's work, with particular reference to the supply and use of electricity.

Although you, as members of an association of electricity supply undertakings, are presumably interested primarily in standardization as it effects the supply of electrical energy it will not be out of place for me to deal briefly with the subject of standardization in general, as it is only by viewing the broad issue that a proper perspective may be obtained.

Standardization hardly existed prior to the Industrial Revolution, but this industrial expansion and development, with the extensive introduction of machinery, made standardization inevitable. Progress was steady, but slow, until the early part of the present century, as, until then, there was nobody with a definite object of promoting uniformity in industry. Standardization, in consequence, evolved as the result of experience, but only very slowly. Engineers, for example, at first produced their own type of screw threads; makers

of electrical machinery adopted their frequencies and voltages, early electric lamps were designed for different types of fittings and holders, according to the ideas of their makers. Doubtless, the underlying idea was that the makers of such special designs would retain the business in extensions and spare parts for the equipment they had originally supplied, but in the light of present conditions it can be seen that the retention of an unnecessary multiplicity of designs would have prevented the development of our modern material civilisation.

Positive industrial standardization originated in Britain through the formation in 1901 of an Engineering Standard Committee, which subsequently evolved into the British Engineering Standards Association and finally into the British Standards Institution. Early activities of this Committee were confined to the consideration of such matters as the reduction in the unnecessary multiplicity of sizes of steel girders, steel sections, tramway rails and similar products.

Standardization such as that just described governs only dimensions and shape, but specifications of quality in the sense of fitness for the purpose required are also of paramount importance (for example, the composition of materials and the physical properties which render them suitable for specific uses). Standard methods of testing, in the form of test codes, such as the Meter Testing Code with which your Association is vitally concerned, need to be formulated in order to satisfy both supplier and user. There are also standards for methods of use (Codes of Practice) which define the methods of application of materials and appliances to the specific purposes for which they are required. Standardization of terms, definitions and symbols is essential to prevent misunderstanding.

I may summarise by stating that full standardization involves specification of dimensions, of shape, of quality of testing, of application and of terminology.

Standards must be prepared on the principles (a) that they shall be in accordance with the needs of the community and

fulfil a generally recognised want, (b) that the interests of the producer, the consumer and, in many cases, the distributor shall be considered, and (c) that periodic review shall be undertaken. In the preparation of a standard it is most important that all the interests concerned be consulted, since the adoption of a standard which is not generally acceptable must result in specifications which will be ignored.

In 1909 the South African Standards Institution was established and in the intervening years has done a great deal to promote standardization, but, owing to lack of funds and absence of laboratory facilities, the framing of standards suitable for South Africa could not keep pace with the demand. During the recent war, a Standardization Committee under the Chairmanship of Mr. C. K. Wilson, was set up to investigate and extend the field of standardization. The Committee recommended the establishment of a Bureau of Standards backed by law, and was, together with the Standards Institution, responsible for drawing up the Standards Bill, which passed into law as the Standards Act No. 24 of 1945.

The Standards Council, a corporate body, was established in terms of section 4 of the Standards Act, No. 24 of 1945. The South African Bureau of Standards is an organisation under the control of the Standards Council. Directly responsible to the Council is the Director, whose function it is to direct and organise the work of the Bureau. In this work the Director is assisted by a staff of technologists and administrative officials. The Bureau is financed partly from funds voted by Parliament and partly from fees charged for its services as well as any donations or contributions which may be received from other sources.

The Bureau has as some of its objects the following

- (a) To promote standardization in industry and commerce;
- (b) To make arrangements or provide facilities for the testing and calibra-

tion of precision instruments, gauges and scientific apparatus;

- (c) to make arrangements or provide facilities for the examination and testing of commodities;
- (d) to control the use of standardization marks;
- (e) to assist any body or authority in the framing of specifications required by it.

In order to carry out its work efficiently the Council maintains the fullest liaison with standardization organisations in all parts of the world, so as to ensure that the very latest information in regard to standards is available for technical committees appointed by the Council from time to time to deal with specifications, codes and similar matters. Liaison has accordingly been established with the Standards Association of Australia, the British Standards Institution, the Canadian Standards Institution, the Indian Standards Institution, the Irish Institute of Industrial Research and Standards, the New Zealand Standards Institution, the Standards Institution of Palestine, the Swedish Standards Institution, the French Standards Institution, the Netherlands Standards Institution and the American Standards Association.

As there are two organisations which handle specifications in South Africa, namely the Standards Institution and the Standards Council, in order to avoid any danger of overlapping of activities a special body known as the Standards Joint Committee has been formed, the most important function of the Joint Committee is to screen or sift all applications for specifications whether the application is submitted in the first instance to the Standards Council or to the Standards Institution. After the applications have been considered and it is decided that a case has been established for the preparation of a South African specification for a particular commodity, the Joint Committee next recommends which body—the Standards Council or the Standards Institution—should undertake the actual preparation of the specification.

Once the work of preparing a specification for a particular commodity has been allocated to the Standards Council a technical

committee is appointed. This committee includes representatives of producers and consumers of the commodity in question together with impartial experts, usually drawn from the personnel of the Bureau, from Government Departments, Universities, etc. When completed the specification is circulated as a draft specification throughout the Union and overseas for general comment. After an interval the technical committee meets again to consider the comments received. The specification is reviewed and if necessary amended in the light of the criticisms and is then submitted to the Standards Council with the recommendation that it become a South African Bureau of Standards specification. The specification, once approved by the Standards Council, is published as a tentative Bureau specification. If, as provided in the Act, the South African Standards Institution decided to adopt the specification the latter may, subject to the approval of the Honourable the Minister of Economic Development, become a South African standard specification. In special cases where it is in the public interest to do so, for example, for reasons of safety or health, the Minister may declare the specification to be a compulsory standard specification.

Linked with the preparation of specifications is the very important matter of the standardization mark. The Act makes provision for the grant to producers and manufacturers by the Council of permits to use its standardization mark. The principal condition will be that the commodity on which the producer wishes to display the Council's mark shall comply with the corresponding specification. The mark will accordingly act as a guarantee that a certain minimum standard is being maintained in the product. Consumers will accordingly know what they are paying for and producers will be protected against unfair competition.

During the war many enterprising local industrialists established factories for the manufacture of articles which were unobtainable or restricted in supply from overseas. In many cases the local product equalled or surpassed the imported article in quality, but with the end of the war the manufacturers found that purchasers

have a prejudice against the locally manufactured article, a prejudice which in many cases is quite unjustifiable. Many local manufacturers therefore feel that the Council's mark as a guarantee of compliance with a quality standard, will assist them to overcome the prejudice against locally manufactured goods.

The South African Bureau of Standards mark consists of an ellipse containing the letters "S.A.B.S." When the mark is used in connection with a commodity for which the South African Standards Institution has prepared a standard specification the ellipse will also contain the letter "S" in a diamond.

The laboratories and the staff of the Bureau play an important part in the framing of specifications and codes by providing technical advice and by trying out projected test methods and by conducting surveys to ascertain whether the requirements of specifications and codes are reasonable and practicable and also to determine how locally manufactured materials compare with imported, how difficulties due to shortages of materials are being met, whether these difficulties are real or only due to inadequate research work and so on. The laboratories will also be responsible for the analyses and check tests which will be carried out to ensure that articles bearing the Bureau's mark duly comply with the requirements of the appropriate specifications.

The testing facilities offered by the Bureau will be of especial interest to you, and I shall elaborate on those facilities which most directly affect you, that is, the codes, specifications and testing laboratories concerned with electricity meters, electrical equipment, electric lamps and storage batteries.

Equipment for the testing of electric lamps is on order and special attention is being devoted by the Bureau's staff to the testing of modern discharge and fluorescent lamps, with particular reference to the problems involved in the measurement of the light, intensity and distribution of coloured sources.

A draft specification on storage batteries for motor vehicles has been prepared by a

committee of the Bureau and has been issued for comment. Equipment for the testing of such batteries for compliance with the specification is under construction and will be used with the object of controlling the quality of batteries manufactured in conformity with the specification.

Laboratory facilities for the checking of electricity meters and for the testing of a variety of electrical appliances are being provided. These facilities merit special attention and I shall describe them in some detail in dealing with the two codes which concern you most particularly, that is, the Meter Testing Code and the Safety Code for Electrical Equipment.

In response to a request by one of the larger municipalities for information on the equipment which would be regarded as necessary for the checking of electricity meters, the Standards Council established a committee to formulate a code for the testing of such meters. A code, based largely on the scheme adopted in Great Britain in connection with the Electricity Act of 1936, was drafted by the committee and circulated for comment to all electricity supply authorities in the Union. It was also discussed with overseas bodies.

The comments received were co-ordinated by the Bureau and considered by the committee when reviewing the code, which has now reached the stage when it is due for submission to the Standards Council for approval. Discussions with the Electricity Control Board with regard to the application of the code are in progress.

The provisions in the draft code of 1946 relating to the introduction of the code, the establishment of testing stations and the approval of testing facilities have not been materially altered in the revised code. A third and lower category of testing station (Class C) has been added, and tests for starting current and insulation resistance have been included. The period between successive calibrations of substandard rotating meters has been extended to three months, and the use of commercial grade energy meters in lieu of substandards, has been approved under certain conditions.

The clause specifying allowable limits of error has been amended to impose a limit of error of $+2\frac{1}{2}$ per cent. for all metering equipment including shunts, potential dividers and instrument transformers associated with the meters, and provision has been made for the testing of such meters separate from their ratio devices.

The exception clauses included in the introduction to the draft code have been revised and included in the code itself.

It is not the intention of the Bureau at the present stage to specify all details of the equipment and the number of items necessary for the fitting out of a testing station, except in so far as these details are included in the specification clauses of the revised code.

It may be assumed, however, that the following list of equipment will include those items normally necessary for a Class A station, but in many cases certain items may be dispensed with, while in other cases additional equipment may be advisable.

For a Class B station, the first six items should suffice, but item 2 may be omitted if there are no (or few) polyphase meters installed, and item 6 is hardly necessary if the mains supply is reasonably good. As a polyphase bench may be used for testing of single phase meters, item 3 will not always be required in addition to item 2.

Items 1 and 3 will suffice for most Class C stations, if polyphase meters are sent elsewhere for test.

Equipment which cannot be checked at Class B or C stations will have to be sent to more fully equipped stations for test.

EQUIPMENT FOR CLASS A STATION

Item.	Approximate number required.
1. Rotating substandards.	One per 4,000 meters.
2. Polyphase Test Bench.	One per 5 to 6,000 poly-phase meters.
3. Single phase test bench.	One per 10 to 12,000 single phase meters.
4. Standard clock and stop watches.	One clock per test room. One watch per bench.
5. Substandard wattmeters	Three per polyphase bench, one per single phase bench.

4. Sine wave alternator.	One per test room, but may be dispensed with in many cases if main supply is suitable.
7. Standard wattmeter.	One per test room.
8. D.C. Potentiometer and accessories and supplies.	One per test room.
9. Standard Voltmeter and Ammeter.	One each per test room.
10. Current test set.	Transformer One per test room.
11. Potential test set.	transformer One per test room.
12. A.C. Potentiometer.	Desirable but not essential for Class A station to possess.
13. Wattmeter comparator.	Can be used to replace standard wattmeter and A.C. potentiometer for certain purposes.

At this early stage in the introduction of a long term programme of regular meter testing on a Union-wide scale, it is not possible to specify precisely the details of the organisation and administration of the services required by the code. Provisionally, however, it may be stated that Class A stations will be required at some seven points in the Union, probably at Johannesburg, Pretoria, Cape Town, Durban, Port Elizabeth, Bloemfontein and in South West Africa.

Neither is it possible to state with accuracy the additional equipment and staff which will be required by supply undertakings for the general application of the code, which requires that one sixth of the meters installed shall be tested annually. The Bureau is of the opinion, however, that the majority of the larger undertakings already have organisations which approximate to those required, and at present test nearly ten per cent. of their installed meters per annum, on the average.

In the areas served by seven of the largest municipalities in the Union, there are 230,000 domestic consumers and 275,000 meters installed, and the code will require that 46,000 meters be tested annually. At present approximately 24,000 meters are tested each year by these centres.

Assuming that one meter tester can handle 3,000 new or 2,000 old polyphase or 5,000 new or 3,000 old single phase meters per annum; that one meter mechanic can recondition 1,500 polyphase or 2,500 single phase meters per annum; and that one meter fixer can change 4,000 meters per annum,

the Bureau estimates that the annual salary bill for additional staff required by seven large municipalities will amount to £10,000 total. This amount, spread over the 230,000 domestic consumers supplied by these centres, means an additional salary expenditure of less than one shilling per consumer per annum on the average; an expenditure which corresponds to the cost of one or two units per month.

The total cost of extra equipment needed in order to meet the requirements of the code is estimated at £21,000 for these seven centres, corresponding to an additional non-recurrent expenditure of about 1s. 6d. per consumer, on the average.

The smaller centres are in general in a less favourable position, but cannot all be grouped together. Considering a group of 18 authorities selling from 3 million to 30 million units per annum, the Bureau estimates that the total annual salary bill of these 18 centres, for additional staff will be approximately £8,400, which amount spread over the 73,000 consumers supplied by these municipalities corresponds to an extra annual cost of 2s. 4d. per consumer per annum. The figure for individual municipalities in this group will vary from zero up to 7s. 6d. per consumer per annum, depending both on the size of the municipality and the magnitude of the additional services required. The non-recurrent capital outlay for these 18 centres is estimated at £6,500 or 1s. 9d. per consumer. This figure will range from zero up to approximately 5s. 6d. per consumer, in different municipalities. These figures are based on the costs of the installations which the municipalities concerned propose to instal and which in most cases are of Class C. Both Class B and Class C stations will normally require to have certain items of their equipment calibrated periodically by more fully equipped stations. In arriving at this estimate, the Bureau considers that certain municipalities have projected installations which are somewhat more ambitious than justified. It must also be noted that some authorities have neglected meter-testing in the past and will accordingly be faced with considerable outlay in the near future.

Those municipalities which handle less than three million units per annum have, in

many cases, insufficient meters installed to justify the cost of setting up independent testing facilities, unless the meter tester can combine repair of meters and other services with this test-room work.

The solution of this problem of the provision of testing facilities for the smallest supply authorities will often lie in the pooling of resources, with perhaps a stock of replacement meters shared by a number of neighbouring municipalities. A mobile testing van and staff might well be employed in an area containing a number of small suppliers, and I should like to suggest that your Association might consider the possibility of organising a mobile calibration project. The Bureau would be glad to assist in such a measure by giving of technical advice and by co-ordinating such projects in the Union.

Another important code on which the Bureau is now engaged is the Safety Code for Electrical Appliances. Under this code specifications will be drawn up for all electrical appliances and supplies sold in South Africa. These specifications will be similar to those of the Underwriters Laboratories in the United States and those of the Canadian Standards Associations Electrical Codes. These specifications will set out minimum requirements with regard to insulation, air gaps, earthing connections and other safety requirements. The specifications will not contain any clauses as to quality or performance. While the design might be affected in order to obtain the necessary safety requirements the details of the manufacture would be left to the producer provided the required result is obtained.

The specifications under this code will be declared compulsory specifications and will apply to all electrical equipment sold in South Africa and it will be an offence under the Standards Act to sell equipment which does not conform to these requirements. Once these specifications have been declared compulsory manufacturers or agents or retailers handling electrical equipment will have to have each type of article approved by the Bureau of Standards. The Bureau will carry out tests on the equipment when approval is sought and at regular intervals thereafter to ensure that the manu-

facturers are maintaining the necessary standards with regard to safety factors.

The bureau has at the moment two committees which are drawing up specifications under the Safety Code. The following is a list of appliances setting out the priority in which specifications are going to be drawn up.

CLASS I.—APPLIANCES (Stationary) Domestic:

Water Heaters—for kitchen and bathing use.
Stoves or Ranges.
Washing Machines.
Wash Boilers.
Vacuum Cleaners.
Floor Polishers.
Ironing Machines.

CLASS II.—APPLIANCES (Portable) Domestic.

Radiators.
Table Stoves and Hotplates.
Toasters.
Kettles and Coffee Percolators.
Radios.
Water Heating Pots and Saucepans.
Electric Razors.
Electric Toys.
Towel Driers.
Hand Irons.

CLASS III.—APPLIANCES (Also used Industrially).

Immersion heaters.
Portable Electric Lamps.
Gaseous discharge Lamps.
Hair clippers.
Massage Vibrators.
Soldering Irons.
Solder Melting Pots.
Glue Pots.
Portable Drills and Grinders.

CLASS IV.—WIRING APPLIANCES.

I.C. Switch-Fuses.
I.C. Switches.
I.C. Fuses.
Lampholders.
Switches—Wall, Ceiling and Through-cord.
Switch-plugs.
Cut-outs and Fuses.
Plugs and Sockets.

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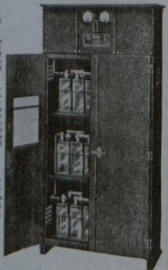
The standard equipment embodies pasted plate cells of the special "Low-Loss" type, but sealed-in plant cells are also available. The latter are recommended wherever the switch-tripping load is particularly heavy and in all cases where maximum durability

is of greater importance than first cost.

It is never necessary to remove the trickle-charged battery for quick-rate recharging unless, of course, special circumstances have caused the battery to be subjected to an exhaustive discharge.

The only maintenance requirements are a periodical examination—say at intervals of six weeks—to test specific gravity, top up the cells and, if necessary, adjust the trickle-charge rate. Battery voltage readings under load conditions can be taken by means of the voltmeter and push button mounted on the cabinet.

The method of housing the battery is optional; it can be supplied either in a steel cabinet in keeping with the metal-clad switchgear usually employed in high tension substations, or placed in a wood cabinet. As supplied to: S.A.R.&H., Electricity Supply Commission, Isaac, Steel Sales Co. of Africa (Pty.), Ltd., Vanderbilt Engineering Corporation, Ltd., Municipal Electrical Undertakings, Gold Mines.



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As a large number of fatalities have occurred throughout the Union due to faulty electrical equipment being used in households the Bureau is endeavouring to complete this work drawing up the safety code as soon as possible. Should any of the members present wish to make any suggestions as to types of equipment which have not been included or suggestions which would aid the Bureau in the furtherance of this work, the Bureau will be pleased to consider these at its specification committee meetings.

The Bureau is anxious to assist any person or body which is interested in standardization work, and would welcome any suggestions as to new projects which should be undertaken by the Bureau.

THE PRESIDENT: Mr. Ritchie has ably presented to us a description of the machinery to ensure the safety of the appliances that are used and that section alone is one that we have been looking for for some time. I don't know whether we are all looking forward with such relish to the meter testing code but that is also desirable and there must be a large number of delegates who might wish to contribute to the discussion and it is open for discussion.

Dr. R. GUELKE (Council for Scientific and Industrial Research): I would like to congratulate Mr. Ritchie on his work and on the work of the Standards Bureau. It may be of interest to mention certain meter testing, that was carried out before the inception of the Bureau. At that time the Regulations of the Cape Town undertaking provided that any consumer who doubted the accuracy of his meter could, for a fee of £1 1s., have it tested by an independent authority. In Cape Town this authority was usually the University. If the meter was within 3 per cent. of its correct reading the consumer lost his guinea: If, however, it should happen to have been found outside this limit the guinea was refunded and certain adjustments were made to the consumer's accounts. I had the job of testing these meters and in my experience every consumer who was suspicious lost his guinea. As a matter of fact not a single meter fell outside the prescribed limits. At

the University we had to go to a lot of trouble to get a suitable degree of accuracy because our equipment was not designed for routine testing. We did, however, fulfil the functions of being an unbiased and independent authority. It is, however, a much better arrangement if, as described by Mr. Ritchie, the Standards Bureau is continually supervising the testing of meters. It does mean that the basic requirements are filled not only that "Justice is done" but that "Everybody can see that justice is done." This means that the consumer has no doubts at all about receiving good measure in electric energy.

In the Council for Scientific and Industrial Research we are also to some extent concerned with standards. We have to maintain the fundamental electrical standards in this country. I can assure the Convention that Mr. Ritchie can rely on us to compare his standards with the best standards available to the highest degree of accuracy possible. We have a number of standards which have travelled to this country under supervision during the whole journey and other sets will be obtained from time to time. Thus we shall maintain in this country fundamental standards which will be as good as they can be maintained anywhere. This will enable the Bureau of Standards to have no doubt at all about the foundation upon which their mechanism will rest.

Mr. FRASER (Johannesburg): The establishment of the South African Bureau of Standards has come at a most opportune moment in the development of South Africa. If South African industry is not only to maintain its present position but is to develop still further in the face of overseas competition, full facilities for research, testing and standardisation must be made available to local manufacturers, and it is to be hoped that, among its other work, the South African Bureau will eventually perform the same functions and enjoy the same high prestige as the National Physical Laboratory in England.

There is a good need in South Africa for an organisation which is prepared and equipped to carry out research and tests of specialised nature on behalf not only

of manufacturing and industrial concerns, but also of bodies such as municipal departments who cannot be expected to have either the plant or the personnel to conduct the tests themselves. It is pleasing to hear that one of these difficulties will be met by the installation of complete equipment for the testing of lamps. This will be of benefit to both consumer and manufacturer, particularly when the lamps are produced locally. Another material which, to many of us, is a somewhat doubtful quantity is plastic insulated wire, many makes and forms of which are now making their appearance. Numerous enquiries are submitted for permission to use not only this type of wire but also all variety of electrical fittings and apparatus for which, very often, no test certificates or other information of an authoritative nature can be produced. Many of these enquiries could well be referred to the South African Bureau of Standards for tests and recommendations as to uses and limitations. Could the author tell us how far the Bureau is at present equipped to deal with such enquiries. Another point of interest is whether it is intended to limit the Bureau's standardization mark to local products, or if it can be applied to all equipment which can satisfactorily pass the tests and conditions specified.

The Meter Testing Code and the Safety Code for Electrical Equipment meet needs which have long been felt by many municipalities. The Safety Code, in conjunction with the measures which have been taken for the registration and licensing of wiring contractors and wiremen will do much to safeguard the public from the potentially dangerous effect of poor workmanship and materials. In conclusion, in congratulating the author on a most informative paper, I should like to suggest that electrical welding plant and inspection lamps for use in damp situations be included in the list of appliances for which specifications are to be drawn up under the Safety Code.

THE PRESIDENT: Mr. Ritchie would you care to deal with these points as they arise?

Mr. RITCHIE: I prefer to deal with them as they arise. I would like to point out that the Bureau of Standards does not

conduct any research work, that is done by the Council for Scientific and Industrial Research with whom we have a very close liaison, but we will carry out test work that any organisation or firm would like done. We intend to set up well equipped laboratories in order to carry out this test work. They will, however, take some time to equip and organise. Equipment and staff is difficult to get but we have been fortunate in obtaining most of the essential equipment.

With regard to plastic insulated wire, we are busy testing some at the moment, but a lot of work still requires to be done. Even if we do state that a certain type of wire is suitable for use there seems to be no easy way of identifying it. We have observed that certain shops take off the tickets and when asked the name of the manufacturer they say they have lost the ticket. We would not be prepared to say that all plastic insulated wire is suitable because we have heard of a number of unfortunate experiences with the material. We do not want to condemn it, but we would like to be very sure by making tests on a particular material. We cannot give a general approval for its use.

With regard to the Mark, at the present moment it is the intention to give the Standardization Mark to South African products only. At the Commonwealth Conference in October there was some discussion about arranging the interchange of one another's Marks but so far nothing concrete has been done. In time, we hope to have specifications which are very nearly on the same level, so that we shall have no difficulty in looking after one another's Marks.

THE PRESIDENT: I would suggest that we don't embark on a discussion of the plastic insulation wires at this stage, as there is an item on the Agenda which will deal with it.

COUNCILLOR MILLER (Johannesburg): Speaking as a Councillor member and incidentally a layman in so far as the technical aspects of this particular subject are concerned, I do feel the urge, however to express my appreciation of the att-

tude and the steps which the Bureau intends to take and apply with regard to household and other appliances, as illustrated on page 6 of the Report. I have for a long time wondered at the fact that the technical side of electrical work did not take up this important aspect earlier and I do think that we of the electrical undertakings should, as fast as we possibly can, accelerate the establishment of the Safety Code in educating the commercial community as to the standard required and of the confidence with which they will be able to approach the public in the sale of the various commodities. I am sure in South Africa we would like to see the expansion of the use of electrical appliances in all homes. In other parts of the world, particularly in the United States, no home is complete unless it is equipped with electrical appliances. I think that South Africa as a young country is ripe for the expansion of these electrical amenities in the home but I think that a cause of the delay has been the caution with which we in South Africa approach new domestic appliances. That caution is based on the view that they will not prove satisfactory or they will be a source of danger, or may not stand the strain of what we require them for and so become more of a nuisance than benefit. From the public's point of view the steps which the Bureau is taking with regard to these appliances is a progressive step not only in the interests of the people themselves but I think also in the interests of the commercial community and of our work in these electrical undertakings. If we in the electrical undertakings could assist the Bureau by educating our commercial community to appreciate the fact that electrical appliances will be required by the consumer on a very much larger scale, by reason of their greater confidence in such appliances, then I think we will be rendering a service to the people as a whole and to the electrical undertakings which we represent.

Mr. MILTON: This time, Mr. President, I speak as a member of the Electricity Supply Commission, Johannesburg.

May I congratulate the Association on the culmination of its efforts, initiated by the late Mr. Swingler, towards control of the

marketing of appliances in the interests of public safety. At each of the conventions of the Association he used to raise the point and stress the necessity for some effective steps being taken to that end. Had he been with us today I am certain he would have been most gratified and have urged that the requirements became compulsory as soon as possible.

As regards the meter code, it seems to me that two aspects may present some difficulty. These are interrelated being the 2½ per cent. permissible limit of error and calibration on a pure sine wave source of supply.

The permissible error of plus and minus 2½ per cent. appears to apply, not only to the meter itself, but as an overall accuracy including meter auxiliaries such as the instrument transformers used therewith.

The permissible maximum error of 2½ per cent. to 3 per cent. has been mentioned by Dr. Guelke and is incorporated in many of the agreements with consumers entered into by Municipalities and other Supply authorities. If the meter code is adopted without suitable provision for overall accuracy, many of those agreements will require modification.

Actual compliance with the requirements of the code as drafted may present considerable difficulty as it seems correct to assume that the accuracy is to be determined on standard boards and checked from time to time against sub-standard instruments which have been calibrated on pure sine wave form, because we are informed that the meter testing laboratories must be equipped with pure sine wave generators. Calibration, therefore, will take place with pure sine wave supply, whereas in use, the departure from this wave form may be considerable in relation to the effect of such departure on the meter accuracy characteristic. This also applies in respect of the instrument transformers.

For the purpose of auxiliary calibrating stations we have been informed that the sine wave generator may be dispensed with if the supply authorities' wave form is satisfactory.

It is well known that if the calibration is carried out with pure sine wave supply and the meters are used on a wave form deviating from the sine wave, an error is almost invariably introduced. The position is further complicated because the inaccuracy so introduced is not always of the same sign. Taking an extreme case it may be found that the deviation between a sub-standard meter and a consumer's meter may exceed the margin of tolerance although both meters tested under standard conditions may show no inaccuracy, this anomaly being due to a substantial departure from the sine wave form brought about by the type of load supplied from the system or some other such influence.

In support of this contention I can quote from my own experience the behaviour of meters calibrated by the National Physical Laboratory. When it came to a question of using those meters in circuits where the wave form was distorted, it was possible at will to obtain a high or a low reading for a given load by choosing one or other of two standardised meters.

The other point which may require further consideration is the application of the 2½ per cent. accuracy requirement to metering installations incorporating instrument transformers, especially if the calibration is to be dependent on pure sine wave and the accuracy requirement in use is to apply to distorted wave. The supply authorities will require to exercise extreme care in choosing replacement instrument transformers when necessary, and in actually choosing their instrument transformers to have departures from accuracy with departures from sine wave corresponding suitably with the departure of the sub-standards which may be used for check testing.

I do not think that these are insuperable difficulties but feel sure that they are factors which must be borne in mind before the code is adopted.

Dr. Guelke's views of these aspects will be appreciated.

Mr. DALTON (Chief Electrical Engineer, S.A.R. & H.): I must voice my pleasure at being here today and having the privilege of speaking. We are indebted to Mr. Ritchie for the talk he has given

to us, and it seems to me opportune for this meeting to know that the progenitor of the Bureau of Standards was the late Mr. Cyril Cocks, who was Assistant General Manager of the Johannesburg Municipal Electricity Department. Mr. Cocks indicated to me the concern that he felt over the electrical junk with which this country was flooded after World War I and he felt that steps should be taken after World War II to avoid a repetition. We convened a meeting in Johannesburg and had several subsequent meetings at which were present the Test and Research Engineers of the Municipality and of the Railways, Messrs. Lehman and Page, arising from which a memorandum was prepared which we asked Mr. Rodwell to present to the Main Committee of the South African Bureau of Standards. Arising from that, a drafting committee was appointed by the Minister responsible to draft this Bill. Owing to the demise of Mr. Cocks, I was appointed to that Drafting Committee but I think it is opportune to have it recorded in your proceedings that the real progenitor of this Bill was the late Mr. Cyril Cocks.

I think Mr. Ritchie has given us a clear conception of what the Bureau of Standards means to South Africa, but there are two points that require elucidation. One is how will they implement the machinery of the Bureau of Standards to make quite sure that the specification they are drawing up will be carried out in spirit and effect? Are they going to institute something on the lines of the Underwriter Inspectors as in the United States? When appliances are marked the consumer knows that he is getting something that will stand up to the specification made.

THE PRESIDENT: Thank you, Mr. Dalton. We are grateful to you for having drawn our attention to the fact so that we can record in our proceedings the debt we owe to Mr. Cyril Cocks and to those others whose assistance he received.

Mr. RITCHIE: With regard to the point raised by Mr. Milton, I will ask Mr. Roberts to deal with it. Specifications will be drawn up and will be very similar to those used in the Underwriter's scheme. We will draw up a specification for a representative com-

modity after which the specification will be declared compulsory. This will prohibit the sale in South Africa of any goods of that type which do not conform to that specification. Agents and shops wishing to sell that type of article will have to submit one to the Bureau for approval. This appliance will be tested, and if approval is granted, our inspectors will purchase articles of that type from shops at regular intervals and have them tested at the Bureau, so that in this way we will have an active policing of all articles.

Mr. ROBERTS: With regard to the points mentioned by Mr. Milton, the first point, plus and minus $2\frac{1}{2}$ per cent., that $2\frac{1}{2}$ per cent. is intended to apply as the overall limit. If a limit is associated with such $2\frac{1}{2}$ per cent. as an overall, it does not apply to each combination and individual. We appreciate that in the application of those limits in certain cases there may be some considerable difficulty in maintaining those limits. Special cases in which special difficulties arise will be treated on their merits. The feeling of the Bureau is that the metering in which installations have transformers presents numbers of problems, but that does not mean that we will not tackle those problems. A large number of cases will be capable of solution, some may be difficult but they will be treated on their merits, and the application of the code will be adjusted.

The question of the sine wave form, that I consider is rather a moot point and one which we will refer back to the Committee. My own feeling, subject to correction, is that you have to specify some sort of wave form. The wave form in practice may be a flat wave form and deviations would have to be specified in detail. It will be preferable to specify a sine wave form rather than leave it unspecified, and the only simple way of specifying is to specify a sine wave form. It is a question in which there is some measure of doubt and it will receive the attention of the Bureau.

When it comes to testing meters at some central spot one has to take what one regards as the flat form. I cannot give a complete reply to that. These points may require more attention.

Mr. EASTMAN (Cape Town): Mr. President and gentlemen: The introduction of these arrangements for the approval of appliances which may be sold, the placing upon them of a mark to indicate the approval of an authoritative body in this country, is something which has been agitated for at our various Conventions for at least twenty years without finding a solution of the difficulties involved.

We have read with very great interest of the proposed introduction of the A, B, and C. testing stations. It is indeed of such great interest to us that I think we would like to know, all of us, when that arrangement will be put into effect. It is important, particularly to supply authorities that have not yet got the equipment needed for testing in accordance with the requirements of this body, to know by what time they are expected to install that apparatus and also know the relationships between the different classes of testing stations. I understand that A stations are to be stations which will act as a sort of sub-standard station to the main laboratory which is administered by this organization. They would be sub-standard testing laboratories for perhaps a large number of other undertakings in the neighbourhood, and upon these A stations then will devolve a great deal of work and for which they possibly may have to obtain testing facilities in addition to those they now have.

The matter of tolerance of $2\frac{1}{2}$ per cent. as compared with the 3 per cent. which has been the usual practice so far does not matter. In point of fact all supply authorities will be only too pleased to work to as close a tolerance as possible in their own interests. Indeed, bulk supply meters will generally be adjusted to an accuracy a great deal closer than $2\frac{1}{2}$ per cent. by means of tests carried out by them in shorter intervals than six years, which is the maximum specified here, but the matter of calibrating each sub-standard against a sine wave as a generator, as compared with the operation of that meter on the wave form that one normally finds in a large supply undertaking system, is a matter which may well prove to be of very great technical importance to us and we shall be only too

glad to learn of what is intended in this direction as soon as possible.

Mr. RITCHIE: We consider a period of from two to three years sufficient for the establishment of these stations. It will take the Bureau at least 18 months to two years to get going, but I don't think there is any doubt that the meter code will be incorporated in the Electricity Act in much under two to three years either. First of all the code has not yet been through the legal adviser's hands. This is usually a lengthy process, after which it has to be published. The Committee has already discussed this point and we laid down a period of two to three years as being sufficient. It will not be introduced suddenly.

The Bureau is establishing the first station in Pretoria but we feel that as we are so far from the coast we will probably have to establish subsidiary stations at Cape Town and Durban.

With regard to the sine wave calibration, we have stated that we will consider that at our next Committee meeting.

Mr. C. R. HALLE (Pietermaritzburg): As far as standardization goes, the introduction of A., B. and C., I was wondering if they would take a suggestion on this clause 2. It would I think be a very fine thing if there were some standard of flex for portable domestic apparatus. If the apparatus itself is standard and the flex is not, everybody will have his own interpretation of it. I think a lot of accidents are caused by bad flexes and we have not yet got a really fine standard to work on. Some of it is really dangerous and if we could, as engineers, get down to a really standard flex, we would be introducing a public safety measure in the home.

Mr. RITCHIE: In reply to Mr. Halle's question, the Committee is considering the class of cord to be used with each item of equipment, e.g. when we draw up the specification for an electric iron we will state the kind of cord that should go with it. In regard to radiators, we shall say how the cord should be connected to the radiator.

Mr. GRIPPER (Worcester): I would like to add my praise and thanks to Mr.

Ritchie and Mr. Roberts though I had not really any questions to ask. However, it is extraordinary how one point after another crops up during the course of a paper of this nature that is a job for this sub-committee or the other sub-committee. The classification of stations is a matter which will be a little difficult to decide upon ourselves. Somebody may be particularly anxious to rank as a class A station where he has no need to be such; on the other hand, another undertaking may be prepared to be a Class C station when there is really a need in that area for one of Class A standing.

I would like, Mr. President, to question Mr. Ritchie on the matter of substandards being returned for calibration. The original suggestion was that they should be returned once a month, now three months is mentioned which is naturally better, but would it not appear sufficient if two or three substandards were used and constantly checked with one another. That would avoid the necessity for frequent transfer of these substandards to a Class A station and is there not a danger of these substandards being upset in transit on their return.

Another point I notice is that batteries are mentioned. I would like to bring up the question of the electric vehicle and the inclusion in the specification of batteries for same. We have car batteries mentioned but they are in a different category from the traction battery. With batteries there arises a question of customs duty. A battery of more than 150 A-hours will get through the Customs free of duty but many traction batteries are just on the borderline. In the case of meter testing equipment we are met with the extraordinary state of affairs that a single phase equipment is charged 15 per cent, whereas the three-phase meter testing equipment comes in free. Some manufacturers put wheels on and the authorities decide that these are portable sets and carry the argument further that any single phase testing set is portable and consequently dutiable!

In the list of apparatus and appliances which have been given certain priority ratings I notice the very first item is

water heaters. Is that not possibly because they are not normally included in a bath room. Personally, I do not feel that they are a danger. Kettles come rather low down. Last year there was a fatal accident in Port Elizabeth over a kettle. This year Johannesburg has had one in January, which was given much prominence in the papers. These are matters which we have to deal with time and time again and I feel that the registration of contractors will be the only solution.

A further item which I would like to see on the list is the hood type drier used by hairdressers. There are not many but a large number of people are put under them and I have had occasion recently to take in every hair drier in the town for examination. They are invariably full of dust, hair and oddments. They contain a motor, a radiator, a switch, etc., etc., which all go on the lady's head and I feel that this is an item which must receive attention very early in any effort to safeguard the public against shoddy apparatus.

I note mention of the possibility of a mobile calibrating unit. Some years ago there was the suggestion of the formation of a South African Electrical Development Association. Possibly an association of that sort, if and when it is formed in this country, will have mobile units for demonstration purposes and I am suggesting it as a possible point that they may be able to share expenses in the equipment.

And last but not least, our Journal. This could be very helpful to us all by giving us up-to-date information on what the Bureau is doing, rather than to re-hash the papers we have heard in this Convention throughout the following year. I feel that Mr. Ritchie has stirred up a number of points and we are indebted to him, although we are not necessarily forced to put them back at him in the form of questions. I want to thank you for the opportunity of raising these points at this stage, particularly there is the fact that when we come to appliances it will be very difficult to pick upon this kettle or that iron while someone may think of something else. How can we specify the

individual item until we have a more general specification for all portable appliances?

Mr. FODEN (East London): I would like to join with the previous speakers in thanking Mr. Ritchie for a most instructive paper.

I would like to ask Mr. Ritchie if the Bureau has purposely left out refrigerators because they may be equally dangerous together with water heaters, stoves and so on if not correctly wired and earthed.

A second point arises on page 4—the third paragraph of his paper dealing particularly with the testing of discharge and fluorescent lamps. I would like to ask Mr. Ritchie if he has any reference in the specification to Power Factor.

Finally, on the subject of accuracy of transformers and meters connected thereto, it is of considerable importance to smaller undertakings that they do not have a multiplicity of spares and supply authorities would be forced to have spare potential transformers, spare current transformers and spare meters, all of the same characteristic and that would be an increased financial burden, because it is possible that a meter may burn out, a potential transformer may burn out, a current transformer may separately burn out and would upset the accuracy, and one would have, perhaps, to replace the whole metering equipment if one of these units failed, and thereby would load up an undertaking with a lot of capital expenditure in stocking suitable spares.

Mr. RITCHIE: Replying to Mr. Gripper with regard to sub-standards, we do appreciate that three months is quite a short while, but the Committee feels that it is a reasonable period to make a start, for experience will soon show whether your instruments are retaining the necessary accuracy and that period may be relaxed at a later date.

With regard to transport, we will be erecting stations in Durban and Cape Town and that will cut down the distance.

In reply to Mr. Foden, the Bureau will be pleased to consider any application for that type of specification.

Talking of Customs, the Board of Trade is considering placing a protective tariff on batteries made to our specification. We hope they will extend that policy and use it for other commodities apart from batteries.

Hair-driers—we will certainly add that to our list.

We will be pleased, also, to supply your Journal with our next bulletin. The Bureau has just appointed a Publicity Officer and will be producing a small bulletin shortly. It will be sold at a very small charge and you should get all the up-to-date information on standards. We will, however, send your Association a complimentary copy of our bulletin and will be pleased to allow any reproduction they may wish to make.

With regard to appliances, I want to make it clear that because there are four classes, we don't work through them in that order. We run water heaters, radiators, immersion heaters and switch fuses together, so that each receives equal consideration.

With regard to Mr. Foden's point, we can add refrigerators to the list as well.

Discharge and fluorescent lamps, that was discussed at the Committee meeting and we felt it was a thorny problem and we have not come to any definite conclusion, but we will consider the matter.

Mr. DWYER (Stanger): I want to add my appreciation of Mr. Ritchie's paper. I am particularly interested in the Safety Code. Particularly in the small towns we are interested, because the rubbish is sent out to the smaller towns and sold by the ordinary shopkeepers. Most particularly I am interested in the suggestion Mr. Ritchie made about the mobile unit and I don't want to let this opportunity pass without referring to it, as I consider it is a matter that this Association should take up. The expense to the smaller undertakings will be terrific and, while I quite appreciate the

difficulties which may present themselves, I think it is a matter which should be thoroughly gone into, this mobile unit, and I would like to make a suggestion or move that the Executive deal with this matter and I do so accordingly.

THE PRESIDENT: This is a matter quite obviously the Executive will take note of and deal with. I would suggest at this stage we have another item on the Agenda closely associated with this and the presentation will be in the hands of Mr. Downey, so if any member wants to say anything more on that particular aspect of it, I ask him to reserve it until we meet it on the Agenda, but if there are any points in connection with the points raised by Mr. Ritchie, I shall be pleased to hear them.

Mr. COLLINS (Dept. of Posts and Telegraphs): I would ask Mr. Ritchie if any arrangements are being made for radio interference in household appliances.

Mr. RITCHIE: I presume the speaker refers to Radio interference from electronic appliances. The Bureau has not yet been asked to undertake that work but should it be asked to do so we would undertake it; the only request received so far is the standardization of the wave length. Radio interference from ordinary electrical appliances has not been done in this country. The British Standards Institution have done quite a lot of work on this subject, but nothing has been done in this country, but we would be prepared to undertake it.

Mr. THACKWRAY (Kokstad): There is one point in connection with safety measures I would like to mention which may interest other delegates, and I would like to know of any of them have had similar complaints.

We have had a couple of cases in Kokstad where people have received shocks from the wireless aerial through its having become "alive." The average outside aerial usually has the switch at the window, and the earthing lead is brought to the same point. This is dangerous where children can play.

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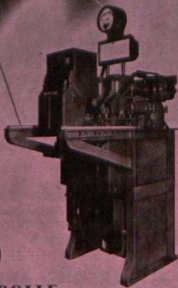
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We have had this trouble with the A.C./D.C. types of sets. The local electrical dealers made adjustments for the safety of the public, but general storekeepers cannot be prevented from selling sets as they receive them.

THE PRESIDENT: Do you mind if we reserve that for the discussion on safety apparatus this afternoon?

Formally, on your behalf, I thank Mr. Ritchie and Mr. Roberts for the paper and for the answers given so clearly.

The Convention adjourned at 12.35 p.m.

The Convention resumed at 2.40 p.m.

THE PRESIDENT: As I indicated this morning, through an omission, I did not deal with the Secretary's annual report and Balance Sheet, and with your approval I will ask the Secretary to present the Annual Report.

THE SECRETARY: I Have the honour to submit the Annual Report together with the Balance Sheet for the financial year ended 31st August, 1946.

**ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS OF SOUTH AFRICA AND RHODESIA
REVENUE AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st AUGUST, 1946.**

	£	s.	d.	£	s.	d.	£	s.	d.
AUDIT FEES				6	6	0			
PRINTING AND STATIONERY				19	12	3			
SECRETARIAL									
Salaries, Bonus and Office									
Allowances				182	13	4			
SECRETARIAL EXPENSES				88	0	7			
BANK CHARGES				6	8	0			
INSURANCE—PRESIDENTIAL									
BADGE				1	0	6			
I.M.E.A.									
S.A. Year Book							3	8	0
Subscriptions Paid				2	4	10			
Less Received				1	4	0	1	0	10
Depreciation—Fixtures									
and Fittings					2	17	0		
Donation—World Power Con-									
ference				10	0	0			
							321	6	6
CONVENTION EXPENSES									
Reporting					49	16	9		
Travelling Expenses, etc.					38	11	6		
Cost of Printing Proceedings					385	12	3		
							474	0	6
Less Advertising	188	5	0						
Sales, Proceedings	120	15	0	309	0	0			
							165	0	6
BALANCE being excess of Revenue									
over Expenditure					144	19	0		
					631	6	0		
								2631	6 0

BALANCE SHEET AS AT 31st AUGUST, 1946.

PAYMENTS IN ADVANCE	8 0 0	INVESTMENTS — UNION LOAN CERTIFI-	
ACCUMULATED FUNDS	772 3 6	CATES	550 3 6
Balance—1st September, 1945	627 4 6	Cost	500 17 0
Excess of Revenue over Expendi- ture for the year ended 31st August, 1946	144 19 0	Add Interest Accrued	49 6 6
		PRESIDENTIAL BADGE	31 8 9
		SUBSCRIPTIONS UNPAID	10 10 0
		FIXTURES AND FITTINGS	25 18 0
		Balance—1st September, 1945	11 0 0
		Additions	17 15 0
			28 15 0
		Less Depreciation	2 17 0
(Sgd.) G. J. MULLER, Chairman.		CASH	163 3 3
(Sgd.) A. T. TAYLOR, Secretary.		In Hand	12 13 6
		Standard Bank of S.A. Limited	149 9 9
	£780 3 6		£780 3 6

We report that we have examined the above Balance Sheet with the Books and Vouchers of the Association for the year ended 31st August, 1946, and certify that in our opinion the above Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of affairs of the Association as at 31st August, 1946, according to the best of our information, the explanations given us, and as shown by the Books.

PRETORIA, 17th October, 1946.

(Sgd.) WARREN & HOFMEYER, Auditors.

OBITUARY

I regret to have to record the death of Mr. G. H. Swingler, past President and one of the oldest members of the Association, and also that of Mrs. Coulthard, the wife of Mr. R. D. Coulthard, Associate Member, Salisbury.

TWENTIETH CONVENTION

The Twentieth Convention of the Association was held at Bloemfontein from Tuesday, the 14th, to Friday, the 17th May, 1946, inclusive. The large number of members and visitors who were fortunate enough to be able to attend will agree that both from a business and social point of view the meeting was an unqualified success. The papers read reached the usual high standard and the discussions generally proved the value of these papers and showed that interest in the Association's activities is being maintained, by Council and Engineer Members alike. A word of thanks and appreciation is due to the Mayor and Councillors of Bloemfontein for the entertainment provided, more especially in view of the difficult conditions prevailing at the time.

1947 CONVENTION

An invitation has been received from the City Council of Durban to hold the next Convention in Durban from the 12th to 16th May, 1947, inclusive. As this Convention will mark the 50th anniversary of the Electricity Undertaking in Durban there is no doubt that it will be well attended.

FINANCIAL

The attached balance sheet shows that revenue for the financial year ended 31st August, 1946, exceeded expenditure by an amount of approximately £145, which may be considered satisfactory in view of the fact that the cost of printing the Proceedings of the 1945 Convention was considerably higher than for any previous Convention, and owing to the increase generally in the cost of stationery and typing, etc.

This small surplus on the year's workings will go to prove, that in order to enable

the Association to carry on without financial embarrassment, the raising of subscriptions, advertising and sale price of the Proceedings decided on at the Salisbury-Bulawayo Convention and subsequently revised at the Bloemfontein Convention to conform more closely with the size of the Undertaking has been very necessary and fully justified.

In this connection the Association's appreciation is due to Council Members and Advertisers for their ready and unstinted support.

STATISTICS

The Statistics and Tables of Electricity Undertakings in the Union, the Rhodesias and South-West Africa will continue to be compiled and as usual will appear in the Municipal Year Book. It should here be noted that the ownership of the South African Municipal Year Book has passed from Captain F. G. Pay, Cape Town, to the South African Association of Municipal Employees, P.O. Box 62, Pretoria, and that all communications in connection with Tables, etc., should be addressed to the General Secretary of that Association. Further for the information of members these statistics are being compiled by Mr. L. L. Horrell, M.I.E.E., late Secretary and Treasurer of the Association, "Shotley," 47 Abel Road, Berea, Johannesburg.

MEMBERS

The following members were elected during the year under review:

COUNCIL MEMBERS:

Aliwal North, Delmas, Kingwilliamstown.

ENGINEER MEMBERS:

Andrew, W. M., Borough Electrical Engineer, Kingwilliamstown; Burger, J. F., Electrical Engineer, Springfontein; Delpont, G. C., Electrical Engineer, Delmas; Kane, R. W., Assistant General Manager, Johannesburg; Redman, R. H. Assistant City Electrical Engineer, Bulawayo; Sim, C. N. Electrical Engineer, Aliwal North; Smith-

M. M., Electrical Engineer, Adelaide;
Theron, G. C., Electrical Engineer, Hercules.

The membership at the 31st August, 1945, and 1946 was as follows.

	1945	1946
Honorary Members	5	5
Council Members	71	71
Engineer Members	67	63
Associate Members	2	2
Associates	22	24

Under the heading of members, I wish to take the opportunity of appealing to members when changing their occupation or address to notify the Secretary and it would also be very much appreciated if members would answer correspondence more expeditiously.

CONCLUSION

In conclusion I wish to thank the President and Members of the Executive Council for their assistance and the courtesy at all times extended to me.

I remain,

Mr. President and Gentlemen,

Yours faithfully,

A. T. TAYLOR,
Secretary and Treasurer.

SECRETARY: Whilst on my feet, I would like to mention that we have written to all Councils and Engineers who are not at present members of the Association. We feel that, especially in regard to the smaller municipalities, it would be beneficial to them as well as to the engineers to belong to this Association. We have made a strong appeal to them and so far as I can see the response won't be too bad, but I would appeal to members who are in contact or who may come in contact with engineers or Councillors who are not at present members, to try and influence them to join the Association.

In regard to the Balance Sheet, you have, no doubt, noted that I stated that at the end of the year 1946 we had a surplus of £145 approximately. The main items, in

so far as expenditure are concerned, were these:

Reporting	£49 16 9
Travelling Expenses	38 11 6
Cost of printing Proceedings	385 12 3

The cost of the printing of the Proceedings for that year was extremely high, but we anticipate that the cost of the next year's Proceedings will be considerably lower; against that, gentlemen, we realise the fact that, apart from the printing of the Proceedings, generally speaking most items in connection with running an Association or any other business concern have very much increased in the latter years. However, we hope that so far as the printing of the proceedings is concerned we will be able to show a reduction on the 1945 cost.

Mr. ANDREW (Kingwilliamstown): There is just one point which I think should be noted for future reference, in particular I refer to page 2, where Engineer Members are defined and given their status. Everyone is called an Electrical Engineer. That is perfectly true but I suggest that we make it clearer in our own publication that it should be town or city or borough electrical engineer.

THE PRESIDENT: Yes, we will note that, Mr. Andrew. Any other discussion on the Annual Report and Balance Sheet? I take it you are all satisfied with the running of your Association by your Executive and your Secretary and Treasurer?

MEMBERS: Agreed.

THE PRESIDENT: Now, proceeding with the Reports of the Sub-Committees, there is the report of the Safety Precautions—No. (iii) under item No. 6 and with that we wish to couple item No. 13 on the Agenda—Standard Wiring Regulations. Our representative on the Committee is Mr. Downey and I ask him if he will now present his report.

SAFETY PRECAUTIONS COMMITTEE.

Mr. DOWNEY (of Springs):

I have to report that the Safety Precautions Committee held two meetings during

the year, and one visit of inspection of the wiring of "His Majesty's Theatre" while under construction. I regret I was not able to attend the meeting held in June last year as no notification was received of that meeting owing possibly to the short time between the date of the last Convention and the meeting in question.

The Committee has been dealing with many proposed amendments to the present Standard Wiring Regulations, and many queries have been dealt with. It should however be made clear that the Safety Precautions Committee's function is to deal with the wiring of premises only, and matters concerning the distribution of supply is outside the scope of this Committee.

Many questions have been considered including Mineral Insulated Copper Covered Cable, Standard House Service and Kitchen Control Units, the prohibition of overhead connections between buildings, and the number of socket outlets on a sub circuit.

The question of Plastic Insulated Wire was considered and the Committee considers that permission must be obtained in each case from the supply authority concerned before it is used.

In regard to Mineral Insulated Copper Sheath Cable, it is considered not as capable of protecting the cable as a steel conduit, and consequently it is deemed advisable that extra protection should be provided when the cable is liable to mechanical damage and the matter of current rating is being taken care of in the proposed revision of the wiring regulations.

The points raised by the Convention at Bloemfontein have also been considered and it is proposed to introduce regulations for socket outlets along the lines of the latest edition of the I.E.E., London. In regard to the supply mains from one building to another outbuilding, it is proposed to introduce a new regulation specifying underground connection unless otherwise approved—i.e. deviation from the regulation regarding the use of an underground connection must be obtained from the Supply Authority.

INCOMBUSTIBLE MATERIALS

The Committee has decided to adopt the definition of "Incombustible" or "Non-Inflammable" as given in the 11th Edition of the I.E.E. regulations with a note to the effect that building materials are involved. *Screw-In Type Cartridge Fuses and House Service Units.*—The Committee does not consider it necessary to specify the Screw-In Type Cartridge Fuse in preference to any other, as even this type has been known to be tampered with, and furthermore the Committee cannot see any justification for specifying miniature Circuit Breakers instead of Air Break Switches in House Service Units as they are not essentially a safety measure.

In regard to the regulations for X-Ray and Medical Apparatus, this is still under consideration at the moment; also amendments to the regulation of the wiring of theatres.

A number of other items that would necessitate consideration by this Committee such as wire, switches and the like are now being dealt with by the Standards Bureau Safety Code Committees.

THE PRESIDENT: On behalf of the Association, I want to thank you for your report; I would prefer Mr. Milton to open the discussion.

Mr. MILTON: Mr. President, Gentlemen, the Safety Precautions Committee has accorded me the privilege of representing them at this Convention and I have been asked to extend the Committee's thanks and congratulations to your Association for the number of helpful suggestions put forward through the Secretary and the Association's representative on the Committee. The Committee wishes you a very successful year of office.

Mr. Downey, who is your present representative on the Committee has presented a most able report which, as an Associate of the Association, it will be my privilege to discuss at a later stage.

As representing the Committee, there are a few points which it seems desirable to

mention in connection with the functions of the Committee, because some aspects of those functions are apparently being lost sight of by quite a number of people at the present time.

I would point out that the Safety Precautions Committee was established by the Institution of Certificated Engineers, South Africa. The Safety Precautions Committee was constituted as far as possible by elected representatives of all those bodies and institutes affected by the adoption of wiring regulations. This Association appointed a special Committee for the purpose of promulgating the regulations, and though your members are all vitally interested in the details, they should not lose sight of the fact that the Safety Precautions Committee itself is not a sub-committee of the Association.

In the early stages of its work the necessity for defining the scope of its activities arose and it was then decided that its activities should be limited to dealing with the wiring of premises, including factories, etc., the wiring of domestic premises receiving preference. It was also necessary to decide the limits of application of the proposed regulations and the Committee decided to exclude entirely any question of drafting regulations to cover equipment beyond the fixed point of outlet.

I believe this decision was taken because it was realised that a supply authority could effectively control the fixed wiring but it was impossible for a supply authority to attempt to enforce legislature controlling portable appliances and other equipment supplied from the fixed outlet. Any control of such appliances and equipment must be applied to the source from which they were obtained by the user, if it was to be effective, that is the sale of unsuitable items should be prohibited. For so long as a user of electricity is able to buy across the counter bad and dangerous equipment, no supply authority could prevent him from doing so, nor effectively prevent him from making use of his purchases thereafter.

Many aspects demanding control of appliances have been brought to the attention

of the Safety Precautions Committee from time to time and suggested regulations have been submitted for incorporation in the wiring regulations. None of these suggestions has been adopted by the Committee for the reason I have just put forward.

When this item on your agenda is discussed, I trust that the limits set by the Committee on its functions will be borne in mind. Should any member, however, consider that the limits should be extended I am not suggesting that he should be ruled "out of order," as any suggestion, if adopted by the meeting, could be presented to the Committee by your representative.

The Committee is very grateful to your Association not only for the points raised but also for the manner in which they have been presented, and for the disclosure of difficulties in interpretation of the regulations in practice.

The Committee has put in a very considerable amount of work and is hopeful of producing the results of its deliberations in the not too distant future.

There is some prospect that the wiring regulations will come under the wing of my friends on my left (Bureau of Standards) and that they may be adopted as a Government measure.

You will probably recall the following lengthy and arduous task of reaching agreement on the details on the first edition of the wiring regulations, consideration was then given as to how best they might be introduced for universal application throughout the Union, leaving our friends from Rhodesia to deal with the Rhodesian aspect. You appointed a special sub-committee for this purpose with the power to act. The Labour Department was approached first with a request to adopt the regulations in terms of the Factories Act. The Chief Inspector of Factories and the Department's law advisers considered the matter after an interview which these gentlemen granted us. They ruled that it was not a function which could be performed under the Factories Act. The subject matter could be

dealt with only in general terms and not in the detail we required.

Our next step was to approach the Electricity Control Board to adopt the regulations, but once more we were told that the Board did not consider it was its function to promulgate such regulations, although we quoted sections and sub-sections of the Act which appeared specifically designed to permit this being done. Our last recourse was to group promulgation, and even this demanded considerable argument with the authorities before agreement was reached.

In the Transvaal and Free State the process of group promulgation was followed, whereas in the Cape, in view of that Province's special facilities, the regulations were adopted by the Provincial Administration for application by quotation. In Natal your District Committee was unable to reach this goal by reason of difficulties raised, I understand, by the Provincial Administration, and so far their endeavours have not met with success.

In consequence, the present indication that a Government Department is interesting itself in the Wiring Regulations with a view to adopting them as a Government measure, can only be regarded as good news, as it is, in fact, the step decided on in the early days as the best to be taken.

In view of the modifications to the regulations which the Safety Precautions Committee consider necessary, it is desirable that the Government Department should be furnished with a copy of the regulations modified to date. The Bureau of Standards will then have in their possession, a completely up-to-date document designed to cover the difficulties and suggestions which have been brought forward by officials administering many supply undertakings also by other parties involved. I would reiterate that so far as I am aware there is no definite decision from the Bureau of Standards to proceed with the adoption of standard wiring regulations, but I am hopeful that they will do so. In your deliberations on this item of the agenda I trust that members discussing points will bear the aforementioned remarks in mind.

Mr. EASTMAN: Mr. President and Gentlemen, we are greatly indebted to our representative on the Safety Precautions Committee for his Report and to Mr. Milton for his descriptive reminder of the way in which the regulations which our Association drafted after many many years of effort were finally taken over by the Safety Precautions Committee and then, in consultation with us, amended to conform to the latest practice, largely based on the 11th Edition of the I.E.E. corresponding Regulations, and finally by arrangement with the Provincial Authorities were promulgated as standard regulations throughout the Union.

And we are indebted to Mr. Downey particularly for drawing our attention to the fact in his Report that the Safety Precautions Committee is functioning. I must confess that I personally did not know that that was so, and now that my attention has been drawn to it and the attention of other members of the Association who might also not have been aware of the fact, it enables us now once and for all to submit our recommendations for alterations which we ourselves individually deem desirable.

We are indebted to Mr. Milton for drawing our attention to the fact that all the members of the Safety Precautions Committee are not necessarily Electrical Engineers in charge of electrical undertakings and not necessarily persons who will administer these Wiring Regulations. The point of that comment is this that we have only one representative on the Safety Precautions Committee from a body which is responsible for administering those Regulations and his duties are going to be very difficult to perform unless we keep him fully posted with our proposed amendments from all over the country and do that soon. I am led to that remark particularly by the phrase relating to the specification of miniature circuit breakers, as they are not a safety measure. They were not intended to be a safety measure. The use of this miniature circuit breaker in place of the ordinary iron clad fuse is a matter of "service" so that instead of the consumer being put to the delay of calling upon the supply authority to see why the current had gone off, when

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posed on a consumer in respect of the supply of electricity not bound up intimately with safety. The present Regulations include a few such Regulations, which have been carried over and which strictly should have been eliminated. Perhaps one of the principal reasons for excluding Supply Regulations from the document was the difficulty of obtaining unanimity of opinion as between each of the Supply Authorities as to what is required of a consumer under the heading of Supply Regulations. It was the intention that each Municipal Authority should be left free to follow its own desires in so far as it wished to regulate the supply to its consumers.

As an example of a Regulation which comes under this category, I would quote the section dealing with the requirements for wiring of installations for two wire or three phase four wire supplies depending on the connected load. One of the major Municipalities would advise you that the requirement insisting on a three wire supply as set out in the Regulations is ridiculous and not in the interests of its consumers. Other Municipalities on the other hand, maintain that it is essential to subdivide the load between phases when the installation is large enough. These requirements, therefore, are not entirely precautionary measures (involving safety) and it is not unlikely that our friends on the Bureau of Standards may exclude this type of regulation when they come to analyse the documents submitted to them.

It has been submitted to the Committee that measures resulting in a saving of cost without prejudicing safety, should be specified. It is felt, however, that such decisions may not be lasting because what may appear to be a saving to-day will not necessarily result in a saving in the future. The individual Supply Authorities could, however, take care of these aspects in the interests of their consumers by suitable provisions in the Supply Regulations.

I was very surprised to hear Mr. Eastman express his fear that the modified regulations would be brought into force without reference to the Authorities who would have to administer those Regulations.

This morning Mr. Ritchie made a very significant statement when speaking on the subject of the meter code. He stated that the code, in draft, had been sent to all Supply Authorities for comment and had, in fact, been sent out of the Union for comment. He advised us that the comments received had been collated, and had been adopted where they were obviously in the interests of the Authorities who would be required to administer and operate the meter code. I do not think it is logical to assume that the Department of the Bureau of Standards will promulgate the Wiring Regulations as a compulsory measure without due reference to the Authorities who will be called upon to see that the Regulations are obeyed.

The proposals of the Safety Precautions Committee, which have not yet been implemented, are to furnish the Bureau of Standards with an up-to-date copy of the Wiring Regulations which would include the modifications submitted to the Committee from various quarters and adopted. Such a document should enable the Bureau of Standards after considering the problem, to submit to the Supply Authorities a comprehensive document likely to be subject to far less criticism than would be the case if the Bureau attempted to work on the existing Regulations. In these circumstances, I feel that Mr. Eastman need have no fear that the members of the Association will not have an opportunity of expressing their individual views to the Bureau should the Bureau decide to sponsor making those Regulations law throughout the Union.

Mr. GRIPPER (Worcester): This subject has been dealt with very thoroughly by our Council and the Safety Precautions Committee, but the first point Mr. Milton made seemed to be relevant to the question of the registration of contractors. As Mr. Milton pointed out, wiring regulations deal with the wiring of the building and if there is any fault, if a contractor has not done his job as required by these regulations, we have the power to refuse to connect. Well I must say from my experience I would much rather have the Contractor in my office and threaten him with refusal to renew registration, than have the lady of

the house with a baby in her arms begging for power and light. The consumer should not be made to suffer for the sake of his own protection.

We have also the case of the appliances, where our Safety Precautions Committee have no power to act. There it may be worse, the consumer may not come in crying, but he may go off in a hearse. The contractor who repairs an appliance may be criminally liable. If a shoddy job is done we have no power at all, but the man who did the repair is the man you want to get at.

One other point, I want to feel the Association's opinion generally on the question of embodying specifications in regulations. Our regulations tell us the type of cooker plug to use and we are now suggesting miniature circuit breakers. I feel miniature circuit breakers are far more preferable on the consumers' side, but if the main supply fails, I submit that the supply authority ought to know something about it, so I make this appeal that if our Wiring Regulations are to become law they should not embody a specification of a switch or a type of connection but keep to their terms of reference which are "safety first"—we will look after the service recommendations and specify whatever may be necessary to meet the regulations in our own undertakings.

THE PRESIDENT: At this stage I certainly am in difficulty. I quite appreciate the point made by Mr. Milton about their concern being safety but I don't see how you can disassociate safety from service and convenience. The Wiring Regulations deal with the limitations of the number of points on a circuit. The Wiring Regulations consider it and I do not see why they should not. The Precautions Committee, having been responsible for an insistence on a limitation of points fed by a circuit should take under their wing the question of the miniature circuit breakers.

Mr. MILTON: Mr. President, you are dealing with a border-line case. The limitation as to the number of points on a circuit was based on experience in relation

to the number of points required and probable loading. Incidentally, the Regulations governing this aspect are to be considerably modified. Thus, the specification as to the limit of the number of points was intended to cover loading and not merely convenience, although naturally the convenience of the user was studied. This is not a parallel case to the request for legislation regarding the use of Miniature Circuit Breakers.

There are two further points which I should have dealt with when speaking to Mr. Eastman's discussion. Firstly, as regards representation on the Safety Precautions Committee and the second dealing with the channels for legalising the Regulations.

As regards representation, the Committee is composed of members representing all the bodies principally interested in, and directly concerned with, Supply Authorities' affairs. If you examine the names of the members of the Safety Precautions Committee I think you will find that, with the exception of three, all are Municipal Electrical Engineers, and permanent members of Municipal Electricity Department staffs. Two exceptions come to mind, namely a representative of the National Federation of Building Trade Employers in South Africa, Mr. Gibson, and Mr. Missing, who represented these same interests and was later co-opted as a life member of the Committee because of his very wide experience in Wiring work and the Safety Precautions necessary in connection therewith. If this Association were to require additional representation, I feel sure the Safety Precautions Committee would accede to the request.

When the Committee is dealing with the matter, it holds the view that opinions expressed by your representative are the opinions of your Association. If he is in doubt as to whether or not he is expressing the Association's views, then he should approach the Association for directions, and would, I am sure, be given ample opportunity to do so.

I am certain the Committee is satisfied that Mr. Downey will, at all times, represent fairly the views of this Association. The

only other reason for requiring more than one representative that occurs to me, is that you may feel you require additional weight on the Committee for voting purposes. To my knowledge, no single Regulation or modification of a Regulation, has been adopted unless complete unanimity of opinion has been reached. Contrary views have very often been expressed and points argued at great length, but the ultimate decision has been unanimous. Further any matter so adopted is brought forward at the next meeting for confirmation.

As there has not been any question of putting the matter to the vote, the addition of more representatives from the Association should not have influenced any decisions taken.

As regards the question of making the Regulations apply, Mr. Eastman seems to be of the opinion that they require to pass through Provincial channels for approval and promulgation. As I understand it, if the Bureau of Standards publishes Regulations as a compulsory standard specification they will at the time make it clear that the compulsory standard supercedes all previous standards and Regulations or Bye-laws of the same nature. The compulsory standard would apply throughout the Union without any necessity for Provincial adoption, in fact, it would become a law of the country. Such standards could not be relaxed, but they could be made more restrictive, by Municipal or other Bye-laws.

It is possible, of course, that the compulsory specification might be restricted for application only to certain defined areas. I would be pleased if Mr. Ritchie would enlighten us on these points.

Mr. RITCHIE: I am afraid that this is anticipating the position. This point was first raised at one of the meetings of our Meter Code Committee, when we stated that the Electricity Control Board was going to promulgate the meter code in their Act and we thought it would be a good idea if the Bureau of Standards is able to help in the same way with the Wiring Regulations. The position has not advanced very much beyond that point nor have we made any arrange-

ments to have the wiring regulations promulgated in the Act, but we did say we would give it our attention.

It might be pointed out that in Canada and America these regulations are brought out as codes by the Standards Associations. They form part of the code, the safety sections form Part Two. We thought we might do likewise but there is nothing hard and fast yet.

Mr. EASTMAN: That is my very point. We want a lot of us to have certain amendments made soon to meet present-day conditions and I was under the impression when I spoke that the Bureau of Standards would not be in a position to promulgate regulations for some time.

Mr. RITCHIE: Once you give us the material you will find there will be very little time lost in having them published.

THE PRESIDENT: Mr. Eastman's point is until such time as they become statutory enactments and we will have to get them through the Provincial Councils.

Mr. STEVENS (Ladysmith): Mr. President, could you as convenor for the adoption of the Standard Wiring Regulations in Natal, tell this assembly for the benefit of Natal Engineers what the latest position is with respect to the promulgation of the Regulations in Natal?

THE PRESIDENT: The position is that they are not yet promulgated. They were put up after considerable argument and discussion; there was the question of promulgation and the Natal structure had no authority to promulgate by reference and when it was the intention originally to promulgate the regulations as first published the whole of those regulations would have had to be printed in both official languages in the Gazette; further amendments would have to be printed in full in both official languages; to save cost and simplify the procedure the Provincial Council decided they would seek powers to legislate by reference. When the Provincial Council does acquire powers to legislate by reference

they will promulgate the bye-laws as Electricity Bye-laws for all the subscribing Municipalities in Natal.

Mr. MILTON: I doubt very much whether Natal will be able to secure the powers referred to, because we have been advised that such powers are not good in law in the Union of South Africa. Of the four Provinces of the Union, three provide similar legislation, the fourth being somewhat different. In the Cape, the Provincial Administration has power to promulgate electricity supply regulations which may be made operative in a Municipal area by that Municipality advertising in the Gazette that they so applied. In the Transvaal and the Free State, the Administrations were opposed to group promulgation but finally agreed that the Regulations could be made applicable to a group of Municipalities provided that group was set out in detail in a schedule attached to, and forming part of, the promulgation of the Wiring Regulations. I would express the opinion that Natal could have followed the same procedure. May I say at this stage that the Safety Precautions Committee is certainly aware of the great effort Mr. Kinsman has made to obtain promulgation of the Regulations in Natal, and also of the extent to which his efforts have been frustrated.

Mr. C. R. HALLE (Pietermaritzburg): I move we adjourn.

The Congress adjourned at 3.40 p.m.

The Congress resumed at 4.5 p.m.

Mr. HALLE (Pietermaritzburg): I am unfortunately confronted with two difficulties in Maritzburg, both of which we have tried to solve. We have a similar amount of difficulty in keeping our customers happy in the Transport and Traffic Departments. We did get a certain amount of help from the Provincial Council, in fact they have passed a very fine effort, the Natal Motor Ordinance, but if they can do that with traffic why can't they do the same thing and pass an Electrical Wiring Ordinance? If they can afford to print that great book at 12s. 6d. and the Local Government Ordinance, surely it would pay

handsomely if they introduced a Wiring Ordinance: I do think that if, instead of passing everything back to the Municipality, in this case we should try in Natal to get them to promulgate the regulations as a Provincial matter.

Mr. MILTON: I find I did not reply to the point raised in connection with Standard Specifications. The Standard Specifications referred to in the Wiring Regulations cover all material used in an installation as the Safety Precautions Committee decided it would be difficult to administer the Wiring Regulations unless a Supply Authority had control of the quality of material and workmanship of the installation.

The specifications referred to are the South African Standard Specifications (applicable in the Union) and in the absence of a South African specification then a Standard Specification of the British Standards Institute.

Mr. STEVENS: Mr. President, in view of the extreme shortage of metal conduit for electric installations, some Municipalities have agreed to contractors doing open or cleat work in the roof space above ceilings. In Ladysmith we are considering doing the same now that 250 feet of tubing only is allowed by the Controller for installations, which is only sufficient for switch drops. I would like the consensus of opinion of our members as to whether such practice is permissible in terms of the standard Wiring Regulations.

One of the larger Municipalities has interpreted Section (c), Appendix iii, to read that such may be allowed with the Engineer's consent, but I am a little doubtful, as the latest edition of the I.E.E. Regulations, Sections 402, 405, 406 and 409 definitely disallows open wiring.

402. *Exposed or Cleated Wiring.* (G).

Where run within floors, walls, partitions, ceilings, roof-spaces, or other concealed spaces in which they are not normally open to view they are protected by casings which

comply with Regulation 409, or by conduits which comply with Regulation 405, or by ducts which comply with Regulation 406.

405. *Conduits.*

406. *Cable Duct System.*

409. *Wood Casing.*

Mr. MILTON: Our Regulations provide for the alternative if approved by the Engineer. Open wiring is dealt with in the appendix to the Regulations and is extensively used inland.

Mr. STEVENS: I, too, am very happy that we have those powers, only I had this question raised and it is an opportunity to have the matter cleared up.

Mr. SIBSON (Bulawayo): I should like to ask whether any member has been approached for permission to employ aluminium conduit. In Rhodesia, stocks of steel conduit have been entirely exhausted, but I believe the Union has certain resources available. Building work has been brought to a standstill in certain cases through lack of conduit, and I have had requests for permission to use aluminium instead of steel. Up to now this permission has been refused; if any member has any information on this subject, I should welcome it.

Mr. EASTMAN: In Cape Town we have gone into the question of aluminium conduit in concrete. We have had a report from the Council's chemist to the effect that under damp conditions, this type of conduit, unless covered with an entirely waterproof material such as a bituminous paste, is subject to corrosion. For that reason, in Cape Town we do not view with favour the use of aluminium conduit in concrete. I see no objection to it being used on the surface. When we realised in Cape Town and in other provinces that there is a really serious shortage of conduit, we relaxed our interpretation of the regulations to permit of open wiring, using cleats in roof spaces, but it is only an emergency arrangement.

Mr. ANDREW (Kingwilliamstown): I would like to endorse Mr. Eastman's remarks regarding the cost of wiring small cottages. The two methods in general practice are (a) to wire the complete job in conduit and (b) to use open wiring in the ceiling space with short conduit runs down to switch positions. The difference in final cost depends entirely on the ability of the electrician, and his training to deal with one or other of these two systems. When he has not been trained to erect open wiring, it has been shown that the cost was in excess of wiring work that used conduit throughout and carried out by a man trained to erect conduit. Mr. Stevens of Lady-smith may be interested to hear that I have personally taken the trouble to examine open wiring in ceiling spaces, and in one case which proved to be over forty years old the V.I.R. insulation was slightly brittle in those areas adjacent to the corrugated iron roof. In general I am perfectly satisfied that the open wiring in ceiling spaces is safe and sound, and should be permitted outside the coastal belt.

Mr. FODEN: The last speaker referred to coastal conditions and for many years at East London we have allowed open wiring in roof spaces and to my knowledge we have had practically no trouble with it, providing contractors use approved wire. That is the secret of the whole thing, if that wire has the department's approval, we have had no trouble whatever with failure due to faults developing in roof spaces. We make one stipulation, however, and that is that the wireman does not run his wires in any direction, he has to run on the beams.

Dealing with the matter of cost, I interviewed the Inspector of National Housing when he came to East London with regard to costs, and he said the cost of wiring an "A" type of house in East London was cheaper than in towns where the local authority insisted on using conduit throughout, so there is something to be said in favour of open wiring in roof spaces.

Mr. TUBB (Salisbury): Mr. Chairman, there are two points. One is the open wiring in the roof, which we have found to be perfectly safe, but I would like to ask Mr. Andrew what he did in the flat roofs where

one cannot walk. In kitchens and outhouses where it is a flat roof, we have not in the past allowed it.

The other point I would like to touch on is with regard to aluminium conduit. I am concerned after you have run your conduit. I would like to know how the final earth will be effected, will it be aluminium wire or a copper wire? If it is aluminium wire, I suggest it will probably be a copper plate in the ground and you will have trouble there.

Mr. ANDREW: No. With flat roofs, conduit is essential. I would like to endorse Mr. Foden's remarks and stress the need to arrange the open wiring in the ceiling spaces in an orderly and tidy manner, avoiding the fixing of wires in ceiling spaces which are normally used for access. If the work is carried out in this manner it will be quite satisfactory.

For general interest I would like to mention that I conducted an experiment about seven years ago. Using different types of V.I.R. Canadian and American Rubber Insulated Wire, it was found that the C.M.A. 600 volt grade was better suited than any of the other types for use in open ceiling spaces, where higher temperatures than normal may occur, as for instance under the corrugated iron roof.

Mr. MILTON: No finality has been reached on the question of the use of aluminium conduit. It occurs to me that the Standards Research Institute might be prepared to carry out research in this connection.

COUNCILLOR HIRST: I would like to know if any of these relaxations that have been allowed in any way endanger the validity of a fire insurance policy.

THE PRESIDENT: In no way do we assume any liability under the fire insurance; that is the fire insurance companies' responsibility; but having regard to the fact that they have always accepted ours as safe, I don't think it would be permissible under the regulations if it enhanced the fire risk.

Mr. TUBB: Mr. Milton mentioned that he was proposing running the earth-wire inside the conduit, I was referring to the main earth. When you come to do the final earthing you have two methods. The whole of our mains, at one time, were aluminium. We had a tremendous amount of trouble in the past; where the aluminium service wires were joined to the V.I.R. copper down-leads to the meter, this aluminium-to-copper joint always gave trouble. The joint was taped with electrician's tape, and then painted, the idea being to exclude air and rain water from the joint.

When low voltage was reported, sometimes as much as twenty to forty volts, re-making the joint immediately rectified the trouble.

I consider that if aluminium conduit is used, the main earth joint should be painted with bitumastic paint, where the copper and aluminium are connected. Since those days, American firms now manufacture service taps (line taps) for copper to aluminium joints. It is a bronze clamp, cadmium plated in one groove. Electrolysis is reduced to a minimum as the aluminium cannot come in contact with a metal having marked difference in potentials.

I know Rhodesia is proceeding to import aluminium conduit. I consider it should not be allowed under plaster.

There was one point that was not mentioned in regard to cleat wiring. We have a number of steel ceilings in Salisbury, and where the wires go through the ceilings, we insist upon porcelain tube.

Mr. ANDREW: I have just been reminded of a very good idea, which we have on occasions used in Kingwilliamstown to overcome the shortage of conduit. Instead of installing wall switches which require a short length of conduit in the wall, we installed cord operated ceiling switches. In such cases the only conduit required are those short lengths between the distribution board and the ceiling space.

Mr. POWELL: I am afraid this is one of my chief worries at the present time, since,

at present, we cannot obtain the type of conduit which you insist we must use. It may be of interest to members to know that at a recent Master Builders' Association meeting it was revealed that the estimated conduit requirements for the Union of South Africa for 1947 is some twenty-seven million feet, but that only approximately five million feet will be available.

You will see, therefore, Mr. President, that it may become necessary for you gentlemen to accept alternative methods.

It has been mentioned that condenser tubes may be a suitable substitute, and as I understand that a firm in Johannesburg is likely to be producing copper tube in the near future, I would like members to consider the possibility of using these alternative forms in place of steel conduit until the latter is in more plentiful supply.

Mr. MILTON: My remarks went further than Mr. Tubb's statement. I feel that aluminium conduit may prove unreliable as an earth continuity conductor due to oxidation at the joints and it might be necessary to run an earth continuity conductor in the conduit in addition to the circuit conductors. If bare copper were to be used then trouble might arise from contact between the two dissimilar metals.

THE PRESIDENT: There has been a very illuminating discussion on this point. One realises and bears in mind the reaction by Mr. Milton to the suggestion that had been made and he has invited the continuance of submissions of those suggestions because it is the Electrical Engineer of a Municipality who probably comes in close contact with these various points and he might see a method of easing the position. But I do suggest to members who have these points that they see that they are constructive, helpful points and submit them to the Safety Committee and there is a representative of our Association on that Committee.

The discussion has been fairly wide and therefore has covered one or two items on the agenda. We have discussed an item on the agenda, No. 16, and the whole pur-

port of that was that in view of the extreme shortage of steel conduit we would, without modifying the standard of safety, modify our requirements.

We have had very interesting points in regard to open wiring in ceilings. I don't think we would subscribe to any policy which would make increased risk to the consumers but the supply position is serious and will be for some considerable time; in the meantime we will use discretionary powers given us under those regulations to provide some relief in the present difficult position.

A point with regard to aluminium tubing I am glad that it has been raised. Mr. Eastman has given us some valuable information on the chemical effect between wet concrete and aluminium. Another point I am glad Mr. Milton made is that although it is a metal conduit and it is continuous through its screwed joints, there is a possibility of those joints weakening and so reducing your circuit. You must carefully exclude any atmosphere, particularly where it is a salt-laden atmosphere.

And so we might dispense with the items on the agenda of Safety Precautions and Wiring Regulations.

STATISTICAL TABLES

I suggest we take item No. 6. It was one of the members of the sub-committee and some papers were handed to me some months ago with the intention that I should finalise that report. I must apologise, for I have not done so, but I will do so as soon as possible. There has been a very good reason and I will do that later.

MEMBERS: Agreed.

THE PRESIDENT: With regard to Overhead Lines and Code of Practice, Mr. Fraser has asked me in his absence if I would present his report. It reads:

REPORT ON OVERHEAD LINES CODE OF PRACTICE

In my report on the above matter, submitted at the Convention held in Bloemfontein last year, I gave a brief outline

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of the field which it was intended to cover the Code of Practices.

The Drafting Sub-Committee has met regularly each month throughout the year and has made such satisfactory progress that it is anticipated that the completed draft Code of Practice will be ready for submission to the Main Committee in the course of the next three to four months. It is probable that, after it has been approved by the Main Committee, the draft will be made available to Engineer Members of this association for comment.

Towards the end of 1946 a committee was established by the Institution of Electrical Engineers, London, to draw up a similar code of practice. Liaison has been effected between this committee and the S.A.I.E.E. Drafting Sub-Committee, under which minutes of meetings and other relevant documents are exchanged.

Is that Report accepted?

MEMBERS: Agreed.

THE PRESIDENT: Then there is the item on S.A. Standards Institution; I would ask that that be left over until tomorrow.

REGULATION OF PROFITS IN RELIEF OF RATES.

The Regulation of Profits in the Relief of Rates—you will recall that in Salisbury Mr. Eden's resolution was adopted and your Executive is taking steps in that direction in submitting our proposals to the United Municipal Executive and I think we might leave it at that stage, but your Executive is very earnestly following that point up, if that might be accepted.

MEMBERS: Agreed.

THE PRESIDENT:

FREIGHT CHARGES ON COAL:

This merits discussion but with your approval I will defer it until to-morrow.

DUTY ON MACHINERY.

At the Bloemfontein Convention it was learned that the Government was consider-

ing the imposition of a 20 per cent. suspended duty on imports of machinery. In response to suitable representations by the Association your Executive was advised that the proposal was being abandoned.

PROTECTION OF ELECTRICAL ENGINEERS.

The view was expressed at the Bloemfontein Convention that similar protection should be extended to electrical engineers as was enjoyed by town engineers under the various Provincial Ordinances. This has already been done in the Cape Province and your Executive will take the matter up with the other Provinces.

MEMBERS: Agreed.

AUDITORS.

A little formal business we could dispose of now—the appointment of Auditors. Messrs Warren and Hofmeyr, of Pretoria, have been our Auditors for a number of years and the recommendation of the Executive is that you re-appoint the present Auditors; is that agreed?

MEMBERS: Agreed.

FREIGHT CHARGES ON COAL.

In the time left to us before adjourning I propose to deal with the item of Freight Charges on Coal. When your Executive learned that a Coal Commission had been appointed it hoped to be able to make representations on this subject. Unfortunately the Commission's terms of reference would not permit. I was, however, authorised by the Executive to give evidence before the Commission on other points within the terms of reference; this I did and I now present my report which has already been circulated.

COAL COMMISSION, 1947.

In accordance with the directions of the Executive Council, I duly submitted the Association's Memorandum—a copy of which is attached hereto—to the Coal Commission during its sitting in Durban. I was closely questioned by the members of the Commission. The general trend of the questions and my replies were:

(a) Q. Had the Association considered what would happen to Municipal Power Stations if a complete embargo were applied against the use of coking coal for steam-raising purposes?

A. In the days of competitive tendering Municipal electrical engineers specified coal burning equipment which would give the highest efficiency having regard to the type and calorific value of the coal and the railage rates.

Any departure from the class of coal for which the firing equipment was designed would result in loss of efficiency and reliability. In support of my statement I put in as evidence a paper by J. J. Coetzee, B.Sc., B.Sc.(Eng.), of the Fuel Research Institute of South Africa read before the Natal Institute of Engineers on the 13th October, 1939. The title of the paper was "Boiler Trials with Coals of Varying Size and Composition." The author showed that in firing a particular coal in various sizes the efficiency varied considerably as these figures show:

Boiler—B. and W. double drum—
10,000 lbs. steam/hour.

Stoker—Chain Grate—air space to
total grate area, 18.6 per cent.

Size of Coal	Efficiency
Peas with 3.7% minus $\frac{1}{8}$ in.	73.6%
Small with 42.8% minus $\frac{1}{8}$ in.	48.9%
Small with 42.8% minus $\frac{1}{8}$ in. (with 8.2% water).	63.9%
Duff	38.2%
Duff (with 10.4% water)	52.4%

(b) Q. What are Municipal Power Stations going to do when natural "pea" coal is not available in sufficient quantities? Will they instal crushing plants?

A. If natural "pea" coal is not available in sufficient quantities Municipal Electrical Engineers will be forced to instal crushing plant and/or modify their firing arrangements. We are prepared to modify our plans if such is essential in the national interest, but the whole burden should not fall upon us.

(c) Q. Why do Municipal Power Stations object to using a crushed coal—minus $\frac{3}{8}$ in.—as do the V.F.P. Stations?

A. Our firing equipment was not designed for burning such coal because the disproportionately high railage rates to the stations more distant from the collieries did not make it economical to burn such coal. The circumstances were different where the railage rates approximated more closely to the pit mouth cost of coal.

(d) Q. What observations have you to make on the suggestion that there should be a reduction in the present calorific standards of coal supplied to Power Stations.

A. Any reduction in calorific standards would mean a corresponding increase in the tonnage of coal to be bought and transported. Quite apart from the reduced capacity of the boilers the cost of railage would increase. Railage rates should in such case be regulated on the policy of "what the traffic would bear."

(e) Q. What observations have you to make on absence of competitive tendering for coal?

A. If power stations were forced to accept a lower standard of coal—as regards both quality and class—then the authority forcing such acceptance should also insist upon the collieries maintaining a continuous supply of approximately consistent quality and class.

I trust that I discharged my duties to the satisfaction of the Executive Council and the members.

MEMORANDUM FOR SUBMISSION TO THE COAL COMMISSION ON BEHALF OF THE ASSOCIATION OF MUNICIPAL ELECTRICITY UNDERTAKINGS

1. ANNUAL CONSUMPTION OF COAL:

Coal is used for electricity generating purposes in a large number of municipally-owned electricity undertakings in the Union of South Africa, the annual outputs of which

range from about 60,000 units in the smallest undertaking to 420,000,000 units in the largest. Correspondingly the consumption of coal in municipally owned electricity undertakings is estimated to be approximately 1,270,000 tons in 1947. This figure may be expected to increase at the rate of 120,000 tons per annum for some time to come because of the expected continued increase in the use of electricity from such undertakings.

2. TYPE OF COAL USED:

Boilers in all municipally-owned steam electricity generating stations, except in possibly the smallest, are designed for the combustion of "pea" coal. This is commonly specified as coal of such dimensions as will be retained on a $\frac{1}{2}$ in. mesh but will pass through a $\frac{3}{4}$ in. mesh, and containing a specified maximum proportion of duff. A specification which has been worked to for many years by one of the largest electricity undertakings has specified that duff should not exceed 10 per cent of the total quantity of coal supplied.

Until recently, for reasons set out in paragraph 4 in this memorandum, all "pea" coal used for electricity generating purposes was derived from the screening of "run-of-mine" coal at the mines in the course of marketing "round" coal.

It will be appreciated that it is essential, in the interests of efficiency and economy in the generation of electricity, that the coal used should be of the grade and calorific value as well as of chemical analysis corresponding reasonably closely to that for which the steam generating plant has been designed.

It has been the usual practice for the specification for new boiler plant to include a specification of the type of coal which it is expected will be obtainable and consumed in them.

3. PURCHASING OF COAL.

Coal is purchased by the larger electricity undertakings on the basis of a "free-on-rail at mine" price and in general on a guaranteed calorific value and an agreed

grading and chemical analysis, ash content, etc.

Competitive tendering for coal for the larger electricity undertakings does not exist, so that for supplies to those undertakings purchases are made on the basis of negotiated contracts. In general those undertakings which are nearest to the Natal coal fields obtain their supplies of coal from the collieries in that Province, and those nearest to the Transvaal coal fields obtain their supplies from Transvaal mines.

In 1942, however, difficulty was experienced in obtaining supplies of Natal coal by at least one large electricity undertaking in the Cape Province, which previously had used only coal from that source, because of the need for utilising a considerable quantity of the output from one of the large Natal collieries for coke making for the iron and steel industries and which previously had been wholly sold for power purposes. In consequence the requirements in excess of that which then became obtainable from the Natal collieries had to be supplied from the Transvaal.

Large undertakings at a long distance from the coalfields prefer to obtain coal from Natal collieries because of the generally higher calorific value from those sources and because of the high proportion of the transportation costs to the total cost of coal delivered on site.

When competitive tendering was in existence contracts were placed with the prospective supplier whose offer represented the greatest number of British thermal units supplied per penny. That is to say, the contract took into account not only the price per ton, but also the calorific value.

The fact that large electricity undertakings are now placed virtually in the position that they are compelled to obtain their coal requirements from sources in which they have no choice has resulted in undertakings being compelled to obtain coal at an increased cost in the form of British thermal units received per penny quite apart from changes brought about in this connection in addition to the cost of trans-

porting the coal to the points of consumption.

The supply undertakings have been placed at a further disadvantage in respect of quality of coal consumed for the reason given in paragraph 4 of this memorandum.

It is suggested that the method to be employed for sampling and testing of coal be standardized for use in all contracts for the supply of coal in large quantities per annum for electricity generation purposes and that steps be taken to make adherence to those standards obligatory upon the contracting parties.

4. THE EFFECTS OF SEASONAL SHORTAGE OF COAL.

For many years past a seasonal shortage of coal supplies has been experienced by all municipally-owned undertakings at a distance from collieries. The explanation for this has invariably been given as being due to shortage of trucks made available by the Railway Administration to the collieries for the transport of coal mainly for bunker and export purposes, so that as the winning of "pea" coal is dependent upon the amount of run-of-mine coal screened to produce the round coal, "pea" coal is not obtained in sufficient quantities to meet the power station demands.

Shortage of supplies of coal from this cause has resulted on numerous occasions in exposing undertakings to serious risk of curtailment of supplies.

In one undertaking, 1,000 miles from the nearest colliery where coal storage accommodation exists sufficient for three weeks' full supply, the amount in hand has fallen as low as two days' supply and has remained at less than a week's supply for a long period notwithstanding urgent representations made to all concerned for an improvement. It is suggested that for an undertaking on which the whole life of the city is entirely dependent to be subjected to the hazard involved in its coal stocks being reduced to a matter of two days' supply at a point 1,000 miles away

from the nearest colliery is one which calls for action by the governing authorities to prevent.

It is submitted that one means of doing so is for the Government to recognize formally, through statutory enactments, that coal is so essential a commodity for the domestic and industrial life of the country that (a) suppliers, including collieries, shall give priority of production of coal for electricity undertakings so as to make supplies available to them at the mines to the quantity corresponding to the daily needs and (b) require the Railway Administration to allocate the necessary truckage to transport that coal expeditiously to the power stations concerned.

Two electricity undertakings have installed coal crushing plant so that in an emergency brought about by non-availability of "pea" coal for the reasons set out about "round" coal could be crushed on the site into a form suitable for burning on the grates. It will be appreciated that under those circumstances the use of crusher plant involves the production and supply to the boiler grates of a much larger percentage of duff than exists in "pea" coal purchased in that form. The efficiency of combustion under those circumstances is seriously impaired and the effect is to increase the coal cost per unit sent out.

SUMMARY OF ADMISSIONS:

For the reasons set out in the foregoing it is submitted to your Commission:

- (a) that arrangements be made so that high quality coal is made available to electricity undertakings situated far from collieries.
- (b) that adherence to standardised methods of sampling and testing be made obligatory on suppliers and consumers.
- (c) that through statutory enactments, suppliers and the Railway Administration be required to give priority to coal for electricity undertakings.

Mr. FURNESS (Electricity Supply Commission): Mr. President, Members of your Association, I am very happy to have had

the opportunity of attending one of your Conferences. I came down with the idea of sitting in one of those chairs and enjoying myself. When I got here I was asked if I would say something on the question of coal.

Just prior to my coming down here I received a letter from the Coal Commission asking me to appear before them on the 21st instant and give evidence on this question and the Commission's work. I think, apart from the question of coking coal they are interested in coal generally.

The position is this. Coal is, I think, the life blood of the electricity supply industry in South Africa. There is still a lot of oil used in this country for the smaller plants, but it is largely a question of the coal supplies. Where are the coal supplies to come from? The large reserves of the Union seem to be in the Transvaal and the Free State. There is coal in Natal still but the output in proportion to the output of the Transvaal and the Free State is relatively small and there has been no great expansion of the mining of coal in Natal. It is 5,000,000 tons and of that 5,000,000 tons a year, power station coal is what we call a by-product. We keep what we call "power station coal," which is either peas or mixed smalls or duff, as a by-product and of course we get it cheaper, and it is only because a high price can be obtained for round coal that we get the smaller coal at the price we do.

The Commission is going into the question in many aspects and one of the aspects is the question as to whether we can use coal with lower calories than we are getting to-day and that is a point I shall have to answer when I see them on the 21st, but there is no doubt that the tendency in the past few years has been that the supply of coal is gradually grading down the calories of coal. Well that has a two-fold effect in so far as they get rid of some of their small coal and they also get a higher price. The Commission I am sure is going to ask what we could do about using a smaller grade of coal and with lower calories. It is a question of selective mining.

If the plant has been designed to burn that class of coal it is all right. It is no use paying 10s., 15s. a ton for coal which simply goes through the grates and is thrown out again.

I was told recently by one of the principal members of the Transvaal Association that there are two associations in the country which practically control the sale of coal, one is the Natal Associated Coal Owners in Natal and the other is in the Transvaal. There are certain collieries which are not in the association, particularly in the Transvaal, but it is not so in Natal. There is at least 300 years' supply of coal in the Transvaal without dropping the calorific value, but to-day the position is that small coal depends entirely on the mining and the supply of trucks to take it away. To-day we are facing a winter with very little coal and I think the chief towns will have to buy a large quantity of large coal and crush it at our power station in Cape Town in order to let other people who have not got crushers get the smaller coal. It would be a much higher price than you would have to pay for peas.

I suggested to the Association three years ago that what should be done, particularly the Transvaal Association, that they should form what is called a pea pool and that they should crush their own coal. A slight increase in cost would result but everybody would get their supply of peas. The point is where to crush the coal, whether at the colliery or at the power station. There is a divided opinion on that but I think the bulk of the Association in Johannesburg rather favour that it should be crushed at the power station, but it would mean a lot of plant.

On this question of shortage, the reason of the shortage of power station coal is this. You have got a certain amount of round coal at the mine. Now if there are no trucks for the small coal obviously the round coal, which is very much better priced, will be sold, but it depends on the stocks that they have got. When I saw the Minister about the question of coal he was not concerned, but said he would see that the trucks available; but it has nothing

to do with him, it is up to you people to make provision for that—either the collieries or the power stations themselves. That may be got over if you can get this pea pool and get the collieries to crush the coal at the collieries.

I presume the findings of the Commission will be recorded and the evidence given before the Commission will also be public, and so in due course I think you will all see what has been said.

PRESIDENT: Thank you, Mr. Furness. I must apologise for having encroached on your time during a holiday, but I can assure you that you will be recompensed by the gratitude of the members here for the talk you have given.

Mr. BRADLEY: I would like to take the opportunity of thanking Mr. Furness through you for the information he has given us. The pea pool would be a good thing, I think. We at the coast have no alternative—at least Port Elizabeth has, if they get no coal it means a shut down.

I do hope that the proceedings of the meeting on the 21st will be made available to us, especially those who are vitally concerned, because we should like to know and have some warning of how we are to proceed for the next six months, and I should like to make sure that we do get some resume of the meeting on the 21st.

Mr. FURNESS: I am only a witness so I will not get any answers from them.

THE PRESIDENT: Being a Government Commission they will duly report to the Minister, but the evidence will be available later, attached to the report.

Mr. FODEN: Should the Commission decide that the local authority has to crush its own coal it is going to be a serious problem. East London put forward an enquiry with regard to coal crushing plant and I was amazed at the long delivery dates, and I cannot see us, in view of the recent trouble in Britain with regard to steel production, getting crushers at the very earliest before 12 or 18 months.

Mr. ANDREW: I have read your report and the association's memorandum to the Coal Commission with interest. Even in a comparatively small generating station such as we have at Kingwilliamstown it is essential that coal deliveries be regular as well as consistent in quality. There is no need for me to repeat that only high calorific fuel should be transported long distances. That is, power stations situated at, or closely adjacent to, pit heads are designed to burn low grade fuel economically whereas power stations situated several hundred miles from the coal fields are designed to use high grade calorific value coal. These are economic considerations and as both coal and electricity are forms of national wealth and need to be conserved, the question of the correct and economic distribution of coal is an important one. I would suggest to the Convention that, despite the evidence which has been taken by the coal commission, the Bureau of Standards might find scope for work in giving consideration to the distance, that is, the railage charges, which coal of various calorific values may be transported to effect a national saving.

THE PRESIDENT: If any other member has anything to say I think we will find time tomorrow or Friday and I think we will be punctual tonight in our adjournment.

The Convention adjourned at 5 p.m.

The Convention resumed on Thursday, the 8th May, 1947, at 9.45 a.m.

THE PRESIDENT: The Convention will now resume. The executive were kept rather late this morning so we must apologise for the late start.

The first thing I would like to do this morning in case any member raised any points and did not have them dealt with, is to deal with them. Mr. Thackway and Councillor Field raised points. Councillor Field assured me that he is satisfied about the point on immigrants. Before they leave they will get information on the registration; there is Mr. Thackway's point and others which Mr. Eastman will reply to.

RADIO APPLIANCES

Mr. EASTMAN: Mr. Chairman, Gentlemen; the point I wish to deal with at the moment is that of radio appliances which come on the market, or which were on the point of coming on the market in Cape Town some months ago, and which we regarded as a potential source of danger.

Some months ago my attention was drawn by certain dealers in town to the fact that appliances were on the point of being put on to the market in connection with which the chassis—and by that I mean the metallic casing which is inside the cover containing the works—could be made alive and also in some cases the casing itself—the ornamental casing—was made of metal and connected to the chassis and was also likely to be alive. We had two kinds of appliances, therefore, which we thought it advisable to look at, that is, the one in which the chassis inside was alive under certain circumstances but which could not be touched by a person operating the appliances unless that person went to some trouble to get inside the cover, and another type in which the cover itself could be alive because it was of metal instead of wood or plastic material. That gave us cause for alarm. We have no power in Cape Town as electrical engineers to disapprove of the use of these appliances. We have the right to disapprove of the use of wiring materials on the permanent wiring system, but we have no power to prohibit the use of appliances of that kind as they are portable and our limits of approval are restricted up to a certain point on the installation itself. But we have the good will of the dealers in Cape Town. This stood us in good stead, and so far as those appliances I heard of are concerned, to the best of my knowledge there are none in Cape Town now. So far as the type is concerned in which the chassis may be alive but cannot ordinarily be touched, we arranged in Cape Town that one could not touch the chassis at all while the current is on. This is done by a simple device whereby, in order to take off the cover one has to disconnect the supply.

Mr. ROBERTS (Bureau of Standards): On the question of "hot" A.C. and D.C.

sets this has been on our programme. We are in touch with the Radio Manufacturers' Association in the States and the corresponding body in Britain and both those bodies are told of the code. The sale of such appliances will eventually be forbidden in this country. The Radio Association has made arrangements to try to cover the points Mr. Eastman has mentioned.

Mr. THACKWRAY (Kokstad): The point I raised was not in connection with the chassis but with the aerial circuit becoming "alive". At least in two cases in Kokstad, men were very unpleasantly surprised by receiving a shock through touching the aerial wire. The trouble has been experienced mainly with the sets imported from America. When one considers that the "alive" aerial and the earth leads are usually led to a naked switch at the window it is very easy for a child playing there to have an accident. This may be a point for consideration by the Standards Bureau.

Mr. SIBSON: We have a case where a wireless aerial has become alive from some leak inside the wireless set, and, as is very often customary amongst a moving population, the aerial was carried through the steel window, which was as often as not closed. Owing to the leak and lack of insulating tape the whole window was alive—a most exciting state of affairs in which the children were deeply interested.

THE PRESIDENT: Now we might refer to item (v) of Section 6, S.A. Standards Institution. Mr. Hugo has a short report to make on that.

Mr. HUGO (Pretoria): I have to report that meetings of the Main Committee of the S.A. Standards Institution, held monthly in Johannesburg, were regularly attended by my alternate, Mr. J. C. Downey.

Numerous draft and completed specifications and codes of practice received from the British Standards and other Institutions were considered and examined and a few were adopted for use in South Africa.

A draft specification, only recently received from the Standards Association of

Australia, and of special interest to our Association relates to Thermoplastic Insulated Cables and flexible cords for Power and Lighting.

The S.A. Standards Institution was represented at the British Commonwealth Standards Conference and at the United Nations Standards Co-ordinating Committee Conference held in London during October of last year. Should any member have an interest in this matter, Mr. Downey has the reports available.

Some members will recall that last year an appeal for funds was received from the S.A. Standards Institution. Your Executive has considered the matter and recommends that this Association make a donation of £5 5s. towards the funds of the Institution, and, on behalf of the Executive, I have pleasure in moving accordingly.

MEMBERS: Agreed.

THE PRESIDENT: Would any members like to discuss that subject? Well, our thanks to Mr. Hugo for his services on our behalf and I think that item may now be discharged.

There is one item to which reference has been made and that is on the question of plastic insulated wire, and I think it would be suitable and useful to have a short discussion; there may be representatives of the trades here, who I know won't take this as an opportunity for sales talk, but it would be useful, so if any visitors would like to speak, will they do so after Mr. Eastman.

NOTES ON PLASTIC INSULATED WIRE

Mr. EASTMAN: I think my Memorandum has been submitted to the Association and all members have a copy. The following notes on plastic insulated conductors have been compiled from information which has come to the writer's notice during the past twelve months.

The term "plastic insulated wire" in these notes refers to wire insulated with thermoplastic materials. The most commonly

used thermoplastic insulation is polyvinyl chloride with or without a layer of polythene over the conductor. Conductors insulated with polythene only are made for special purposes where low power factor of the dielectric and very high insulating qualities are essential.

A conductor with polythene covered with polyvinyl chloride has very high insulating properties but as both materials are thermoplastics the cable suffers the disability of being subject to deformation through softening when subjected to heat above its designed level. Polyvinyl chloride has a much lower insulation resistance than polythene, but both materials are not affected by oil or oily vapour and by other substances which soften and otherwise attack indiarubber.

To the best of the writer's knowledge cables of this class have not been used extensively for electric lighting and power installation in the Union of South Africa. Conductors of this class were used during the war in England mainly as a result of the difficulty in obtaining natural rubber.

Polyvinyl chloride (P.V.C.) was used more for power wiring in factories than for other purposes and was found to be particularly valuable in cases where the life of rubber cable due to the presence of oil or oily vapour had previously been short. In such circumstances P.V.C. cable was found to give good service and to be unaffected by the conditions.

The use of polyvinyl chloride for house wiring installations has been restricted to relatively small quantities because of difficulties experienced in drawing unbraided P.V.C. cable into conduit without lubrication resulting in the tearing of insulation at sharp points or at the entrance of the conduit.

P.V.C. has little elasticity and so does not readily withstand rough handling of this kind.

Provided the cable is well made and designed for the purpose it should be possible to use P.V.C. cable at an ambient temperature of 120 degrees, but it is essential

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to ensure that the particular type of P.V.C. used is suitable for the conditions. The ambient temperature of 120 degrees is mentioned as this is a usual temperature in roof spaces throughout the Union of South Africa at certain times of the year. In addition to the ambient temperature, however, it is necessary to consider also possible local heating due to the heating effect of apparatus or loose connections in conduit boxes and direct heating effect from the sun through apertures and windows, etc.

Whilst this temperature is undesirable even for rubber cable, the latter has the advantage over the former that even when heated above its normal designed level it maintains its shape, whereas P.V.C. cable softens and deforms, leading to a breakdown at an earlier stage than would be expected in the case of rubber-insulated cable.

Much of the P.V.C. cable produced during the war was not of first-class quality because of the difficulty which existed in obtaining the best type of plasticisers and extenders, and also due to lack of knowledge and experience in the most satisfactory ways of extruding the material on to the conductors. A present-day product might, therefore, be expected to be superior to a war-time product, and it appears that the quantity of P.V.C. cable which is being limited mainly by the fact that more rubber is available than before.

It is possible indeed that some manufacturers will be able to produce P.V.C. specially suited for use at high temperatures such as those met with in tropical or semi-tropical conditions.

In short, care should be exercised in granting general approval to the use of thermoplastic cables to ensure that such cable is suitable for the working conditions.

Mr. SMITH (C.M.A.): I would like to say with regard to P.V.C. cables that the members of the Cable Makers' Association are not unmindful of the position but until we know whether the material is going to stand up we are not prepared to ship the material to this country except in special

circumstances. At the moment considerable quantities of P.V.C. cable are under test in this country—are under test in the Post Office. It will take some time before working conditions can be decided but until such time we are not advising the importation of P.V.C. cable.

Mr. ROBERTS (Bureau of Standards): I may mention for the information of delegates that this is a subject on the research programme of C.S.I.R. They are investigating the properties of P.V.C. cable but the amount of information available in this country is somewhat limited and I don't think they are in a position to report. Apart from that, one of the Committee Members of the Bureau of Standards in connection with building has asked for investigation to be carried out and that is proceeding.

Two points have been brought to our notice, P.V.C. and similar things are made in a number of different grades for different operating temperatures, and those grades suitable for high temperatures are not suitable for low temperatures. A cable that may be suitable for low temperatures is not suitable for high temperatures. That information is being used in connection with our investigations on the subject.

Mr. JOUBERT (Chief Inspector of Factories): Several municipalities have addressed applications to me, whether they would be allowed to use this cable for house wiring. The Factory Regulations do not cover the point of house wiring but only surface wiring from the pole to the house and it is for the engineers and different municipalities to approve of certain types of house wire and wire for factories because this is not covered by the Factories Act.

THE PRESIDENT: I think it will be advisable to hold one's hand until there is some information available. There is apparently great promise in this synthetic insulation and steps are being taken in this direction. I think on that we can leave the subject.

At this stage I would like to announce two items, both purely domestic ones—salary scales and the amendment of the Constitu-

tion. The amendment of the Constitution refers only to the class of Engineer Member and I think it would not be asking too much if we put it on the Agenda for 9.30 and invite our guests to meet us at 10.40 to-morrow morning to join us at tea.

We have with us among those representing Government Departments a very important representative in Mr. Joubert, the Chief Inspector of Factories. He is always welcome here because of the atmosphere he has created between engineers and the department and I would like to give him the opportunity to address us on any matter if he feels so disposed.

ACCIDENTS

Mr. JOUBERT: Mr. President and gentlemen, one thing I am very pleased about is that the number of accidents caused by electricity has not increased in spite of the fact that most power stations and suppliers have increased their supply. I have the figures of the number of accidents which have been directly caused by electricity and there is no doubt that due to the Wiremen's Act administered by the Wiremen's Registration Board and the Safety Precautions Committee and the active co-operation between electrical engineers and inspectors of the Department of Labour, accidents primarily caused by electricity have been cut down to a minimum. I am sure you will agree with me when I say that we must not be satisfied, but we must do everything in our power to bring about a reduction in the number of accidents in spite of the increased demand for and use of electric current.

Mr. Ritchie also mentioned about electrical accidents and therefore I am very glad that electrical appliances and fittings are going to be brought to a standard, whereas at the present moment you can go to any bazaar or store and get an electric iron kettle and fittings which may cause the death of a person. This step which Mr. Ritchie pointed out, to standardise electrical fittings, is a step in the right direction to bring about a reduction in the number of accidents. There are between 30 and 40 accidents reported annually and I am sorry to say that the majority of these cases,

well over 50 per cent., are fatal. This is quite a good record as recently nearly one person per day was killed in motor accidents over a period of a month in one of the cities of the Union, but we must do everything in our power to reduce the number of accidents. I am very pleased to be able to tell you for the years 1940 to 1946 the number of electrical accidents did not show an appreciable increase. With a very few exceptions all power stations in the Union which are covered by the Factories' Act have increased the supply of current during the years 1940 to 1946, although the increase has been below normal, but with the increase in the use of electricity one could expect an increase in the number of accidents.

Most of the accidents are preventable. For instance, a child was electrocuted on the roof of a dwelling, another was killed by coming into contact with a corrugated iron wall of a building. In each case the accident would not have happened if the earth wire of the roof had not been cut. In each case the cause was found to be due to a leakage in the house which caused the current to go to the roof and the child was electrocuted. And then again, an electrician was electrocuted because he did not make sure that the conductors he was going to work with were dead, and in nearly every case reported there is always the "if"—if some precaution had been taken the accident would not have happened; like the accidents with electric irons and kettles—if the plug had not been near the water tap the accident would not have happened.

During 1940 there were 37 accidents directly caused by electricity and this included 21 fatal. In 1941 there were 40 accidents with 20 fatalities. In 1942, 41 accidents, also with 20 fatalities; in 1943 there were 34 accidents with 14 fatalities. That is quite a big reduction on the previous year's. In 1944 there were 28 accidents—that is also a big reduction—with 23 fatalities; in 1945 there were 35 accidents with 15 fatalities, that is about the least number of fatalities we have had for a long time—generally it is between 45 per cent. and 55 per cent.—and in 1946 there were 49 accidents with 23 fatalities, and

I am sure, Mr. President and gentlemen you will agree with me that both these figures are comparatively low when compared with the large amount of current being used both in factories and residences. But we must not be satisfied with 23 fatalities, we must bring it down to 4 or 5 or nil if we can possible manage it.

THE PRESIDENT: We are very grateful to Mr. Joubert for his interest in the Association and for the way he and his assistant officers co-operate with us to one common end and that is towards the elimination of accidents. I am sure you would wish me to pay tribute to Mr. Joubert and his colleagues for their co-operation in this matter.

I don't think we ever carry out our meetings in camera but I do appeal to the Press to use their discretion. We can render a great disservice to the industry first of all by ignoring the potential accidents and then again by over-publicising them, and I am sure the Press will help us in that.

I have been in collaboration with Mr. Joubert over a period of years over the question of artificial resuscitation. The average medical man probably has one lecture on artificial respiration, that is resuscitation from apparent death from a variety of causes. Apparent death from an electric shock is rather different from that resulting from most other causes and in my experience I have attended three cases of apparent death from electric shock and in each case the local doctor who arrived within 10 minutes of the accident instructed us to desist from our efforts because the patient was dead. Shortly after that I read an article in the *Lancet* by a man who had studied this subject over a long period. He said that the attendants at the time should persist in their efforts despite any opinion expressed by the doctor because cases had occurred where after a number of hours life had been restored and that all ordinary tests for death did not apply in the case of electrocution and attempts at artificial respiration should be persisted until rigor

mortis had set in or death spots appeared on the body.

I took that up and decided that the approach should be on the official side and that I as Borough Electrical Engineer should approach the Department of Labour in getting a definite statement from the Medical Council. Unfortunately war broke out; our approach to the Medical Council via the Department of Labour got a good response and they said they would be prepared to issue such a statement in their local journal, but unfortunately they could not pursue it at that stage because the members of their profession who were best able to deal with it were on active service, but they would bear it in mind and I think it is right that that position be on record. Again I would appeal to the Press to appreciate that we know the potential dangers, we are satisfied that we have reached a very high standard in protecting the public from those dangers and that we have done so to such an extent that we might be satisfied at this stage, but we can never be entirely satisfied although the accidents reported represent an infinitesimal proportion of the people who use electricity in South Africa.

Mr. MULLINS (Electricity Control Board): Mr. President, I agree with your remarks in regard to carrying on artificial resuscitation after what appears to be death from electrocution. It is on record that in the Transvaal on a gold mine where a person was electrocuted, the doctor was there in a few minutes and gave him up as dead, but his friends kept on for a matter of three and a half to four hours and that man is alive to-day. Since then the safety first measures with regard to ambulance work is drilled into men not to give in but to carry on as long as they possibly can, and that confirms Mr. President, what you have said.

Mr. TUBB: A little while ago there was an accident. I turned up a quotation from the President of the Medical Institution in London in which he says that "Every case of so-called electrocution is merely a case of suspended animation and if the approved methods of life saving are utilised, practically all cases can be brought back to life

provided there are no severe burns or injuries."

FIRST-AID

THE PRESIDENT: A feature of the training of apprentices to which I attach very great importance is the training in first-aid, particularly artificial respiration, pressure points for bleeding and the treatment of burns, and our apprentices are given regular lectures by a qualified first-aid-er on those three points. Every artisan is given a refresher course once a year in artificial respiration. When a shock case comes it comes so unexpectedly that a man has to refresh his memory, and the most valuable time, the first few moments, is lost, and I suggest that it might be considered as part of the curriculum of a wireman's course that he should go through a course of artificial resuscitation.

Mr. H. O. SMITH, Inspector of Factories (Engineering), Durban: Mr. President, gentlemen; before I join in this discussion, I would like to place on record my appreciation of being invited to this Convention, as a guest, and to thank you very much, Mr. President, for having had the opportunity of listening to your wise deliberations. I have been very highly impressed with the importance of this gathering and feel that I have missed something in the past in not having had the opportunity of attending these Conventions more regularly.

I had the intention of mentioning a few points that occurred to me during the various discussions which took place here, but in view of the particular subject that is before the Convention at the moment, I will not dwell upon them now, but hope to be given an opportunity perhaps tomorrow, when I would like to make some further remarks and will confine the points I want to make now to the subject under discussion.

First of all, I would like to thank you personally, Mr. President, in bringing up this subject, which has always been a very sore one with me. As you know, Mr. President, you and I have been associated personally in many cases where we have felt very perturbed and I feel you have expressed yourself very ably and diplo-

matically on the subject. As a Government official, I have to be very careful in what I say, but wish to fully endorse all the remarks you have made here this morning. I am grateful to the other gentlemen who have offered opinions supporting your contentions. The question of training apprentices has been referred to and the methods of artificial respiration have been mentioned and the point I want to make now, Mr. President, is this, that there are many municipalities which have an ambulance service and where an accident occurs, naturally the first thing that is done is that the ambulance is telephoned for. The ambulance men arrive and have been trained in artificial respiration, they do their duty, but knowledge and methods have progressed. It is possible that both in the training of the apprentices and in the training of the ambulance men antiquated methods of artificial respiration are resorted to and I would like to submit to you, Mr. President—not being a member of course I may be out of order—but I would like to submit to you that this be one of the subjects discussed by your Executive and that research be made to determine the latest and most modern methods of artificial respiration and that once the proper information has been collected by the Executive—if necessary I would even suggest that a special sub-committee be appointed for this work—that once the latest methods have been determined that the members be circulated on these methods and that where such organisations exist the members get in touch with their ambulance departments and make sure that the ambulance departments are trained in the most modern methods.

I shall be grateful if you will give me an opportunity later on to make some more remarks which have occurred to me on other subjects discussed at this convention.

THE PRESIDENT: That was the original line of approach, that in view of the developments that have taken place and of the various methods that we read of from time to time it would be very injudicious for us to dogmatise on any particular method; what I put up to the Medical Association was that they should suggest an approved method.

COUNCILLOR VAN JAARVELD, Boksburg (Speaking in Afrikaans): Mr. President, this is the first occasion on which I have attended a Convention of this Association and may I say I am agreeably surprised to see the good work carried out by the Association and particularly how pleased I am, Mr. President, with your remarks in connection with first aid. As I am greatly interested in the welfare of employees, this will give me an incentive to enlarge on my efforts to increase the efficiency of the employees of the Boksburg Municipality in first aid, especially in the Fire Department.

THE PRESIDENT: Thank you, sir, and may I tender my apologies to you and any of our other colleagues who might prefer to speak in Afrikaans for my inability to answer and express my thanks to you in Afrikaans. I will ask Mr. Hugo to express this for me.

Mr. HUGO (speaking Afrikaans): On behalf of the Convention, I would like to express appreciation to Councillor van Jaarsveld for his remarks.

THE PRESIDENT: I am very pleased to see the increase in number of Afrikaans-speaking members in our Convention and before very long one of the qualifications for President will be that he be bilingual.

COUNCILLOR VAN DER WYVER: I also wish to express my appreciation to you, Mr. President, for the remarks you have made with regard to first aid. I feel that you have done a great service to the country in the actions you have taken. I think it is a question in which every one of us should be very much interested and you would forgive me, Mr. President, if I somewhat criticise the Government Department for the action that they have taken in the past.

I wish to mention a few points with regard to first aid in factories. There are certain regulations governing factories and works, but I don't think that the Department is quite strict enough in the carrying out of same. I can mention one or two

cases where the management was very slack in carrying out the regulations, and I think it is not too much to ask Mr. Joubert for his department to be more strict on the question of first aid in factories. I know of a factory that employed in the vicinity of 500 souls—Europeans and Natives—and for as long as two or three months that factory had not one single competent first-aid person in attendance. It is certainly something that should be gone into and I hope that Mr. Joubert will have his department see to this.

THE PRESIDENT: There may be some members who wish to speak at a later stage so we won't close; at this stage we will adjourn and resume at 11 o'clock for Mr. Wilson's paper.

The Congress adjourned at 10.40 a.m.

The Congress resumed at 11.5 a.m.

MODERN POWER STATION PRACTICE IN AMERICA AND BRITAIN, AND OTHER SUPPLY MATTERS."

THE PRESIDENT: Gentlemen, we now resume and the item on the Agenda is a paper by Mr. John Wilson, Assistant City Electrical Engineer, Pretoria, on "Modern Power Station Practice in America and Britain and other Supply Matters."

Mr. WILSON: Mr. President, and Gentlemen: At the beginning of 1946, the City Council of Pretoria sent Mr. E. A. McWilliam, Generating Engineer, and myself on a visit to the United States of America and to Great Britain to investigate modern power station development in those countries and to discuss with the Council's Consulting Engineers in Great Britain, the design of a new power station to serve the needs of Pretoria.

This paper will, therefore, be an endeavour to describe the impression gained in connection with the design and operation of modern power stations and to describe certain developments which were taking place in connection with power station plant.

Since, at the time of our visit, conditions were far from normal both in regard

to travelling and in industrial labour problems, the field of our investigations was somewhat restricted and in consequence it is felt necessary to make it clear that the impressions gained and the opinions expressed herein may not be as representative as they would have been under normal circumstances. With this reservation, however, it is hoped that what follows may prove both interesting and instructive.

As indicated above, the primary purpose of the visit was connected with power station practice and the greater part of the time was, therefore, devoted to this subject. Whenever possible, however, the opportunity was taken of gaining information on other matters concerning electricity supply and reference will be made to this in the paper. In America particularly such a high degree of specialisation exists amongst the personnel of electricity undertakings, however, that it was not always possible to contact the people concerned since, in most cases, the personnel selected to conduct us had been chosen to cover some particular aspect which had been advised as the primary object of the visit and experts in other matters were not always available at short notice.

In the interests of brevity and, since it is presumed that particular interest attaches to American practice, which is less well known to us in South Africa than the British counterpart, comment will deal largely with the former and only where British practice differs will it be referred to directly.

POWER STATION PRACTICE

(a) General: As is generally known, American practice in the past has been to instal large units in central power stations wherever possible and although it was ascertained that 200,000 kW generators and 1,000,000 lb./hr. boilers were still being manufactured and installed, the general opinion expressed by operators favoured limiting the size of turbo-alternators to about 80,000 kW capacity. With this was coupled a desire to see the ultimate capacity of any one power station limited to about 400,000 kW. It was considered that from the point of view of economy in design and

operation experienced favoured the limits proposed.

A noticeable feature of modern power station design lay in the almost universal adoption in America of the unit system in which each turbine is supplied with steam from a boiler of commensurate output. This tendency was also noticeable in Great Britain, although, as far as could be ascertained, in each case where the unit system has been adopted in the latter country, it was usual to provide interconnections between the steam, feed and condensate piping of adjacent units to provide for unusual or emergency conditions. In the States on the other hand most operators were of the opinion that the provision of such interconnections were an additional expense and complication which was not warranted by their experience in the operation of the unit system and it was not unusual, therefore, to find that no such provision had been made. In this connection it must of course be borne in mind that extensive system interconnections exist in America so that although individual companies may each operate a large transmission system they are invariably tied into the system of an adjacent company.

Whether interconnections exist or not between adjacent units, under the unit system each unit normally operates entirely isolated from its neighbours and control of each unit is centralised at a control panel located between the turbine and the boiler. This carries the indicating instruments and control apparatus for the entire unit and is under the control of a "unit operator." Although not confined to stations employing the unit system, a physical parallel to this grouping of turbine and boiler lies in the omission of the usual wall or partition between turbine room and boiler house so that the entire steam raising plant and generating plant are housed in one chamber.

The value of the unit system is naturally dependent on high boiler availability so that it approaches that of the turbo alternator closely. Operators were emphatic that this had indeed been attained and in some cases claimed higher boiler than turbine availability.

In several cases where the unit system had been adopted, the initial installation

had comprised a single turbo-alternator and its associated boiler with the addition of the second unit planned for some years hence. A notable example was the Port Washington station which had commenced operation initially with one 80,000 kW. turbo-alternator supplied with steam by a 690,000 lb./hr. boiler operating at 1,320 lbs./sq. in. and 840 degrees F. It was stated that no difficulty had been experienced in operating the boiler for continuous periods of 12 months between cleanings. In the design stage, consideration had been given to the installation of two boilers per unit but, having regard to the fact that the company's experience with other large boiler units on the system had shown an average boiler availability of 94.5 per cent. over a five year period and the further fact that the presence of an 80,000 kW. generator on the system would require an 80,000 kW. reserve in any case, it had been decided to instal a single boiler particularly as the saving in first cost was considerable and operation would be much more simple.

Another notable tendency in new power station layout concerned the location of auxiliary plant. This applied both in Britain and America. With the exception of small items, auxiliary plant was, in most cases, located at ground level with a view to facilitating maintenance and eliminating vibration. In some cases, too, it was noticeable that considerable simplification of cable runs had resulted particularly in the case of Jennison Station where the controlling switchgear was located on a mezzanine floor between the basement and turbine floors and so arranged that the cables in many cases dropped straight down from the switchgear to the associated motors, the majority of which had been arranged in line.

The layout of the auxiliary plant in the basement of this station was such that every item was under the observation of the attendant who was accommodated in a glazed office at one end of the basement. An instrument panel located in the office provided him with all essential information regarding the functioning of the plant.

This particular station which had been in operation for only approximately a year at

the time of our visit was unique in several ways. A single building without intervening walls housed the whole of the plant, including boilers, turbines, main and auxiliary switchgear and unit transformers, the latter being Pyranol filled and the main and auxiliary switchgear being of the air-blast and air-break type respectively. It was the only modern station visited which was equipped with stoker-fired boilers, and stokers had been selected to deal with a local anthracite coal which had a grading equivalent to that of course-ground coffee as delivered to the station. A special alloy steel multi-cyclone grit collector was located between the boiler and economiser to collect the grit for return to the rear of the furnace where it was reburned and served the purpose of reducing the fouling and wear of the economiser and air heater surfaces. The stoker grates which have an area of 672 square feet (28ft. long by 24ft. wide) were stated to be the largest to have been installed in any American central station. The stoker drive was at the rear end and the speed was varied by electronic control of the field circuit of the D.C. motor employed. The compartments under grate were provided with small screw conveyors which removed the coal falling through between the links and discharged into a large screw conveyor running at right angles along the side of the boiler and which returned the fuel for reburning.

The induced draught and forced draught fans were driven by A.C. motors through magnetic couplings, the field supply of which was electronically controlled as in the case of the stoker motor.

The principle on which the electronic speed control functions in each case is briefly as follows:

The driven member of the unit, the speed of which it is desired to control, operates a small A.C. generator called the governor generator. The frequency of the output from the governor generator will thus be proportional to this frequency and therefore to the speed of the driven member of the unit is obtained. This voltage is compared with a voltage determined by the automatic combustion control and the resultant vol-

tage, applied by the automatic combustion control and the resultant voltage, applied to the grid circuit of the rectifier supplying the excitation of the D.C. motor or magnetic coupling as the case may be, varies the speed of the driven member of the unit in accordance with the requirements of the automatic combustion control. Each unit has its own electronic excitation control panel and for each two there is an emergency panel which takes over automatically should any failure occur in either of the associated equipments.

Buildings of modern power stations were all of pleasing appearance and simple design. Steel framed structures employing little bracing were usual and in many cases large panels of glass bricks proved striking features. Interior walls were usually tiled throughout with cream or light brown coloured glazed tiles, even the steel columns being encased and tiled and basement walls were invariably light coloured.

In the more modern stations none of the building steelwork was connected to the turbo-alternator foundations and a small gap was left in the flooring around the edge of the foundations to prevent the transmission of vibration to the building.

Special attention was given to the ventilation of the buildings, large auxiliary fans frequently being installed and arrangements made to furnish cooling air for men operating soot blowers and lancing equipment; while for winter conditions heaters were provided in the colder parts of the basements.

A noticeable feature of all modern stations was the great cleanliness and it was ascertained that most, and in some cases all, the cleaning work was performed by the operating staff. For example, all cleaning at the Mystic Power Station at Boston was performed by the operating staff which, including the shift engineer, comprised nine operators per shift. The station capacity was 100,000 kW, comprising two 50,000 kW units and the boilers were pulverised-fuel fired. Both units were normally in operation and at the time of our visit the station was delivering 100,000 kW to the system.

The omission of walls wherever possible and the consequent elimination of corners for collecting dirt, together with adequate spacing between the various items of plant and between plant and the walls of the building as well as the provision of mechanical dust collecting plant undoubtedly accounted in large measure for this desirable state of affairs particularly when combined with the psychological aspect produced by the provisions made.

In many cases, older power stations had been or were being modernised and this invariably took the form of substituting topping units for the oldest generators in the station and installing large p.f. boiler units in place of smaller stoker-fired units. In these older stations steam pressures of up to 600 lbs./sq. in. were in use, while the topping units invariably employed steam at about 1,250 lbs./sq. in. and exhausted into the lower pressure plant.

In general it was found that plant in America was designed to have a flat efficiency curve over a wider range than is usual in British practice and while this resulted in a slightly lower maximum efficiency, it was contended that a better efficiency was obtained at light loads, and that in view of the loading conditions on many of their plants, particularly those designed to operate on systems fed by hydro-electric plants, this was a desirable feature. In addition, availability was always stressed and there was a natural reluctance to strive for the last fraction of a per cent. in efficiency if this were likely to effect availability.

(b) Coal Storage and Handling: Due to weather conditions in the States, sufficient coal has to be stored to enable the stations to carry on for two or three months on end without fresh supplies, and this condition also applies to some extent in Britain. Elaborate coal storage arrangements are, therefore, necessary and in general the practice in both Britain and the States is very similar, depending on the types of coal, site conditions and methods of delivery. Coal is usually stored in coal piles on the site and, in America particularly, bunkers are seldom used. Various types of plant

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are employed for stacking the coal and for recovering it from the coal piles, but with large quantities in storage normal methods have required the use of large areas of the site in view of the limitation in depth of coal piles introduced by the danger of spontaneous combustion fires. In the States it was found that a novel method of packing the coal on the coal pile was being employed with some coals and it was ascertained that similar steps were being introduced in Britain. In this method a bulldozer and carry-all is employed to stack the coal. The caterpillar tracks of the bulldozer compact the coal in storage to a density of about 70lbs. per cu. ft. with the result that the possibility of fires due to spontaneous combustion is largely eliminated and instead of having to restrict the depth of the coal pile to some 5 or 6 ft., it can be as great as 40 to 50 ft. The bulldozer and carry-all are also employed for removing the coal from the pile for delivery to coal conveying plant supplying the boilers and it was stated that the bulldozer alone was satisfactory for handling coal for all distances up to 150 feet.

To prevent dust being blown from the coal piles during windy weather some operators were spraying the surfaces with chemicals which, it was stated, absorbed moisture from the atmosphere and formed a crust on the surface of the coal piles. Details of the chemicals used were not, however, available.

(c) Boiler Plant: While in Britain the accepted ranges of steam pressure in central station practice were 400 lbs./sq. in. for the smaller units and 600 lbs./sq. in. for the larger units the corresponding ranges in America were 600 lbs./sq. in. and 800/900 lbs./sq. in., while a large proportion of the bigger stations employed a steam pressure of about 1,200 lbs./sq. in. There were some plants operating at this pressure in Britain too, but due to their bigger generating units the Americans have a much larger proportion of this comparatively high pressure plant. Operators seemed to be quite satisfied that they can obtain the required reliability and availability with this pressure and some contended that their difficulties had been no greater than with

600 lbs. pressure plant and felt that the adoption of the higher pressure was fully justified in view of the fact that thermal efficiencies of about 30 to 31 per cent. were obtainable with good availability as compared with 26 to 28 per cent. in the case of 600 lbs./sq. in. plant. Naturally, taking into account thermal efficiency, cost and availability, the higher pressure can only be justified for large stations or for use with topping units in the case of modernisation of old plant.

In America large boiler units with capacities of 300,000 lbs./hr. and over are usual and pulverised fuel firing is almost universal while in Britain this system of firing is in fairly general use for units of 200,000 lbs./hr. and over. In some cases in the States boilers employing pulverised fuel firing were also arranged for using fuel oil in emergencies.

With regard to pulverising plant, practice was similar in both countries and the unit system was that most generally employed. That is, each boiler had its own pulverising plant which was fed with coal for grinding at a rate corresponding to the boiler steam output, and the supply of air and pulverised coal from the pulverisers passed direct to the burners in the face of the boiler. Naturally at least one spare pulverising unit must be provided with this system but it is claimed that it is very simple compared with the "bin and feeder system" for which little support could be found amongst operators consulted.

In the States all modern boilers appeared to be of the bent tube type with either two, three or four main drums and in designs employing the former the ends of the top and bottom drums were usually connected by means of large down-comers.

All-welded drums were usual in the States, the Unimelt process being employed. The welding process was automatic and all welds were photographed by X-rays or by gamma rays emitted by a capsule of radium. This practice was also adopted in Britain.

Water wall tubes were either bare or where this was unsuitable the tubes were

studded and chrome ore applied. Bailey walls were not being used in the States.

Various methods of superheater temperature control were in use, often in combination with one another. Dampers, tilting of burners and external de-superheaters were equally popular. It was emphasised by manufacturers that the range of superheat control required should be specified and that turbine manufacturers preferred the temperature to be kept constant over a wide range of loads thus increasing the area of the superheater required with considerable effect on the cost of the boiler. In one make of boiler, temperature control was effected by passing a portion of the steam through a coil in the lower water drum of the boiler before it entered the second pass of the superheater.

All modern boilers are provided with fully automatic combustion control, it being claimed that this played a large part in obtaining high availability factors. While in Britain automatic soot blowing appeared to be becoming standard practice in new installations this did not seem to have been considered in America. No actual reason for this surprising omission could be ascertained unless it could be ascribed to the difficulty of application to the popular types of soot blowing equipment which comprised a power operated retractable soot blower the element of which was made in lengths of up to about 13 ft. with the nozzle at the tip. The element was run into the furnace through a special door in the casing and the soot blower head was suspended from a small carriage running on the flange of an I beam which projected from the boiler casing. Stainless steel nozzles welded into elements made of 23 per cent. chrome steel were popular and said to provide better service than calorised elements.

Care was exercised in both countries to keep the solids in the boiler water down to minute quantities (about 300 parts per million) in order to avoid scaling in the boilers but in the States elaborate arrangements were provided to prevent solids being carried over from the boiler to the turbine, since solids deposited on the turbine blades

not only tend to reduce output due to the choking effect, but more important still is the possibility of overloading the thrust bearing of the turbine due to the increased end thrust of the steam on choked blades. In one make of boiler a cyclone separator was employed in the drum while in another case the steam which was collected in the front top drum was made to flow to the superheater through the rear drum in which it was washed by the entering feed water. It was ascertained that British manufacturers were also incorporating improved water separation equipment in the steam drums of modern boilers.

Two interesting developments in boiler plant practice were witnessed. The first comprised the cyclone furnace installed on one of the boiler units at the Calumet Station of the Chicago Edison Company. This was the outcome of some 15 years' experiment in the firing of crushed as opposed to pulverised fuel with the object of reducing the whole of the ash to a fluid state which would permit of it being quenched and converted into a solid state for disposal, thereby obviating the necessity for cleaning the boiler surfaces externally and incidentally eliminating fly-ash and carbon losses.

The unit, installed on a boiler evaporating approximately 150,000 lbs. of steam per hour, was approximately 8 feet in diameter and about 8 feet long. It was water-wall cooled and the tubes were studded and covered with chrome ore. The cyclone was located at the bottom of the front wall of the boiler with its axis inclined at about 15 degrees to the horizontal and the flame from the opening at the lower end of the cyclone entered the main furnace below a slag screen.

The coal supplied to the furnace was crushed in a hammer mill to pass a j-in-mesh screen and together with the primary, secondary and tertiary air supplies at pressures varying from 20 to 32 inches water gauge was fed into the cyclone tangentially at the end remote from the furnace. The fuel particles were thus directed on to a molten film of ash where they burned out rapidly, the gasses generated leaving the burner through the throat situated in the

vortex and being burned out in the furnace of the boiler proper, while the fluid slag ran forward into the bottom of the main furnace from which it was collected in the normal method applicable to a wet-bottom pulverised fuel fired furnace. It was claimed that at least 80 per cent. of the ash in the coal was being collected as slag and that operation had been free from trouble, occasional lancing of slag whiskers or coke in the cyclone and soot blowing of the closely pitched superheater elements being all that had been necessary. The unit had been in operation for some twelve months when visited.

An order had been placed with the manufacturers for further cyclone furnace units and it was stated that in this case the design would incorporate a vertical feature to permit of the slag being recovered directly from the burner instead of from the boiler furnace as in the present installation.

Although in the installation described above, only one unit was employed, no difficulty attached to the employment of say four cyclone burners per boiler unit if the evaporative capacity of the latter was, for instance 600,000 lbs. of steam per hour.

The other development concerned stoker firing and was seen at a manufacturer's works in Scotland although it is understood that boilers fitted with such equipment have been in successful operation in America for a long period of years on boilers having evaporative capacities of up to 210,000 lbs. of steam per hour.

This was the spreader stoker for over-feed firing and for which the advantage was claimed that it had the ability to burn a wide range of fuels without modification. Coal is fed into a hopper at the front of the boiler from which it is thrown into the furnace by means of a number of kicker bars so designed that the trajectory of the particles of coal is such that the heavier particles are thrown to the rear of the furnace while the lighter particles fall further forward. A travelling grate moved from the back to the front of the unit and this had specially designed surfaces to ensure even air distribution

and was protected from undue temperature by the ash layer throughout its travel. The depth of ash on the travelling grate was controlled by the grate speed. With this design much of the coal is burnt in suspension in the furnace and only the heavier particles burn out on the travelling grate. It was contended that coal graded from 1½ in. to nothing could be burnt successfully, and in this connection, the following would be suitable:

All coal should pass a 1½ in. mesh screen but not more than 50 per cent. should pass through an ½ in. mesh screen. Approximately 25 per cent should remain on a ¼ in. mesh screen and of this about 10 per cent. should be retained by a ⅜ in. mesh screen.

The percentage of volatiles should not be less than 20 per cent. on a dry ash-free basis when the coal is to be burnt in a furnace with four water-cooled walls but in a refractory furnace the percentage of volatiles required should be less than this.

Tests conducted show that coals containing from 4 to 27 per cent. ash can be burned without reduction in the B.T.U. output from the grate.

It was claimed that no coking or heating of ash took place and therefore none of the sublimation which had led to so much trouble on retort type stokers and to a lesser extent on travelling grate stokers of conventional design.

While both these developments are in the experimental stage it would appear that much will be heard of them in the near future and it is quite possible that for boiler units of up to 300,000 lbs./hr. the spreader stoker type will supplant the usual stoker while the cyclone burner bids fair to oust the pulverised fuel fired boiler with its costly pulverising equipment and complicated dust extraction plant.

On the subject of dust extraction it was found that in the States less attention has so far been given to this subject than in Britain, mainly because onerous legislation such as that in force in the latter country has not yet become general. In both coun-

tries it was generally held that with pulverised fuel fired plant electrostatic precipitation was most effective but even in some of the largest American cities such plant had not yet been installed and reliance was placed on tall chimneys with high gas velocities to spread the fly ash over as big an area as possible. It should also be mentioned, however, that the wet-bottom boiler is almost universal in modern American stations and this in itself decreases the dust nuisance. In this system the boiler is designed for complete combustion of the fuel in the high temperature zone in order to keep the ash in a molten state so that it can be collected as a molten pool at the bottom of the furnace. This pool is either intermittently or continuously tapped and the molten slag caused to fall into a water tank where it is quenched and from which it is readily extracted by mechanical means. In this way a high percentage of ash in the coal is recovered in a form which has a marketable value for such purposes as road metalling, etc., in contrast to the useless and embarrassing fly-ash.

In a dry bottom type, which is that used exclusively in Britain, it is estimated that as much as 65 to 85 per cent. of the total ash in the fuel leaves the furnace and passes through the boiler with the flue gasses so that it is essential to protect the induced draught fans and to eliminate ash from the chimney gasses.

Reference has already been made to the emphasis placed on boiler availability in America and the similar tendency in Britain. In America flue gas temperatures of up to 350 degrees F. are common and although this results in reduced overall efficiency better availability obtains as a consequence of the elimination of condensation inside the boiler and the attendant corrosion and fouling of surfaces such as air heaters. According to operators scale seldom formed on the external surfaces of tubes and this probably resulted from the use of large furnaces and careful combustion control. Freedom from the formation of bonded deposits on superheater and economiser surfaces is, of course, one of the advantages of p.f. firing as compared with stoker firing.

As regards supplies to auxiliaries, A.C. supplies were almost universal in both countries though a few large stations in Britain use D.C. for such auxiliary plant on which variable speed is required to meet changing load conditions. In this respect a modified form of boiler combustion control is now in use which provides several advantages over A.C. control both in regard to first cost and in operation.

Where A.C. auxiliaries were in use and required speed control, various methods were popular. For fan drives the one or two-speed A.C. motor with vane control of the fans was widely used in both countries. Variable speed hydraulic couplings were also popular but in the States the variable speed magnetic coupling appeared to be supplanting the former and this tendency was also noticeable to some extent in Britain.

(d) Turbo-Alternators: While in Britain the standard frequency is 50 cycles per second giving generating unit speeds of 1,500 to 3,000 r.p.m. for 4 pole and pole generators respectively, the standard frequency in the States is 60 c.p.s. giving corresponding speeds of 1,800 and 3,600 r.p.m.

Because of their small size and weight and their suitability for higher pressures and temperatures, 3,600 r.p.m. machines were adopted for outputs of up to 65,000 k.W. while 80,000 k.W. units were being proposed. Twin cylinder turbines were being used for outputs of above 30,000 k.W. Where the capacity of the unit exceeded 60,000 k.W. a speed of 1,800 r.p.m. was in use and units of up to 80,000 k.W. usually had a single cylinder turbine even when high pressures and temperatures were employed.

Because of their higher speeds, hydrogen cooling has been introduced on units of 20,000 k.W. and over since being lighter than air it reduces the windage losses considerably. In Britain it is possible that hydrogen cooling may be introduced for machines of 40,000 k.W. and over but at present air cooling is the rule.

Because of the increased danger of damage being caused due to rubbing or vibration

with turbines operating at the higher temperatures in use in the States a number of operators have installed turbine supervisory equipment which comprises the following electronic tube operated instruments:--

- (1) An eccentricity recorder which indicates and records the eccentricity of the turbine shaft projecting from the front bearing. The eccentricity is recorded at barring and running speeds and the instrument is calibrated to read from one to 15 mils.
- (2) An interference detector which serves as an electric listening rod through a loud-speaker. The latter is mounted on the turbine gauge panel and is usually connected during the starting-up period.
- (3) An expansion recorder which records the axial movement of the turbine casing due to expansion. The range of the instrument is adjustable and movements of up to 1 inch may be recorded.
- (4) A vibration amplitude recorder which records in mils the transverse vibration of the main turbo-alternator bearings. The instrument is calibrated to read from 0 to 10 mils and the vibration of each bearing is recorded in turn on a 6 minute cycle.
- (5) A speed and camshaft position recorder which provides a continuous record of the speed of the turbine during the starting-up and running-down periods. When the generator switch is closed, the recorder indicates the amount of the governor valve opening.

It is understood that certain British manufacturers are manufacturing or designing equipment with a similar purpose in view.

The larger American turbo-alternator units had a pleasing stream-lined appearance which was attained largely by using pressed steel casings instead of the usual planished steel. Also, with hydrogen cooling and ventilating fan and the hydrogen cooler were included in the alternator casing, so greatly simplifying the foundations.

A noticeable feature of American machines was the absence of vent pipes on the bear-

ings for the release of oil vapour. Instead a small vapour extraction plant was employed to draw off the oil vapour and discharge it outside the building.

Solid couplings were in general use in the States and while heated bolts for the horizontal joint of the turbine were widely used it was noted that in one modern station the bolts were being tightened with the aid of the turbine-house crane and an extensometer.

In general there did not appear to be any material difference in the design of units operating in the two countries and while it was the general practice to have the exciter driven off the end of the alternator it was noted that some stations employed separate motor-driven exciters.

Auxiliary supplies in the States were almost invariably through transformers, the unit system being widely adopted with a spare transformer for each two units.

In many cases double winding transformers were employed to provide low voltage supplies for small auxiliary motors and a higher voltage for the larger motors. Air-break switchgear was universally favoured for the control of auxiliary equipment.

As regards generating voltage, the popular voltage in the States appeared to be 13,800 volts. Switching was, however, carried out at the higher transmission voltages with the step-up transformer connected directly to the alternator terminals so as to obtain the advantage of the transformer reactance on the machine side of the circuit breaker. This practice was also general in Britain though in some cases generation was being performed at 33,000 volts. General opinion favoured the combination of low voltage alternator with step-up transformer and switching at the higher voltage.

(e) Condensing and Feed Water Plant: In the majority of American stations which are located on the shores of lakes or on the banks of rivers, cooling water was drawn from these sources and was adequate. Single-pass condensers were widely used and

In some cases two circulating water pumps were installed—one being used in winter and two in summer. Condenser water boxes were divided into two sections to permit of cleaning without shutting down the turbine and in some cases provision was made for reversing the water flow through the condenser to remove debris which had collected on the inlet end tube plate.

The design of surface condensers in both countries was very similar except that in America the tubes are expanded at both ends. An expansion joint is used on the shell to take up differential expansion between tubes and condenser shell in the event of the turbine going over to atmosphere.

Various methods of condenser cleaning were noted. In one case air was blown through the tubes by means of fans mounted on the cleaning doors, the idea being that the current of air would dry out the sludge causing it to crack and so making it possible for the circulating water to wash out the tubes when the condenser was put back into service. In another case the method comprises blowing a mixture of compressed air and water through each tube by means of a specially designed gun at a pressure of about 75 lbs./sq. in.

In both countries the closed feed system is largely used, and in America the hotwell is invariably omitted. De-aerating heaters or heaters of the direct contact type were almost universally used in the States particularly on the higher pressure units and several operators declared that they would not operate the generating unit without such a heater as they considered it the only reliable means of eliminating the risk of troubles due to dissolved oxygen for pressures of 600 lbs./sq. in. and over. Such heaters were also provided for the make-up water to evaporators.

Feed water treatment followed the usual practice, caustic soda and sodium sulphate being pumped into the feed range and sodium sulphate and phosphates being pumped directly into the boiler drums.

Base exchange softeners were used for the treatment of make-up water.

(f) Other Features: Loud-speakers were frequently used for communication in power stations and appeared very satisfactory in every case. In one station, communication was by means of a "Write-o-Graph" system in which a message written on the pad at any transmitter was reproduced at each receiver by a pen which followed exactly the movement of the transmitting pen. This method has the advantage of providing a permanent record of the message transmitted while the latter cannot be "misheard."

Where ordinary telephones were installed in noisy places a three-sided cabinet was provided with sides and roof 2in. thick made of two sheets of expanded metal with a layer of sound absorbent material in between. These cabinets did not extend below waist-level and had no door but reduced the noise level surprisingly.

A high standard of lighting was provided throughout American stations, this being particularly noticeable in basements, etc.

In most other respects, practice in the two countries visited did not differ materially from what has been adopted in modern power stations in the Union.

As regards main switchgear opinion was equally divided between the advantages of oil filled and air blast gear and between outdoor and indoor gear although where the stations fed overhead transmission systems as was most usually the case, outdoor switchgear seemed to be the more popular.

Control rooms were often situated some considerable distance away from the main buildings of the power station and in general British control room layout and equipment was considerably in advance of that seen in America.

APPLIANCE MERCHANDISING AND SALES PROMOTION

(a) Merchandising of Appliances: On the question of pure hire of electrical appliances no support could be found amongst the supply authorities consulted in the States whilst the consensus of opinion in Britain did not favour it although it was felt that

the activities of their gas competitors would make it necessary to retain hire facilities on some appliances. It was felt, however, that such facilities should be confined, if possible, to appliances such as water heaters and others in which there were no design features such as to create any personal preferences.

The objections taken to the provision of hire facilities were briefly that the ownership of appliances by the supply authority carried with it the obligation to maintain such appliances and to keep available appliances of the latest design in a range sufficient to meet individual consumers' preferences. Maintenance invariably proved to be higher than in the case of consumer-owned appliances while changing designs led to the supply authority being saddled with a stock of outmoded appliances.

In regard to the operation of hire-purchase schemes, supply authorities in the States contended that since finance corporations had made it possible for dealers to finance such schemes themselves on reasonable terms it was not desirable for the supply authority to compete. Most authorities were, however, prepared to provide such facilities for their consumers if the latter desired it, but emphasised that their terms would be no more favourable than those available from the dealers. They contended that their best contribution lay in an intensive sales promotion programme and in providing such service to consumers as would encourage the use of desirable electrical appliances.

In Britain it was felt that the provision of hire-purchase and outright sales facilities would be resumed not only to keep in step with the gas companies but also because it was felt that the terms offered by dealers were not sufficiently encouraging. It was stated, however, that whereas prior to the war hire-purchase schemes had provided for repayments over periods of as long as eight years, this was not likely to exceed a maximum of four years when such schemes were resumed.

(b) Sales Promotion: The promotion of sales of electrical appliances in both Britain

and America is conducted largely by extensive advertising, the provision of facilities for the display and demonstration of appliances, free and copious advice to consumers by means of demonstration staff who visit consumers' homes, financial grants towards the installation of certain appliances and the servicing of appliances by the supply authority at moderate charges.

It was usual to find a centrally situated showroom in every city visited in which electrical appliances were both displayed and demonstrated. The essential difference between Britain and America in this respect was that whereas the supply authority staff officiated in the former, in America all the business was usually conducted by the appliance dealers' representatives.

Apart from actual demonstrations, much use was made of movie films, particularly in the States, to show the proper use of appliances, and showrooms invariably contained several alcoves especially equipped for this purpose. These appeared to be a very popular lunch hour feature. In one case, the supply authority replaced free of charge each old electric lamp brought in by the consumer as an inducement to him to visit the showroom and see the latest appliances available.

As regards visits paid by the demonstration staff to consumers' premises, the usual procedure appeared to be for a demonstrator to call on the consumer immediately after installation of an appliance and to continue making periodic visits until such time as the consumer was thoroughly familiar with the use of the appliance. At the same time demonstrators proffered advice on other possible uses of electricity thus canvassing further business.

Where it was desired to promote the use of any particular appliance and where the installation costs of such an appliance were comparatively high, the supply authority promoted the sale by making a contribution towards the cost of installation. For example, in Chicago, where gas has always been a serious competitor of electricity particularly for cooking and water heating, the supply authority makes a con-

tribution of about £11 towards the installation of each cooker and about £13 in respect of water heaters. In addition they provide free servicing of these appliances for the initial period of two years.

(c) Servicing of Electrical Appliances: In general, supply authorities in America undertake the servicing of all electrical appliances and maintain comparatively large staffs and premises for this purpose. In Britain, the consensus of opinion favoured this scheme.

It was contended that this was definitely the duty of the supply authority and was a service which the consumer was entitled to demand. The maintenance in service of an appliance was just as essential as the continuity of the electricity supply itself and the one without the other was of no more value to the consumer than the supplier. It was held, therefore, to be in the interests of both for the supplier to provide servicing facilities which would ensure that every electrical appliance that became defective was restored to service with as little delay as possible. Dealers, it was pointed out, had no immediate interest in the matter beyond the effect that a prolonged outage of the appliance might have on their future sales, and the servicing organisations which they could justify could not be expected to deal promptly with every call made for assistance.

The charges raised for servicing were stated to be purely nominal as it was contended that the supply authority's chief source of revenue lay in the sale of electricity and that any profits required for the payment of dividends, etc., were derived from this source. Losses incurred on this section of their activities were, therefore, regarded as a charge against the promotion of sales of appliances.

In Britain, in many cases, it was apparently the practice prior to the war to service all appliances sold under hire-purchase free-of-charge throughout the repayment period and unless direct evidence existed of wilful damage no attempt was made to differentiate between service required due to defective materials or workmanship and

damage resulting from wear and tear of the appliance. As far as could be ascertained it was intended to resume this practice in connection with post-war schemes.

(d) General: In general, therefore, it may be said that both in Britain and in America it is considered that for successful load development the supply authority must take an active part in the promotion of sales of electricity consuming appliances and must assume responsibility for an efficient servicing organisation.

RURAL ELECTRIFICATION

In America the supply of electricity is largely in the hands of private companies and up to some 12 years ago rural electrification lagged far behind most European countries mainly due to the fact that except in the case of fairly densely populated areas the costs of furnishing supply were prohibitive. Thus outright payments of up to £750 per mile were demanded without the consumers having any title to the lines and tariffs were as high as 1/3d. per unit.

In an effort to promote rural electrification the American Government set up a Rural Electrification Administration by Act of Congress in 1936. Its object was to provide funds for the electrification of rural America by creating long term loans at low rates of interest, preference in the granting of loans being given to non-profit and limited profit groups.

As it was found that, contrary to expectations, power companies were not anxious to avail themselves of the loans provided but in many cases were content to continue their policy of furnishing supplies to densely populated areas only, the Administration sought a solution along the lines of the various co-operatives which had proved so successful in European countries. These Rural Electrification Administration Co-operatives are private enterprises, owned and operated by the members who comprise the farmers and other rural residents in the locality of the individual co-operative. Loans are granted to these co-operatives to finance not only the cost of the reticulation system but the cost of individual installations as

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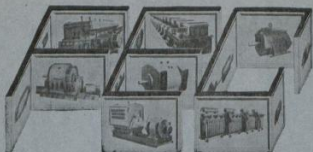
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well and are repayable over a period of 35 years with interest at the rate of 2 per cent. per annum.

The co-operative appoints its own manager, maintenance and clerical staff subject to the approval of the R.E.A. and operates the scheme entirely, its only responsibility to R.E.A. being its annual payments in respect of redemption of the loan and payment of interest.

The Administration for its part assists not only with the financing of the scheme but also gives advice on organisation, engineering and management problems. It maintains field engineers who are constantly seeking to find new means of making electricity perform as many functions as possible and who are always at hand to advise the individual consumers on any problem.

R.E.A. engineers have produced standard specifications for low cost, durable lines which were essential to providing as wide a service as possible and as a measure of their success in this direction it was stated that lines are being built at a cost of less than £250 per mile, while in some areas this cost has been as low as £150. These lines are constructed by contract under R.E.A. supervision and the standard is a single phase high voltage line with small step-down, pole-mounted transformers at consumers' premises.

Where necessary, loans are granted for the construction of power stations to furnish supply to one or more co-operatives but in general bulk supplies are furnished by the local power company and here again the R.E.A. organisation is always at hand to assist the co-operatives in getting reasonable terms.

R.E.A. claims credit for the immense strides that have been made in rural electrification in the States in the last decade and this claim is naturally hotly contested by those power companies who have entered this field. Whoever is responsible, however, the fact remains that whereas only about 11 per cent. of the nation's farms were electrified in 1935, by June, 1945, the percentage had increased to 45 and of about

900 borrowers of R.E.A. funds servicing some 1,300,000 consumers through over 420,000 miles of rural lines, 825 were R.E.A. co-operatives.

One of the most progressive of the private companies who undertake rural electrification is the Public Service Company of Northern Illinois, whose area of supply covers some 6,000 square miles and who since 1919 have developed their rural electrification to almost 90 per cent. saturation. They now serve 48,500 farms with an average consumption of 2,300 units per annum. The average revenue received per consumer is about £21 per annum and the average price received is a little over 1½d. per unit.

At the outset this company required prospective consumers to make outright payments in respect of line costs but since this proved prohibitive in all but a few cases this system was discarded in favour of a guarantee scheme in terms of which consumers were required to guarantee and pay a minimum monthly revenue for 50 consecutive months of an amount equivalent to the cost of the scheme divided by the product of the number of consumers and 50. As saturation was approached in terms of this scheme it was modified from time to time by extending the guarantee period until this eventually reached 80 months. Such a high degree of saturation was achieved under this scheme that within recent years it was decided to go full out for 100 per cent. saturation and with this end in view any prospective consumer in the area may now obtain supply by undertaking to pay a minimum monthly payment of approximately 17s. 6d. for a period of 80 months and this minimum monthly payment covers the first block of 40 units consumed. Additional consumption is then charged for at a reducing scale on the normal blockrate system.

The company carries out an extensive publicity campaign and sponsors publications devoted to the use of electricity on the farm. It employs canvassers and field engineers who devote their activities to encourage a more diversified use of the electricity available and developing new uses to meet individual needs.

What was stated to be a very successful promotional scheme consisted of selecting a good type of farmer with a good educational background and providing his premises with a complete installation, including appliances on a consignment basis for a period of six months. During this period he had complete use of the installation and equipment and in addition is paid about £10 per month to demonstrate it to his neighbours. At the end of the period, the farmer has the choice of purchasing any or all of the appliances at cost or of requiring the company to remove them. In any case he retains the electrical installation free of charge. No less than 190 farms were being equipped under this scheme during our visit.

In Britain, rural electrification is for the most part in the hands of private companies and while time did not permit of any detailed study such information as it was possible to obtain indicated that no hard and fast schemes had been developed to cover the financing of these projects.

The general procedure seemed to be an endeavour to get the consumer to make as high a direct contribution towards the cost of providing the service as possible and to cover the balance of the cost by means of either guaranteed revenue or a minimum periodical payment. Tariffs in general were slightly higher in respect of rural supplies than the equivalent urban supplies.

As regards the form of construction of rural lines, opinion was divided but strong support was forthcoming for simple but sturdy single phase lines, the tendency thus being the same as that in the States.

CONCLUSION.

In conclusion I would like to express my thanks to Mr. McWilliam for his assistance in the preparation of the paper and to the City Council of Pretoria and Mr. Hugo, City Electrical Engineer, for having granted me the privilege of making the visit which forms the subject of this paper and for permitting it to be presented to you.

THE PRESIDENT: I am sure the thanks of this Association are due to Pretoria City Council and to Mr. Hugo for having made this paper possible and to Mr. Wilson and Mr. McWilliam for its preparation and presentation. The personal contact of men like Mr. Wilson and Mr. McWilliam and the recording of their experiences gained in these countries is of value to us and no matter where our interests are, in large central power stations or in less developed country areas, all of us will find interest in this paper and we are grateful to those who made this paper available, and the matter is now open for discussion.

Mr. SIBSON: I would like to add my own small meed of praise to Mr. Wilson for his extraordinarily valuable and interesting paper. There is no doubt that the visit sponsored by Pretoria was well worth while and useful to us as well, and I suggest that Pretoria be let off its subscription to the Association for the ensuing year!

There are one or two matter of interest to me and, in particular, I did get the impression, from the description of the methods employed, that money means far less to the Americans that it does to us, certainly in respect of capital plant. This is probably due to what must be much greater labour costs in America. I believe that the minimum salary paid for the lowest paid man, corresponding to our ash boys, is £40 a month, so one can well imagine what the labour bill of any undertaking in America will be like.

With reference to the question of the unit system of boiler/turbine design, it seems to me that this is less of an advantage as far as we are concerned in this country. It is true that under certain conditions one might get a modern boiler to work for months without being laid off, but there is no question that ultimately it must be laid off for a considerable period. In that respect a boiler is different from a turbine. If one must design a station entirely on the unit principle, then one will have to face the position of having a boiler unit laid off at least every six months and during that time the turbine's availability no longer exists, and another unit will be required to be standing

by. While this is quite a reasonable proposition in a grid scheme with a number of stations interconnected, it would certainly not work satisfactorily in this country where there are so many independent stations, and we should go warily in adopting this particular trend of design.

The remarks about firing are of particular interest to us, especially after what we heard about the difficulties that may arise before long in obtaining particular grades and sizes of coal consistently. Dealing with this problem may become a dominant feature in our power station design in the future. The installation of a coal crusher produces everything from dust to nuts and you get these in varying proportions, and the use of such widely different sizes of coal in an ordinary chain grate boiler produces results that will not be comparable with those obtained with coal of a uniform grade. For that reason I was particularly interested in the description given by Mr. Wilson of the "Spreader" type of stoker. We all know the disadvantages of pulverised fuel, and I note the stoker mentioned by Mr. Wilson may eliminate these and we will possibly have something which might develop into the solution of what will be a pressing problem in this country.

I was interested in the remarks regarding generation voltage. There are a few undertakings operating economically and rightly on voltages of 33 k.v. I do think that British practice has too rapidly settled on certain standard voltages and there is a possibility that a generation voltage of 22 k.v. will still be worth while. I shall be interested to hear whether it has any of the advantages of 33 k.v., because if not it seems to me to be a much better voltage than 11 k.v.

One or two of the other remarks made towards the end of the paper call for comment: I was struck by the responsibility which overseas undertakings took to themselves in respect of the maintenance of consumers' installations. I know that there are a number of smaller towns in this country who do this very successfully, but most of the larger towns find it difficult because we should have the contracting firms up in

arms if the Councils undertook what they consider to be their particular work. From the consumers' point of view the maintenance of apparatus by the Supply Authority is probably more satisfactory. Whether we will ever be able to do that in this country is another question, and I certainly feel it would be a good thing if we could.

The question of single phase reticulation in America has intrigued me. Where the question of rising costs is becoming serious I suggest we could give a good deal more consideration to single phase reticulation.

Did Mr. Wilson in his stay in America or England come across anyone who had strong views on the subject of motor bearings? We have had a considerable amount of trouble on large auxiliaries in power stations, and some engineers are beginning to think back to the days of the sleeve bearing and to use it in even the largest modern power stations. Ball bearing manufacturers assure me that the trouble is due to the greases; and the oil people tell me the trouble is in the bearings.

THE PRESIDENT: In this connection it may be felt that there is not sufficient time for discussion on these subjects, but I would suggest that it would serve a good purpose if, after this Convention, one would read the papers and submit in as short a time as possible any questions on which the author might elucidate his point. Those question and answers would be incorporated and be on record.

MR. WILSON: With regard to bearings, we did try to discuss that both in America and England, but we got no further than we had with our discussion in South Africa. One favoured the one type and one favoured the roller bearing and it came back to the same thing—the bearing people said it was the grease and the other people blamed the bearing—so we did not get any further on that argument.

As regards the question of capital cost in America labour charges are a big factor there. Skilled labour wages were 8s. 6d. an hour and there have been several increases since.

You asked also whether we had made any contacts either in Britain or America with operators who were generating at 22 k.v.—we did not. In the States, wherever we went it was 13,800 v.—that was their universal generating voltage; and in Britain we did not come in contact with any stations operating at 22 k.v.

On the question of maintenance of appliances, it does seem desirable but it was rather frightening when we saw the organisations that supply authorities had set up in the States for maintenance of consumers' appliances, especially when one considered that they were only dealing with American appliances, whereas we have to contend in this country with American, British, etc., so that the investment in spares would be absolutely terrific.

Mr. MULLER (Bloemfontein): I think we owe a debt of gratitude to Mr. Wilson and Mr. McWilliam and to Pretoria. This paper comes at a very opportune time. Most of us find ourselves in the position of our plant running close to the limits, some more so than others, and when at the end of the paper I saw sales promotion, I almost wondered whether we should mention such things these days, but we do hope for better times and, although we shiver when we see a stove go in, like the traders, we should not get into that attitude that we do not want any new consumers. We should look forward to the future when we shall be very glad to see them.

I was impressed with the difference in ideas in America and Britain and I think Mr. Sibson's remark was correct as to the cause of it, through greater elaboration in supervisory control which pointed to a lesser regard for capital and a greater regard for a labour cost of the undertaking. To us capital is the more expensive item and to that extent we could not follow in their footsteps.

In connection with coal, the handling of coal is another of my pet problems at the moment. The station was designed over 20 years ago and at that time the designers did not visualise the growth, and the coaling facilities are not adequate. I had thought

of the idea of the bull-dozer, but I was somewhat worried about this use of the bull-dozer to stack coal and to bring it back to the operating plant as it might act as a crusher to further reduce the size of the coal and increase the percentage of duff. We have had considerable trouble with the difference in the size of coal. Chain grate stokers were not designed to burn coal from duff to nuts, but during last winter we could not take any notice of our specification as to the percentage of duff, we were only too glad to see a truck of anything black coming our way and what did arrive sometimes looked more like duff, but we shut our eyes to it because we could at least keep going.

The spreader stoker has interested me and Mr. Wilson's views as to the use of these stokers for a large range of coal would be rather interesting.

We must take trade talk with a pinch of salt and we do like to hear what their personal views are.

I recently had an interesting experience—we considered single phase lines from the point of view of simplicity and cost, and I found that I could get small single phase transformers cheaper than three phase units. Some views on the subject of single phase rural supply would be useful.

I would like to repeat my thanks to both the Pretoria Council and to the gentlemen who presented this paper.

Mr. WILSON: In reply to Mr. Muller, the bull-dozer does crush the coal considerably. That is no disadvantage so far as the States is concerned, but where it was used in Britain the same conditions applied—it was being used where pulverised coal was used. From the point of view of stoker firing, it will create more duff.

With regard to the spreader stoker, we fortunately at the time we were in the States we were not able to visit any station where the spreader stoker was in use and we were unable to obtain the proprietor's views on the subject. The only boiler I saw in use was in the manufacturer's works

in England and that had been put in for the precise purpose of testing its possibilities as far as available supplies of coal were concerned. The opinion we received was that it has been successful in doing that over a very wide range.

Coming back to the electrification and the use of single phase line, single phase transformers are used in America but as far as the motor is concerned, the main idea is to use a portable motor. They don't encourage the rural user to use a motor for each appliance. In a large number of cases the transformers are one K.V.A. and they overload the transformer. Five K.V.A. transformers seemed to be the maximum size used for the average individual consumer.

Mr. DAMANT (Electricity Supply Commission, Durban): I thank you Mr. President for the opportunity to speak. There are two points which Mr. Sibson mentioned which deserve explanation. They reflect, perhaps, on the judgment of the Commission and, therefore, I feel obliged to give an explanation. The first point was that there is no precipitator in the world which will get rid of the disadvantages of pulverised fuel. If that were the case, we would not have the position that in America practically all the development is with pulverised coal. The fact remains that with the electrical precipitator we can get practically 99 per cent. elimination, if we wish to pay for it, and the dust nuisance can be avoided. We are confident that that can be done.

The next point was with regard to 33 k.v. generation. The only generators of this voltage in the Union of South Africa have been installed by the Commission and most of you know that trouble has been experienced with those generators. Certain of the troubles in the earlier machines were due to the use of 33 k.v. but, in most cases, the trouble has been common to machines generating at other voltages. Owing to increase in size of generating units, the existing designs for rotor windings have not been adequate and have had to be modified. The difficulties have been overcome and we do not anticipate very much more trouble on that score. With regard to our experience at Congella, we have had a 33 k.v. genera-

tor operating since 1938 and no trouble on account of the 33 k.v. windings has been experienced.

Mr. SIBSON: The allusion I made to Durban was prompted by the humorous comments made in the Press.

THE PRESIDENT: I would ask any other member or delegate who wishes to give his opinion to submit it to the Secretary and in due course they will be replied to by Mr. Wilson and question and reply will be incorporated in our printed Proceedings.

THE PRESIDENT: We will now adjourn.

The Convention adjourned at 12.40 p.m.

The Convention resumed at 9.45 a.m. on

FRIDAY, the 9th MAY, 1947, in No. 3 Committee Room, City Hall, Durban.

THE PRESIDENT: Gentlemen, in opening this morning's proceedings, I want to sketch what we proposed to do to-day. We will deal with two purely domestic matters, the alteration of the Constitution and Salary Scales. With regard to the paper by Mr. Downie, I understand he has made a precis of it so it will not take a long time and that will enable us to deal with several other matters because we wish to close about midday to-day. The reason the Executive suggested that is, although it was hoped that there would be more time to discuss matters under General, it is considered that there is not sufficient business to occupy longer than half an hour. If any member has some contribution to make, if he would submit it to the Secretary within the next week or so, it will be included in the proceedings, together with any reply.

AMENDMENT TO RULES AND CONSTITUTION

Now, on the question of the alteration to the Constitution: Engineer Members, Clause 4(c) of the Constitution reads:—

"Engineer Members: The Member shall be the Chief Electrical Engineer engaged on the permanent staff of an Electricity Undertaking owned by a

Municipality or Local Authority and who has had a thorough training in Electrical Engineering and is otherwise acceptable by the Council of the Association. Any duly qualified Assistants in an Undertaking with sales of over 20,000 units per annum may also be admitted to this class on the recommendation of the Chief Electrical Engineer."

It will be noted that "Any qualified assistants" in the plural "may also be admitted . . ." etc. As that stands it would be competent for the Chief Electrical Engineer of one of the larger municipalities, selling over twenty million units a year, to propose one, two, three or four of his duly qualified assistants. It does not designate the Chief Assistant, and if the Executive accepted those proposals, it might lead to an undue weighting of a larger municipality, and we thought that was not the original intention of the Constitution. So your Executive proposes as an amendment these words:—

"After the 1st June, 1947, one 'only duly qualified assistant' in place of the words 'any duly qualified assistants.'"

Now you may wonder why we say after the 1st June, 1947. Already there are one or two of the larger municipalities who have more than two representatives and one cannot take away membership from those who are already members, but to safeguard in the future the possibility of a large municipality having representatives in excess of two, we recommend that the Constitution be revised.

Mr. Smith (Boksburg) seconded this proposal, which was passed.

SALARY SCALES

THE PRESIDENT: Now the next domestic matter we want to deal with is the question of the Salary Scales. That has been under consideration for some considerable time, and I want to put this view before you on behalf of the Executive.

There was a suggestion put forward that we should have rather an elaborate

system of adjustment of the units on which salaries should be based, and we feel we have no power to enforce any salary scale—that rests with the local authorities by whom we are employed—and we feel that this is a new departure. It would be rather purposeless to make the method of the assessment too involved and so your Committee has suggested a scale of salaries which are minima, and the intention is that we should put forward for the guidance of local authorities what we consider should be the minimum salary. We at the moment do not see any way of making it compulsory. We are putting forward from the informative point of view and to amend it if we see fit in a few years' time. I now ask Mr. Hugo to present his report.

Mr. HUGO: I don't think I need say very much about this matter. Most of you were present in Salisbury two years ago when you had before you an excellent Report of a sub-committee under the chairmanship of Mr. Powell. The recommendations of that sub-committee were based largely on an agreement relating to salary scales which applies in Great Britain. You had no serious fault to find with those recommendations except, perhaps, that they were too involved and, for that reason, we have put before you a very simple scale merely with the object, as the President has said, of getting a basis accepted and then suggesting to Municipalities that the scale is for their guidance when they advertise the position of Chief Electrical Engineer.

I may say that this report by Mr. Fraser and myself was sent out prior to its consideration by the Executive with the object of giving you an opportunity of considering and discussing it. We have since submitted it to the Executive who have accepted it in principle with one exception, and that is the deletion of section (b) under Clause (8). The Executive thought for the present this proviso could be left out.

SALARY SCALES SUB-COMMITTEE REPORT.

MEMBERS OF SUB-COMMITTEE:— Mr. J. C. Fraser, Johannesburg; Mr. D. J. Hugo, Pretoria.

At the A.M.E.U. Convention held in Salisbury and Bulawayo in May, 1945, a very comprehensive report on Salary Scales for Chief Electrical Engineers prepared by Messrs. Powell (Chairman), Bradley, Foden, Halle, Harvey and Muller was considered. The Convention, however, failed to adopt the recommendations contained in the report but agreed to an amendment "that the report be adopted as a basis on which a scale of minimum salaries should be drawn up, and that the Executive Council be empowered to prepare a suggested final scale to be submitted as early as possible to all members for individual comment."

At an Executive Meeting held in Johannesburg on the 15th November, 1946, Messrs. Fraser and Hugo were asked to undertake the task of "preparing a suggested final scale" and the following recommendations are submitted by them for consideration:—

RECOMMENDED SCALE OF SALARIES

(1) INTERPRETATION.

The following expressions have the meaning assigned to them:—

- (a) "Supply authority" means and municipal, borough, town or village council, village management board, town board, local board or health board, constituted in accordance with any law and authorised to supply electricity.
- (b) "Chief Electrical Engineer" means an engineer employed by a supply authority as defined in sub-clause (a) hereof and responsible to this authority for the management of the electricity undertaking and the direction and control of the technical and all other staff of the undertaking.
- (c) "Chief Electrical Engineer" may also be known in so far as municipal electricity supply undertakings are concerned as City Electrical Engineer, Borough Electrical Engineer, Manager of Electricity Department, Town Electrical Engineer.

(2) SALARIES TO BE DETERMINED BY SCHEDULE:

The salary of a Chief Electrical Engineer, excluding all allowances, shall not be less

than the relevant salary shown on the Schedule annexed, subject to the provisions herein after appearing.

(3) DEFINITION OF UNIT ASSESSMENT:

"Unit assessment" means the total number of units sold per annum less 25 per cent. of any units purchased in bulk by the supply authority.

(4) INCREMENTS BY STAGES:

Where on the coming into operation of this Schedule of Salaries payment of a salary in accordance with the schedule hereto involves an increase (hereinafter called the "initial increase") of more than one hundred pounds per annum upon the salary paid immediately prior to the coming into operation of this agreement the undertaker shall have the option of paying the initial increase by annual increments which shall not be less than one hundred pounds per annum except in relation to any final increment which may not amount to one hundred pounds per annum.

Provided that this clause shall have no application to a variation of salary which may be due in respect of each annual ascertainment of the unit assessment, the intention being that the initial increase only shall be subject to this clause.

(5) NEW APPOINTMENTS.

On the appointment of a chief electrical engineer, the undertaker shall have the option of paying a salary of 85 per cent. of the scheduled salary for one year, 92 per cent. of the scheduled salary for one year and at the commencement of the third year the full salary shall be paid.

(6) PROTECTION OF PRESENT HOLDERS.

Where the existing salary of any chief electrical engineer is in excess of the salary payable under this scheme no alteration shall be made for the existing holder of the position until the salary payable under this scheme is in excess of the present salary.

(7) DATE FOR ADJUSTMENTS:

Adjustments of salary shall date from the first day of each financial year of the

undertaking and shall be based on the Statistics of the financial year immediately preceding.

(8) EXCEPTIONS

(a) Where the Chief Engineer is in full charge of other municipal departments and activities, the scheduled salary shall be increased by an amount considered appropriate in accordance with the increased responsibilities.

SCHEDULE.

UNIT ASSESSMENT (MILLIONS)	MINIMUM SALARY EXCLUSIVE OF ALL ALLOWANCES.
Under ½	£600
Over ½ Under 2	£700
Over 2 Under 3	£800
Over 3 Under 5	£900
Over 5 Under 10	£1,000
Over 10 Under 25	£1,250
Over 25 Under 50	£1,500
Over 50 Under 100	£1,750

APRIL, 1947.

THE PRESIDENT: Thank you Mr. Hugo. Anybody wish to debate that? It might be as well if Mr. Hugo would formally move.

Mr. HUGO: I have pleasure in formally moving the acceptance of the recommendations.

Mr. MULLER (Bloemfontein): I second it.

Mr. GRIPPER (Worcester): It appears to me that we may possibly be tackling this matter in the wrong way. The first and most crying need in my opinion is for some means of fairly correctly assessing one undertaking against another. A Council requires assistance in this respect and I would suggest that it is not *interference*. You cannot expect a layman to understand at once the causes that lie behind the need for such assessment. It is not the height of the power station chimney nor the population of the town. The responsibility depends upon many other factors. As soon

as you put forward a method that depends on the sale of units there is a certain feeling that every time a man goes out to get a new consumer he is trying to put up his own salary. We want to avoid that feeling but, at the same time, to make it as simple as possible. I do agree on the need for simplicity in the form in which this Association, or a similar body, submits any schedule to Municipal Councils but it will not expect the Councillors to work out the formula. At the same time we do expect them to appreciate just a little bit, the importance of load factor, also the importance of inducing new consumers to take supplies, also the importance of getting out as many units as possible with the minimum of capital outlay and plant in the station. A man who can double his output just by trebling or even doubling the power station plant does not deserve the same credit as a man who can double his output with his existing plant.

Well, Mr. President, I feel, and will in a few moments suggest that the Association at this stage should consider the assessment only and not mention salaries. Let any suggested salary scale be the subject of a second motion. The idea at this stage is to provide assistance to our Councils.



Just to illustrate the need for such assistance, may I refer to the Cape Province Municipal agenda for their meeting held only the other day in Kimberly, where Port Elizabeth proposed that

"This congress views with alarm the competition which is at present taking place between the various municipalities in the matter of recruitment of staff to the detriment of each other and resolves to discontinue the practice of outbidding each other in the matter of salaries in order to obtain the personnel necessary to carry on the various municipal activities."

If there was a definite assessment and if the Councils and Municipalities knew where they stood in relation to their neighbours on the schedules, the only out-bidding (against which nobody could have any complaint) would be due to a man's own improvement where he becomes too big for


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his present job. And there are many other cases. We see daily in the papers, advertisements calling for men with various qualifications and not long ago an Assistant Electrical Engineer was advertised for at £12 10s. Od. per month, out of which a sum had to be contributed towards a pension fund. There I feel certain that that municipality who advertised in those terms should have realised that they were calling for an apprentice electrician, not an Assistant Engineer.

I move Mr. President therefore that this Association adopts as a basis for assessment of undertakings for the purpose of grading the Chief Electrical Engineer a formula such as I have already submitted to our Secretary for circulation prior to this convention. (Here refer to the reproduction of my report on this page of these proceedings).

By way of explanation I would mention that the basis of that formula is the same as the basis submitted by your sub-committee with the additional two items brought in, not in my mind to conflict it, but to grade it. That is, one function or factor, to take care of the number of consumers, and another factor to take care of the maximum load on the whole undertaking. The reason for putting the factor to take care of the number of consumers is fairly obvious. A man who has to supply one million units to one thousand consumers has a great deal more on his hands than the man who has to supply one million units to only one consumer. The Maximum Demand which appears in the formula has an inverse effect. There the man who has to supply one million units with a one thousand k.w. station is surely more deserving than the undertaking supplying one million units but with a three or four thousand k.w. Maximum Demand. The effect of a few new consumers, if they are of the same type and class as the average consumers already on the system, will not have any revolutionary effect upon the formula for that town.

March, 1947.

A SUGGESTED METHOD OF ASSESSING THE UNITS SOLD FOR THE PURPOSE OF DETERMINING THE APPROPRIATE REMUNERATION OF CHIEF ELECTRICAL ENGINEERS AND MANAGERS OF MUNICIPAL ELECTRICITY UNDERTAKINGS.

While a method of fixing salaries in direct proportion to the units sold may be better than many of the "hit and miss" or "comparative" methods employed at present it is open to criticism for the following reasons:—

- No cognisance is taken of the difference in responsibility between the running of a Power Station and the mere Distribution of supplies purchased in bulk.
- One consumer alone may take a large number of units (at comparatively low tariff) while the amount of work, responsibility and financial return attached to the sale of the same total quantity to a scattered number of smaller consumers is much greater.
- An increase in units sold may be achieved at the expense of a disproportionate increase in generating plant or in the "fixed charge" payable to the Bulk Supply Authority.

If however the number of units sold is "Weighted" to take these factors into account, the result should be fair and reasonable. It is therefore suggested that the following formula be used in assessing the output of an Undertaking:—

$$A = (S - P/4) \times C/M$$

where A = The unit Assessment in millions per annum.

S = The units actually sold in millions per annum.

P = The units (if any) purchased from a bulk Supply Authority in millions per annum.

C = The total number of Consumers.

M = The Maximum Demand (or load) on the System in kVA.

(To avoid frequent alterations to the Assessment, the values of "C" and "M" should be taken to the nearest 100).

It will be seen that this formula overcomes the disadvantages (a), (b) and (c) as follows:

- (a) Units which are purchased for distribution are assessed only at 75 per cent. of the value of the units which are generated.
- (b) An increase in the number of Consumers takes effect only when the resulting increase in units sold produces no more than a proportionate or lesser increase in the maximum demand (or load) on the system.
- (c) Any increase in units sold which is accompanied by a proportionate increase in plant capacity or power demand, will have little or no effect on the assessment.

Just to illustrate that need, may I refer to the Cape Province Municipal agenda for their meeting held only the other day at Kimberley, where Port Elizabeth proposed that "This Congress views with alarm the competition which is at present taking place in various municipalities in the matter of recruitment of staff to the detriment of each other and ourselves . . ." etc. There, if there was a definite assessment and if the Councils and Municipalities knew where they stood in relation to their neighbours on the schedules, I submit that the only out-bidding for which nobody could have any complaints would be due to that man's improvement, where he got too big for that job. And there are many other cases. We see daily in the papers advertisements calling for men with qualifications and not long ago an Assistant Electrical Engineer was advertised for at £12 10s. per month, out of which a sum had to be contributed towards a pension fund. There I feel certain that that municipality who advertised in those terms should have realised that they were calling for an apprentice electrician, not an Assistant Engineer.

I move, Mr. President, therefore, that this Association gives serious consideration—I will go further than that—that this Association adopts as a basic formula for assessment of undertakings for the purpose of grading the Chief Electrical Engineer. And may I add that the Municipal Electrical Engineer is omitted from the definitions and we would require, I submit, to amend it to cover such points, and at this stage that the assessment be based upon a formula such as I have already submitted to your Association.

I move that, and by way of explanation would mention that the basis of that formula is the same as the basis submitted by your sub-committee with the additional two items brought in, not in mind to conflict it, but to grade it. That is the same function of factor, to take care of the number of consumers, and another factor to take care of the capacity load on the whole undertaking. The reason for putting the factor to take care of the number of consumers is fairly obvious. A man who has to supply one million units to one thousand consumers has a great deal more on his hands than the man who has to supply one million units to one or more consumers. The maximum which appears in the formula has an inverse effect. There the man who has to supply one million units with one thousand k.w. station is surely more deserving than the same undertaking supplying one million units but with three or four k.w., not necessarily plant, and the effect of a change of one consumer coming on that with that formula can easily be worked out; if that consumer comes on and is of the same type and class as the average consumers already on the system, it will not have any revolutionary effect upon the formula for that town. But I do submit, in putting that forward, that this Association will have to operate it; if it is too complicated for that then . . . but I don't feel it is too difficult to explain the working of it to Council, but you cannot expect or desire the Council to operate it.

Mr. BURTON: I second that motion.

THE PRESIDENT: The proposal is that the assessment be based on the total number

of units where a municipality generates, but where it purchases those units shall be devalued by 25 per cent.

The amendment is that a greater refinement be provided for the factors indicated by Mr. Gripper.

Councillor VAN JAARSVELD (Boksburg): Mr. Chairman, I find the majority of the Councillors do not actually know what the work of the engineers is. We really expect guidance from you people. We have just appointed an Architect and we have not the slightest idea of the salary scale. We have just appointed an assistant Town Engineer. That is what we want clearly from you people—guidance to show us what should be paid. A human being is not like an animal—pay a man and make him happy, and that is what we expect from you—guidance—and we will always do our best to help you.

Mr. HALLE (Pietermaritzburg): That was practically what I was going to say. What we have all got to do as engineers is to try and keep our scale on the same basis as in the commercial world. The simplest one we have in the meantime is the unit system, but however, just and equitable as it is, it has not the punch behind it and I therefore support the original motion.

Mr. MULLER (Bloemfontein): I thank Mr. Gripper for the useful work he has done in this connection. It has been interesting studying his suggestions, but I felt that most municipalities have some form of grading scheme and I do not anticipate that there is any possibility of a municipality creating salaries that do not fall within the category of their grades. The suggestion might make a difference of 10% to the amount on the schedule, but whether that would make any difference to the Council would have to be seen, because they would naturally fix it into the scale of existing salaries and the refinement would lose a good deal of its punch because it would be disregarded in the salary scales.

Councillor WEBB (Benoni): Mr. President, I congratulate Mr. Gripper but I think at this stage I would not be prepared to adopt it. He should delay another 12 months. You have a schedule before you. I know that

most Councillors will take to it like ducks to the water. Take my own Council; it will mean if we adopt these scales that he would be the highest paid official in the municipality, and it would have repercussions. I think that this should be submitted to all Councils and at your next Conference you will be able to adopt the scheme.

Mr. FODEN (East London): Mr. President, I have listened with interest to the various speakers and I would now epitomise my remarks which are based on the lines of the previous speakers.

I appreciate the amount of work Mr. Gripper has put in on this subject, also by the committee dealing with the salary scales, and I know the trouble we had overseas with getting this adopted, but we found that simplicity was the key note, as Councillors are not a little bit interested, in my experience, in matters such as load factor and maximum demands.

Mr. Gripper made reference to the responsibility with regard to the number of consumers. I would counter that by saying that the responsibility of the Electrical Engineer is just the same whether the undertaking turned out one million units to three consumers as it is with one million to two or three thousand consumers. Councils are concerned with the revenue and the responsibility, and I agree with the original proposer that simplicity is the key note and we should not involve Councillors in these difficult formulae which we as engineers can understand, but not Councillors, and I think it would be much better if we adopted simple tactics.

The President made reference earlier to legal machinery. That is a matter which our legal advisers at a later stage can deal with, but it is very desirable that we do get a basis for assessing salaries, because Councils are at sea at the moment with regard to what they should pay, and everyone here knows that it is most undesirable to have a constant labour turnover, and it is an axiom of the managements of those bigger undertakings, bigger than many we have in South Africa, that it is unprofitable to have a constant labour turnover and much better to

have a satisfied staff being paid reasonable salaries than have these men going from body to body seeking reasonable salaries. This constant change of staff is occurring in the East London Municipality. For instance, another Department may advertise for a 1st Grade Clerk and you may have a 2nd Grade Clerk who is worth more salary who applies for the vacancy due to the financial attraction. The Departmental head knows the value of that employee's services and would recommend an increase in salary but often the recommendation is rejected by the Council, with the result that the employee leaves your Department and the other Department has now got a man requiring training and your Department has to train a new man, which means that both Departments lose efficiency for a time. The same thing happens in Municipalities with regard to Engineers. There is this constant turnover going on, which is all to the detriment of our profession, and I would support the original proposition that we make this salary scale simple and put it forward to the respective Councils in the Union; and I suggest for consideration that Councillor members who are going back pass it on to their Councils, and that this Association try and get a meeting of representatives of the various Councils in South Africa with this Executive and then we could get down to it and explain the reasons why it is undesirable for this turnover of staff to go on; we would have a basis for discussion and probably arrive at an amicable settlement.

Councillor FIELD (Worcester): I would like to say that it appears to me that the Committee which has drawn up the proposal of actual salaries that has been submitted to us, are technical men and fully appreciate the difference between current generated and current purchased, but Councillors generally are business men and they will appreciate perhaps better than the electrical men do the amount of work involved in salesmanship. It is very advisable to bring in the question of whether the units are sold to two or three big consumers or to one thousand small consumers, that seems to be the extra factor brought in by Mr. Gripper, and I tried to put it in commercial terms to the Councils and Mr. Gripper put it in technical terms. It boils down to this, that the

salesmanship side of an electrical undertaking should be borne in mind in the scale as well as the generating side.

Mr. SIBSON: I don't think anyone can doubt that the aims of this proposal are good, and that we should try to bring about something on these lines, but we shall probably have to be prepared for a considerable amount of compromise on these proposals. The idea of a schedule of minimum salaries based on units sold originated in England where so many Undertakings are owned by private Companies. Practically no Undertakings in this country are privately owned and we are in a different position to employers in private enterprise. The main difference between us is that each of us is only one of a group of heads of departments of a municipality. Any scheme such as this will produce a different salary every year, it might go up or it might go down, depending upon the ability of the Engineer and conditions which are quite beyond his control. But most municipalities feel that heads of departments should be on the same grade, and I cannot see the heads of other departments viewing with pleasure the City Electrical Engineer getting more because he sells a greater number of units. There are these difficulties in the relationship between the Electrical Engineer and the other heads of departments, and all we can gain by this discussion is a general acceptance that we are probably paid too little.

I would like to look at Mr. Gripper's proposal for a moment. The ideas he has put forward are very excellent and there is no doubt that this is the sort of formula that would be desirable. There are one or two things, however, that would immediately be criticised by Councillors. The Engineer's salary is related to Maximum Demand and the instrument or instruments measuring this are, of necessity, under the control of the Engineer. It is he that can wield the sealing pliers, and this can hardly be regarded by others as a satisfactory state of affairs.

Again the number of consumers is a factor of the formula, but we have not yet reached any unanimity in regard to the means of assessing this number—different methods are

adopted in different places and I see little hope of satisfactory uniformity in this respect.

Finally, if the Maximum Demand is taken for a particular period—say the financial year of the Municipality—there would be an obvious desire on the part of the Engineer to restrict the taking on of additional load towards the end of the period.

I myself had a case where a consumer wished to increase his demand by 1,300 KVA due to emergency conditions towards the end of the year. I might well have been inclined to find reasons for objecting to this had my salary depended upon it, with unfortunate repercussions on the Gold Mining Industry!

While the formula is basically and theoretically sound, therefore, I think it would be quite impracticable to operate.

PRESIDENT: May I suggest that to clear the issue I invite anybody to speak in favour of the amendment so that we can put the amendment. I suggest only those members speak at this stage who wish to speak for and against the amendment, not on the general principle of how we are going to bring this to the municipalities.

Councillor BAXTER (Kimberley): It has been pointed out that the Councillors require simplicity. Mr. Gripper's motion is simple in itself because all the Councillors want to know is the comparison with towns on an equal standing. They are only interested in a figure that concerns themselves. This can easily be obtained from the formula. It gives a fair discrimination on the various types of towns and their undertakings. We have, with the electrical development of the Free State, long transmission lines which will bring new consumers into the area, they must have some foundation on which to start, and I must congratulate your committee here in fixing the minimum at the maximum. In the past the municipalities have endeavoured to get the best man at absolutely the lowest salary and when they get him they refuse to increase his grade and make no advances until such time as

that man left them. You then see an advertisement for a new engineer on a much higher grade to replace that man. This formula will give the Council a guide. They have their Electrical Engineers to explain the actual meaning of the terms, they are only interested in the £.s.d., but there will have to be a factor of zoning brought into that which will class towns in certain areas as A, B or C zones to bring them down to a scale of salary comparable to the high salary paid in other towns. It is quite improbable that any Council will accept engineers' salaries that will be higher than any salaries paid to officials in that Council and I think some factor must come in to bring those into line. On the other hand, I don't think that the average Councillor to-day is endeavouring to compare the electrical engineer on the same basis as in the past as nothing more than an electrician watching a bit of machinery, and I support Mr. Gripper.

Councillor VENTER (Cradock): You suggested that only those in favour of the amendment should speak?

PRESIDENT: No, or against.

Councillor VENTER: The amendment is the principle involved?

PRESIDENT: To get the point clear, I said we have no power to enforce any salary scale which we agreed upon as being suitable, having regard to the size of the undertakings; all we could hope to do was to give a lead to local authorities as to what we thought would be a minimum salary, having regard to the responsibility. When we assess the responsibility the executive has put forward a scale based on the number of units sold, but Mr. Gripper has put forward as an amendment that we evolve a formula, taking into account other factors. So it is whether we put forward a scale or not and whether it should be a simple basis put forward by the Executive or one more involved, taking into account other factors.

Mr. GRIPPER: The intention of my amendment was primarily to discuss and vote on a method of assessment without any reference to any scales; the words "salary"

and "scales" could be left out. Coupled with that was the suggestion that that assessment should be based on my formula.

Councillor VENTER: My apologies; I unavoidably missed the opening part of the debate and ask for your indulgence. If Congress is now considering and discussing the amendments then I think it advisable that I reserve what I have to say for later when Congress decides the course of action to be taken after the matter of principle has been decided. I do feel that this matter is one of such magnitude that it goes to the very root of the profession of Electrical Engineers. Will Congress kindly consider that hostilities only recently ceased after the biggest war the world has known and this war was for the cause of democracy. Whereas Electrical Engineers are professional men of the highest integrity and well trained, should you not avoid becoming a trade union on which course you seem to be set at the moment? You all at present are members of the Municipal Association of Employees through which Association certain salary scales are provided. Should you follow the proposed amendments you will simply be heading for a trade union, which will provide no more protection and benefit to the Municipal Electrical Engineers than is already provided by the Municipal Association of Employees, but you will undoubtedly encounter trouble and complications.

I want to make it abundantly clear that where I am personally concerned I have in the past and will always battle for the protection of the interests of Municipal Employees and I should like to see every man paid according to his merit, but when Congress starts fiddling around with scales of this nature, you are going to run into conflict with the natural law of supply and demand and have to contend with developments which bristle with pitfalls, for example, you fix a salary scale for the Electrical Engineer of a certain town, that Engineer is immediately branded as a man of a calibre relative to that of the town. He may, however, be a man of extreme ability and capable of controlling a much bigger power plant, but he may prefer to stay in the particular town for health reasons or because

he prefers rural conditions. On the other hand a Municipal Council may wish to retain the services of this Electrical Engineer who, however, applies for a position commanding a higher salary elsewhere. The Council to induce him to stay may increase his salary above that of the scale provided by you. This in turn may have repercussions where the Councillors are concerned for the Rate Payers' Association of that town may say, "why are you squandering the Municipality's money when there is a fixed scale?"

Is it not more advisable for Congress not to take a substantive resolution now. If you were say, mechanics, I would agree and say develop into a trade union, but "Heavens alive," Electrical Engineers are highly qualified men and the standard of debate of the proceedings conducted at this Congress is the highest I have come across anywhere. Mr. President, is it therefore not much more desirable that the Electrical Engineers who hold these high qualifications should rather form themselves into a faculty and obtain a charter, such as, for instance, the Medical Councils and Law Societies have. These bodies have been created by statute and are accordingly masters in their own home. They have complete control of their members, and whatever they decide becomes a "fait accompli." If the Engineers can obtain a charter, it will definitely give them a professional status, which I consider is to be preferred to a trade union especially in view of my remarks re the war we have just fought for democracy and which is adverse to trade unionism and communism. In the circumstances I move that this matter be deferred and referred to the Executive of this Association to explore other means of introducing fair remuneration to Electrical Engineers in the employment of Municipalities throughout the country, and, if possible, the prospects of obtaining a charter.

PRESIDENT: I would like to say in reply to Cr. Venter, we appreciate his efforts on behalf of the engineers, but we have to be very careful not to use this Convention as a trade union. Our expenses are paid by our Councils.

The idea behind the Executive in putting forward this scale, either in the original or

amended form, was to pursue the first objects of this Association as laid down in our Constitution and there are local authorities who are managing undertakings and are considering establishing undertakings and it was felt that an Association such as this could put forward a minimum salary scale which in our opinion would be the minimum that would get for them a type of man who could assume responsibilities, and we have at all times been very careful that we are not putting forward something we are claiming for ourselves; we consider if you are starting an undertaking the minimum salary should be £600.

Councillor VENTER: I appreciate the position but am apprehensive that should you circulate a resolution submitting certain salary schemes to the various Municipal Councils, it will from these Municipalities go forward to the Municipal Congresses where the schemes submitted will probably be opposed. Would it not be better to arrange for the whole matter to be discussed by delegates from this Conference with the Executive of the Municipal Association of the four Provinces? I respectfully suggest that this Association's Executive confer with the Executive of the Municipal Association and test the reaction of that body. I assure you that circumspection will have to be exercised in handling the matter, and I withdraw the original motion moved by me.

PRESIDENT: Your Executive has put forward a suggested salary against certain scales and it has suggested that the scales be assessed by discounting 25 per cent. where units are purchased. Mr. Gripper mentioned an amendment that he does not want to associate any particular unit with any particular salary but we say that we should use a more scientific formula in assessing the units sold. I think we should dispose of that amendment. If it is passed I should say that this Association prefers the formula and then it will be open for debate.

May I put forward the motion of Mr. Gripper? He finds fault with the recommendation put forward by the Executive—100 per cent. if you generate and 75 per cent. if you purchase.

The amendment is lost.

The proposal before the meeting now is that the salary scale as published be approved by this Association and we deal then with our method of approach.

Councillor IMMINK (Johannesburg): Mr. President, may I suggest that your first approach be to the Joint Municipal Executive?

PRESIDENT: May I ask that the scale put forward be approved?

MEMBERS: Agreed.

Mr. MULLER (Upington): I can assure you that these figures which have tentatively been given have already been accepted. I see one that should be waived before we go any further, and that is the wide range between the half and the two million mark. If this Association considered that the load of the two million mark practically all engineers dealing with those structures are also in charge of the water works.

PRESIDENT: Thank you, Mr. Muller, your Executive dealt with that because it makes specific exception of those scales where the Chief Engineer is in charge of other activities. (Read relative section.)

Having agreed on that scale it has been suggested by Councillor Immink that this be transmitted to the United Executive, making clear that we are not claiming this and that we only suggest the minimum salary to be offered to a man.

Councillor BAXTER: I don't quite agree with that; in the first place it will have to go to the National Executive but I think we should hear the views of the smaller municipalities. Let us send them a copy of what transpires and at the same time state that this Committee intends to approach the United Executive on a certain date and would like their reactions sent to you through the Electrical Engineer. Let the smaller towns have a voice. The decision will then be made between your Executive and the United Executive by which we must all abide.

Councillor FIELD: If this scale has been decided upon, I can see no objection to its going to the municipalities. Let them get hold of it and discuss it and pull it to pieces.

PRESIDENT: I would suggest that every delegate to this Convention would present his own report to his own particular Council and include in that report a copy of this. I think that would follow in due course, but I think the approach of this Association would be to the United Municipal Executive, inviting, if necessary, their comments and it could come on the agenda of the next Convention. We have discharged a duty to give what we think are suitable salary scales.

Councillor BAXTER: When a report goes in with the proceedings here in nine cases out of ten it is not read. I would like to see a copy sent to the Town Clerk of various towns so that it can be placed on the agenda.

PRESIDENT: The Councils may say that they cannot agree to this, but it is a right of the members of the Association that they should be given a copy and we will see that that is given effect to.

Mr. VORSTER: Every Town Clerk is not a member of this Association and we pre-suppose that this Association is going to circularise every municipality in the Union—members and non-members. In your approach to the United Municipal Executive can you not put the onus on them to approach the municipalities? It then comes before the Town Council from the National United Executive, but if it comes from this Council they will say it is the engineers' move to get more salary.

Mr. ANDREW: In listening to the discussion, I feel I must support the views put forward by Councillor Venter; namely, that this matter be submitted to and dealt with by the Municipal Executive.

Councillor LIDDELL (Bulawayo): I would like to remind you that if this is referred to the United Council that would exclude Rhodesia.

PRESIDENT: I thank you for reminding us of that. Would it meet your wishes if we formally send this to the Municipal Associations of the Union, Southern and Northern Rhodesia? And I suggest that we should circularise every municipality in this country owning and operating electrical stations. Personally, I feel that we would have done all that we need do in sending that to the United Municipal Association, but if there are delegates here who feel that we should send a copy to each one, I hope to get agreement on that. Is it agreed that we send it to the two United Municipal Associations and to the municipalities?

MEMBERS: Agreed.

Mr. MULLER (Bloemfontein): My colleague behind me seemed to think that because we lay down or suggest what we consider to be a reasonable remuneration for the responsibility it is bordering on trade unionism. He does not seem to have regarded the medical profession or the legal profession as trade unionists—they don't suggest their rates of pay, they just demand it and we have not regarded them as unprofessional. It is merely a manner of assisting and we are not trying to be trade unionists.

Congress adjourned at 10.50 a.m.

Congress resumed at 11.10 a.m.

PRESIDENT: Well, ladies and gentlemen, we are not much behind time and as I explained to the meeting earlier we find that we have progressed so much that there will not be enough business on the agenda to justify our sitting this afternoon. It is a pity because it is nice to have a little time to discuss items under General, but there is so little left over and some members want to get away by this afternoon's train.

After Mr. Downie has read his paper I suggest that members who want to speak should submit their comments to the Secretary and they will be embodied in the record of the proceedings together with the reply. So we will go on to one o'clock.

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FACTORS IN THE ECONOMIC AND COMMERCIAL DEVELOPMENT OF MUNICIPAL ELECTRICITY UNDERTAKINGS.

By

CHRIS. G. DOWNIE, B.Sc., A.M.I.E.E., A.M.I.Mech.E.

Chief Technical Officer — City of Cape Town Electricity Department.

I. INTRODUCTION.

In the civilisation of to-day the most important "commodity" in every branch of human endeavour and activity is energy or the means of performing work, and by far the most useful and convenient form in which that "commodity" can be made available is Electricity. Through this medium the raw energy stored in solid, liquid or gaseous fuels (and should one say at this stage atomic "fuel") can be transformed easily into light, heat, motive power or chemical activity to suit the job, process or need of the moment.

There is, however, one important exception to this statement which should be given due recognition, and that is the direct harnessing of the thermal energy inherent in liquid fuel for the propelling of ships, long-distance rapidly-moving road vehicles and aircraft by means of internal combustion engines and turbines. For practical and economic reasons the scope of Electricity in these fields is somewhat restricted.

Concerned with the production, distribution and sale of Electricity an Electricity Supply Industry of considerable magnitude holding a position of vital importance to the general economy and life of the community has arisen in every civilised country throughout the world. This development has taken place during the comparatively short period of 67 years since 1880 when electricity was produced on a commercial basis for the first time merely as a new and more convenient form of illuminant. Corresponding progress in the supply of electricity over an even shorter period has been made in the Union of South Africa and Rhodesia where every city and town, including the rural districts adjacent to them, are now served as a matter of economic and social necessity by an Electricity Undertaking.

Soon after the supply of Electricity on a commercial scale was inaugurated in Great Britain it was found desirable to introduce Legislative Control of the Industry providing for the establishment of "Electricity Undertakers" who were to be authorised under Licence to supply Electricity within specified areas. Following this example corresponding Legislation controlling the supply of Electricity has been introduced in all other parts of the world also including the Union of South Africa and Rhodesia. Right at its inception the supply of Electricity was regarded as a public service and all legislation relating to it therefore has been motivated by the necessity to safeguard the public interest and, because of the very high capital investment needed for the industry, to conserve capital resources and avoid unnecessary expense in providing the service.

The Industry has developed over a comparatively short space of time compared with Commercial enterprises and other manufacturing industries from which it differs in several important respects. It is important that not only those who are connected with Electricity Undertakings, but the far greater number of others who are engaged in spheres of industrial, commercial and social activity, should know something about these differences in order that the economic and commercial problems associated with the development and operation of Electricity Undertakings may be appreciated and understood.

PART I of this paper describes the salient points of difference that exist between the Electricity Supply and other industries and at the same time endeavours to explain the economic and financial features and problems that are natural concomitants of the production, distribution and supply of Electricity.

PART II deals with immediate future prospects in regard to the development of electricity undertakings such as those which are directly engaged in the supply of electricity for general industrial, commercial, domestic and public purposes.

PART III deals with the means that are open to Electricity Undertakings to render greater service to the communities they serve with a view to increasing the sales of electricity to a greater extent than hitherto which it will be most necessary to do in order to meet rising costs and avoid the raising of electricity tariffs.

PART I.

2. CHARACTERISTICS OF THE ELECTRICITY SUPPLY INDUSTRY.

(2.1) Peculiarity of Product.

The Electricity Supply Industry is concerned mainly with the production of a single product which is intangible and invisible. All other Manufacturing Industries (with the exception of the Gas Industry) are engaged in producing goods of a material and palpable kind that are required for satisfying human needs and desires. Methods of production, distribution and sale of the products of the two industries therefore differ very widely.

It is unfortunate, because the Laws of Nature do not permit otherwise, that the production of electricity from those fuels which are the most abundant and at the same time are the most accessible for that purpose than is, for example, water power, should be accompanied by considerable waste of the energy stored in the fuel. The highest efficiency so far achieved in this process when coal is used is no more than a little over 30%, whereas the average for the whole industry is under 20%. On the other hand the conversion of water power into electricity can be accomplished with an efficiency as high as 90%.

The fact, however, that the supply of electricity is concerned with one product gives the industry this advantage over others in that it enables financial accounting procedure and routine to be a comparatively

simple matter. It has been possible to standardise the accounts and operating statistics of the electricity supply business so that technical results and costs can be easily determined and expenditure kept in check. It is thus possible also for comparisons to be made in these matters between one Undertaking and another. This induces a certain amount of healthy rivalry among Undertakings in their efforts to produce results which may tend to show, with due allowances for differences of magnitude and technical characteristics that one Undertaking at any rate is just as efficient as any of the others. In the Electricity Industry therefore the competitive incentive is always available even though Undertakings, for economic reasons, are saved from the necessity to compete with one another for markets for the sale of their product.

Although the production and supply of Electricity may be regarded as somewhat of a monopoly this does not mean that those who are in control of Electricity Undertakings are absolved from the need to manage and operate them in accordance with commercial business principles at the lowest possible cost. It has to be borne in mind all the time that Electricity has to meet competition from substitutes in different fields of use, such as gas, coal, coke, oil and private plants. Managements have a double responsibility in seeing that consumers are well served 24 hours a day and that the service is given efficiently at minimum cost.

(2.2) Storage of Output.

The Electricity Supply Industry suffers from the great disability that electric energy cannot be stored in the same way for instance that gas, water or any of the tangible products of other industries can be stored. This means that the electricity industry must be organised for the production of something that is virtually 100% perishable. As Professor R. O. Kapp put it in a lecture which he gave overseas recently, "even the fish and milk trades are not at this extreme and most commercial goods can be stored for quite a long time." Although the demand for ordinary commercial goods also may fluctuate from time to time, production can be so organised as to require the minimum amount

of plant (capital) and labour working continuously at the most efficient rate of production. If the demand for goods subsides they can be stored against the time when the demand becomes heavy. Manufacturers and commercial concerns in any case can usually judge the course of events in such matters and can plan accordingly even to the extent of either engaging additional staff to increase production or discharging employees when business is bad.

The Electricity Supply Industry is not in such a favourable position. In general it has to deal with demands that fluctuate widely over the 24 hours of the day. Furthermore, the demand varies not only according to the time of the day but from day to day and from season to season. On an ordinary weekday the demand from hour to hour differs appreciably from that which has to be catered for on a Saturday and a Sunday. The demand is also subject to wide variations according to changes in weather conditions.

The position of Electricity Undertakings in this respect was very aptly described by Mr. D. Bellamy, General Manager of the Hull Electricity Department, at a Sales Management Conference of the British Electrical Development Association in 1938 when he said:—

“The fundamental difference between the electrical and other industries and businesses is to be found in the ways and means of meeting these difficulties (wide variations in demand for service and supplies). The Post Office deals with its problem by temporary measures adopted for the period and later dispensed with. The large stores can easily maintain stocks of supplies, they can engage or dispense with temporary staff, they can temporarily close their doors, or they can say, ‘We are out of stock and cannot supply.’

The Electricity Supply Undertaking

- (a) cannot dispense with temporary measures employed for a peak period;
- (b) cannot keep stocks available for peak demands;

(c) cannot say ‘sorry, we are out of stock and cannot supply.’

Once the demand is made for electricity the supply of the same must be available for the consumer even though he has no desire for the use of it at the time.

The Consumer desires his lighting and heating during the winter months, and will make his demand then, but the Electricity Department must be in a position to render similar service at any time during the remainder of the year, should any occasion arise for the consumer to so desire. The difficulty which arises is that of finding a complementary demand for the supply which would not arise at the time of the normal peak demand. It is not possible to change the seasons; neither is it possible to change the fundamental habits of the people.”

Figure 1A depicts a typical load curve of an electricity undertaking where the highest demand (A) occurs during the evening of a wet, cold weekday in winter. It also shows, in the divergence between curves A and B, the effect of cold weather on the demand. Curve C is the lowest load in the summer preceding the winter during which Load Curve A was recorded. An Electricity Undertaking therefore must have sufficient plant available to supply instantly the highest demand, whenever that is likely to be made—usually in the winter. If storage on a large scale were possible (as in the case of water or gas) something like only half the plant would be required.

The wide daily fluctuation in load described above which applies to the system as a whole occurs to an even greater extent at the various centres or substations from which supplies are distributed to consumers. At these points in the distribution system plant capacity must be available to meet a demand which may vary from almost nothing at night to a “peak” that may load the plant intermittently to its maximum capacity during a short period at two or three widely separated times of the day.

This special feature of the business of supplying electricity is probably the most

important because of its influence on the economic development of electricity undertakings and, in particular, on costs and tariffs.

It results in such Undertakings having to be equipped with a considerable amount of capital plant and equipment, an appreciable portion of which has to be available merely to deal with spasmodic and varying peak demands, the output of electricity corresponding to which forms only a small fraction of the total output. It introduces the conception of "load factor"* which for the purpose of this paper may be defined roughly as the ratio:

amount (or capacity) of plant that would
suffice to supply the demand if it were
possible to store electricity

amount (or capacity) of plant actually
needed because electricity cannot be stored.

In general it will be found that the load factor of municipal electricity undertakings in this country varies from about 20 per cent. to 50 per cent. according to the magnitude of the undertaking—the load factor of the larger cities being in the region of 40 per cent. to 50 per cent.

* The true definition of Load Factor is as follows:—

The ratio of the number of units supplied during a given period to the number of units that would have been supplied had the maximum demand been maintained throughout that period.

Figure 1B which is related to the daily load curves depicted in Figure 1A previously referred to shows the number of hours throughout a year during which demands of various magnitudes persist and gives an indication of the extent to which plant is effectively used for supplying those demands.

If the total amount of plant required to supply a maximum demand on a system such as that having a load curve shown in figure 1A, is expressed by 5, or, in other words that 5 separate units of plant have to be run at the time of maximum demand and be started and stopped successively, then one unit, that is one-fifth of the plant, will operate at a load factor of 100 per cent. and

supply 44 per cent. of the total output. This is represented by the area QEFG in Figure 1B. Two-fifths of the plant will operate at a load factor of 47 per cent. and supply 49 per cent. of the total output (area PCDEQ). The remaining two units, that is, the remaining two-fifths of the plant will operate at an average load factor as low as 8 per cent. and supply only 7 per cent. of the total output represented by area ABCP. The over-all load factor of the system is 44 per cent. In actual practice reserve plant capacity also has to be provided as a safeguard or insurance against inadvertent breakdowns. In the simple example described above therefore 6 units of plant in all would have to be available for a maximum demand which normally can be catered for by five units. Such a safeguard is essential in order to ensure continuity of supply to all consumers for whatever they may all collectively demand of the productive capacity of the undertaking at any time. In its financial implications this is an onerous but unavoidable burden and represents a very different state of affairs from that existing in other industries.

(2.3) Capital Outlay.

Because of the above-described peculiarities of the product with which the Electricity Supply Industry is concerned all Electricity Undertakings become heavily capitalised. Not only is the plant and equipment required for the production, transmission and distribution of electricity comparatively costly but a considerable amount of it, as previously explained, is needed in comparison with the requirements of other Industries. This will be evident from Table No. 1 which shows that in the case of Electricity Undertakings the capital outlay varies from $4\frac{1}{2}$ to $6\frac{1}{2}$ times the turnover or revenue whereas with other manufacturing industries or commercial enterprises the position is reversed. In their case the turnover varies from twice to over three times the capital outlay. Putting it in more familiar terms, one can say that the Electricity Supply Industry turns over its Capital only once in anything from 5 to 6 years, whereas other Industries turn theirs over at least two or three times a year.

The heavy capital outlay that has to be incurred by Electricity Undertakings in

giving the service required results in the fixed charges on capital outlay being the dominating factor in controlling the technical and commercial development of such undertakings. This factor also has a preponderating influence in controlling the price of supplies, particularly those having a low load factor which incurs the putting into commission of plant to deal with peak loads (Area ABCP Figure 1B). In this category are supplies required for lighting and radiators which accentuate the necessity for additional generating plant having to be put into commission during the short periods of the highest peak loads of the year. Such supplies therefore become liable to be charged at a higher tariff than those which result in a more prolonged and more efficient use of the Electricity Undertaking's plant and capital.

Table 1 also shows that of the total cost of production (including the cost of transmission and distribution of supplies), capital charges alone constitute anything from 33 per cent. to close on 50 per cent. Figures for the year 1938 relating to the five largest undertakings in the Union reveal that capital charges average 33 per cent. of the total cost of production and supply.

In designing or extending any electricity supply system therefore it is most important to bear in mind the incidence of capital charges. While efforts are constantly being made to operate plant in such a way as to save fuel and working costs, it is of far greater importance to economise in capital expenditure. In these times when prices of plant and materials (*vide* Figures 2 and 3) are double what they were just prior to the outbreak of World War II, it becomes more necessary than ever in designing extensions that great care be exercised in keeping capital expenditure down to the minimum consistent with sound engineering practice and safeguarding continuity of supply. The position is such that Engineers should "think twice" before scrapping old plant when it can still operate and serve a useful purpose. The following example should make this clear.

It is assumed that the system having the load curve shown in Figure 1A is served by two Power Stations, one an efficient pre-war power station which is operated continuously so as to produce 93 per cent. of

the total output (Area PCDFGR of Figure 1B) and the load factor corresponding to which is approximately 68.5 per cent. and the other an old comparatively inefficient station, which is brought into operation to carry the peak loads and 7 per cent. of the total output represented by area ABCP of Figure 1B with a load factor of 8 per cent. Assuming that the new and the old stations cost £30 and £20 respectively per k.w. of the maximum load to be carried by each station and using appropriate figures for operating costs the position as regards production costs at the two stations on the basis of each proportionately subscribing 1 k.w. towards meeting 2 k.w. of system total peak load would be as follows:

COSTS BASED ON A LOAD OF 1 KW. NEW STATION:

Output at 68.5 per cent. load
factor = $.685 \times 8760 \times 1 \dots = 6,000$ units

Capital Charges at 9 per cent.
per annum on £30 $\dots \dots = £2.70$

Coal: Consumption
1.5 lbs. per unit at
25s. per ton = .225
pence per unit; 6,000
units at .225 pence
per unit $\dots \dots = £5.63$

Operation and Main-
tenance: 6,000 units
at .09 pence per unit = £2.25
 $\dots \dots = £7.88$

Total $\dots \dots \dots = £10.58$
(or 0.42 pence per unit).

OLD STATION:

Output at 8 per cent. load
factor = $.08 \times 8760 \times 1 \dots = 700$ units

Capital Charges: at 9 per cent.
per annum on £20 $\dots \dots = £1.80$

Coal: Consumption 3.0
lbs. per unit at 25s.
per ton = .45 pence
per unit; 700 units
at .45 pence per unit = £1.32

Operation and Main-
tenance: 700 units
at .3 pence per unit = £0.88
 $\dots \dots = £2.20$

Total $\dots \dots \dots = £4.00$
(or 1.37 pence per unit).

In general it will be found that the capital outlay on old power station plant will have been written off or capital charges thereon ceased before it reaches the end of its useful economic life. In dealing therefore with the question as to whether or not the old plant should be scrapped and replaced by new and more efficient plant elsewhere one would have to consider in the above example not the comparison between the average costs per unit of 1.37 pence against 0.42 pence, but whether the new plant necessary to take the place of the old can supply 1 kW. and 700 units for £2.20. In other words that the new plant will be so efficient as to offset the additional capital charges incurred by it. For this to be possible the new plant would have to be installed at a total capital cost of no more than £20 per kW. At the present time power station plant such as that with which the above example deals costs something like £40 per kW.

Because of the heavy capital outlay needed for the establishment and expansion of electricity undertakings it becomes desirable, in the interests of economy, for such undertakings to be made subject to Legislative control to the extent, for example, of having to be licensed or authorised to supply each within a fixed area. If there were no such control, undertakings would be free to compete in the same area which would ultimately result in overlapping of mains and services thereby incurring considerable waste of capital for which consumers have to pay.

Even where an undertaking is permitted by licence to supply for a special purpose within the area of another undertaking the vital need to economise in capital outlay and keep down the cost of supply is so strong that it is not uncommon to find such undertakings eventually coming to some mutual arrangement with a view to satisfying that need. A typical example of such an arrangement is the "pooling" of the generating plant resources of the Cape Town City Council and the Electricity Supply Commission which latter body is licensed to supply electricity to the South African Railways and Harbours for power and traction purposes within the City Council's area of

supply. By the pooling of those resources there has been a considerable saving in capital outlay and in the cost of production as compared with what the corresponding costs would have been had the two undertakings remained entirely independent. Mutual arrangements also exist between these two undertakings whereby the one is enabled to be supplied from a point on the transmission system of the other and vice versa thereby making use of cable capacity and capital which might otherwise remain unused.

The capital required for financing the expansion of electricity undertakings and for new plant and extensions (when these may not be financed from reserve funds) is usually found by the raising of loans upon which interest and redemption has to be paid. The redemption periods of such loans should correspond as closely as may be estimated to the useful lives of the assets to be purchased thus avoiding the necessity to make financial provision for normal depreciation. It is usual therefore to find power station plant being assigned a life of 20 years, and transmission and distribution systems a life of 30 years, with corresponding "lives" for other assets. This method of finance, of course, results in the high ratio of capital charges to total cost of supply which, as previously mentioned, is a characteristic of the electricity supply business. In a rapidly expanding undertaking these charges tend to predominate. If, however, ample reserves can be set aside from surplus revenue and be ploughed back into the business the capital charges are kept down in proportion to the amount of revenue so used. This practice will in the long run make for cheaper electricity than if all new capital is raised by the flotation of public loans. It is through adopting a conservative financial policy such as this which enables an undertaking to supply electricity for domestic purposes at 3d. per unit with a service charge of 1s. 4d. per room, and for the average overall price of Industries and Commercial Establishments to work out at no more than a little over 3/5ths of a penny per unit notwithstanding that coal costs 27s. per ton—a price which is nearly double that paid by electricity undertakings situated close to the coal mines.

Because of the high cost of plant and equipment in the electricity supply industry and of the fact that this industry is continuously expanding it is essential that adequate financial reserves be set aside to meet the cost of inadvertent breakdowns, extraordinary maintenance and to defray the cost of replacements which may be found necessary before existing plant reaches the end of its useful life.

The need for reserves to be built up is considered to be of such importance that legislation controlling the industry makes it obligatory for those undertakings that are subject to such legislation to provide adequate reserve funds. Particulars of existing legislation both in the United Kingdom and in the Union which deals with this matter are given in Appendix I.

(2.4) DISTRIBUTION AND DELIVERY OF SUPPLIES.

The distribution and delivery of supplies of electricity involves special techniques which have no parallel in any other industry except that of the supply of gas and water. In the first place the means of conveying electricity to consumers are relatively inflexible. Secondly, the means themselves comprise fixed capital items of plant and equipment which are very costly.

In general the capital outlay necessary for transmission and distribution plant and equipment amounts to something like double that on power stations, and it will be seen from the figures quoted in Table No. 1 (Rows A, B and C) for capital expenditure on British electricity undertakings that expenditure on transmission and distribution, etc., comprises approximately 70 per cent. of the total capital expenditure on the whole industry. Corresponding comprehensive figures for electricity undertakings in the Union are not readily available but insofar as the two largest municipal undertakings in this country having power stations of their own are concerned it may be of interest to know that capital expenditure on transmission and distribution amounts to approximately half the total capital outlay on these two undertakings taken together.

Because of the high cost of the facilities required for transmitting and delivering sup-

plies of electricity it may well happen that the choice of a site for a power station is governed just as much by considerations of distance over which electricity has to be transmitted and distributed as by the availability of fuel and water supplies for steam raising and condensing purposes. In other words, the question should always be considered whether the overall cost of producing and delivering supplies of electricity would be less (because of the saving in capital charges on transmission) by locating a power station nearer the centre of demand and remote from a site favourable to low generation costs, than such overall cost would be if the power station were to be constructed on the site which is favourable to it only.

The design and setting out of any electricity transmission and distribution system is governed mainly by the inviolable rule of "continuity of supply." To ensure that supplies to consumers shall be maintained continuously notwithstanding breakdowns of plant and equipment it is necessary to incur a considerable amount of duplication so as to make the means of satisfying the above requirement as flexible as possible. Extra high tension transmission feeders are laid in duplicate or "ring" mains are arranged so that if one feeder breaks down the other will maintain the supply. At distributing substations two transformers and their associated equipment are usually installed—one a standby to the other. The Distribution System is arranged in such a way that in the event of failure of the supply from the normal source consumers can be connected to an adjacent source. The duplication, of course, also accounts for the high capital outlay with corresponding high overheads involved in "delivering the goods" of the industry.

PART II.

3. DEVELOPMENT.

(3.1) PRESENT-DAY POSITION AND FUTURE DEVELOPMENT.

On looking through the statistics and accounts of any electricity undertaking, it will be found that the size of the undertaking, its capital expenditure, the number of consumers, sales of electricity, costs,

revenue are continuously growing notwithstanding the fact that the area within which the undertakings is licensed or authorised to supply is fixed. This, of course, is quite natural so long as industries, commerce and the population in that area continue to grow and higher standards of living, housing and other social amenities are demanded. In terms of its ultimate market electricity supply has a long way to go yet before saturation point is reached, and that point, insofar as this country is concerned, is very far from being in sight.

At the present time, however, special problems have to be faced in connection with the immediate future development of electricity undertakings. They arise as the result of the recent devastating war, the effect of which on municipal electricity undertakings in this country may be described as follows:—

- (a) Materials have become so difficult to obtain that it has been impossible to carry out repairs and maintenance on a normal basis necessary for the proper upkeep and efficient operation of existing plant. A backlog of delayed repairs and maintenance of some magnitude involving considerable expenditure awaits having to be dealt with.
- (b) By now, most undertakings would have used up whatever spare capacity may have existed in their mains and services at the outbreak of the recent war. The stage will have been reached where transformers, cables, transmission lines and distribution networks are fully loaded thus making it necessary to provide new plant and equipment not only to relieve existing services but also to cope with growing demands for additional services.
- (c) Supplies of plant and materials are far from being so freely available as they were in 1938 so that electricity undertakings will be hard put to it to maintain existing ser-

vices let alone keep pace with new development.

(3.2) COST OF PLANT AND MATERIALS.

Already the cost of electrical plant and materials, most of which still have to be imported from overseas, has risen to approximately double that prevailing immediately prior to the outbreak of World War II. Figure 2 shows that both wages paid to employees in the Engineering Industry and materials required for the manufacture of engineering plant are about double what they were before the War.

The opportunity has also been taken to depict graphically in Figure 2 the recognised formulae for the adjustment of contract prices, which it is necessary to make when variations take place in the cost of wages and materials during the execution of contracts involving the supply of plant and materials from overseas.

Not only are wages and costs of materials subject to change under present day conditions but rates of exchange, freight, insurance, import, landing and delivery charges also are liable to vary. It is usual therefore to require tenderers when tendering for plant and materials to quote figures or dates appertaining to all those factors which may affect their prices should any of the factors change after date of tender. A typical specification clause covering this requirement is given in Appendix II.

Figure 3 is of interest in showing the increase which has taken place in the prices of copper, lead, galvanised steel, wire and iron. Those who are engaged in the Electricity Supply Industry will know that most materials and many items of plant and equipment now cost even more than double what they did in 1938. (Since Figure 3 was first prepared the price of Electro-lytic copper wire has advanced from £117 to £137 per ton, and the price of lead has risen from £70 to £91 10s. 0d per ton).

When plant and materials become more readily available Electricity Undertakings will be committed to heavy capital expenditure in having to provide additional

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generating plant, mains and services and also to heavier working costs due to increases in the cost of fuel, salaries and wages, rates and taxes, etc., which are already appreciably higher than they were before the War. In the Undertaking by which the writer is employed the cost of coal, due mainly to surcharges on railage, has gone up by close on 10 per cent. and wages are already 15 per cent. higher than they were in 1938.

The capital cost of plant and materials being double the pre-War cost, Undertakings in all probability will find themselves faced with capital charges (notwithstanding slightly lower interest rates on loans) amounting to at least double those which were incurred before the War for the same amount of work. If, for example, the capital charges on the cost of an extension to the mains, or of providing a new completely equipped substation before the War amounted to £750 per annum, the same extensions in the immediate future are likely to incur additional capital charges of at least £1,500 per annum.

(3.3) FINANCIAL IMPLICATIONS OF INCREASED COSTS.

The matters referred to above raise the question as to what their financial implications are likely to be on immediate future development. Will costs continue to rise at such a rate, without corresponding increases in sales of electricity, that electricity tariffs will have to be raised? Of the Undertakings in the A.M.E.U. which one will be the first to find itself confronted with having to increase its electricity tariffs?

In considering the question of costs there are two figures to be borne in mind. One is the total cost of rendering supplies and the other is the cost per unit of electricity sold. As already indicated, a big proportion of such costs comprises overhead charges which are related mainly to the demand for supplies and estimated future demands. The other charges vary almost directly with the amount of electricity produced. It follows therefore that if sales and corresponding output can be increased the inci-

dence of increasing overhead charges will be reduced and consequently the cost per unit will either be prevented from increasing or even be reduced thereby giving a working margin as between expenditure and revenue. The latter item, on the basis of average price received per unit in most undertakings hitherto has shown a tendency to slight reduction from year to year.

In this connection a useful "yardstick" or index as to whether increasing costs are being offset by increased sales and whether the Revenue/Expenditure Account is showing satisfactory results is "the number of units sold per £1 of capital outlay on the undertaking". In the case of undertakings having their own generating stations this figure becomes subject to spasmodic decreases which coincide with accretions to capital expenditure on extensions to generating plant capacity required from time to time in advance of expected increases in total load. A more suitable guide therefore is the figure for "units sold per £1 of Capital Expenditure on Transmission and Distribution" because such expenditure is more closely related to the expansion of an undertaking and under normal circumstances is incurred regularly from year to year. It will be seen from Table No. 1 that in the case of the five largest municipal undertakings in the Union the number of units sold per £1 of Total Capital Expenditure during the year 1938 amounted to 53. As Capital Expenditure on Transmission and Distribution forms about half the total outlay on undertakings possessing their own generating stations it can be assumed that the corresponding figure when related to Transmission and Distribution amounts to approximately 105.

For the three largest municipal electricity undertakings in the Union taken together the present day number of units sold per £1 of Capital Outlay on Transmission and Distribution is a little more than 100 corresponding to which the revenue is 7/- or .84 pence per unit sold. Now it will be found that over the past 15 years both these figures have shown a steady annual increase notwithstanding appreciable annual increments of Capital Expenditure which naturally had to be incurred to keep

up with rapid development, particularly in the field of supplies for domestic purposes.

Figure 4 which relates to the Cape Town Electricity Undertaking has been prepared to illustrate what might be considered as being typical of the steady development that took place among Municipal Electricity Undertakings during the pre-War period. It shows the predominance of the domestic load in increasing the business of the Undertaking thereby affecting a consistent reduction in the average price per unit sold. Curve ABC depicts the annual progressive total capital expenditure incurred on Transmission and Distribution since 1932 corresponding to which the number of units sold per £1 of such expenditure, as indicated by curve PQ, has steadily increased also. During the period 1932 to 1940 Expenditure on Transmission and Distribution averaged £150,000 per annum but the additional units sold per £1 of such expenditure were proportionately higher thereby giving an economic return on the additional capital outlay.

The criterion as to whether the return on expenditure is economic or not depends on whether or not the additional units sold in any year (over and above the number sold during the previous year) per £1 of additional capital expenditure during that year exceeds the figure based on total units sold during the year and the aggregate capital expenditure at the end of that year. For example, the average annual increase of sales of electricity corresponding to the average amount spent on transmission and distribution, namely £150,000, amounted to approximately 21 million units, which gives a figure of 140 units per £1 of Capital as compared with 102 units based on aggregate total figures. If Capital charges are taken as 7 per cent. this shows that in respect of the fixed component of the total cost of transmission and distribution each unit of added load costs 0.12 pence as compared with an aggregate average cost of 0.165 pence per unit. In other words from the point of view of capital charges the increase in the sales of electricity has been remunerative.

Now what is the position likely to be in the future when it becomes possible to proceed with deferred extensions to mains

and services and to put in hand pre-conceived schemes to cater for the increasing requirements of existing and new consumers of electricity. Consumers, moreover, who are spreading further afield into new housing schemes, new industrial sites and into rural areas?

If it is assumed

- (1) That extensions will be made to the transmission and distribution systems in the future to the same extent as those required for development in the past,
- (2) that the capital cost of new extensions, as indicated by extension CE to curve ABC of Figure 4, will exceed the pre-War cost of corresponding work by say 67 per cent (although the increase is more likely to be nearer 100 per cent.),
- (3) that the rate of increase of total sales of electricity will be the same as the pre-War rate as indicated by extension KL to curve AK of Figure 4,

it will be found that the number of units sold per £1 of Transmission and Distribution Capital (as shown by extension QS to curve PQ of Figure 4) will recede thereby indicating that the added load is likely to be uneconomic. If the effect of additional capital expenditure on generation and of increasing fuel and labour costs, rates and taxes, etc., are also taken into account it is obvious that working and overhead costs would eventually overtake revenue and result in the charges for electricity having to be raised. The only thing that is likely to prevent such a course having to be taken would be an acceleration in sales of electricity to a higher rate of increase than that which took place during the pre-War period of expansion. This means that the number of units sold per £1 of transmission and distribution capital should continue upwards as indicated by extension QR to curve PQ of Figure 4, which result can only be brought about by the number of units sold following the line depicted by extension KM to curve AK. This

actually represents an increase of close on 10 per cent. per annum as compared with a pre-War average rate of increase of 8 per cent. per annum. If, however, capital costs work out to be nearer twice what they were before the War the rate of increase of sales of course would have to be higher than 10 per cent. per annum.

PART III.

4. DEVELOPMENT FOR INCREASED SALES.

(4.1) Need for Greater Effort towards Increasing the Use of Electricity.

Part II of this paper has attempted to show that the inflated cost of electrical plant and materials and of steadily rising costs of production and distribution are likely to cause electricity undertakings to be hard put to it to make ends meet unless those costs can be offset by considerable improvement in the sales of electricity when judged by pre-War standards. It is assumed that the raising of electricity tariffs should not be resorted to as a means of overcoming these difficulties if that course can possibly be avoided.

Because of the development of new and more efficient appliances and equipment that require less electric energy for their operation increasing the sales of electricity is not going to be so easy a matter as it has been hitherto.

Having first of all taken the requisite steps to ensure that sufficient generating plant capacity will be available and that transmission and distribution systems will have adequate copper to carry the additional load resulting from such measures Electricity Undertakings, faced with the necessity to accelerate the pre-War sales of electricity, will need to intensify all previous sales promotion efforts in which they may have engaged.

It will be the duty of those in control of such undertakings to render even better service than hitherto and to bring to the public as widely as possible information as to the many ways in which electricity can

be put to greater use, convenience and economy in the home, in commerce and industry, in institutions, and on the farm. Methods by which these objects can be attained and the scope for greater development will now be briefly dealt with.

(4.2) Propaganda and Advertising.

Although the use of electricity may be considered by some as having reached the stage where there is no longer any need to indulge in advertising and that it can now be taken for granted that everybody is 100 per cent. "electrically minded" to the extent, for instance, that they all cook or heat water by electricity in preference to any other method, the author is of the opinion that such is by no means the case yet. As mentioned earlier in this paper, electricity has to compete with several other forms of fuel and one finds that in many instances gas, oil and coal are being preferred. Unless therefore the advantages of the use of electricity are kept constantly in people's minds and before the public eye the possibility always exists that potential heavy users of electricity will be lost to other fuels, or those who could and should use more electricity are not doing so through not being told how they would benefit if they did.

Although in terms of the bare cost of the fuel it may be cheaper to use oil or coal the convenience, cleanliness and labour saving features of electricity have a definite economic value which usually more than compensates for the lower cost of other fuels. This is mentioned merely as an example of the sort of thing about which the public should be constantly told.

Not only in the domestic field but also in its commercial and industrial applications justification exists for the policy of constantly advertising the service. Electricity Undertakings should make known all the time and as conspicuously as possible the fact that they exist not only to produce and supply electricity but also to give service and advice to their customers in connection with the use of electricity. Advertising and publicity should be arranged on systematic lines on as broad a basis as possible so as to influence all classes of consumers.

The ways in which this can be done are dealt with briefly hereunder:—

- (a) **NEWSPAPER ADVERTISING.** Before the War many of the daily newspapers regularly, at least once a week, carried a special feature embracing a whole page and sometimes up to four pages, of interesting articles with accompanying advertisements describing the manifold uses of electricity. Judging by what the Cape Town daily press did in this connection even to the extent of their assigning special members of the editorial staffs to run such features, the author is of the opinion that newspapers serve a very valuable purpose and in many ways are the most effective vehicle for putting across the electrical idea. As nearly everybody is a newspaper reader it is obvious that publicity by this means, with the possible exception of the cinema, spreads over a far wider field than it does by any other means.
- (b) **MAGAZINE ADVERTISING.** The question as to whether Electricity Undertakings should use magazines for advertising depends mainly on the extent of a magazine's circulation and of the type and number of its readers. The popular monthly magazine of Electricity Supply Commission "ESCOM" already serves a very useful purpose in promoting the use of electricity particularly in the home and is therefore deserving of every encouragement and support. Its scope will no doubt be increased when normal conditions return.
- (c) **POSTERS, ELECTRIC SIGNS AND SLOGANS.** Where space exists upon or inside municipal buildings, particularly where it can be seen by large numbers of the public, the opportunity should be taken to use such space for displaying posters that extol the uses of electricity and advertise the fact that an electricity undertaking exists to give electricity consumers the service and advice that they may be seeking.

Opportunities for the display of electric signs occur on public buildings and

property but with this form of advertising it is mainly a matter of deciding whether the results likely to be achieved are worth the expenditure involved. Opportunities frequently occur for combining electrical slogans with illuminated signs that serve other public purposes.

Another effective place on which to display slogans is the exterior surfaces of the transport vehicles of electricity undertakings. The "Cook by Wire" cars, lorries and trucks of the Cape Town Municipality's and those of the Electricity Supply Commission's Electricity Undertakings, for example, are very well known all over the Cape.

- (d) **PAMPHLETS, LEAFLETS AND PUBLICITY MAGAZINES.** The use of pamphlets and leaflets affords perhaps one of the least expensive ways of advertising electricity supply, because every copy can be sent direct to consumers with their electricity accounts. Such circulars, however, should be made more striking and be got up in a more attractive manner than ordinary commercial leaflets if they are to hold the attention of the recipient.

For educational work and in order to convey to the reader more than can be said in an ordinary circular a small bulletin such as that which was issued regularly before the War by the Durban Electricity Department, whose example was followed subsequently by the Cape Town Electricity Department, has been found to be an effective publicity medium. A considerable part of the cost of such bulletins can be defrayed by the sale of advertising space to electrical dealers or contractors who may wish to advertise in the bulletin.

The possibilities of producing and distributing a calendar to consumers every year at Christmas time should not be overlooked. The North Metropolitan Electricity Supply Company in England has for a number of years distributed a calendar to every consumer, now numbering 250,000, and has been astonished by the goodwill attached to this feature.

(e) **CINEMA ADVERTISING.** Last, but by no means least, there is the pulling power of the cinema which can be very usefully exploited to publicise the electricity undertaking and the service it offers the public. As one can reckon that something like 90 per cent. of the population in every urban area visits the cinema at least once a month, it is obvious that advertising through this medium should be worthwhile. Within recent years the cinemas have introduced the animated type of advertisement or "talkie-ad," which, because of the animation and d'ologue associated therewith and of the fact that the advertisement lasts longer, is more effective than the transient advertisement slide. Here again it is a matter of deciding whether the expense of indulging in this new form of cinema advertising is worth the additional cost compared with what the more conventional slide can do.

(4.3) Showrooms.

Electricity Undertakings have an obligation—moral if not legal—to give the public they serve the best possible service. In the fullest sense of that word, service implies and embraces the education of the public in the many uses of electricity. It also involves placing at their disposal facilities for seeing and subsequently using that service which in some circumstances may be in competition with other forms of service. For large sums to be spent on generation, transmission and distribution and then to leave the development of the business to take care of itself is, to put it mildly, bad business. What better means therefore are there available to Electricity Undertakings to enable them to spread knowledge on the uses of electricity and make known to the public the service which they have to offer than the establishment of showrooms?

By this means Electricity Undertakings are enabled to exhibit and explain the operation of electrical appliances and to give impartial advice, which a consumer of electricity may desire, on all matters concerning the use of electrical equipment.

One of the great advantages of a showroom to the public lies in the fact that

consumers and prospective purchasers of electrical appliances may go there to inspect and compare the merits of different makes and types of equipment without feeling under any obligation to buy as they would do when inspecting equipment at the premises of a distributor of electrical equipment, whose main interest is that of selling the goods and the profit he makes on each sale. The Electricity Undertaking's concern is in the use and sale of electricity so that its interest in the purchase of appliances only starts after purchasers have acquired them. Electricity Undertakings also are vitally concerned in the degree of satisfaction which consumers obtain in the use of appliances and consequently have every right to engage in measures such as are offered by showrooms in making available to purchasers of appliances the advice and assistance which will cause consumers to be satisfied customers.

Although showrooms hitherto have been used mainly for the purpose of displaying electrical appliances that are used for domestic purposes, is there any reason why such facilities should not be extended to include the exhibition of electrical appliances and equipment designed for use in other spheres such as farming, commerce and industry?

With the co-operation of the electrical trade it would seem possible for the scope and usefulness of showrooms to include the permanent display of electrical equipment on a more comprehensive scale with the object of educating industrial, commercial and agricultural besides domestic consumers in the practicability and economy of electricity in their particular processes.

As an adjunct to the display of equipment showrooms should of course, have an advisory service to assist consumers in their lighting, heating and power problems.

Showrooms can also serve a most useful and economic purpose, as they have been doing in Cape Town, as depots for the payment of electricity and water accounts, rates, taxes and other municipal revenue, and by this means the availability of all kinds of electrical equipment and appliances is brought to the notice of many people who otherwise

would probably never consider using any appliances beyond the usual electric iron or kettle.

Showrooms therefore may be regarded as one of the brightest features on the commercial or selling side of the electricity supply service and to a large extent it is by the facilities which can be made available in showrooms that the public will judge that service.

It may be of interest to mention that the Cape Town Electricity Undertaking operates seven showrooms in various parts of the City and suburbs, three of which were established at the special request of the ratepayers organisations in the areas which they serve.

(4.4) Domestic Electrification.

The field in which the greatest advance has been made during the past fifteen years in promoting the business of municipal electricity undertakings is that of the domestic consumer.

This field is of greater value than that of the Industrial or of any other consumer because of its stability. The domestic load is not so subject to change with changing industrial conditions such, for example, as may be brought about by a trade depression. In these circumstances people having committed themselves to using electricity for all their domestic purposes are not likely to economise by endeavouring to reduce their electricity bills and thereby endure some of the hardships of doing without the amenities made available to them by the use of electricity. In fact it is known that many consumers have been able to dispense with the services of a servant by acquiring electrical equipment such as washing machines, floor polishers and vacuum cleaners.

Another advantage of the domestic load is its high diversity with correspondingly good load factor which results from the widely diverse habits of different sections of the community and the fact that the various types of appliances are used at different times of the day. The maximum demand of a composite domestic load therefore is usually very much less than that of the summated

maximum demands of its constituent parts. In the residential areas of Cape Town for instance it is found that taken by and large the amount of distribution transformer capacity required to supply the average domestic consumer having a total connected load of 9 kW works out to be no more than 1 to 1.5 kW.

Figure 4, which, as previously mentioned, relates to the Cape Town Electricity Undertaking may be taken as typical of the extent to which the progress of electricity undertakings has been dependent on the sales of electricity for domestic purposes. It shows that in 1932 the total sales of electricity amounted to 91 million units of which the number of units sold for domestic purposes was only 35 millions, or 38 per cent. In 1946 the latter had risen to 243 million units or 64 per cent. of a total of 381 million units sold for all purposes. That the scope for this field of service has by no means been exhausted yet will be evident from the figures which are quoted in Tables 2A and 2B.

Table 2A has been compiled by choosing at random from the records of the Cape Town Electricity Department a number of consumers several (up to 10) at a time in each case occupying domestic premises of 3, 4, 5 up to 12 rooms and sub-dividing the choice further according to the several different types of domestic electrical appliances being used. The number of consumers, or premises, so chosen amounted to 673 and an analysis was made of the amount of electricity consumed according to groups based on the amount of domestic equipment installed. This Table shows that where lighting and small appliances only are in use the average consumption of electricity amounted to 267 units per month or 3,204 units per annum. A cooking range causes the consumption to increase to 474 units per month and 5,688 per annum, and the addition of a refrigerator causes a still further increase. Finally, what may be regarded as an average "all-electric" home consumes 803 units per month or 9,636 units per annum. The most striking feature of these figures is the effect of the water-heater. It would appear that on the average this appliance is worth at least close on 300 units per month or 3,500 units per annum.

Another interesting feature is what may be regarded as the effect of a washing machine in reducing the consumption of electricity where this appliance is installed with a water-heater. A reason for this may be that washing machines involve the use of less hot water on washing days than is required where the washing is done by hand.

Table 2B, which is published along with 2A, shows that the average number of units consumed per domestic consumer had risen from 1,631 in 1931 to 4,502 in 1946. This is less than half-way towards the consumption of the average all-electric domestic premises above referred to and may be taken as indicating the scope which still exists for further development in the domestic field.

(4.5) Sale of Domestic Appliances — Hire Purchase Schemes.

In view of the successful results achieved before the War by Electricity Undertakings which engaged in the sale of domestic electrical appliances on the Hire Purchase System, it can be taken as a matter of course that this method of enabling consumers to acquire domestic appliances will be revived when these appliances become freely available again. Hire Purchase Schemes are likely to be restored to their pre-War popularity not only because by operating such schemes themselves electricity undertakings would serve their own interests in a better manner than would be the case were the selling of appliances to be left entirely to private enterprise but also because prospective purchasers would in all probability prefer to deal with an electricity undertaking knowing that the latter is mainly concerned with the performance of appliances after they have been acquired and therefore that their interests are in common.

The pre-War Hire Purchase Scheme of the Cape Town City Council was mainly responsible for popularising the use of electricity for domestic purposes, resulting in the great expansion which took place in the sales of electricity in Cape Town during the years 1932 onwards referred to above. Full particulars of this scheme and the results achieved thereunder have been presented to the

A.M.E.U. in two papers, one in 1934 and the second in 1938. (See references (8) and (9).) The Scheme had to be suspended in 1942 through lack of domestic appliances but steps have recently been taken to revive it in the near future. The basic principles of the scheme are as follows:—

- (a) Full co-operation between the Electrical Trade — Distributors and Wiring Contractors — and the Electricity Undertaking.
- (b) The Electricity Undertaking acts merely as the financial medium through which purchasers of appliances acquire appliances from Distributors—agreed arrangements being come to between the Distributors and the Electricity Undertaking with regard to Types of Appliances to be offered for Hire Purchase, Retail Prices, Discounts, Guarantees, approval of types of appliances and Hire Purchase terms.
- (c) As large a variety as possible of approved makes and models is made available so as to give purchasers the wide choice which they usually desire.
- (d) Repayment period for large appliances—not less than 36 months. Repayment period for small appliances—12 months.
- (e) The satisfactory performance of appliances is guaranteed throughout the hire purchase period. Distributors carry the Manufacturer's guarantee period (at present 12 months) and the Electricity Undertaking carries the guarantee for the remainder of the period.
- (f) Hire Purchase terms include supply, delivery and where necessary the installation of the appliance complete and ready to work in the premises in which it is to be used.
- (g) Free service and advice to purchasers in all matters pertaining to the correct and economic use of appliances.

In conjunction with the Hire Purchase Scheme and, as a further adjunct to Show-rooms, a most valuable aid towards spreading the use of electricity for domestic purposes and maintaining the goodwill of consumers is the holding of regular demonstrations in electrical cooking. At such demonstrations opportunities occur to bring to the notice of the public, and to demonstrate the use of a large variety of useful labour saving electrical appliances about which people (housewives in particular) may not be aware.

Figures 5A, 5B, 5C and 5D are attached to this paper as a matter of interest to indicate the results achieved by the Cape Town Hire Purchase Scheme during the period of its operation from 1930 to 1942. They show the number of appliances sold per month during that period and the effect of extending the hire purchase period to 36 months in causing an appreciable increase in the number of sales. Figure 5C is of special interest in showing how the sales of refrigerators varies according to the time of the year. Far more of these appliances are always sold during the summer months than at any other time.

Presupposing that it is possible to estimate the number and average total monthly cost of appliances likely to be sold over hire purchase periods of 12, 24, 36 or 48 months, Figure 6 gives a ready means of determining for estimating purposes the total amount of money that would be needed by the end of the hire purchase period (when the scheme becomes financially self-supporting in respect of sales thereafter) to inaugurate a Hire Purchase scheme.

(4.6) Water Heating.

As already indicated in paragraph 4.4. above, water heating may be regarded as one of the most lucrative loads making for increased sales of electricity. This load therefore is well worth encouraging. It also has this feature in that it is one of the few, if not the only load, which lends itself to being controlled by the supplier. By suitable well known means of remote control and relays it is possible for water heaters to be switched off during the short periods when the system peak loads occur, thereby reduc-

ing the incidence of such "peaks," of arrangements can be made for the water heating load to be transferred to the period of the day when power stations are in need of load. Generally from about 11 p.m. to 7 a.m.

In installations where supplies of hot water are made available from a central source such as in centrally heated thermal storage systems the heating of water by electricity cannot compete economically with coal or oil unless electric heating is carried out only during the "off-peak" period above referred to, thereby justifying a very low price which may be only slightly higher, if not equal to, the power station fuel cost per unit. To compete with coal costing as much as 37/6 per ton and fuel oil costing 5d. per gallon respectively, electric energy for thermal storage purposes would need to be sold at a price not exceeding ½d. per unit.

The possibility of switching off domestic water-heaters during "peak-load" periods with a view to giving some measure of relief at the power station and delaying extensions thereto and also of confining this load to the "off-peak" period has formed the subject of preliminary investigations by the Cape Town Electricity Department, the results of which, so far, go to show that:—

- (a) Of the water-heaters at present connected to the system 53 per cent. are 20 gallon cylinders, most of the others being of 30 gallon capacity.
- (b) The quantity of hot water used in the average home varies widely and does not seem to be related in any way to either the number of people or the size of the house.
- (c) One quarter to one third of total water heating consumption takes place between 7 p.m. and 12 midnight, and the lowest water heating load occurs between 3 a.m. and 6 a.m.
- (d) Only one of the 20 gallon installations of which records were taken used less than 20 gallons per day, while in the case of the 30 gallon installations



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Station	Capacity in Kilowatts	Output in Units
Coleman*	88,000	357,961,710
Chongelis*	132,000	538,012,561
Klip	428,500	2643,035,705
Ball River	90,000	131,298,133
Witbank	106,000	709,541,781
Vaal*	106,000	377,962,035

*Under extension.

Electricity Supply Commission

Head Office

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JOHANNESBURG

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consumption exceeded 30 gallons in at least one day per week, hence the bulk of present installations would appear unsuitable for "off-peak" heating. The most that could be done under existing conditions would be to switch off the water heating load during the relatively short peak periods in the morning, at midday and in the evening (say 3 two-hour periods). This procedure would result in a reduction of the system peaks without, however, any benefit being gained during the "off-peak" period of 11 p.m. to 7 a.m.

be installed in circuit with the selected water-heaters and set to control the cylinders in accordance with proposed "off-peak" intervals over a period of say 14 days after which the householders' opinions of the scheme could be studied.

One of the difficulties foreseen in changing over to this scheme of water heating control will be in getting the consumer, unless he has a water-heater of large thermal storage capacity, used to cold water, or at least to lack of hot water, in the evening, since at present the majority of consumers may be considered to be in the habit of taking baths in the evening.

- (e) If "off-peak" heating is to be made a practicable proposition satisfactory to consumers sufficient storage capacity must be provided for each consumer to meet the highest consumption in any one day. Cylinder capacities should be at least 30 gallons, as a minimum, fitted with 1,500 watt heating elements, 40 gallons fitted with 2,000 watt elements and even 70 gallons fitted with booster elements. The above heating element wattages are such as to heat the whole of the water content of the cylinder in a period of approximately 8 hours, thereby ensuring a reasonably prolonged "off-peak" load during the period 11 p.m. to 7 a.m.
- (f) The control of a load of this nature does not appear to present any insurmountable difficulties and methods enabling this to be done by splitting the system up into substation districts and arranging for the load to be switched on and off by control equipment at substations would appear to be the most suitable.
- (g) Before considering the financial aspects of an "off-peak" scheme or going into details of a control system it is felt that some experiments may profitably be carried out with the co-operation of a number of householders owning say 30 gallon and 40 gallon cylinders equipped with elements of the approximate wattage specified above. Time switches could
- (h) Any scheme for the switching on and off of water-heaters by the Electricity Undertaking must offer some inducement to consumers to install larger water-heaters than they would otherwise require if the water heating were left switched on 24 hours a day subject only to thermostatic control. Such inducement usually takes the form of a lower tariff for supplies to limited hour water-heaters, but the possibility of some form of additional inducement having to be offered also cannot be overlooked.
- (i) The greatest scope for the application of such a scheme lies in new water-heater installations particularly in new housing schemes and residential areas. It may be well worth while equipping the substations that supply such areas at the outset with apparatus for controlling the water heating or any other load (e.g. street lighting) that lends itself to this arrangement.

(4.7) Lighting.

In this field one finds a typical instance of development taking place in the production of new and more efficient appliances requiring less energy for their operation, reference to which has already been made previously in this paper. The Fluorescent lamp

and "Cold Cathode" lighting tubes have only within recent years reached the stage where this method of lighting, insofar as users are concerned, can be regarded as a more economic proposition than the conventional incandescent lamp. In commercial and industrial application fluorescent lighting is now being adopted as a matter of course. These lamps give over three times the amount of light and at least double the life for the same wattage as compared with incandescent lamps. Information just recently to hand is to the effect that, as the result of further research, means have been evolved which will still further increase both the life and light output per watt of fluorescent lamps by 50 per cent. The possibility that sales of electricity for lighting purposes may fall off as the result of this more efficient means of lighting becoming universal need not, however, unduly disturb electricity undertakings because the history of electric lighting since its inception has been a succession of developments each resulting in a more efficient lamp than its predecessor. But the amount of electricity consumed for lighting purposes has continued to increase. The reason for this is due partly to the increasing number of lighting consumers and also to the human characteristic of people preferring to avail themselves of more of an amenity if it can be got without additional cost rather than economise in the amenity itself for the sake of saving a little money.

History may therefore repeat itself in regard to fluorescent lighting but Electricity Undertakings may do well to indulge in campaigns for better and more effective lighting nevertheless.

(4.8) Industry and Commerce.

In these two spheres it can be taken for granted that electricity will be adopted in all the processes to which it can be applied for motive power, lighting and heating. Exceptions occur, however, in the use of electricity for heating purposes in some industries such as bakeries and where ventilating or air conditioning systems catering for a large space heating load are installed. In these instances one finds solid or liquid fuels being preferred because heating by

these means works out to be more economical compared with the cost of using electricity, but in some cases where "off-peak" supplies will suit the circumstances electricity may be competitive.

Mainly as the result of developments during the recent war a large field has been opened up in the application of heating methods to industrial processes involving special techniques about which a lot more has yet to be heard. Typical examples of some of these techniques are:—

- (1) The heating and drying of materials and paints by means of "infra-red" rays.
- (2) High frequency induction heating which is applied to metallic conductor materials such as steels. By this means the hardening treatment of steel and tools can be accomplished in a matter of seconds as also can the melting of metals.
- (3) High frequency di-electric heating, which, for instance, has greatly facilitated the production of plywoods and many other types of laminated boards, the dehydration of vegetables, the drying of grains, the production of refractories, etc.

The feature of these methods is that the tasks are accomplished in far less time, and are far more effective and efficient in producing the desired result than other means, and there is no dust, dirt or fumes.

Many industries have already discovered that these methods of heating can be profitably used for speeding up and improving their work. It would seem that the opportunities offered by these techniques are endless.

It is of interest to note that the cost of fuel, light and power consumed in various industries expressed as a percentage of the value added to raw materials used in the manufacture of the final product varies from as little as 0.7 per cent in some industries to no more than 12.5 per cent. in others.

(4.9) Electricity in Agriculture and Rural Supplies.

From the aspect of propaganda and educating the farming community in the more general application of electricity to farming methods the author is under the impression that much still remains to be done in this country. Perhaps this is because there has been so much preoccupation in developing the domestic load that little thought has been given to the possibilities of cultivating the agricultural load. No doubt greater attention will be paid to this field of electricity supply in the future and in due course this subject may be found to be figuring more prominently in the proceedings of the A.M.E.U.

5. CONCLUSION.

The author hopes that the objects described in the concluding paragraphs of the introduction to this paper have been attained and that those who are not directly connected with the management and operation of municipal electricity undertakings who happen to read this paper will thereby have gained a better understanding of the economic, financial, and commercial set-up of such undertakings.

It is hoped also that the paper will result in a fruitful discussion and exchange of information on the various matters that have been referred to herein.

In conclusion the author wishes to express his thanks to his chief, Mr. H. A. Eastman, City Electrical Engineer, for having been given the opportunity of writing and presenting this paper to the A.M.E.U. Acknowledgements are due also to Messrs. A. C. T. Franz and J. F. McHutchon, Assistant Chief Technical Officer and Professional Engineering Assistant respectively in the Cape Town Electricity Department for assistance in the preparation of the charts and compiling the data for the tables which are attached to this paper.

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APPENDIX I.

LEGISLATION AFFECTING THE
THE FINANCIAL OPERATIONS
OF ELECTRICITY SUPPLY
UNDERTAKINGS.

(A) GREAT BRITAIN.

Of special interest insofar as it concerns the financial policy and commercial operations of Electricity Undertakings, Legislation in the United Kingdom lays down certain guiding principles which have been followed to a large extent in corresponding legislative measures for the control of Licensed Electricity Supply Undertakings overseas. They are of such significance that the opportunity is taken here to quote them in full.

The principles to be followed in regard to the application of money in the United Kingdom are contained in Section 7 of the Electric Lighting (Clauses) Act, 1899, as amended and are as follows:—

“Where a local authority are the undertakers the following provisions shall have effect:

(1) All moneys received by the undertakers in respect of the undertaking, except (a) borrowed money, (b) money arising from the disposal of lands acquired for the purposes of the Special Order, and (c) other capital money received by them in respect of the undertaking, shall be applied by them as follows:

- (a) In payment of the working and establishment expenses and cost of maintenance of the undertaking, including all costs, expenses, penalties, and damages incurred or payable by the undertakers consequent upon any proceedings by or against the undertakers, their officers or servants, in relation to the undertaking;
- (b) In payment of the interest or dividend on any mortgages, stock or other securities granted and issued by the undertakers in

respect of money borrowed for electricity purposes;

- (c) In providing any instalments or sinking fund (a) required to be provided in respect of moneys borrowed for electricity purposes;
- (d) In payment of all other expenses of executing the Special Order not being expenses properly chargeable to capital (b);
- (e) In providing a reserve fund, if they think fit, by setting aside such money as they think reasonable, and investing the money the resulting income thereof in Government securities, or in any other security in which trustees are by law for the time being authorised to invest other than stock or securities of the undertakers, and accumulating it at compound interest until the fund so formed amounts to one-tenth of the aggregate capital expenditure on the undertaking.

The reserve fund shall be applicable to answer any deficiency at any time happening in the income of undertakers from the undertaking, or to meet any extraordinary claim or demand at any time arising against the undertakers in respect of the undertaking, and so that if that fund is at any time reduced it may thereafter be again restored to the prescribed limit, and so on as often as the reduction happens.

“The undertakers shall apply the net surplus remaining in any year and the annual proceeds of the reserve fund when amounting to the prescribed limit—

- “(a) in reduction of the charges for the supply of energy; or
- “(b) in reduction of the capital moneys borrowed for electricity purposes; or

"(c) with the consent of the Electricity Commissioners in payment of expenses chargeable to capital; or

"(d) in aid of the local rate:

provided that—

- (i) the amount which may be applied in aid of the local rate in any year shall not exceed one and a half per cent. of the outstanding debt of the undertaking; and
- (ii) After the 31st day of March, 1930, no sum shall be paid in aid of the Local Rate unless the Reserve fund amounts to more than one twentieth of the aggregate capital expenditure on the undertaking."

(B) SOUTH AFRICA.

The counterpart of legislation in the Union corresponding to the above will be found in the Electricity Act, 1922, which stipulates, in regard to the operation of the Electricity Supply Commission, comprehensive conditions relating to the financing of that body. It also lays down "That it shall be a general principle of the Commission that its undertakings shall as far as practicable, be carried on neither at a profit nor at a loss and that its charges shall be adjusted accordingly from time to time."

In regard to the setting up of a Reserve Fund the Commission is required to:

- "(1) Set aside annually a sum towards a reserve fund, which shall be utilised, when required, for the replacement of obsolete machinery or plant, and generally for the betterment of the plant owned by the Commission, or for exceptional repairs, or emergencies but not for ordinary maintenance.
- "(2) The annual amount so set aside and paid into the reserve fund (apart from interest or profits earned on investments of the fund) shall not exceed three per cent. of the aggregate amount of the Commission's unredeemed loans up to the end of the current financial year, and no such payment shall be made which would increase the sum in the fund to more than fifteen per cent. of the said aggregate amount;

Provided that when any loan repayment has been made and as a result thereof the amount in the reserve fund (apart from such interest and profits) exceeds fifteen per cent. of the aggregate of the loans still unredeemed, then such excess shall continue to be available for the purpose of sub-section (1), but shall thereafter not be taken into account in any calculation under this sub-section.

- "(3) The moneys in the reserve fund may be invested by the Commission in such securities as the Governor-General may approve and the interest and profits on such securities shall accrue to the fund, even though such accrual may cause the fund to exceed fifteen per cent. of the said aggregate amount."

APPENDIX II

TYPICAL CLAUSE EMBODIED IN CONDITIONS OF CONTRACT TO CATER FOR ADJUSTMENT OF TENDERED PRICES DUE TO SUBSEQUENT VARIATIONS IN COSTS, ETC., ON WHICH SUCH PRICES ARE BASED.

The Price(s) stated in the Form of Tender shall be based on costs ruling at the date(s) stated therein.

If by reason of any variation in the rate of exchange between the South African pound and the currency of the country of origin of goods or of any rise or fall in the cost of material, labour, transport, ordinary marine risk insurance, marine war risk insurance, customs and import duties, landing charges, dock dues, or of the cost of conforming to Acts of Parliament and with all orders, regulations and bye-laws made with statutory authority by any Government Department or by local or other Authorities above or below such costs ruling at the date of Tender, the cost to the Contractor of performing his obligations under the Contract shall be added to or deducted from the Contract Price(s) as the case may be, provided that no account shall be taken of any amount by which any cost incurred by the Contractor has been increased by the default or negligence of the Contractor.

The rates in respect of

- Currency Exchange
- Ocean Freight
- Marine Risk Insurance
- Marine War Risk Insurance
- Customs and Import Duties
- Landing Charges and Dock Dues

ruling at the date of Tender shall be those stated in the Form of Tender.

The Contractor shall immediately advise the Purchaser of any actual, or anticipated variation in cost of material and/or labour as soon as such variation is or can be ascertained, and shall submit satisfactory documentary evidence in support of his statement. The Contractor shall submit documentary evidence of the actual transport rates, landing charges, dock dues, customs and import duties paid on each and every consignment of the material delivered to the purchaser in the Terms of the Contract.

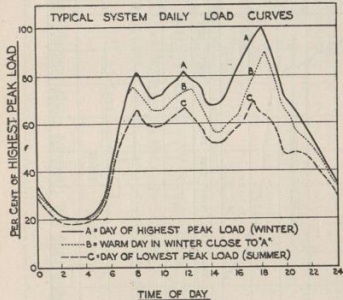


FIGURE 1A

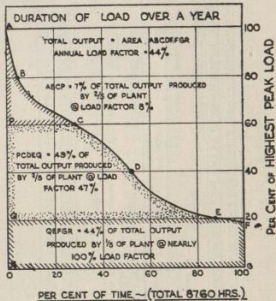


FIGURE 1B

Steel means SAFETY in line support



TUBULAR STEEL
POLES

with

TUBULAR CROSSARMS

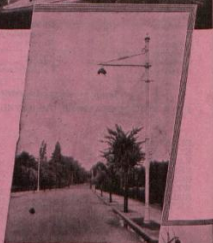
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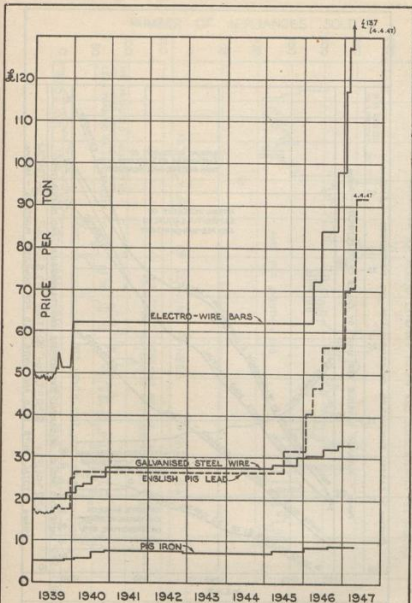
MAXIMUM STRENGTH WITH MINIMUM WEIGHT.

Tubular crossarms are stronger, in relation to their size and weight than other types of crossarms, and can be more easily attached to the poles.

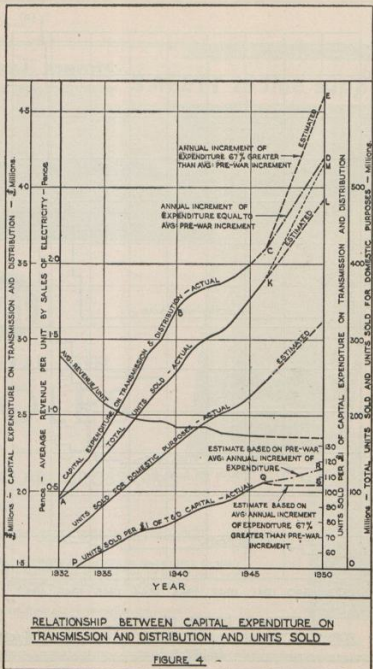
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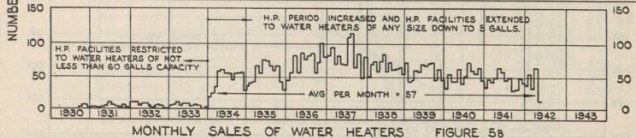
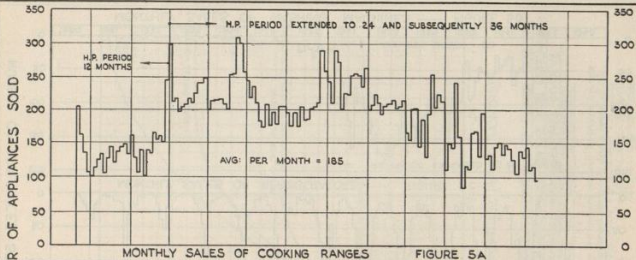
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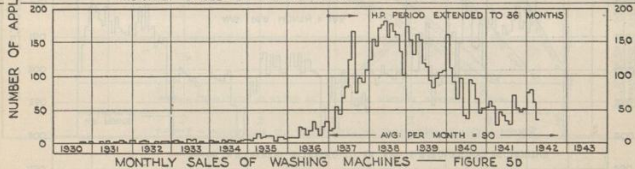
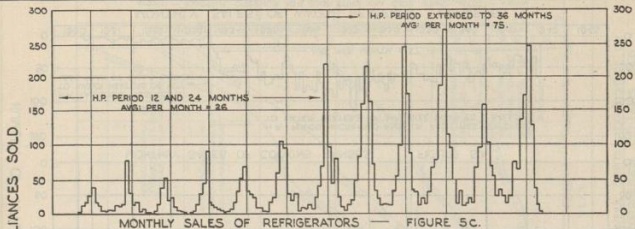


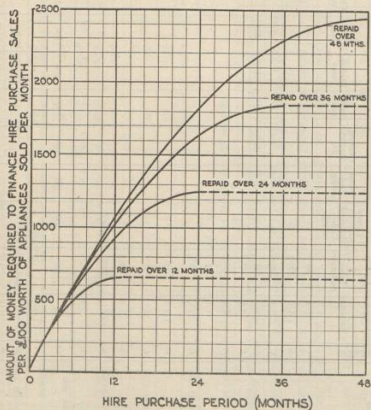


VARIATION IN PRICES OF METALS USED
FOR ELECTRICAL ENGINEERING PLANT & EQUIPMENT
FIGURE 3









CURVES FOR ASCERTAINING THE AMOUNT OF MONEY REQ'D TO FINANCE THE SALE OF APPLIANCES ON THE HIRE PURCHASE SYSTEM ASSUMING FINANCIAL ARRANGEMENTS INVOLVE NEITHER PROFIT NOR LOSS TO SELLER

Example: To determine the amount required to finance the sale of \$6,000 worth of appliances per month over a period of 36 months. After 12 months amount = $\$1,020 \times \frac{2000}{100} = \$6,120$

• 24 " " " $\$1,640 \times \frac{4000}{100} = \$98,400$

• 36 " " " $\$1,850 \times \frac{6000}{100} = \$111,000$

FIGURE 6

TABLE 1.
TABLE SHOWING COMPARISON BETWEEN THE ELECTRICITY SUPPLY INDUSTRY AND MANUFACTURING INDUSTRIES IN REGARD TO CAPITAL OUTLAY, COSTS AND REVENUE.

(Figures quoted for Capital Outlay, Costs and Revenue are in millions and all figures relate to the year 1938 or 1937/38.)

MAIN HEADING	SUB-HEADINGS	REFERENCE	BRITISH ELECTRICITY UNDERTAKINGS			SOUTH AFRICAN MANUFACTURING INDUSTRIES								
			Companies	Public Authorities	5 Largest S. African Municipal Undertakings	Metal Engineering,	Clothing Textiles Etc.	Furniture	Leatherware	Books, Printing Etc.	Chemicals	Food, Drink, Etc.	Total All Industries	
CAPITAL OUTLAY or *Value of Land, Buildings, Machinery, Tools, Plant	Generation	A	71.4	99.5	—	—	—	—	—	—	—	—	—	—
	Transmission, Distribution, etc. ...	B	151.7	230.9	—	—	—	—	—	—	—	—	—	—
	Total	AMOUNT	C	223.1	330.4	14.7	12.6	4.1	1.6	1.8	5.5	5.6	16.0	86.6
		Percent. of Revenue ...	D	593%	625%	474%	41%	36%	42%	31%	68%	47%	33%	50%
COSTS	Generation	AMOUNT	E	14.8	23.7	1.9								
		Percent. of Total Cost	F	32%	37%									
	Distribution, Management Etc.	AMOUNT		11.5	17.9	67%								
		Percent. of Total Cost	G	25%	28%									
	Capital Charges (Interest, Redemption, Depreciation, Reserve)	AMOUNT	H	119.6	22.7	0.95								
		Percent. of Total Cost	I	43%	35%	33%								
	Total Cost	AMOUNT	J	45.9	64.3	2.85								
		Percent. of Total Cost	K	100%	100%	100%								
REVENUE FROM ELECTRICITY OR *Gross Value of Product	Amount	L	37.6	52.9	3.1	30.6	11.3	3.8	5.9	8.1	12.0	47.8	172.8	
	Percentage for Comparison with Capital Outlay	M	100	100	100	100	100	100	100	100	100	100	100	
		N												
Total Number of Units Sold (Millions)		O	7,643.5	12,120.5	777.3									
Average Revenue per Unit (Pence)		P	1.18	1.0	0.96									
Units Sold per Pound of Total Capital Outlay		Q	34	37	53									
Average Revenue per Pound of Total Capital Outlay		R	3/4d.	3/2d.	4/2d.									

*This term applies to manufacturing industries and amounts quoted for these industries represent the original cost less depreciation for machinery & plant. †Includes dividends.

TABLE 2A.

AVERAGE CONSUMPTION OF ELECTRICITY BY DOMESTIC CONSUMERS IN CAPE TOWN—SHOWING VARIATION OF CONSUMPTION WITH APPLIANCES INSTALLED.

(Data relating to premises varying in size from 3 to 12 rooms chosen from Installation Records at random several (not exceeding 10) of each.)

REFER- ENCE	APPLIANCES INSTALLED — LIGHTING PLUS						UNITS PER CONSUMER		UNITS PER ROOM	
	Small Appliances	Cooking Range	Refrigerator	Water Heater	Washing Machine	Radiators	Per Month	Per Year	Per Month	Per Year
A	X	—	—	—	—	—	267	3,204	39	469
B	X	X	—	—	—	—	474	5,688	65	780
C	X	X	X	—	—	—	498	5,976	83	996
D	X	X	X	X	—	—	786	9,432	111	1,332
E	X	X	X	X	X	—	762	9,144	113	1,356
F	X	X	X	X	X	X	803	9,636	128	1,536
G	X	—	—	X	—	—	655	7,860	87	1,044
H	X	—	—	X	X	—	644	7,728	99	1,188

TABLE 2B.

ANNUAL CONSUMPTION BY ALL DOMESTIC CONSUMERS.

YEAR	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
Average Number of Consumers ...	13,490	17,245	20,565	24,014	27,718	28,490	34,648	37,777	40,708	43,749	46,616	49,755	51,513	52,119	52,935	54,061
Average Number of Rooms ...	82,073	101,137	116,995	134,816	151,795	166,443	181,360	196,912	213,119	229,593	241,142	266,597	259,774	258,195	265,163	275,312
Units Sold, Millions	22·0	35·0	48·7	63·7	81·0	97·9	114·7	132·0	144·6	161·2	177·2	190·2	203·3	211·0	223·9	243·4
Units Sold per Con- sumer ...	1,631	2,032	2,369	2,652	2,922	3,436	3,310	3,493	3,553	3,685	3,801	3,823	3,947	4,048	4,230	4,502
Units Sold per Room	268	346	416	472	534	588	632	670	679	702	735	714	783	817	844	884

THE PRESIDENT: I am sure you will wish me to express your thanks to Mr. Downie for his paper and to thank him for having condensed it to some disadvantage to himself. We thank him for the trouble he had in doing it. I think we can take a quarter of an hour in discussing this. I now leave the matter in your hands.

Mr. MILTON: Mr. President, may I congratulate Mr. Downie on a paper full of interest to both types of members of the Association. It should also prove of great value to a number of people who are not members of this Association. A difficulty very frequently encountered is that of explaining the difference between the demand rate and the unit rate and the necessity for both of these in many tariffs. Your remarks, Mr. President, must bring home once again to this Association the advisability of circulating papers to all members beforehand so that the authors need only present them to a meeting in the form of a precis.

Each paper that has been submitted during this Convention has suffered seriously from curtailment in presentation. I am sure each of the authors will admit that the value of his paper has been considerably enhanced by a discussion thereon. A paper, as presented, expresses the view of one person but, as discussed, the complete document then expresses the views of a large number and it is the views of numbers which are important.

Might I, therefore, recommend to the Executive Committee that ways and means be found for circulating papers beforehand.

The water heating load of Municipal systems was often advocated by the late Mr. Swinger and I can remember that the subject was dealt with quite fully during each of the Conventions at Cape Town. This type of load is the one which suffers most from competition from other sources of energy, and the tariffs for electricity supply must be favourable indeed, or alternatively the location of the undertaking must be peculiar in regard to availability

of household fuel, if water heating electrically can be shown to be less costly than by other means.

The unit rate in Cape Town compared with the cost of household fuel gives a more favourable comparison than would the unit rate in Johannesburg as compared with the cost of household fuel. In general the more distant the place from the coal-fields the more competitive electrical water heating becomes. I am a firm believer that the customer who adopts electrical water heating should do so knowing the full facts of the case as regards probable relative costs. Convenience and cleanliness have a monetary value which depends entirely on the individual consumer's standard. These aspects, therefore, must be argued in individual cases or for particular localities.

The difficulty of giving satisfaction to a customer using the thermal storage systems arises from ensuring that he installs a sufficient bulk capacity. A combination of thermal storage with thermostatically controlled rapid heating elements on the top of the tanks offers a solution to this difficulty and ensures the householder of at least a limited supply of hot water at short order under all circumstances. With this system thermal storage installations can be reduced in bulk with advantage in cost and positioning on the premises. It seems to me that there should also be a market for that form of water heating which combines electrical elements with other sources of heat. There are undoubtedly periods during the years and more frequent weekly periods when the demand for hot water is very much in excess of the demand for the remainder of the year or week. If an assisted form of heating, say by means of slow combustion with electrical heating units, is used, then again the size of the installation may be further reduced, the peak on the electricity supply system is reduced, and the overall cost to the consumer should also be reduced. In some cases the original charge of fuel in a combination unit may be used to furnish the bulk of water during the peak period of the day and the electrical heating unit is used to provide the basic heat for normal use and to ensure rapid response from fuel heating.

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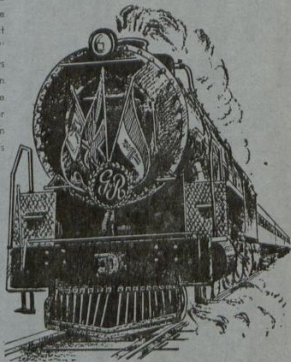
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In such cases the initial charge of fuel may be allowed to burn out completely each day without replenishment, the electrical unit taking over as the fire dies down.

Suggestions have been made to furnish an interlock between a thermostatically controlled storage system with, say, supply to the electrical range, in such a way that when the range is switched on the water heating elements are automatically disconnected. Where there are a large number of stoves and water heaters in a community or district, the effective load from these installations on the supply authority's system may be considerably reduced by the foregoing means.

It is as well to bear in mind, however, that the control of load to off-peak periods must be very guardedly carried out. The peak period on a system may occur during the early evening and there may then be a temptation to encourage day load by offering very low tariff rates. Such a proposition may result in a change of the peak period from the evening to the day time, when it may be found that the day load at the special tariffs applied thereto, is uneconomical. A similar remark may be applied to special off-peak periods for night use although the possibility of incurring maximum load during the night hours is remote except maybe in towns attracting specialised industries.

Systems which provide for the switching on and off of the consumer's load being carried out by a supply authority to avoid peaks, do not suffer from these disabilities but call for the use of special equipment which may be costly in purchase and maintenance.

Mr. SIBSON: I agree that a considerable amount of valuable data arises from discussion and I do hope that we shall be able to arrange more time for discussion in the future. This paper of Mr. Downie's is one of the most valuable papers we have had presented to this Convention. We owe a debt to Mr. Downie and to the Electricity Department of Cape Town in giving us this paper.

The general matter with which the paper is concerned is a consideration of the effect of rising prices on electricity undertakings. I don't think that anybody believes that the pound is ever going to get back to the pre-war level; it never has done in the past, and yet we go to a lot of trouble in trying to stick to an old figure which has no longer any meaning at all. Is it really reasonable for the public, or for anybody, to expect us, as supply undertakings, to maintain the pre-war position although we have nearly doubled our costs? Devaluation has, in fact, occurred, and by sticking to existing tariffs we are in effect nearly halving our revenue, and this merely because we think in terms of a penny which is now something different and should have another name. There is no other commodity sold to the public which has not increased in price since 1939 and, while I agree with Mr. Downie's recommendation that sales should be increased, I do feel that any attempt to increase sales as though it was the only solution to the present crisis will have fatal consequences. The difficulty is the Engineer's attitude to all such problems. The engineer always says "reduce tariffs if possible": it is a natural outlook; but the situation to-day is such that I think we are compelled to face facts and increase tariffs—or rather to adjust them to the real value of money.

Obviously we do not need to follow methods that apply in ordinary commerce, but at least we must not overlook the fact that our incoming stocks are double the price, measured in pounds, paid before the war. If some allowance is not made on the revenue side we shall certainly find ourselves in trouble. On the one hand we have just been agreeing that a pound is no longer a pound where salaries to Engineers are concerned, and on the other we are trying to maintain a tariff position based on the opposite assumption.

Since increased sales must mean more plant and equipment, the proportion of high priced plant to low priced equipment purchased before the war must in every undertaking increase and, so far from solving our financial problems, increased sales are likely to enhance them.

Although Mr. Downie has produced an excellent formula to guide us in this respect, the general tenor of his paper would indicate that sales, and not tariffs, should be increased, and I suggest that this should be accepted with considerable caution.

Mr. MULLER (Bloemfontein): I would also like to thank Mr. Downie for his valuable paper, it is crammed with information which will take me a little time to digest.

There is one point of view I wish to place before you and that is that by increasing our sales, unless the load factor is very materially improved, it may land us further in trouble. From that angle there are various ways and means, by tariffs, and otherwise, but our Council runs a transport and an electricity committee. I therefore have sat through the transport section as well and in the process I do gather some of their troubles in the course of time. They have transport peaks caused by business and industries all more or less congregating at the same times and I have wondered whether if we work through the Chamber of Commerce and alter the time—if my breakfast needed to be an hour later than my neighbour's, if in certain blocks of business we step our times, we could very materially reduce our demand. I think most of our peak is definitely—apart from industrial—a cooking load, and I feel that a certain amount of stepping would have the necessary effect.

Mr. FODEN: I would like to join with previous speakers in thanking Mr. Downie for one of the most interesting papers I have listened to and it is couched in language which everybody can understand.

I will confine myself to a note of warning with regard to reserves. Mr. Downie quotes the analogy between British practice and the Electricity Supply Commission, as laid down in the Act, but I do not think there is any legislation which makes it incumbent upon municipalities to keep reserve funds, and the time has now arrived

when they should be compelled to build up reserve funds. It makes a big financial difference when we can finance some of our extensions from reserve funds. I would emphasise the advisability of keeping reserve funds, even to the detriment of the relief of rates.

If you refer to Mr. Downie's curves on the prices of raw materials, you will note that the price of copper pre-war was down to £50, at the present moment it is up to £137. It is higher than the figure actually shown by Mr. Downie, which was compiled this year, so it has gone up in the last month, and it is desirable that we should have adequate reserve funds, for which no legislation exists in so far as municipalities are concerned, so that conditions which we are experiencing at the moment, i.e., high prices of materials, would not cause frequent fluctuation of tariffs.

THE PRESIDENT: I would like to refer to our experience in Durban. Just before the outbreak of war there was an accumulated surplus. The City Treasurer, in consultation with the City Electrical Engineer, suggested that the surplus amounting to over £90,000 should form a Tariff Adjustment Reserve. During the war successive deficits were met from this reserve without the need for any increases in tariffs.

Mr. Downie has taken note of the contributions and any other contributions that might be made and they will be dealt with in the record of proceedings and I want to thank Mr. Downie again on your behalf for having given us a paper which calls for congratulations, and our thanks are due to Mr. Downie for an exceptionally instructive and useful contribution to our proceedings.

There is one item in the agenda, the standardisation of voltages. The reason it was again placed on the agenda was the fact that there has been suggested in Great Britain an alteration to the standard. I don't think we can add to what we have done other than to leave it in the

hands of the executive, so can that item be discharged?

MEMBERS: Agreed.

THE PRESIDENT: There is one Committee Report to be presented by Mr. Downey—S.A. Meter Standards and Meter Testing Codes. I will ask Mr. Downey to present his Report.

SOUTH AFRICAN STANDARDS BUREAU METER TESTING CODE

Mr. DOWNEY (Springs): Mr. President gentlemen, your association is represented on the South African Bureau of Standards Committee for the Meter Testing Code.

As you already know, the first draft was circularised to all members of the association for comments. These have been considered and the draft is now approaching its final stages.

In order to expedite matters, meetings of the Committee are held as often as possible in Johannesburg, but there still remains some work to be done before it is completed.

SAFETY CODES FOR ELECTRICAL APPLIANCES.

Your Association is also represented on the Committee of the South African Standard Council for the consideration of Safety Codes for Electrical Appliances, and the drafting of specifications for the apparatus in most need of a specification. The first meeting took place in Johannesburg on the 12th December, 1946, and as a result of this meeting you were all circularised at the end of last year for the purpose of obtaining your urgent requirements in this respect. Your replies were tabulated and forwarded to the Safety Codes Standards Committee for consideration, and two Sub-Committees known as A and B were formed.

(1) A Code of Safety Standards for Electrical Appliances; and

(2) Specifications for materials and parts such as wire, switches, etc.

Consideration for the control of repairs to apparatus was given, but was finally decided to leave this in abeyance in the meanwhile, although it was felt that if municipalities would give greater authority to their Municipal Electricity Departments before granting licences to repair shops and retailers of electrical goods this would go far towards solving the problem.

Since then a considerable amount of work has been done and a number of draft specifications have been prepared and considered by the responsible committees.

THE PRESIDENT: Gentlemen, as I said earlier, most of the ground covered by that Report was covered by Mr. Ritchie's paper. May I ask that it be received with a vote of thanks to Mr. Downey?

MEMBERS: Agreed.

CONTROLS.

THE PRESIDENT: We have another item—Controls. A letter suggested that all controls should be abolished—I don't think we could go to that extent; but it is a matter for discussion.

Mr. EASTMAN: You will recall that at our Convention in Johannesburg in 1944, our Association discussed very carefully the likely post-war problems and difficulties in obtaining material which were likely to be experienced by authorities in making electricity supply available to all the various schemes of industrial development, housing development, etc., which the Government indicated it was intending to bring about. This Association then resolved that we should make representations to the Government that as we were the body which would be responsible for making those supplies available, we were a body which might reasonably be expected to be represented on Government sponsored bodies so as to be able to give them the benefit of advice as to what was wanted, when it was wanted, and so on. Largely as a result of our discussions, I think, we were invited, as an

association, to appoint a representative on the Generation and Distribution Advisory Committee, connected with the Director General of Supplies organisation, to co-ordinate the Union's war time requirements and to prepare the ground for the Union's post-war requirements in so far as electrical plant and distribution and generation plant were concerned. The Committee obtained from all electricity supply undertakings throughout the Union as well as from industrialists in the Union a schedule of their requirements for generating plant on a programme of development lasting to 1950. The schedule produced by the Committee proved very valuable in providing for "programming" the output from generating plant manufacturers' works overseas. We reported to the Electricity Convention at Bloemfontein last year and appointed a representative on that Committee again, should that Committee continue to function, but in June last year we received a letter from the Controller of Building Materials informing us that this Committee has now ceased to function. The Committee was not asked to deal with and did not deal with distribution plant requirements.

The distribution side of electricity is just as important as the generation side and I suggest that a co-ordinated plan should be evolved for the supply of distribution plant and equipment by the authorities and that we should be represented thereon. We know that although there is a critical shortage of steel, an important Government Department has in the Cape Province been able to obtain tens of thousands of poles and wants more tens of thousands of poles. The more poles that Department obtains the fewer we can get. We all realise the futility of the Government planning industrial developments, etc., unless electricity authorities are able to make supplies available to them. The organisation which it was intended should deal *inter alia* with this problem does not now function and should, in my opinion, be resuscitated.

THE PRESIDENT: Mr. Eastman has put the position very clearly. It may be that you will give your Executive authority to proceed in whatever direction it thinks best to bring under some control

the materials on the distribution side of the undertakings, particularly.

Mr. ADAMS (Oudtshoorn): We have definitely suffered undue delay. We decided on a scheme and it was approved by the Administrator and the Electricity Supply Commission in the shortest possible time that could be expected, but it was a different story when it went to the Utilities Board. Application to this Board with all the necessary information went forward on the 9th November, 1945, after volumes of correspondence with ridiculous questions, we received their approval on 10th June, 1946, a delay of six months. This meant that plant that would have been in commission for this coming winter will probably arrive, if we are lucky, in December or January.

I wish to move that, This Conference is of the opinion that the time has arrived when the control exercised by the Municipal and Public Utilities Advisory Committee over the activities of Municipal Electricity Undertakings be removed.

In so far as:

- (a) The purchase of generating plant and
- (b) Distribution plant and material are concerned;

for reason that the export market is free, that the preparation of information for the Advisory Committee is embarrassing Electricity Undertakings, and that the control is no longer of assistance as a liaison with the exporting countries in obtaining access to supplies.

Mr. J. S. Clinton, of Johannesburg, seconded this motion.

THE PRESIDENT: I would ask you to consider the point made by Mr. Eastman. I agree that Oudtshoorn has been unfortunate in not receiving a reply from the Utilities Advisory Board.

Mr. MILTON: I feel, Mr. President, that I must speak in defence of the Committee, as I know of some of its difficulties which arise from complete lack of con-

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sideration for the requirements on the part of some of the applicants who lay complaints. Surely it must be realised that the Committee would be failing in its duty if it granted each application simply because some particular authority had made the application. It is up to the authority to justify its application by submitting evidence in support thereof. I know that delays have arisen on account of lack of justification.

It might be interesting to examine each case submitted by members complaining of delays to determine whether the blame lies at the door of the Committee or not. It is no use adopting a high-handed attitude and submitting as the justification of an application that such-and-such a municipal council who have decided that they desire a permit for such-and-such work. Supporting evidence is surely essential, otherwise there would be no necessity for control.

Mr. ADAMS (Oudtshoorn): In our instance they were given all information. We even tried going so far as to make an appointment 'phone call to the chairman of the Board at an appointed time. It took us three days to get an appointment and that was a waste of money and time because obviously he either did not want to discuss the matter with us, or he did not wish to consider our requests at all.

Mr. BRADLEY: I have no complaint against the Board, except that I don't know why they should demand triplicate copies of actual reticulated areas from a local authority whose officer obviously would not ask his Council to go to great expense—even to the value of £50,000—to do a scheme if it was not essential.

Mr. CLINTON (Johannesburg): We are now considering a different matter from that which was raised by Mr. Eastman, who is desirous of appointing a body to control and allocate supplies of electrical equipment on a permit system. This the present Committee is not doing for the only commodity which is subject to control in regard to distribution and generating plant requirements is cable. The Committee functions to issue permits in principle for schemes

but does not carry the work through to a permit stage for all commodities required. Unless its powers are extended Mr. Eastman will not be met.

An official of the Committee has informed me that it serves the community in two ways—

- (a) by assisting Municipalities to obtain the materials they require, and
- (b) to allocate materials in proportion to the volume of exports permitted by Great Britain, which form of control is required by the exporting countries.

I do not agree that either of these contentions can be supported. There is, as far as I can ascertain, no restriction upon the export of goods from the United Kingdom and I believe the commercial community is better able to obtain the supplies we need. We should rely on them rather than on the Board which has no means of putting pressure on the firms in exporting countries. From my experience in work outside this territory where no control is exercised, Municipal extensions to distribution networks and generating plant are being completed in eighteen months instead of the three to four years common in the Union.

Mr. EASTMAN: We did our best to be represented on the Public Utilities Advisory Committee because we felt that our advice would be valuable to the Controller, especially as he came under a different organization from that of the Building Material Supplies.

The essential point is that there never has been any organization responsible for co-ordinating the manufacture of supplies of distribution plant.

THE PRESIDENT: You have a proposal before you. You have heard Mr. Eastman and Mr. Adams. I now leave it to the vote.

That motion is carried.

Mr. EASTMAN: Might I put a proposal to the meeting that we make representations for the resuscitation of that body or a similar body.

THE PRESIDENT: I think that would be helpful because we are not yet out of the wood. I suggest that that be left to the Executive.

MEMBERS: Agreed.

GENERAL.

OFFICIAL ORGAN OF THE A.M.E.U

I am sorry that no time was allowed at this Convention for the discussion of this matter which has arisen several times in the past and does not appear to get any nearer to a solution. The South African Electrical Review does not stand to the A.M.E.U. as the I.M.E.A. Journal does to that institution. Our Electrical Review does not appear to be suitable as the official organ of this Association as it is primarily a technical publication and, as such, it is first class. For our members, however, it is not of very much interest to re-hash our own proceedings or the papers read before our Convention.

It will be submitted that our official journal will be what we make of it. To some extent I agree with this but not in the sense that we, as members, are required to contribute to it. The really interesting information given in the I.M.E.A. Journal does not appear to be contributed by Engineers but is vastly more interesting on that account, since it gives information on legal matters, parliamentary discussions, wage awards, claims, tariffs, etc., etc.

Even if we could issue merely a quarterly bulletin, it would be advisable for the Association to brief a legal man to compile and edit it.

At the present time it is very difficult for us, engineers, to keep abreast of legislation and Provincial Council and Government debates and I feel sure our members would be prepared to subscribe to a bulletin which would fill this breach. I would like to suggest that the Executive Council inves-

tigates this matter fully and reports to members as soon as possible.

H. J. GRIPPER.

Worcester.

LICENSING OF ELECTRIC BATTERY VEHICLES.

I have submitted to previous Conventions the suggestion that the Provincial Authorities be approached with a view to allowing the weight of the battery in an electric vehicle to be deducted from the licensing weight. Once again I submit some notes on this matter for the information of members and our Executive Council and would stress particularly the fact that a vehicle, loaded with a battery must needs reduce its pay load capacity, consequently the gross load of the vehicle on the road is no more than a similar petrol vehicle which, however, has the advantage of being able to carry a greater pay-load. The increased advantages of the electric vehicle, however, will outweigh this matter in many cases. There is also the point that the vehicle may be operated over a short range with heavy loads part of the year and over a long range with lighter loads during another part of the year. This would mean that the vehicle would have to be submitted for a fresh licence whenever the change was made.

The accompanying notes have been submitted to the Page Commission and to the Municipal Association. The latter body has apparently come to the conclusion that amended provincial legislation is not warranted.

I would urge the Executive Council to request the Provincial Administrations in all Provinces to reconsider this matter in the national interests or at least to give some reasons for turning it down. It should be noted that taxation revenue will not suffer as the Electric Vehicle will not compete to any great extent with petrol vehicles but will tend to replace animal drawn traffic and hand barrows.

The recent decision of the Cape Municipal Association against the proposed amended legislation amounts to deliberate discouragement of a public amenity. The municipi-

palities themselves have no direct interest in the matter as their own vehicles pay no licence fees in any case.

(Notes as submitted to C.P. Municipal Association in January, 1946, are appended as part hereof.)

H. J. GRIPPER.

Worcester.

CONCLUSION

THE PRESIDENT: I hope we have not unduly rushed these proceedings and my first pleasant duty is to welcome His Worship, the Mayor, who is a very busy man, but who has spared us the time to come here. We are grateful to His Worship for having come along to our concluding proceedings. May I state that at this stage we usually give a few moments for visitors to give speeches.

May I, before asking any delegate to speak on those lines, say that I think we can be gratified with the results of this Conference. I think it has been a very happy one and it will be very useful to us; we have in the past and we will in the future look to the happy relationship between the engineers and councillors and I think from that point of view and from the amount of business we have transacted, we can be well satisfied with the proceedings of this Convention.

Mr. MILTON: As President of the S.A. Institute of Electrical Engineers, as representative of the Safety Precautions Committee, and as representing the Electricity Supply Commission of Johannesburg, I wish to thank you firstly for your invitation to attend the Convention in Durban and secondly, for the warm hospitality we have received in your City. Not one of your conferences which I have attended, and there are not many that I have been unfortunate enough to miss, can be considered as having been better managed, and more efficiently organised and more enjoyable than the conference about to terminate and I congratulate you on your achievement. As representing these bodies and also as a Associate of the Association, may I thank you, sir, and His Worship the Mayor, for

a most constructive and enjoyable Convention.

COUNCILLOR WEBB (Benoni): Mr. President and Your Worship the Mayor; as a representative of the consumers of Benoni, I wish also to congratulate you and your Executive for the able method in which you have conducted this Convention. There is no doubt about it, as a representative of the consumers I would like also to congratulate those responsible on the sub-committees that directly affect the consumers. To my mind that should be called the Controllers' Sub-Committee because, as you know, under their jurisdiction they seem to have brought everything under control.

There is just one matter I have felt that I would like to touch on and that is I know Councillors come from far afield with great guns full of steam to oppose you on the regulations, on profits and the relief of rates, but there I noted you tactfully withdrew discussion, you weathered the storm but you were not quite satisfied and you rightly invited us for a trip round the ocean and I don't know what your intentions were. However, we all weathered that storm!

Now, I think you will agree when I wish to thank the Mayor and the Mayoress for entertaining the ladies while we have been busy at our deliberations.

Mr. HANLON (Institute of Certificated Engineers): Mr. President, Mr. Mayor, and gentlemen: representing the Institute of Certificated Engineers, I am very pleased indeed that our wishes that this Convention should be a most successful one have been fully realised, and I am glad to couple my remarks with previous speakers that it has certainly been a most enjoyable Convention to me personally. I have enjoyed every minute of it; the papers have been excellent and a very worthy contribution to such a Convention. I am quite sure this Convention will go down in history so far as municipal undertakings are concerned.

The social activities have also been very enjoyable and I am very pleased indeed to join with the others in their complimentary remarks to you.

COUNCILLOR VAN JAARVELD: For my part, I came down to increase my knowledge. We want to help our engineers and I am going to Boksburg again to help the Council in this respect. We thank everybody for the glorious time you have given us here and we will carry sweet memories of Durban.

COUNCILLOR JAFFRAY (Salisbury): I would like to say how much I have enjoyed this Convention and to congratulate the Executive on the very able way in which the proceedings have been organised. I would like to thank the City Council of Durban for the hospitality to the delegates and finally I want to congratulate the delegates for reaching this last day of the Convention looking as fresh as they do—generally they look a bit worn!

COUNCILLOR LADEN (East London): Mr. President, Mr. Mayor, Mrs. Maytom and gentlemen: Now that this conference has drawn to a close, I would like to thank the Corporation of Durban for the wonderful manner in which they have entertained us. Durban is a glorious town, but I don't think you will oppose any publicity about your town. This is the second time I have visited your town and delegates will go away thinking that they have come to a very fine town and they can go back to their municipalities with big ideas. As you know, you are coming to the City of South Africa—East London—next year and we hope we will be able to entertain you as royally as Durban has done. I would like to say "au revoir" and "tot siens" and "Thank you, Durban."

COUNCILLOR LIDDELL (Bulawayo): On behalf of the City of Bulawayo, I wish to offer you my deep appreciation for the privilege of attending the Convention.

Unfortunately, much of the discussion which takes place at a Convention such as this is not, in so far as regulations and legislation are concerned, applicable to Southern Rhodesia, but, nevertheless, that fact has not diminished our interest in the smallest degree in your difficulties, and the decisions made to overcome them. The relative economics of Electrical Undertakings

are no different in the Union of South Africa than in Rhodesia, and because of that fact, we have gleaned much useful knowledge and at the same time perceive the road along which you are travelling. It will be our duty as associate members to carry back to our various municipalities in Rhodesia the various improvements you make, and the progressive decisions arrived at during this Convention, so that as we in Rhodesia progress that progress may be on common lines.

I want to convey to the Mayor and Mayoress of Durban our deep appreciation of the many kindnesses shown to us during our stay. We have thoroughly enjoyed it, and I do feel that Rhodesia as a friendly neighbouring State will continue to show an increasing interest and desire to be represented at future Electricity Conventions.

Mr. THERON (Krugersdorp): I would like to express my thanks for the hospitality shown and the information gained.

Mr. EASTMAN: Mr. Mayor, I cannot add anything to what has been said in thanking the Durban Corporation for the enjoyable and interesting time which we have spent in Durban; those expressions of appreciation have already been made adequately. We can merely endorse them, but there is in the background of a Convention of this kind a tremendous amount of work involved which devolves upon a number of people who at a time like this are liable to be forgotten or disregarded. I feel sure that is the last thing we would like to happen. We have come in contact with only two of your staff, sir—Mr. Simpson and Mr. Atkin—and, therefore, I can refer only to them by name, but they must be representative of a large number of your assistants who have made our stay in this City so pleasant by arranging for all our needs, our accommodation and our reservations on trains and other means of transport. Everything has been done so as to place us at a minimum of inconvenience and this has contributed so much to the success of the conference.

THE PRESIDENT: I understand this will be the last Convention which Mr.

Frank Joubert will attend in his official capacity. I hope it will not be the last Convention he will attend in his personal capacity, and I would express the high regard we hold for him and our regret that through the effluxion of time it is the last Convention he will attend as Chief Inspector of Factories.

Mr. JOUBERT: As the official representative of the Factories Section of the Labour Department, I would like to thank you very much for your invitation to this Convention and I would like to congratulate you and your Executive on the success of the Convention—there is no doubt about the success at all. And if at any future Convention I may attend as a private citizen I shall be only too pleased to attend.

And, Mr. Mayor, I would like to thank you and the City Councillors, as a guest for your entertainment and hospitality here; it has been very pleasant indeed in between the hard labours of the Convention.

Mr. SAUNDERS (B.I.C.): On behalf of the commercial firms I do wish to extend our thanks to the Mayor and you, Sir, for the kind invitation to this Convention and to the Durban Corporation for your kind hospitality. We have enjoyed the various lectures very much indeed and also the social activities, and I am sure we shall return to our homes with very happy memories of Durban.

Mr. CLUTTERBUCK: On behalf of the Electrical Wiremen's Registration Board, we have to thank you for your invitation and to express our appreciation of the social arrangements made.

Mr. MULLINS (Electrical Control Board): I wish to associate myself with those remarks.

COUNCILLOR BAXTER (Kimberley): Mr. President, I wish to thank the Durban City Council for the arrangements made, and to congratulate you on the way you have handled these proceedings and the work done by your Committee. Each Congress seems to vie with the last to do something different. We move from here to East London and they

intend to surpass what has been done in Durban—by the time you meet us in Kimberley, the standard will be very high!

HIS WORSHIP, THE MAYOR: Mr. President, Madam, Gentlemen: I want to thank you, first of all, Mr. President, for the little thought that you evinced in suggesting that I should be present at the valedictions that I have just had the opportunity of listening to. It was nice to be here at the opening and very nice to realise that the hopes that I expressed at that time appear to have borne fruit.

It would appear from what I have listened to since my presence here this morning that not only has it been a very successful conference, but undoubtedly it has been a very enjoyable one. That will be the reward of the City Council, a fact which I will make known to them, that what little we have been able to do for you was so much appreciated and that in turn will imbue them with a desire to suggest to you "Will ye no come back agin?" And I hope that we will in due course have that pleasure, but I know that this Convention will have to go round, so it might be in 50 years!

I heard that even East London praised our city and it is suggested that they will certainly do their utmost to go one better and then Kimberley anticipates going one better still, and, probably what the Royal Family witnessed—diamonds—will be lavished on you. However, it is a little thought for Kimberley Municipality or de Beers, whichever is the greater.

You seem to have had the usual matters cropping up and controllers have been very much to the fore and some people like them and some people don't. I think actually of course, there is an inherent dislike of control of any kind. One does not like to be controlled, even in one's family life. How much more irksome does it become when a body of citizens who are specialists in a certain job cannot get on with that job?

Then I did hear that the suggestion of a little profit towards the alleviation of

rates was a debatable point; it, of course, is quite reasonable that the official in charge of a particular section of a municipality's activities would rather see any profits that are made go back into his concern so as to build it up, and quite rightly so. There can be a danger, of course, of taking too much away, but you officials realise the position that we poor City Councillors are put to when we have to raise money to run a city and the way to run it is an increase in rates and it is not easy, so if we can take one or two per cent. from the successful undertaking I think that undertaking should be only too pleased to supply it to put us out of our predicament.

I can give you a figure that would rather surprise most of you. We are very fortunate in this city in owning a telephone department; it does not provide the whole of our city with telephones, but about one-third of it in area, but certainly it is the most populated area. We are going to take this year, helping to relieve our rates, over £100,000 of profits on the Telephone Department.

I think that there is one thing that I can say, the result of conferences like this, particularly when they are held in Durban, is to let all the other people in South Africa know that there is no truth in the canard that Natal is still outside the Union. That is a little jest, of course. We are very much in the Union. No doubt it took a little time to be converted, and I am happy to think that Conferences such as this are helpful in dissipating that suggestion that we are not.

I think that I missed a great deal by not being present during your discussions, but I console myself with the thought that you, sir, are in charge of the proceedings and at least the City Council would be supplied with a very intelligent resume at least of all that was undertaken during your conference, because we have a great appreciation of the gentleman whom you appointed President, and so all the matters of real importance, which means, I think, everything you discussed will be reported to us in full detail and in that way I excuse myself for not having attended, Mr. Presi-

dent, and I wish your Association all the very best of luck in its future conferences and in its desire to do the best that it can for the various cities that it serves.

THE PRESIDENT: Mr. Mayor, I thank you for your attendance this morning and for your words of wisdom to the visiting Councillors who will, no doubt, take them back to their respective Councils.

May I thank everybody for the extreme courtesy to the Chair which has made my chairmanship very pleasant—"au revoir"—"tot siens."

The Congress then closed at 1.15 p.m.

SOCIAL FUNCTIONS

These Proceedings introduce a new note by making reference to the social functions which were held in conjunction with the Convention.

The cocktail party at the Durban Country Club, on Tuesday, 6th May, was attended by about 250 delegates and visitors. The Mayor and Mayoress of Durban (Councillor and Mrs. Rupert Ellis Brown) received the guests in their usual genial manner and a most cordial atmosphere prevailed. Flash-light photos taken of some of the delegates and their wives had a mixed reception, the "victims" claiming that they did not do justice while others thought them flattering. Municipal transport was provided but it is feared that some of the delegates missed the last bus home.

On the afternoon of Wednesday, 7th May, the Mayoress entertained about 60 ladies to a motor tour of the city and to tea on the Bluff Marine Drive. It is not true that there was more talking on this occasion than was indulged in by the men during the whole of the Convention.

That evening over 200 delegates and visitors were entertained to the cinema by the City Council, some at the Playhouse and others at the Metro. At the latter house the audience was entertained by Tommy McLennan on the organ and particularly by his parody on "Bless 'Em All." This ran:

You know there are
 Engineers now in our town,
 Come from their homes far away,
 Pooling their knowledge
 Of post-war ideas,
 Planned for the world of to-day.

They say that these men
 Are all jolly good chaps,
 President Kinsman is, too,
 And Mayor Ellis Brown
 Who will show them around,
 Needs no introduction to you.

Bless them all,
 Bless them all,
 The long and the short
 And the tall,
 Bless all these men
 Who are here to succeed
 Solving the problems
 Of present-day needs.

And the volts and the watts
 And the ohms,
 That streamline the work in our homes,
 All credit is due
 And so we say to you,
 Let's give them a cheer
 Bless 'em all!

On Thursday afternoon, 8th May, by the courtesy of the South African Railways and Harbours Administration, about 150 delegates and visitors were taken on a tour of the harbour works in one of the Government tugs. Captain Jarvis, the Port Captain, accompanied the party on the tour which covered the whole of the harbour and included two short "voyages" out to sea. There were no "casualties" and the tour was thoroughly enjoyed by all. So much so that two or three of the more hardy souls sought — and obtained — the permission of Captain Jarvis to repeat the trip out to sea the following morning—this time at 6 a.m. and in a small pilot tender!

A very happy spirit pervaded all the social functions and the thanks of the association are due to the Mayor, Mayoress and City Councillors of Durban and to the South African Railways and Harbours Administration and Captain Jarvis for all the hospitality and kindness.

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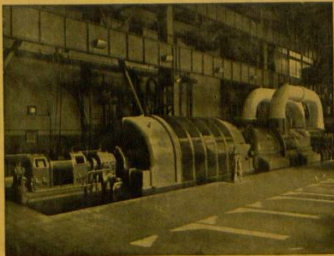
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