PROCEEDINGS

of the

Eighth Convention

of the

Association of Municipal Electrical Engineers

(Union of South Africa and Rhodesia).

HELD AT EAST LONDON,

From Monday, September 12th to Friday, September 16th,

1927.

Price Five Shillings.

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ASSOCIATION OF

Municipal Electrical Engineers

(Union of South Africa and Rhodesia).

Founded 1915.

EXECUTIVE COUNCIL, 1927.

President:

J. MORDY LAMBE (East London).

Vice-President:

R. MACAULAY (Bloemfontein).

Past Presidents:

JOHN ROBERTS (Durban).
B. SANKEY (Johannesburg).

Other Members:

L. F. BICKELL (Port Elizabeth).
T. MILLAR (Harrismith).
E. POOLE (Durban).
R. A. YOUNG (Bulawayo).

Hon. Secretary and Treasurer:

PRESCOTT ADKINS, Electricity and Tramways Dept., East London.

RULES AND CONSTITUTION

of the

ASSOCIATION OF
Municipal Electrical Engineers

(UNION OF SOUTH AFRICA AND RHODESIA).

As submitted and passed by the full Meeting of the Association held at the Town Hall, Johannesburg, on Friday, 19th November, 1915, with amendments as submitted and passed at the Durban, Port Elizabeth, Pretoria and Johannesburg Conventions.

---

1. TITLE.—The Association shall be called the Association of Municipal Electrical Engineers (Union of South Africa and Rhodesia).

2. OBJECTS.—The objects of the Association are to promote the interests of Municipal electric undertakings.

3. HONORARY MEMBERS shall be distinguished persons who are or who have been intimately connected with Municipal electrical undertakings, and who the Association especially desires to honour for exceptionally important services in connection therewith.

4. MEMBERS.—Members of the Association shall be Chief Electrical Engineers engaged on the permanent staff of an electric supply or tramway undertaking owned by a local authority in the Union of South Africa or Rhodesia, and any duly qualified assistants whom they may recommend for election. Should any member cease to hold his qualification as above his membership shall cease.

5. ASSOCIATE MEMBERS.—Any member resigning under Rule 4 shall be entitled to apply for election as an associate member. Associate members shall not be entitled to vote on matters affecting the conduct and management of the Association, nor to hold office, but otherwise shall be accorded the privileges of ordinary membership.

6. CONTRIBUTIONS.—The subscription for members shall be £2 2s. for Chief Engineers and their Chief Assistants and £1 1s. for other members and associate members. Any member elected within six months after the Annual Congress shall pay the full subscription for the year, and if elected six months after the Congress shall pay half subscription.

7. OFFICERS.—The Officers of the Association shall consist of President, Vice-President, Hon. Secretary and Hon. Treasurer.

8. COUNCIL.—The Council shall consist of the President, Vice-President, the two immediate Past Presidents and four members to be elected at the Annual Congress.

9. ELECTION OF OFFICERS AND COUNCIL.—Officers and Members of Council shall be elected by nomination and ballot at the Annual Congress, and shall hold office until the next Congress. In the event of a vacancy occurring during the year the remaining members shall have power to appoint a member to fill the vacancy.

10. All those who attended the Congress in Johannesburg in November, 1915, shall *ipso facto* be members of the Association.

11. ELECTION OF FUTURE MEMBERS.—The election of future members of the Association shall be vested in the Council and applications for membership must be made on the prescribed form.

12. 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.

13. The voting of the Congress shall be restricted to the members present at such Congress.

14. The financial year of the Association shall terminate on the first day of the Annual Congress, at which date all subscriptions for the ensuing year become due, and no member will be allowed to vote whose subscription is in arrear.

15. PRESIDENT.—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.

16. In the absence of the President, it shall be the duty of the Vice-President to preside at the meeting 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.

17. The local Press of the town in which the Congress is held shall be notified of the time and date of the reading of all papers, but 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.

18. The Honorary Secretary and the Honorary Treasurer shall present a yearly report on the state of the Association, which shall be read at the Annual Congress.

19. The Honorary Treasurer shall be responsible for the funds of the Association, and shall present a Balance Sheet at the Annual Congress.

Association of Municipal Electrical Engineers.

(Union of South Africa and Rhodesia).

Members and Councillor Delegates at East London (8th) Convention. September 12th to 16th, 1927.

Top Row.—Cr. A. R. Davison (Roodepoort-Maraisburg), J. Younger (Vryheid), (————), W. H. Blatchford (Greytown), W. G. Wearne (Mayor, Roodepoort-Maraisburg), T. Sutcliffe (Benoni), H. L. Groom (Roodepoort-Maraisburg), S. V. R. Lewis (Aliwal North), Cr. T. Gibb (Alice), H. H. Hall (Mayor, Dordrecht), Cr. M. Freeman (Johannesburg).

Second Row.—A. H. E. Rogers (Technical College, East London), Cr. H. Rugg (Maraisburg-Roodepoort), W. D. Ross (Potchefstroom), P. H. Newcombe (Indwe), L. Ralston (Dundee), H. A. Morris (Kimberley), T. A. Siebert (Uitenhage), F. C. D. Mann (Worcester), J. G. Clark (Fort Beaufort), A. J. Clemo (Alice), J. J. Wud (Adelaide), T. Jagger (Ladysmith).

Third Row.—W. M. Mail (Kokstad), Cr. J. W. Bryson (King William's Town), J. Vowles (King William's Town), R. A. Young (Bulawayo, Member of Council), J. T. Smith (Durban), L. B. Sparks (Pietersburg), I. J. Nicholas (Umtata), G. C. Brown (Middelburg), C. H. V. Baskerville (Salisbury), Cr. C. Boardman (Barkly East), G. H. Simpson (Dordrecht), W. F. Bower (Barkly East), R. D. Coulthard (Oudtshoorn), T. P. Ashley (Queenstown), H. A. Prevost (Somerset East).

Fourth Row.—F. Stevens (Public Works Department, Pretoria), C. Westaway (East London), Cr. H. H. Hart (Grahamstown), A. S. Chalmers (George), Cr. T. A. Scott Warren (Kokstad), Cr. A. C. van Heerden (Harrismith), J. Iverach (Grahamstown), Cr. J. D. Low (Capetown), Cr. L. O. B. Sparks (Cradock), S. W. Dadswell (Cradock), R. Macaulay (Bloemfontein, Vice-President), Cr. D. A. Thomson (Bloemfontein), Cr. J. Paton (Kroonstad), R. A. Stoker (Kroonstad).

Bottom Row.—Cr. G. W. Prior (East London), Cr. J. F. Fourie (Pretoria), Cr. R. L. Weir (Port Elizabeth), A. M. Jacobs (Elect. Commission), T. Millar (Harrismith, Member of Council), B. Sankey (Johannesburg Past President), J. Mordy Lambe (East London (President), G. H. Swingler (Capetown), E. Poole (Durban, Member of Council), T. C. Woolley Dod (Pretoria), F. Mullins (Chief Inspector of Machinery), Cr. A. L. Clark (Durban), R. W. Fletcher (Krugersdorp).

EIGHTH CONVENTION
EAST LONDON.

PROGRAMME OF PROCEEDINGS.

Monday, 12th September, 1927.

9.0 a.m.—Council Meeting in Council Chamber, City Hall Buildings.

10.0 a.m.—Registration, issue of Programmes, etc., Trinity Church Hall, Oxford Street.

10.30 a.m.—Opening of Convention in Trinity Church Hall by His Worship the Mayor of East London (Councillor James Stewart, Esq.)

10.45 a.m.—Annual General Meeting.
(Municipal Delegates may attend this Meeting, but only Members are entitled to vote).

Agenda.

1. Annual Report of Honorary Secretary and Treasurer.
2. Election of President.
3. Valedictory Address by the Retiring President.
4. Election of Honorary Secretary and Treasurer and Officers.

   The following are the retiring Officers and Council, who are eligible for re-election by nomination and ballot to hold office until the next Convention.

   President: B. Sankey (Johannesburg).

   Vice-President: J. Mordy Lambe (East London).

   Past-Presidents: John Roberts (Durban), G. H. Swingler (Cape Town).

   Other Members: L. F. Bickell (Port Elizabeth), T. C. Wolley Dod (Pretoria), T. Millar (Harrismith), E. Poole (Durban).

   Honorary Secretary and Treasurer: R. G. Tresise (Johannesburg).
5. Place of Meeting of next Convention, 1928.

6. Presidential Address.

2.30 p.m.—Discussion on the Presidential Address.

Tuesday, 13th September, 1927.

10.0 a.m.—Paper by Mr. A. M. Albertyn (Cape Town) on "Electricity Meters."

Discussion on Mr. Albertyn's paper.

1.15 p.m.—Civic Luncheon, Deal's Central Hotel.

2.45 p.m.—Visit to Messrs. Wilson & Co.'s Sweet Factory. Members and Delegates will be conveyed to Messrs. Wilson & Co.'s Factory by Special 'Buses leaving Deal's Hotel at the conclusion of the Luncheon.

Wednesday, 14th September, 1927.

10.0 a.m.—Paper by Mr. Mortimer Mail (Kokstad) on 'Running Conditions of a Small Steam Plant with batteries giving a 24 hours' supply."

Discussion on Mr. Mortimer Mail's paper.

2.30 p.m.—Official Photograph. City Hall.

3.0 p.m.—Visit to Municipal Power Station.

Thursday, 15th September, 1927.

10.0 a.m.—Paper by Mr. I. J. Nicholas (Umtata) on "Distribution Problems in Small Towns."

Discussion on Mr. Nicholas' paper.

2.30 p.m.—Miscellaneous. Conclusion of business.

7.45 p.m.—Trip over the Bar on Union-Castle Co.'s Steam Launch. Special 'Buses will leave the Beach, Marine and Windsor Hotels, starting from the Beach Hotel at 7.45 p.m.

Friday, 16th September, 1927.

9.0 a.m.—Special train will leave East London for King William's Town, arriving at 11.30 o'clock.

1.15 p.m.—Civic Luncheon by His Worship the Mayor and Councillors of King Wiliam's Town.

3.30 p.m.—Special train will leave King William's Town, arriving at East London 5.30. Special 'Buses will meet train.

PROCEEDINGS

OF THE

EIGHTH CONVENTION.

MONDAY, 12th SEPTEMBER, 1927.

INTRODUCTORY.

The Eighth Annual Convention of the Association of Municipal Electrical Engineers (Union of South Africa and Rhodesia) was opened in the Trinity Church Hall, Oxford Street, East London, at 10.30 a.m. on Monday, 12th September, 1927.

The retiring President (Mr. B. Sankey, Johannesburg) was in the chair. There were also present His Worship the Mayor of East London, J. Stewart, Esq., and the undermentioned:—

Members.—T. P. Ashley (Queenstown), G. C. Brown (Middelburg, Transvaal), C. H. Baskerville (Salisbury), W. F. Bower (Barkly East), W. F. Blatchford (Greytown), A. S. Chalmers (George), J. G. Clark (Fort Beaufort), A. J. Clemo (Alice), R. D. Coulthard (Oudtshoorn), P. W. Dadswell (Cradock), T. C. Wolley Dod (Pretoria), R. W. Fletcher (Krugersdorp), H. L. Groom (Roodepoort-Maraisburg), J. Iverach (Grahamstown), T. Jagger (Ladysmith), J. Mordy Lambe (East London), S. Lewis (Aliwal North), R. Macaulay (Bloemfontein), W. M. Mail (Kokstad), F. C. D. Mann (Worcester), M. McDonough (Bethlehem), T. Millar (Harrismith), H. A. Morris (Kimberley), P. H. Newcombe (Indwe), I. J. Nicholas (Umtata), E. Poole (Durban), H. A. Prevost (Somerset East), L. Ralston (Dundee), W. D. Ross (Potchefstroom), B. Sankey (Johannesburg), T. F. Siebert (Uitenhage), H. G. Simpson (Dordrecht), T. J. Smith (Durban), L. B. Sparks (Pietersburg), R. A. Stoker (Kroonstad), T. Sutcliffe (Benoni), G. H. Swingler (Capetown), J. Vowles (King William's Town), J. Wud (Adelaide), R. A. Young (Bulawayo), J. Younger (Vryheid).

Associate Members.—Nil.

Delegates.—C. Boardman (Town Clerk, Barkly East), Councillors J. W. Bryson (King William's Town), A. L. Clark (Durban), A. R. Davidson

(Roodepoort-Maraisburg), M. Freeman (Johannesburg), J. T. Fourie (Pretoria), T. Gibb (Alice), S. H. Hall (Dordrecht), H. H. Hart (Grahamstown), J. D. Low (Capetown), J. Paton (Kroonstad), G. W. Prior (East London), H. Rugg (Roodepoort-Maraisburg), D. A. Solomon (Potchefstroom), L. Sparks (Cradock), R. A. Thomson (Bloemfontein), A. van Heerden (Harrismith), F. Scott Warren (Kokstad), W. G. Wearne (Roodepoort-Maraisburg), R. L. Weir (Port Elizabeth).

Visitors.—A. M. Jacobs (Electricity Supply Commission, Johannesburg), C. Mullins (Chief Inspector of Machinery, Johannesburg), F. C. Stephens (Public Works Department, Pretoria), C. Westaway (East London).

Hon. Secretary and Treasurer.—R. G. Tresise (Johannesburg).

CIVIC WELCOME.

His Worship the Mayor of East London (Councillor James Stewart): Mr. President and Gentlemen, I can assure you that it affords me a good deal of pleasure to have the privilege of opening this, the Eighth Annual Convention of the South African Association of Municipal Electrical Engineers. A mayor is called upon, during his term of office, to open conferences and congresses of all kinds. This year, I think, has been a record for East London in so far as conferences are concerned. It has been said that East London is "off the map," but East London is certainly not "off the map" in regard to congresses. I think East London is getting a name as being a very fine centre at which to hold congresses—possibly our beautiful beach is a great attraction.

I understand that you have present to-day the largest number of members that you have ever had attending any of your Conventions. This is a very pleasing feature indeed. I understand also that those municipalities who have electrical undertakings are better represented by councillor delegates at this Congress than at any previous one, and I feel that their presence cannot be other than beneficial to the municipalities they represent. It is in my opinion only right and proper that a municipality which has an electricity supply undertaking should be represented by one or more of its coun-

cillors at all Congresses like this. We are very fortunate in having as chairman of our Electricity Committee here, Mr. George Prior; he is in the mechanical world and always looks forward to these Congresses. It is very pleasing indeed that our City Electrical Engineer, Mr. Mordy Lambe, has been selected as your new President. Mr. Lambe, who holds the esteem and confidence of every citizen of this city, has had to work under many difficulties. Money is very scarce in East London, but with the few "bob" he has had at his disposal, Mr. Lambe has performed wonders. It is to be regretted that we could not welcome you in our City Hall, but—I should say fortunately—we are holding there at the present moment an Electrical Exhibition supported by the various electrical firms throughout the Union. It is very pleasing indeed to think that these firms have come along with their exhibits, because it is going to do much indeed to encourage our inhabitants to go in for electricity for cooking and other domestic purposes. We in East London are very backward to-day in this respect, and we hope that when the exhibition opens this evening, those exhibiting will take plenty of orders. There is no doubt that electricity has become a very big factor in the everyday life of this world. The other day a man was bemoaning the smallness of the number of cart licences—motor vehicles having taken their place. The same thing applies to almost everything, including electricity. In this city I think there are only two users of power who do not use electrical power, showing that people realise the necessity for and the benefits resulting from the use of electricity.

It is not my intention to make a long speech, but on behalf of the city desire to extend to you all a very hearty welcome, and hope and trust that your stay in our midst will be a pleasant one, that when you leave you will regret leaving, and that you will become advertising mediums, advocating to all your up-country friends that they should come to East London for their holidays. We claim, and we think rightly so, that we have the finest natural beach in South Africa, and our City Electrical Engineer has done a tremendous lot to make the beach as popular as it is by reason of its beautiful and effective lighting. Whether we have fine weather or not, we will show you a park illuminated

in a way that even Durban cannot show. It is indeed a pleasure to me to see you here, and again, on behalf of the city, I extend to you all a very hearty welcome and hope that the results of the Conference will be of tremendous value to the Association to which you belong, and to the Municipal Councils which you represent.

The PRESIDENT: Mr. Mayor. On behalf of the Association of Municipal Electrical Engineers, and as its President whose term of office is now rapidly drawing to a close, it is my pleasing duty to thank you most heartily for the wonderful reception which you have given us in East London. I shall very shortly have to hand over the duties of President to a worthy successor, your Electrical Engineer, Mr. Mordy Lambe, whom I have had the pleasure of knowing as a colleague and neighbour ever since I first came to this country. Whilst the weather has not been too kind to us since we arrived in your city, it was an agreeable surprise to us to find the facilities which you have placed at our disposal for the holding of our Convention. Our numbers now have grown to such an extent that it requires quite a large amount of accommodation to hold our Convention, and it is with pleasure that we notice you have fixed us up with a convenient and commodious meeting place, and that you are providing us with tickets for tram and bus transport and bathing facilities, which one might almost say convey the freedom of the City of East London, and I have not yet had time to investigate what else is included. We find that you are organising a very interesting Electrical Exhibition, which will be of interest not only to the inhabitants of East London, but to all of us taking part in the Convention, and I should like, Mr. Mayor, in conveying our thanks to you for the facilities provided, to mention the work which we can see that Mr. Mordy Lambe and his staff have put in in organising this Convention and exhibition. I know from experience what the work of organising a Convention of this kind means to the engineer and the authorities of the town. I can see that your organisation is a very complete one, and we wish to express our appreciation to Mr. Mordy Lambe and his staff, through you, for what has been done for us.

We also notice that the various firms of local electrical contractors and others have co-operated

with him, and the result is the Electrical Exhibition in your City Hall, which we look forward to with keen interest. Before the week is out we hope to have some opportunity of seeing some of the amenities of East London as a health and pleasure resort. This is new territory to many of us, but perhaps the result of our visit to East London on business and to the Convention, which means many hours of work, will result in our desiring to come back again to explore East London at our leisure.

On behalf of our Association I wish to again express to you our thanks and appreciation for the facilities which you have placed at our disposal.

Councillor LOW (Capetown): Mr. Mayor. On behalf of the councillor delegates attending this Convention, I extend to you our thanks for the cordiality of your welcome this morning. I have the pleasure of knowing East London, having first passed through somewhere about '98 or '99. I have passed through East London on various occasions since, and can testify to the progress which your city has made in that time. You have always been famed for your hospitality and we have evidence of it in the programme and invitations placed before us. When we were in Johannesburg last year and your then Mayor (Dr. P. P. J. Ganteaume) informed us of the invitation of your Council to hold the Convention here, we keenly looked forward to it, and the cordiality of the reception which you have given us assures us that we will have a very pleasant time indeed.

BUSINESS MEETING.

The PRESIDENT said that it afforded him considerable pleasure to welcome members, new members and delegates to this the Eighth Convention. The very large attendance, a record in fact, was a matter for congratulation. He trusted they would all benefit by their visit, and by the discussions and opportunities for the exchange of views afforded by the Convention.

Apologies.

The PRESIDENT said he had to apologise for the absence of the following members, who found it impossible to attend:—J. Balfour (Ficksburg), L. F. Bickell (Port Elizabeth), F. Castle (Capetown), J. Davison (Mafeking), J. H. Dobson (Johannes-

burg), H. A. Eastman (Capetown), L. L. Horrell (Pretoria), Dr. E. Hamlin (Johannesburg), P. G. Kersten (Windhoek), C. M. McComb (Springs), R. J. Morris (Wakkerstroom), H. M. S. Muller (Beaufort West), A. S. Munro (Pietermaritzburg), J. Roberts (Durban), A. T. Rodwell (Johannesburg), R. Royle (Rustenburg), B. A. Sargent (Vryheid), G. A. Stewart (Johannesburg).

Confirmation of Minutes.

The minutes of the Johannesburg Convention having been circulated, were taken as read, and were confirmed.

Report and Balance Sheet of Honorary Secretary and Treasurer.

The Honorary Secretary and Treasurer (Mr. TRESISE) then read the following report:—

Mr. President and Gentlemen,—

I have pleasure in submitting my report and balance sheet for the period I have been acting as Honorary Secretary and Treasurer of the Association, namely, since the Johannesburg Convention in April, 1926.

There has been a substantial increase in the membership during this period. At the Johannesburg Convention, my predecessor reported that there were 43 full members and 7 associate members, totalling 50 in all. Since then, we have lost two members, namely, Mr. F. T. Stokes, Johannesburg (deceased), and Mr. C. K. Turner, Kimberley (resigned); two members (Mr. B. Marchand, Paarl, and Mr. R. J. Morris, Roodepoort-Maraisburg) have ceased to be in municipal employment and wish to be transferred to associate membership; and 22 new members have joined. These additions and changes will come forward for confirmation at this Convention. As the membership stands to-day, therefore, there are 61 members and 9 associate members, making a total of 70, and representing an increase of 40% during the period under review. Two or three further applications for membership will be considered at the Convention.

A change in the method of printing the proceedings was adopted in the case of the Johannesburg Convention, these being first printed in full in the *South African Engineer* (our official organ), and copies then being printed in the usual booklet form

from the same setting up of the type. The management of the *South African Engineer* undertook to supply the Association with free copies of the special Convention number, and practically all our members availed themselves of this opportunity of obtaining copies for distribution amongst the members of their Councils, the total number so issued being approximately 440. In addition, free copies were sent to the Municipal Electrical Engineers, Town Clerks and Chairmen of Electricity Committees of 52 towns in the Union and Rhodesia that were not represented on the Association, thus giving considerable publicity to our Association. In spite of these free copies, however, a number of Councils very kindly assisted our funds by purchasing copies of the proceedings in the booklet form.

The balance sheet shows the financial position of the Association to be in a very satisfactory condition, and (despite the fact that this is the first of a number of years in which no donations were received from municipal councils) there is an increase over the last balance carried forward of £50 2s. 5d. It will be seen from the balance sheet that there is a subscription of £1 1s. outstanding, but I am pleased to be able to record that this subscription has since been paid, and that the new year will commence without any arrear subscriptions. The cost of printing the proceedings, namely, £61, is considerably less than it has been in most cases in the past, but against this there has not been any revenue from advertisements, and the return from the sale of proceedings was not so great as it would have been if free copies in the magazine form had not been available. As far as I can estimate from the quotations that were received for printing the proceedings, from the revenue derived from advertisements in past years, and from the decreased amount received from sales, the net cost of the proceedings was about equivalent to the amount that would have been incurred had the usual procedure been adopted.

In August, 1926, I compiled the usual statistical tables for the *Official S.A. Municipal Year Book*, and at the present time I am engaged on the preparation of another set, which will be completed within the next week or two. Payment for this second set will be due in the course of a month or so.

At the Johannesburg Convention, draft by-laws for the Licensing of Electrical Wiremen and the Registra-

tion of Electrical Wiring Contractors, together with a draft Bill for submission to Parliament (compiled by the Johannesburg Electricians' Licensing Board) were submitted, and considerable discussion took place on the different sections of the by-laws and the principles involved. It was decided to ask members to place these draft by-laws before their respective councils and licensing boards (where such existed), with a view to getting expressions of opinion and suggestion thereon, the object being to try and make these a standard set of by-laws as far as possible applicable to all towns in the Union. Unfortunately, a period of about 12 months elapsed before replies were received from all centres where licensing boards were in operation. A considerable number of amendments and additions were suggested, and these were duly placed before the Johannesburg Licensing Board for its consideration and recommendations, but it is regretted that the Board has not yet completed its deliberations, and it is not possible to submit the matter to the Association at this Convention.

In conclusion, I have to place on record my thanks to the President for his ever-ready help (without which it would have been very difficult for me, as a layman, to have carried out certain of my duties) and to the members of the Council for their co-operation in connection with the carrying out of my duties during the period under review.

R. G. TRESISE,
Honorary Secretary and Treasurer.

JOHANNESBURG,
27th August, 1927.

REVENUE AND EXPENDITURE ACCOUNT FOR PERIOD 16th MARCH, 1926, TO 19th AUGUST, 1927.

Expenditure.

To	Reporting Proceedings				£18	3 3
„	Printing Proceedings				61	0 0
„	Stationery and Printing				18	11 0
„	I.M.E.A. Reports				5	7 4
„	I.M.E.A. Proceedings				0	16 3
„	Honorarium to Durban Typist				5	0 0
„	Photographs				19	9 0
„	Railage on Proceedings, etc.				3	0 1
„	Bank Charges				3	2 9
„	Secretarial Expenses:					
	Postage	£12	6	4		
	Statistical Tables	10	0	0		
	Telegrams	1	4	1		
	Sundries	0	6	9		
					23	17 2
					158	6 10
„	Balance carried to Balance Sheet				50	2 5
					£208	9 3

Revenue.

By	Subscriptions				£127	8 0
„	Fee for Statistical Tables				20	0 0
„	Bank Exchange				0	16 9
„	Sales:					
	Convention Proceedings	£25	10	0		
	Old ditto	5	0	0		
	Photographs	18	19	0		
	I.M.E.A. Reports	9	19	6		
	I.M.E.A. Proceedings	0	16	0		
					60	4 4
					£208	9 3

BALANCE SHEET AT 19th AUGUST, 1928.

Liabilities.		Assets.	
Accumulated Funds:		Sundry Debtors. Subscriptions	£1 1 0
At 16th March, 1926	£87 9 5	Cash at Standard Bank	136 10 10
Add Balance from Revenue and Expenditure Account	50 2 5		
	£137 11 10		£137 11 10

I have examined the above Account and Balance Sheet with the books and vouchers of the Association, and report that such are properly drawn up so as to exhibit a correct view of the Association's affairs, according to the information given to me and as shown by the books.

(Sgd.) E. PARSONS, F.I.S.A.,
Honorary Auditor.

JOHANNESBURG,
26th August, 1927.

The PRESIDENT: You have heard read the Report and Balance Sheet of the Secretary and Treasurer, and before formally asking you to move the adoption thereof, I would like to call the attention of all members to the desirability of purchasing copies of our proceedings and circulating them amongst the members of the Municipal Councils whom they represent. It serves to assist the finances of our Association, which are entirely found out of the fees which members pay each year, i.e., £2/2/- each. Out of these fees the Association has done some very useful practical work in the way of publishing quite a number of features, and I think that the best report which any Engineer can give to his Council is to circulate our printed proceedings and show the Councils what is done when we attend these Conventions. Otherwise I think you will find that the Balance Sheet is a very satisfactory one, and all the new members who have joined during the last twelve months show that we have every prospect of continuing to show a very satisfactory Balance Sheet. It only remains for me now to ask someone to move and second the adoption of the Report and Balance Sheet.

This was moved by Mr. Wolley Dod, of Pretoria, seconded by Mr. Macaulay, of Bloemfontein, and carried unanimously.

The PRESIDENT: Before proceeding to the next business, I would ask, for the convenience of those reporting our deliberations, that every member who gets up to speak will kindly give his name and town beforehand.

Honorary Auditor.

On the motion of the President, seconded by Mr. Swingler (Capetown), a vote of thanks was passed to Mr. F. Parsons (Johannesburg), who had audited the accounts just adopted.

Gratuity to Johannesburg Typists and Messengers.

On the motion of Mr. Baskerville (Salisbury), seconded by Mr. Blatchford (Greytown), a gratuity of £5 was voted to the typists and messengers for work done during the Johannesburg Convention.

Election of President.

On the motion of Mr. Jagger (Ladysmith), seconded by Mr. McDonough (Bethlehem), Mr. J. Mordy Lambe (East London) was unanimously

elected President of the Association until the next Convention.

Mr. SANKEY (Johannesburg): It is my pleasant duty to declare Mr. J. Mordy Lambe (East London), duly elected President until our next Convention takes place.

Mr. Sankey then vacated the chair, which was taken by Mr. J. Mordy Lambe (East London).

Mr. J. MORDY LAMBE (East London): I am indeed honoured by your having seen fit to appoint me President of our Association. I realise that in taking the chair in succession to the retiring President (Mr. Sankey), I am taking on a very difficult task. I realise that because I think it can be truly said that during Mr. Sankey's term of office, the Association of Municipal Electrical Engineers has made greater and more substantial progress than in any previous term of office. In saying this, I make no reflection on previous past Presidents. The progress made has been outstanding in the accession of new members and in the very substantial increase in councillor delegates present at the Congress to-day. We, as engineers and members of the Association, can, you will all agree, do little unless we have the sympathy and practical support of the Councils whom we are appointed to advise. I know I am voicing the feelings of every member when I say that we do appreciate the presence at our Annual Conventions of councillor delegates, and I feel sure that the progress made by the Association in the increase of membership has been in part, at any rate, due to the fact that a better knowledge has come to Municipal Councils as to the benefits resulting from the existence of such an Association as this. There is one other extremely satisfactory feature, and that is that our Association enters the new year with no arrear subscriptions whatsoever. In this connection, and on your behalf I desire to pay tribute to our Honorary Secretary and Treasurer (Mr. Tresise). The fact that I enter upon my term of office following on the conclusion of such a successful period as Mr. Sankey's term of office, will not deter me, I can assure you, from making every effort to improve on the results of last year. I certainly will make every effort to at least maintain them.

RETIRING PRESIDENT'S ADDRESS.

By Mr. B. Sankey, M.S.A.I.E.E., M.I.Mech.E.,
Municipal Electrical Engineer, Johannesburg.

In handing over the duties and responsibilities of the office of President of our Association after completing my second term of office, I desire first of all to wish my successor, Mr. E. Mordy Lambe, a successful year of office and to express to the members of the Council my appreciation of the time and work they have spent in attending to the interests of our Association. The past year has been a busy and an important one, and without their active and practical assistance it would have been impossible for me to deal with the various important matters which have arisen since our last Convention at Johannesburg, to which reference will be made later.

It was with feelings of deep and personal regret that I had to record in our November notes the somewhat sudden death of Mr. Frank T. Stokes, a foundation member and the first Honorary Secretary of our Association.

Whilst the Secretary's report deals in detail with the position of the membership of our Association, I wish to bring to your notice the activities of our Secretary in his efforts to maintain our membership and to get in touch with engineers of new undertakings, of which quite a number have been started up since our last Convention, and I wish to welcome particularly to this Convention all new members and their Councillor delegates and to express the hope that we shall in future meet them regularly at our future Conventions.

In addition to new undertakings, our Secretary during the past eighteen months has sent copies of our proceedings and letters to every Municipal Electrical Engineer in the Union who is not at present a member of our Association, and although the number is small, I regret to state that there are a few who consistently fail to make any response and are evidently not interested in Municipal matters outside their own particular sphere. It is a matter for the consideration of your new Council as to whether proceedings should in future be sent to any non-members or any further invitation for membership be sent to those who obviously are not

interested. Since the last Convention, when our Constitution was widened to include Rhodesia, three out of the four municipal undertakings have joined up, and will, I hope, be represented by both Engineers and Councillor delegates at this Convention.

On two occasions, as reported in the Association's notes, the members of your Council have met at Johannesburg to consider the proposed amendments to the Mines, Works and Machinery Regulations, the first occasion being on November 4th, 5th and 6th, 1926, and the second occasion on April 27th, 1927, and as the result, important recommendations were made to the Government Mining Engineer.

Subsequent to the first meeting, the Government Mining Engineer invited representatives of various bodies to confer with his Department, under the chairmanship of Mr. C. Mullins, the Chief Inspector of Machinery. Your Council appointed, in the absence of Mr. T. C. Wolley Dod, of Pretoria, Mr. L. L. Horrell his deputy and myself as our representatives on the Committee. Meetings were held twice weekly from 10 a.m. to 1 p.m. for several weeks, and I wish to express, on behalf of the Association, my appreciation of Mr. Horrell's work in attending these meetings regularly from Pretoria each week and undertaking the principal burden of the work at a time when I was particularly hard pressed with important work on behalf of the Johannesburg Municipality in connection with their Gas and Electricity undertakings.

For the same reason I have found it impossible to attend the meetings of the British Engineering Standards Association, but hope that in the future I may be free to give more attention to the interests of the Association in this direction, if no other member will relieve me of this responsibility.

Since we last met, our energetic Secretary has given particular attention to the writing of our Association notes in the *S.A. Engineer* each month. I regard these notes as of great importance in keeping our Association together and maintaining the interest of members, and I trust that our new President and Secretary will be able to continue this monthly contribution to our official magazine, and that our members will actively assist with contributions thereto. These notes not only reach our members regularly but also a

wide circle connected with the engineering industry, and serve to emphasise the existence and purpose of our Association.

Two sets of Statistical Returns have been issued during the recess, and I desire to particularly draw your attention to the improvements and additional details which have been added. These Statistics are amongst the most complete issued in any country and are of great value to all concerned in electrical business.

In these remarks I have, so far, dealt entirely with the activities of our Association since the last Convention, and whilst desiring not to encroach on subjects which may be dealt with in our President's address, there are one or two subjects of general interest to which I desire to draw your careful attention.

During the last two years, it has been noticeable that whilst most undertakings have recorded increased profits or improved financial results, they have in most cases reduced tariffs at the same time.

One of the most important and responsible duties of every Municipal Electrical Engineer is to advise his Committee and Council on Tariffs, and in this direction I would offer a word of advice, firstly, have as few Tariffs as possible. Johannesburg at present manages very well with five to cover all present requirements, and, secondly, when reducing prices, give the reduction in such a manner as encourages greater use. A reduction of 1d. per unit in a 1s. flat rate merely gives money away without encouraging business, and, thirdly and lastly, make your Tariffs as simple as possible. A simple sliding scale Tariff will almost, without exception, give the same results in revenue and average cost per unit as some of the most complicated Maximum Demand Tariffs.

The other question to which I desire to direct your serious attention is the advances made in recent years in the application of electricity to heating and cooking, and the enormously improved efficiency and reliability of such apparatus. Durban, as is well known, has been the pioneer in this direction, and other towns are rapidly following suit. The time is coming when every Engineer, even of the smallest town, can, with advantage, consider the possibilities of development in this direction.

In concluding this address, I desire especially to record my appreciation of the assistance rendered and the keen interest displayed by our Secretary, Mr. Tresise, in the onerous work he has undertaken during his term of office, and the members of the Council for their ready help and assistance.

The PRESIDENT: Before asking you to voice your appreciation of our retiring President's address, I want to repair a very grave omission, for which my newness to office must be my only excuse, and that is to welcome amongst us to-day our Visitors. First of all, Mr. Jacobs, a member of the Electricity Supply Commission and Chief Engineer to the Commission; secondly, Mr. Mullins, Chief Inspector of Machinery, and Mr. Stevens, Chief Electrical Engineer of the Public Works Department, to all of whom we tender a very hearty welcome, and whose participation in our discussions we cordially invite. Certainly the presence of these gentlemen amongst us cannot but be of great assistance to the Association, and through the Associations of great assistance to the important industry which it represents.

Mr. JACOBS (Electricity Supply Commission): On behalf of the Electricity Supply Commission I want to thank your Association for the kind invitation you gave us to attend your Convention. It was with great regret that the Chairman of the Commission found that he was unable to attend. You already have his apology, and I would like to add my own personal appreciation of the opportunity so kindly afforded me of again attending your Convention. This is the third Convention I have attended, and it gives me very great pleasure to renew the acquaintances which I made at the first and second Conventions, at which I was also present, and I hope to meet your new members who have joined your Association since the last Convention. May I also say that I have been requested to represent the Institute of Electrical Engineers. The Chairman of the Commission is also Chairman of the Institute of Electrical Engineers, and as he could not attend, the Secretary asked me to represent him. As a member of the Papers Committee of the Institute, I would like to extend an invitation to all your members here to let us have contributions as frequently as possible, as we find it a little difficult at times to get papers. I have no doubt

but that there are many papers on plant operation which might be procured if it were not that members were a little shy of coming forward. Some of our papers might be designated as somewhat of a highbrow nature, but that should not deter your members. I would like to congratulate your Association on the substantial progress which is reflected in the valedictory address of your retiring President. We as a Commission are at present dealing with a great many new municipal schemes, so that there is every prospect of your membership showing a further substantial increase.

Mr. MULLINS (Chief Inspector of Machinery): This is my first attendance at your Convention, and I must first apologise for the absence of the Government Mining Engineer, Dr. Pirow, who is, at the moment, too busy on other important matters to attend. This being the first occasion on which I have attended your Convention, I prefer to leave any further remarks till later.

Mr. STEVENS (Chief Electrical Engineer, P.W.D.): On behalf of the Public Works Department, I would thank you very much for your kind invitation, and for your cordial welcome. I am quite certain that as the result of the deliberations during the Convention, we shall all go back better equipped for our work.

Mr. WOLLEY DOD (Pretoria): In moving a vote of thanks to our retiring President, I would like to draw the attention of many of those who may not know to the fact that Mr. Sankey was really the founder of this Association. It was through his efforts, when, I think, he was still at Port Elizabeth, that the idea of having this Association came forward, and we, all of us, can realise the enormous amount of work put in by him. It is not generally known that he is practically the father of the Association, and that he was a member of the parent Association in England, and he learned there how useful such an Association can be and is actually. It is owing to him that we have come into being and done the work we have done. I know, perhaps through being situated nearer to Mr. Sankey than most of us, the enormous amount of work he has put in. In moving a vote of thanks to Mr. Sankey I know you will heartily support it, as you know he is really the moving spirit in this matter. This was carried unanimously.

Mr. SANKEY (Johannesburg): Mr. President, I am not at all deserving of all the kind things you have said about me, but I have taken a very keen interest in our Association, and can well remember our first meeting in Johannesburg in 1915 under the presidency of Dr. Dobson, who has since retired from municipal life. It has always been a pleasure to do what I could and I hope also to be of assistance to our newly-elected President. For the past eighteen months, without the assistance of our Secretary and Treasurer and the members, I could not have carried on the work which has fallen to my lot. Without detaining you unduly, I thank you for the way in which you have received the very kind remarks of Mr. Wolley Dod.

Election of Honorary Secretary and Treasurer.

On the proposal of Mr. Millar (Harrismith), seconded by Mr. Poole (Durban), Mr. PRESCOTT ADKINS (East London) was unanimously elected Honorary Secretary and Treasurer of the Association until the next Convention.

Vote of Thanks.

Mr. POOLE (Durban): I have much pleasure in moving a very hearty vote of thanks to Mr. Tresise for the excellent work put in by him during his term of office as Honorary Secretary and Treasurer of our Association. As one of your previous Secretaries, I know the amount of work involved, and we are under great obligation to Mr. Tresise for the very excellent manner in which he has carried out his duties.

Seconded by Mr. Sucliffe (Benoni) and carried unanimously.

The PRESIDENT: Mr. Tresise. In conveying to you the vote of thanks just passed I do not propose to say much, but what I do say contains a lot. If ever you desire a testimonial in your capacity as Secretary and Treasurer you have it in the record contained in your Annual Report which has just been received and adopted. More than this I do not think I can say.

Election of Council.

The President intimated that it was suggested by the Council that the election of the new Council, together with the election of Vice-President, should stand over until the meeting on Thursday. In the

meantime the existing Council would continue in office until Thursday.—Agreed.

Venue of Next Convention.

The PRESIDENT intimated that it was also suggested that the fixing of the venue of the next Convention should be left over until Thursday's meeting.—Agreed.

New Members.

The PRESIDENT announced that under the Rules of the Association, the Council had elected the following new members since the last Convention was held:—C. H. Baskerville (Salisbury), W. F. Bower (Barkly East), J. G. Clark (Fort Beaufort), A. J. Clemo (Alice), J. A. Coetzee (Ladybrand), W. Dance (Humansdorp), H. L. Groom (Roodepoort-Maraisburg), A. Q. Harvey (Tarkastad), J. Iverach (Grahamstown), S. V. R. Lewis (Aliwal North), H. A. Morris (Kimberley), I. J. Nicholas (Umtata), J. O. Pentz (Frankfort), H. J. Relihan (Paarl), H. G. Simpson (Dordrecht), K. F. Spang (Brandfort), F. E. Syers (Umtali), B. H. J. Tubb (Salisbury), D. Walker (Mafeking), J. J. Wud (Adelaide), R. A. Young (Bulawayo).

Banking Account.

On the motion of Mr. T. Wolley Dod (Pretoria), seconded by Mr. McDonough (Bethlehem), it was resolved:—"That the Account of the Association be transferred from Johannesburg to East London, and that the Honorary Secretary and Treasurer and one member of the Council be authorised to sign cheques on behalf of the Association.

British Engineering Standards Association (South African Branch).

The PRESIDENT stated that the next business was election of a representative on the Engineering Standards Association (South African Branch), Mr. Sankey being the present representative.

Proposed by Mr. McDonough (Bethlehem) and seconded by Mr. Blatchford (Greytown), that Mr. Sankey continue as this Association's representative on the British Engineering Standards Association (South African Branch).

Mr. SANKEY: In accepting you very kind nomination I can only say that I would have been

rather pleased if someone else could have been appointed. The fact of my being in Johannesburg makes it more convenient for me to attend, but I can only say that my attendance for the last eighteen months has been disgraceful. I am hoping, however, shortly to be relieved of some of my municipal duties, which will thus give me more time. I have no formal report to give you as the work done has consisted of more or less routine matters which have been dealt with in the mechanical and electrical committees, and in the main committee. I will endeavour, however, in the current year to attend more regularly and to give you some indication of the work that has been done. I may say that nothing of outstanding importance has taken place in this connection during the past eighteen months.

Papers for Next Convention.

The PRESIDENT stated that in regard to this very important matter the Council was desirous that members who may feel able and willing to contribute papers at our next Convention would, as far as practicable, make their promises now. He appealed to all such to make their promises to the Secretary before the close of the Convention.

On behalf of the members, the President invited Mr. Councillor Low, of Capetown, to contribute at the next Convention a paper on Accountancy in relation to Electricity Supply Undertakings.

The President also invited Mr. J. T. Smith, of Durban, to contribute a paper on Boilers.

PRESIDENTIAL ADDRESS.

By Mr. J. Mordy Lambe, City Electrical Engineer and Tramways Manager, East London.

Gentlemen,—

First let me thank you for the honour you have extended to me by electing me President of this Association, which, inaugurated in 1915 under the Presidency of Professor J. H. Dobson, has made substantial strides forward, both in strength of membership and status, but particularly in the growing recognition by Government and quasi-Government bodies, as well as by Municipal Councils, of the Association's usefulness

in furthering upon sound lines developments in the production, distribution and use of electricity for public, industrial and domestic purposes.

The progress made by this Association in so far as strength of membership is concerned is more fully dealt with in the report, which you have just received, of our energetic Honorary Secretary and Treasurer, to whom more than a word of praise is due, but I may perhaps point out that whereas at the first Convention of the Association held in Johannesburg in 1915, the number present totalled only seventeen, the attendance at the present Convention will approximate seventy, of which no fewer than twenty-seven are Councillor delegates, clearly indicating as it does the increasing interest being taken in the proceedings of the Association by members of Municipal Councils, an indication which cannot be other than pleasing to this Association.

It is in my opinion but right and proper, and in the best interests of all concerned, that Councillor delegates should be appointed to attend our Annual Conventions and thereby, as laymen, obtain a better understanding of the many problems and difficulties which have to be faced by those whose task in life it is to advise Municipal Councils in regard to the conduct and development of their electricity supply undertakings, as well as to conduct, on their behalf, the operation of such undertakings, greatly influenced as such conduct and development is by the constant stream of new developments inevitable in the case of the every-day practical application of such a comparatively young science as that of electrical engineering.

In this Union of South Africa of ours, in which the towns owning and operating electricity supply undertakings are, in most cases, separated from one another by very great distances, as well as being remote from the great manufacturing countries from which electrical plant and apparatus is procurable, the difficulties in the way of keeping in touch with the latest developments in the art of producing, distributing and applying electricity to the industrial and domestic requirements of a local community, are really very substantial, and opportunities for the exchange of views such as are afforded by our Annual Conventions are therefore of all the greater value.

Whilst not in any way wishing to exaggerate the importance of the supply of electricity as compared with other public services, I might emphasise the fact

that practically without exception the Governments of the world have realised that a reliable and sufficient supply of electricity at the lowest charges practicable is a matter of national importance, and it was the realisation of this fact by the Government of the Union of South Africa which placed upon the Statute Book the Electricity (Supply) Act of 1922, and the formation thereunder of the Union Electricity Control Board and the Electricity Supply Commission, by which bodies excellent work has been and still is being done.

There unfortunately still exists, even to-day, particularly in the minds of Municipal Councillors, a good deal of uncertainty and indefiniteness, resulting in wide difference of opinion and practice, particularly in the financial policy to be pursued in regard to their electricity supply undertakings. It is of the utmost importance that a sound conservative financial policy should be maintained in the conduct of a municipal electricity supply undertaking, and whilst some Councils have realised that such undertakings are purely trading concerns, and as such must be conducted upon sound business lines, it is a regrettable fact that in the majority of towns the undertaking is starved in so far as equipment and development is concerned, and in others is looked upon as a milch cow from which to quench the insatiable thirst of that hoary old warrior, General Rate.

Having regard to the almost bewildering rapidity with which new developments take place in the production, distribution and application of electricity, and the probability of existing plant and apparatus being thereby rendered obsolete and uneconomical of operation long before the physical life of such plant and apparatus is exhausted, it is of paramount importance that each undertaking should have a substantial Reserve Depreciation, or Replacement Fund, whichever of the three names one cares to apply to the fund. Certain it is that no portion of the proceeds of an electricity supply undertaking should be appropriated in relief of rates until the following have been met in the order given:—(*a*) Working Expenses, (*b*) Interest and Sinking Fund Contributions, (*c*) the Depreciation Fund built up to a proper figure, and (*d*) the charges for current reduced to a suitable level, having regard to local conditions.

The policy which to-day obtains in some towns in the Union of requiring the electricity supply undertaking to make contributions in aid of Rates whilst

leaving its own legitimate obligations unprovided for, is one which should be reviewed at the earliest possible moment, and further, is one upon which this Association and the members of respective Councils might well look to the Electricity Commission for a definite ruling.

The effect of such a ruling by the Commission, which, in regard to its own undertakings, is required to make definite provision for Depreciation (Reserve), would be to remove this very important point from the sphere of local municipal politics, besides placing matters upon a definite uniform and therefore a sounder basis.

For some years past this Association has endeavoured to secure the adoption by all municipalities in the Union of a uniform system of keeping and presenting the accounts of their electricity supply undertakings, but so far with comparatively little success, although the Association has prepared a model set of forms of accounts which, I regret to say, did not find favour with many Town Treasurers. The adoption of a uniform system for the presentation of electricity supply costs and accounts throughout the Union, in my opinion, could not but be beneficial to the electricity supply undertakings of the Union as a whole, by rendering possible a much truer comparison of the accounts of the several undertakings and thus stimulating that healthy competition which is so desirable if the best results are to be achieved by a number of undertakings engaged in the same industry, in this case the production, distribution and use of electricity.

This again is a matter which I am of opinion that the Electricity Commission with the powers which it has, might well tackle and decide, with beneficial results to all concerned. I suggest that in this matter the Association, in conjunction with the recently formed Association of Municipal Treasurers and Accountants, might very well formulate proposals for submission to the Electricity Commission. In making the foregoing suggestions I have no wish to appear to be, so to say, teaching the Commission its business, but I feel free to make them, knowing, as I do, that the Electricity Commission is at all times glad to receive from bodies such as this Association, suggestions having for their object the advancement of the electricity supply industry.

In the production of electricity in those towns operating steam plants and using coal as fuel, and especially in those towns remote from the coal fields,

a very large proportion of the cost of generating electricity is incurred on the purchase of coal. Taking the undertaking which I administer for the City Council of East London as an instance, I may say that for the year 1926 the cost of coal delivered into the power station bunkers was, in round figures, £8,500 os. od., but of this no less a sum than £6,700 os. od., over 75%, or in other words, 15s. out of every £1, was paid to the South African Railways Administration for the carriage of the coal purchased: surely an altogether unreasonable proportion and one which it behoves the members of this Association to make every effort, through their respective Councils, to have substantially reduced. Might I emphasise the point by saying that in the case of the East London undertaking the amount paid to the Railways Administration for the carriage of coal during the year 1926 represented no less than one-third of the total cost of operating the Power Station.

As you are no doubt aware, the relative importance of Generation and Distribution (the latter including transmission) has considerably altered of late years; this is especially true from a financial standpoint. The proportion of capital invested outside the power station is becoming increasingly larger, and it is therefore becoming increasingly important that only the most economical methods of design and construction should be adopted. There can be no doubt but that, in many areas, the adoption of overhead distribution mains assists tremendously, but the construction, and therefore the cost, of such mains is largely influenced by the requirements of the two Government Departments concerned, *viz.*, the Mines Department and the Post Office. Let me here pay a tribute to the former for the eminently reasonable and sympathetic manner in which its various requirements are formulated and administered, only after full consultation with and with due regard to the requirements and difficulties of public electricity supply undertakings. It is to be regretted, however, that the same cannot be said of the Post Office authorities, at any rate, those responsible for the framing of its requirements, in which there is exhibited a lamentable lack of consistency and consideration for the rights of undertakings such as those this Association represents. If this Association, either directly or indirectly, can be the means of infusing into the Post Office authorities a little more of the spirit of sweet reasonableness, then a very great deal will have been

achieved in reducing the cost of constructing what is in most cases the cheapest form of electricity distribution, *viz.*, by overhead mains.

The matter of the standardisation of supply pressures is also one of very great importance from a financial aspect, and it will be remembered that at our last Annual Convention held in Johannesburg it was decided, on the suggestion of President Sankey, that this Association should offer to the Electricity Commission the Association's hearty co-operation in the formulating of a definite plan for the bringing into line of non-standard undertakings. I would suggest that this offer be renewed.

In the all-important matter of Tariffs there would appear to be more hopeful signs that some degree of uniformity is coming about, at any rate in the methods of charging, and in this connection one cannot but feel that this Association has had a very strong influence for good.

There are, however, still in existence in many towns tariffs so complicated as to be, to the lay consumer, things frightful to contemplate. Let us bring in to the framing of our tariffs just a little less of the engineer and a little more of the salesman. In the marketing of the commodity which we produce and sell, salesmanship is becoming increasingly important and simple tariffs readily grasped by the layman will constitute the electricity salesman's most useful tools.

Let us wipe out irritating and vexatious charges such as Meter Rentals, Connecting Fees (within limits), etc., and retain a substantial Minimum Charges and a price per unit for different classes of consumers, it being more important, however, that the number of classes should be reduced as far as practicable.

Let us also make an earnest endeavour to get as nearly into line as is practicable in the matter of our requirements in regard to consumers' apparatus and appliances, so that, for instance, an electric motor and control gear which is acceptable in Cape Town is also acceptable in East London or *vice versa* (these two towns being quoted because they both have the "standard" system of supply), thereby reducing electrical supplies, dealers' stocks, and, consequently, selling expenses, bringing in turn reduced selling prices. By going through the requirements of our several undertaking with a small tooth comb and discarding all but those which, after careful *joint* consideration, are

deemed absolutely essential, we will be rendering the task of the electricity salesman—who has come to stay, whether purely as a salesman or not—much easier and thereby promote the object for which we are all striving, *viz.*, increased sales.

The battle of the hot water systems continues, and it will be very interesting to hear from our members and delegates, as I hope we will, their experiences in the matter of this essential service. I say *essential*, because if electric cooking—which beyond all manner of doubt, and despite the dying efforts of the gas advocates, has come to stay—is to develop to its fullest extent, then an electrically heated water service *is* essential.

This Association has every reason to be satisfied with the work it has done so far, but we are very young, as is the industry we represent, so that there is still ample scope for further real hard work. Let us avoid at all costs that deadly drug, self-satisfaction, and let us push on, firm in the belief that the commodity we are all striving to produce and sell in increasing quantities is one of the world's handmaidens. Firm also in the belief that by reason of the tremendous advantages which electricity—when properly applied—enjoys over all other readily distributable mediums for the production of light, heat and power, our task will be rendered comparatively easy of achievement.

J. MORDY LAMBE,
President.

Mr. SWINGLER (Capetown): Mr. President. In rising to propose a vote of thanks for your address, I might remind you and the members, delegates and visitors of your remarks made upon your election to your present office to the effect that you would do your utmost to emulate the past President, and to uphold the traditions of the Association. I am sure that all present appreciate very much your address and what you have done up to this point. We know of your work in the past in East London,, and we know that when it was suggested that you should be our new President, that you would not be any less prominent as our President than you have been in the electrical world in East London and in South Africa. It was suggested at the last Convention that you write

your address and raise points for discussion. You certainly have provided plenty of meat for contention—Coal Freights, Post Office Regulations and Standardisation of Pressures and Tariffs—all matters of very real interest, owing to their importance.

I understand, Mr. President, that your address will be open for discussion, and I have to thank you on behalf of the members for your excellent address and for the many important points you have raised, the discussion arising out of which will be most beneficial. I thank you, sir.

The PRESIDENT suggested that the discussion on his address be broadened to include the retiring President's address, which contained much useful matter for debate.

Announcements.

The PRESIDENT read a telegram just received from Dr. Hamlin, of Stellenbosch:—

> "My Council would not appoint delegates. Sorry to miss Congress. Best wishes for successful meeting."

Railway Facilities.—The South African Railways Administration has made a special request that in view of the large number of delegates in the city attending this and other Congresses sitting at the same time, delegates intending to return by train should book accommodation at the earliest possible moment.

Electrical Exhibition.—The City Council of East London has seized the opportunity afforded by this Convention to hold an exhibition of domestic and other electrical apparatus in the City Hall, the opening of which, at 8 o'clock this evening by His Worship the Mayor of East London, would, it was hoped, be attended by all here present.

Printed Proceedings.—The Association at one time looked to Municipal Councils for contributions to the funds of the Association. These contributions have taken two forms—in cash and through the amounts paid for the purchase of copies of the Association's printed proceedings. It was suggested that any contributions which Municipal Councils may be desirous of making should take the latter form, i.e., that every Municipal Council should purchase copies of the printed proceedings and that

every member of such Councils should be furnished with a copy at the expense of the Council to which he belonged. It was felt that by this means the aims and objects of and the work done by the Association would become better known and better appreciated.

General Business.

Mr. SANKEY (Johannesburg): Under the heading of General Business, Mr. President, I have been asked by one member who will not bring it forward himself, to enquire as to whether our Association would issue "Certificates of Membership" to members of the Association. That is a matter which I think will require very careful consideration, and I would suggest, Mr. President, that it is a matter which might be referred to our Council to go into and consider it between now and our next Convention. I put this forward as a suggestion.

The PRESIDENT: Are you agreeable that this suggestion should be adopted, and that the matter should be referred to the Council for consideration and recommendation?—Agreed.

I want to appeal to members to bring forward items of general interest. Would any councillor delegate like to bring up any matter of general interest? If there is no further business, I suggest that we adjourn until 2.30 p.m., when we will enter upon a discussion of the retiring President's and the new President's addresses.

Discussion on Valedictory and Presidential Addresses.

The PRESIDENT: The first business on the agenda is the discussion on the valedictory address of the retiring President and the Presidential address. As there are similar subjects which appear in both addresses, although in different aspects, we may very well have one discussion on both addresses. In those subjects which are isolated and appear in one address only, I would ask you to deal with the retiring President's address first. Just to give an opening, the first item of interest in the retiring President's address is in regard to the Mines and Machinery Regulations, and I think that as we have the advantage of the presence here of the Chief Inspector of Machinery, Mr. Mullins, he might care to give us some information on the matter, as we would like him to do. This has been

a matter of keen interest to our Association, and so far as indications are at present, it would appear to me approaching a solution. I would invite Mr. Mullins to give us some information as to how matters stand.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): With regard to the regulations referred to by the President, I think he is referring to Chapter (16) of the Mines and Machinery Regulations Act as drafted and put forward by the Committee appointed to go into the matter.

I think several members here have a copy of that Act. Although it is not yet actually passed, I think it is simply awaiting in its present form for the completion of the remaining Mining Regulations, when it will be put forward as a whole.

There are several useful points which were brought forward and adopted in regard to those regulations. One in particular I was very pleased to see go through, and that was the facilities given for the construction of cheaper power lines and the extending of power lines in out-of-the-way places—in the wilds, you might say. The existing regulations are rather drastic and unduly restrictive in comparison with the proposed ones; but in regard to the proposed regulations the Posts and Telegraphs representatives almost caused a deadlock, which, however, we eventually got over. In the future, when disputes arise between Posts and Telegraphs authorities and Supply authorities, the matter is to be referred to the decision of the Government Mining Engineer, which will be final. That, I think you will agree, is a step in the right direction.

The regulations as drafted are wide and as far as possible devoid of unnecessary detail, so as to fit in with present-day practice and at the same time provide for future developments in practice. The old regulations were only for the day and did not provide for the future.

If any of you would wish for a copy of the new draft of Chapter (16) I have one or two with me. Beyond that, I have nothing further to say on the point, Mr. President.

The PRESIDENT: We are exceedingly pleased to hear of the work done in this important matter

by the Council of this Association in conjunction with the other bodies concerned, and that the representations put forward by our representatives have received the consideration and recognition which they appear to have done. It is also very pleasing indeed, particularly in view to the remark of my address, to note that someone has been able to infuse a little of the spirit of sweet reasonableness into the Post Office authorities. That the final decision is to be left to the Government Mining Engineer will please all of us. Everyone has a very great deal of faith in the impartiality of the Government Mining Engineer.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): I would like personally to thank the Committee for the assistance given to the Mines Department in the drafting of the proposed new regulations..

Mr. FLETCHER (Krugersdorp): I have had a glance through the Draft Regulations, and what struck me most was the reference to telephone lines—one of the most important points from a municipal point of view. Are we to understand that the Government Mining Engineer will be in control under the Telephone Department if these go through?

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): No, it is not the intention that the Government Mining Engineer shall have control. He is simply there in the interests of public safety. The reference which you pointed out just now is to provide for dealing with cases where an agreement cannot be come to between the two parties concerned, the Posts and Telegraphs people and the public body, whatever it may be. If no agreement can be arrived at by those two parties the decision of the Government Mining Engineer is to be called for and is final.

Mr. FLETCHER (Krugersdorp): We will still be at the mercy of the Telegraphs Department?

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): For instance, supposing that a public body is going to put up a power line anywhere from, say, an existing line, the public body will apply to the Post Office authorities for permission to do so, explaining by diagram where they (the public body) intend to put their line. It is within the power of the Posts and Telegraphs.

authorities to explain exactly where they propose to put their lines for, say, the next twenty years, and they would give you permission, subject to their projected routes being respected. Consequently, it is understood that if you have that permission and that if at any future date they wish to build their lines in such a position as to call for alteration to your lines, then such alteration will not have to be done at your expense. At present under the existing regulations they can shift you anywhere at your expense.

Mr. FLETCHER (Krugersdorp): What I more particularly refer to are the precautions they are going to require to be taken in crossing their lines and the conditions they can and may lay down. In so far as the Post Office is concerned, there are no regulations at present.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): If this draft wording goes through, as I think it will do, there are definite instructions laid down as to how you should carry on in the passing and crossing of telephone and telegraph lines. There are such things as important lines and unimportant lines. These are very clearly laid down in Chapter (16), and these you should be able to follow. If you are extending a line in a section where the telephone line may be already existing, then you get permission to do so from the Posts and Telegraphs Department, who will tell you whether they are going over that section or if they are not going over that section within the next twenty years. They can decide for the next twenty years where they will be going. Should a disagreement crop up between the two parties, then the matter will be referred to the Government Mining Engineer in accordance with the new regulations. The numbers of the regulations which actually appear in the draft will not necessarily be the same numbers as in the Mines and Works Regulations when finally completed.

Mr. RALSTON (Dundee): In regard to the draft regulations, I would like to ask if there is specified therein the class of insulated wire which the Posts and Telegraphs Department will approve of for crossings over telephone and telegraph lines. Have they definitely decided what class of wire we are to use, and also, in the case of any extensions

or additions which might be made to municipal boundaries, are we still to apply to the Post Office authorities for permission to make extensions within our own boundaries, provided we keep to the right side of the road?

The PRESIDENT: I understood Mr. Mullins to say that in case of any extension of power lines, application was to be made in the first instance to the Post Office authorities. In cases of disagreement between the local authority and the Posts and Telegraphs Department the Government Mining Engineer would act as the final arbitrator. In regard to the class of wire to be used in the case of electric light and power wires crossing telephone or telegraph lines Mr. Mullins might be able to give you some information.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): In regard to the class of wire for service lines crossing telephone lines, the regulations here call for "schedule" wire. The idea is to put certain classes of wire on a schedule, i.e., certain classes of wire for house services. For instance, at present we have only had two applications for wire to be put on this schedule. Naturally you cannot put a wire on the schedule until the new regulations are actually passed, and the only two I know of at the present time are Underwriters First Class and Maconite. Any other applications received for any particular class to be approved and put on the schedule will be decided upon by the Machinery Branch of the Mines Department.

Mr. RALSTON (Dundee): I would also like to ask if it is necessary that the whole of this work be carried out in insulated wire?

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): Have you seen a copy of the regulations? We are, I think, rather wandering away from the subject. You should get a copy of the regulations, otherwise we will have to explain all the items, which is impracticable within the time at our disposal.

The PRESIDENT: I think it would perhaps be rather unfair to question Mr. Mullins upon details at this stage. These regulations are not actually in force yet. I think that Mr. Ralston will feel reassured when I say that the Council of this Association has been largely instrumental in drafting these

regulations and in having them amended so that the interests of the members of the Association and their Councils have been amply safeguarded. Matters of detail might, I think, be left to a later date.

Mr. RALSTON (Dundee): Thank you very much, Mr. President, because this would be a very big point in my district. The Telephone Department are requiring that wherever we cross their lines we should alter them at our expense. I am very interested in this subject, whether it comes from the Mines Department or Telephone Department, and am anxious to gather as much information as possible.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): Wait until the regulations are approved.

The PRESIDENT: As I have already stated, the Council of this Association have taken an active part in the drafting of these regulations and our interests are amply safeguarded.

Mr. RALSTON (Dundee): If the Council had heard the views of members beforehand they might have been able to safeguard them still better. This is the first time we have heard that the Council was taking any part in the framing of the regulations.

Mr. NICHOLAS (Umtata): What is the attitude we are to take up between now and such time as these regulations are actually put in force? Are we to hang fire until they are actually in force?

The PRESIDENT: Until the regulations are put in force there is nothing else to do.

Mr. NICHOLAS (Umtata): Is it good policy to hang fire?

Mr. SWINGLER (Capetown): The last speaker suggested that if the President knew of the troubles experienced elsewhere in this matter he would appreciate the point. Having had the same trouble that most Municipalities have experienced, I might say that you are in the right if you take reasonable precautions. I maintain you *are* in the right if you do so. Mr. Lambe circularised every Municipality in reference to this and he was good enough to send me the replies. Durban have been fortunate in having telephones owned and

operated by the Municipality, and most of the up-country towns have been fortunate in having underground connections. Mr. Lambe and I have been in the soup more than most, and I think we have had more experience of the unreasonable attitude of the Post Office authorities than anyone else. By that I do not mean the Postmaster-General himself. He is most sympathetic in his attitude towards electricity supply undertakings. He was responsible for agreeing to their representatives sitting on the Committee with Mr. Mullins and the Chairman of the Electricity Supply Commission. The Postal authorities must adopt a reasonable attitude for their own protection, otherwise they cannot carry out their duties under the Act.

In so far as the supply of electricity is concerned, we have an idea that there is no one moving in the matter excepting the electricity supply undertakings. We employ by far the highest electrical pressure and therefore we are the most likely source of danger. The Post Office people, somewhat naturally, have framed regulations covering themselves only. If electricity supply undertakings are reasonable and take reasonable precautions, I do not think that the Posts and Telegraphs people can sustain any charge against them. The Post Office people would have had the undertaking which I control in the law courts long ago if we had not taken reasonable precautions, but we have at all times endeavoured to carry out their reasonable requirements. The Council of this Association can testify to the good work done by the Committee of which Mr. Mullins is Chairman, and we can thank the Electricity Supply Commission and others for getting the draft regulations made as reasonable as possible. The representatives of electricity supply undertakings on the Committee had to sacrifice something, and they have, I consider, sacrified quite a lot to the Post Office in order to get on to common ground, but they could not, of course, sacrifice public safety. That is what they are there for—to treat public safety as the primary consideration. We cannot kill people. We cannot get away from the fact that the pressures we employ are dangerous, and we have to protect the public against that very fact. I think the draft regulations provided are just as reasonable as we can hope to get. The most important point is that in the future

if there is any difference or dispute, it is to be referred to an independent party, the Government Mining Engineer, who acts as umpire. Up to now we have had to work under the Post Office Act of 1911, and have repeatedly been told that if we did not do as we were told by the Post Office, we would be prosecuted. This has not actually happened, but there is the possibility of being prosecuted for doing or leaving undone things which are not laid down in any regulations but only vaguely referred to in an Act. Durban and other places have not had the experience of Port Elizabeth, East London and Capetown, because Durban owns and operates its own telephone system. I can assure you it is a very real difficulty.

Mr. SANKEY (Johannesburg): In connection with the Post Office Regulations, I would just like to ask members whether they have had an experience similar to the one which I have had in the last few months. In 1911 it was found that certain underground telephone cables in Johannesburg were suffering from electrolysis, the blame for which was laid by the Post Office at the door of the Johannesburg Municipal Tramways. Eventually a conference took place between the Post Office authorities and the Municipal authorities, and as a result three Rotary Converter Sub-Stations were established by the Council to obviate as far as possible the real trouble, which was due to tram return drop. During the year, one of these particular cables completely gave out, evidently from electrolysis which had taken place, and the Post Office have now admitted that this cable has now had a useful life to them without previous trouble of twenty years; and yet they are claiming on the Municipality for the sum of £1,700, being the full cost of the replacement of the cable. Now the point arises, what is the useful life of a cable, and is it fair that the Post Office should have twenty years' use of a cable and then get it replaced by a new one at the cost of the Municipality? or is it a fair thing to say that the Post Office authorities should put by a Renewals Fund which should provide for renewing that cable, and therefore the Municipality is only liable for the remainder of the useful life of the cable? I should like to know whether members think it is fair that the Municipality be called upon to pay the full cost of the cable after the Post Office has had 20 years'

use of it? I contend that it is not.

Councillor FREEMAN (Johannesburg): Mr. President. I would like to avail myself of the opportunity which you have extended to councillor delegates to take part in the discussions arising out of certain observations made in your address, wherein you indicated your pleasure at the fact that there were clear indications of a greater collaboration and exchange of views between Municipal Electrical Engineers as well as with the members of the Municipal Committees principally concerned with the administration of electrical matters. I think it might be a suggestion to the Council of this Association to consider whether they should not from time to time circulate their considered conclusions on many questions of public interest to the different Lighting and Tramway Committees of the several Municipalities in the Union. I do not pretend to be able to discuss technical matters from a technical point of view, but am here as a layman. I will go further and say that on many occasions when matters are put to the Electricity Committee by the responsible adviser, the Council is in a position to adopt the line of least resistance by supporting the recommendation of that particular Head of Department without knowing the ins and outs of the question placed before them, and I think, in order to give some technical education to Municipal councillors, it might be a good plan if your Council consider the suggestion and discuss the advisability of getting certain papers sent to Electricity Committees throughout the country for their consideration and attention, so that when matters relating to the supply of electricity come before the Councils concerned, they would be able to some extent, at any rate, to understand the matters that are put before them. It is suggested that there is a desire on the part of some councillors to make wrong use of the revenues of electric supply undertakings by contributing sums therefrom to the relief of the General Rates of the city or town.

Perhaps in saying this you were not thinking of the tramways in Pretoria and Johannesburg, because it is manifest to every delegate here that instead of taking money out of the General Rates of the city in order to make up the loss on the tramways system, we in Johannesburg have made a definite attempt to reduce tramways expenditure

by way of a larger spread-over period for motormen and conductors in order in turn to reduce the losses, so that there should be no necessity to entrench on the possible profit made out of the departments. I see in Pretoria they are also making an effort in that direction. We are at present governed by legislative restrictions, and the Government steps in and to a certain extent prevents us working upon what you might call sound business principles by making things pay for themselves. We had a committee appointed to introduce the necessary reform in order to avoid the General Rate of the town paying for the tramway losses; but we found that we reached a dead end and we were told by the responsible committee, which suggested an Arbitration Court or Conciliation Board in order to arrive at a settlement, that it was a fair thing to make the General Rate pay, and not make the consumer of electricity pay in order to bolster it up and maintain uniformity of charges for certain services.

You, sir, mentioned one as an illustration—the charge for installing electricity supply connections. This has been a thorny subject with us on the Rand. Many people have put forward objections and wanted to know why the person having a connection of five yards in length had to pay the same amount of money as the consumer having a connection of over 40 or 50 yards long. Then one man who has soft ground in which his connection is to be laid, and thus has a very easy connection to make, will refuse to pay; another man has rocky ground to be gone through and the first does not see why he should have to pay the same charge as the latter. He is really paying for the construction of the other man's connection. I was particularly struck by the reference in your address to the pleasure it gave you to see so many councillor delegates present here to-day. You mention twenty-seven as the number, and from my own point of view as a councillor and a member of the Electricity Committee which has to deal with matters of a highly technical nature, it is very essential that we should attend these Conferences. It is not only instructive to councillor delegates to attend a Conference of this description, it is almost an education, and I feel sure that I will when I return to Johannesburg, be more competent to discuss electrical

matters than I have been hitherto. I reciprocate your good wishes, but do not propose to take up more of the time of the Conference at the present moment.

Mr. MACAULAY (Bloemfontein): In Bloemfontein we have had no trouble whatsoever with the Posts and Telegraphs Department. I must admit that I have found the Post Office people most agreeable and very reasonable.

Mr. SWINGLER (Capetown): I might say that in Capetown we have been fortunate in not having on our hands the running of the tramways. With regard to electricity supply, we have had electrolysis on some of our underground cables on the tramways system, and not only on our cables but on our water pipes as well. We have actually had trouble and the Tramways Company has had to pay for the damage done. So far as the twenty years' life of the cable mentioned by Mr. Sankey is concerned, I may mention that the Electricity Commissioners in Great Britain have allowed 40 years as the life of some trunk cables at Manchester—that is the largest period of replacement so far allowed, and I should imagine that if Mr. Sankey took that as an example and fought the Post Office, as he will have to do one day, he will not have to pay more than half of the cost of replacement. In the particular instance when you put down your sub-stations in Johannesburg, the Post Office probably did not expect to get as much as they got. In my opinion the Bloemfontein Municipality has been most fortunate in its experience of the Post Office authorities. My experience of the Post Office has been that for a time you get a decent chap in charge and get on very well with him and then you have a change to the opposite. The Post Office is very human in one respect, that is, they generally ask for much more than they expect to get. When points arise between an electric supply undertaking and the Post Office and some amicable settlement is arrived at, no sooner is that put into effect than they change the man in charge for one who has different ideas, and the whole matter is reopened and you get into trouble. I think Mr. Macaulay is very lucky indeed in having a reasonable man in charge of his area, and still more so in having the same man continuously over a long period of time.

Before sitting down, Mr. President, I would like to know whether you are going to take the items in the addresses seriatim.

The PRESIDENT: I think it will be very much better to deal with the items seriatim. I would like to say that so far as the Post Office in East London is concerned, we have not by any means been free from trouble, so much so that in 1926 I addressed a circular letter to 64 electrical supply undertakings in South Africa asking what methods of construction they adopted in the installation of electric service connections crossing overhead telephone lines. I got 52 replies and have had these tabulated. A perusal of this document shows how utterly inconsistent the Post Office authorities have been. If regulations are put into force why should the application or interpretation of any of these regulations depend upon the whim of the Post Office engineer in charge of the district or area for the time being? A number of municipalities have in the past quietly given way without questioning the rights of the Post Office. In matters of this importance we should not be dependent upon the whim of the man in charge for the time being, sometimes a very short period indeed.

In regard to the position in East London we were told by the Post Office that we had to do certain things in certain ways, but my experience in this connection is just the same as that of Mr. Swingler. We declined to do so and we have heard nothing more of it. Is that proper administration of the regultaions by the Post Office?—if, in fact, there are any such regulations, because I have not been able to find any. The Post Office is operating an important public service, but I consider that we too are operating an equally, if not more important, public service, and to my mind it is highly necessary that because the Post Office are operating works just as we are that we should have the right to finally appeal to an independent body such as the Mines Department.

Mr. SWINGLER (Capetown): It has been suggested that the trouble is that the Post Office authorities have not got any regulations, they only have the Act. That has been the difficulty—their having no regulations.

The PRESIDENT: The attitude of the Post Office has always seemed to me most anomalous in that they ask you to state what construction you propose to adopt and that they will approve or disapprove. That to my mind is an extraordinary attitude to take up and surely is one which would not stand in a court of law. They must clearly state their requirements.

Mr. BASKERVILLE (Salisbury): It may be of interest to members to know that during the last few years in Salisbury three drums of cable arrived from overseas for the Post Office the lead covering of which was badly pitted all over. As I was going to England at the time I was asked by the Post Office people themselves to certify that I had examined the cable. The makers in England said that they considered that the length of time taken in transport from Port Elizabeth to Salisbury and the vibration therefrom caused the pitting. As you will readily agree that theory could not for one moment be accepted and eventually the makers took the cables back and replaced them. These were supposed to be new cables made only a couple of years ago. Further, I saw telephone cables taken up after being two years in the ground and they were badly pitted, notwithstanding the fact that they were nowhere near any electric power cables and that no tramways existed. There were also telephone cables shown to me with holes eaten practically through the lead, and it seems to me that there are other causes—probably in the soil itself —why then, always put the blame on the electricity supply undertaking?

The PRESIDENT: In connection with the remarks of Mr. Councillor Freeman, of Johannesburg, the matter of the taking of monies from the revenues of electricity supply undertakings for the relief of the General Rates of the city or town is one which I think will well bear discussion, more especially the practice which obtains in some towns of requiring the electricity supply undertaking to make substantial contributions in aid of rates whilst not making adequate provision for depreciation and obsolence. In my address I have suggested that this is a matter upon which the Electricity Commission might very well be asked to give a very definite ruling, and I think a subject like this might very well provoke a useful discussion, both from members and councillor delegates.

Mr. POOLE (Durban): The question of the relief of rates by electricity supply undertakings is a very thorny one in the minds of the members of our Association. You will probably remember that we dealt with it as far back as 1917 and again in 1924 at our Durban Convention—and we re-affirmed our previous resolution on the subject—that provision for the relief of rates should be deleted from all electricity accounts. This question of the relief of rates looks rather like flogging a dead horse and I think the suggestion that the President makes that the Electricity Supply Commission might in some way assist us and see that our best interests are safeguarded is a very useful one.

Councillor WEIR (Port Elizabeth): I wish to congratulate you on the manner in which you have prepared your address, because as laymen we are to some extent, students seeking to learn. You have afforded us a very fine opportunity to air our views on certain points which you have raised. One is the financial question of taking profits from the electricity undertaking for the relief of rates. Personally speaking, I think it is not the correct procedure to adopt. I hold that the electricity undertaking should be run as a purely trading concern, supplying to the public and therefore it should be treated on commercial lines. I am very pleased that we have this opportunity, because when we come to this very real commercial point, I think we can go hand in hand with the technical officers. I think it is up to all heads of Electricity Departments to see that their departments are protected from a financial point of view. Some people say that it is the right of the general ratepayer to get any profit that may result from the sale of electricity, but as has been pointed out from time to time, from a commercial point of view, that with the advancement of electricity, it is essential that the Electricity Departments of all municipalities should be adequately protected in regard to provision for obsolescence and renewals of plant. This is a matter which should receive the very careful consideration of all municipal councils in dealing with the point of who should get the benefit of any profits made. I dispute the point of view which contends that the general ratepayer in the community should get the benefit, and not the users of electricity only. The people who really get the greatest benefit from contributions in aid of rates are those who are not actual

consumers of electricity and have therefore taken no part in the making of the profits so disposed of. I trust that other councillors, as well as engineers, will take it up with their Committees and Councils to see that their treasurers are told to keep their hands off the profits of the trading concern—the Electricity Supply Department.

Mr. JAGGER (Ladysmith): This question of the appropriation of profits has been more or less a bone of contention between engineers and councillors for some time past. It has been brought up at several of our Conventions. I think that to a great extent the larger municipalities, i.e. Durban, Capetown, Johannesburg, are greatly to blame for the present situation. For instance, in Ladysmith, we made quite a handsome profit and I was told that all of that profit would have to go in relief of the general rates as was being done in Durban, Capetown and Johannesburg. In Durban they use the greater part of their profits for the benefit of the consumers and bring down the price of current. We in the smaller municipalities should turn round and say that we know they are doing that in Durban, why cannot we do it also? If they made a special effort to reduce the present tariffs by utilising profits in reduction of charges we in the smaller towns would be very pleased to follow in their footsteps.

Mr. CHALMERS (George): I should like to raise the question of the setting aside of reserve funds, speaking from the point of view of one who takes a very keen interest in the financing of his department. I think you will bear in mind that Dr. Hamlin at our last Convention pointed out the advisability of engineers taking a much more practical interest in the financial working of their departments. From my own point of view I think it is advisable to assume the entire responsibility for the financial side of my department, and although this entails extra labour and responsibility, I think it is a point well worth considering that engineers should take up this position rather than take over the departmental charges levied by Town Clerks' Departments. If this were done I think the engineer would be better able to advise their council regarding what attitude they should adopt in regard to the taking of monies for the relief of general rates. What percentage on the capital of an electricity supply undertaking should be set aside annually in order to provide for reserve, depreciation and obsolescence? I have

corresponded on this matter with several town treasurers and there is a certain similitude about their replies. I should like this matter to be fully discussed by our Convention in order to see what guidance members and delegates can get.

Mr. SWINGLER (Capetown): I think you all know, the older members at any rate, that the matter of taking monies from electricity undertakings for the relief of rates has long been a trouble of mine. Mr. Jagger suggests that if the bigger municipalities tried to get their councils to abolish relief of rates the smaller municipalities would be able to follow suit. I wish he could realise that it is just as difficult for the engineers of the larger towns to get their councils to abolish relief of rates as it is in the smaller towns, in fact it is more difficult. The engineer cannot have financial control of the Department *wholly* without having a treasurer who has to make both ends meet, and must have regard to the financial interests of the city or town as a whole. It is not so easy to convert a treasurer to the view that there should not be any monies taken in relief of rates. There is the old argument that the ratepayers have bonded their properties for the electricity undertakings' loans and that if it were not for the general ratepayer there would not be any Electricity Supply Undertakings. My reply to that is, if the undertaking is not paying its way, it has no right to exist. You should not have an Electricity Supply Undertaking if it cannot make both ends meet. In Great Britain the question of the relief of rates has been dealt with very definitely in the Electricity Act. In regard to the selling of electricity at cost, this is a principle which has already been adopted in South Africa by the Electricity Supply Commission, i.e. that electricity should be sold at cost. In Capetown last year we paid £26,000 or no less than 22% of our revenue in relief of rates. Then there is the matter of the credit for street lighting. To-day in Capetown the amount which the electricity undertaking receives for street lighting is £21,500; in 1903 it was £14,000. If a Council will not allow the undertaking more than £5,000 for street lighting, what redress has an engineer got? We have tried in Capetown to get the Council to see the necessity for, and the benefit of running the undertaking without its being required to make contributions in relief of rates. You will notice if you look at the report of the Advisory Committee set up to advise the Electricity Commission

of Great Britain on tariffs, that on page 22 they make a point of the desirability of no contributions in relief of rates being required from electricity undertakings and as a matter of fact, in the Electricity Act of Great Britain provision is made for debarring such contributions. It is more beneficial to a town to have a cheap electricity supply than to have a slightly reduced general taxation. If you wish to encourage industrial development by providing electricity at the lowest possible charges, then it can only be done at the expense of the relief of rates, because you cannot have both. The fact that a town has bonded all its property to raise a loan is, in my opinion, no argument. The electricity undertaking never calls upon the town for any contribution. It pays its way and I maintain that as soon as an electricity undertaking is established on a sound financial footing, everybody's property appreciates as a result of the service being available. Any part of a town appreciates when such essential services as water and electricity supply are made available to it. By making contributions in aid of rates in Capetown we are actually assisting our competitors, the gas company, and the same applies to all your competitors. The question of the relief of rates has been and still is a burning question. Such important and progressive towns in Great Britain as Manchester and Glasgow and others have changed their opinion on the experience they have had and I am told that they would never go back to the short sighted policy of taking money from their Trading Departments to relieve the general rates. There is no question of the relief of rates from waterworks in the Cape Province; they have to be run at cost. I believe if we hammer away at the Provincial Authorities we will get them to pass an ordinance providing that Electricity Undertakings are to run without profit or loss. While you have treasurers and councillors and electrical engineers who are afraid to go to the public for a loan and not be prepared to argue that their trading undertakings are an asset to the town, independent of what direct financial results they may show, a proper solution of the problem will not be found. In the matter of what allowance should be made for depreciation and obsolescence, not less than 3½% per annum is allowed in Great Britain, and I think you will find in due course that the Authorities in South Africa will adopt the same figure, because if you allow less than that you are on dangerous ground. I do hope that our councillor friends will express their views freely.

Councillor HART (Grahamstown): I think a most important thing is the provision of adequate reserve funds. I am afraid, however, that from what I have heard that in South Africa electricity undertakings do not provide sufficient reserve funds. We are still, comparatively speaking, a small undertaking in Grahamstown, having been in existence just over 3½ years. Our Finance Committee in Grahamstown, I am glad to say, have very strong views on the necessity of providing an adequate reserve fund, much to the disgust of some of our consumers. I think it would be a very good thing to give from this Convention very strong support on the lines suggested by you, otherwise you are going to have a very large increase in Capital Expenditure, with the result that there will be over capitalisation of electricity undertakings, so I do hope to see that this Convention will pass a resolution strongly supporting those councils that are trying to build up reserve funds for the future and especially for the replacement of obsolete plant.

Councillor FOURIE (Pretoria): First of all, I would like to thank your ssociation for the kind invitation which you have extended to councillors throughout the Union to attend your Convention. I think it was a very wise and very useful thought to bring councillors here to hear what you discuss and to get a better understanding of the lines that you propose to follow in the future. The point under discussion appeals to me very much. I think it is a most important point and one that deserves the fullest consideration of everybody present. As a councillor I have always advocated the cheapest possible current that can be produced and to supply that current to the public and to the consumer at the lowest possible prices, because I feel that by supplying that current at the cheapest rates you get back more than the contributions to the general rates which some municipalities seem to be so keen on getting from their trading concerns, and you get it back by encouraging industries, which you cannot encourage unless you can give a supply of current very cheaply. As to what is necessary to build up an adequate reserve fund to provide for obsolescence of plant? With the rapid strides that science to-day makes and the constant changes in the apparatus used in electricity undertakings I feel that it is most important that a suitable and adequate reserve fund should

be built up by every municipality to provide for this from time to time and to avoid over capitalising the undertakings. In Pretoria, for instance, about three or four years ago when we built our new power station, it was thought that we had made provision for 10 or 15 years ahead. We found after four or five years that the plant had to be doubled. Now if we had not made ample provision for renewals and depreciation, a very difficult position would have arisen. I no not want to convey the impression that the *additional* plant is to be paid for out of the reserve fund, but I mean that if you provide a substantial reserve fund first of all and then decide not to make any profit out of your concern then you induce industries to make more and more use of your product, because of your being able to impose the lowest charges possible and thereby gain the support of the industrial community, and get your return. If you are not getting it directly you are getting it indirectly and I think it is a better way of making your trading concern pay, therefore I feel if your deliberations here can influence municipalities in that direction, I think that you have done a very good bit of business. I feel that the Municipal Electrical Engineers' Association, as it is constituted, should be looked upon as advisers—and of course they are advisers in the true sense. Most of the councillors here are laymen and they look to their engineers for advice in these matters. We cannot discuss matters on a technical basis, but we can only use our common sense, and if engineers can go back and can inspire their councils and their committees with what they have been able to learn at your Conventions, then I think they can do very useful work. I think, Mr. President, one very important point is that the production of electricity should as far as possible, be centralised. Smaller municipalities should not be encouraged to start plants on their own, but where possible should call in the assistance of the larger municipalities or of the Electricity Supply Commission, and if they require electrical power should try if at all practicable to get it through those channels. This will, to my mind, be a far better thing to do than to erect small isolated plants. They can not hope by any means to produce electricity at such a low cost as can the larger undertakings such as the Electricity Supply Commission, therefore I think that the Engineers representing smaller Municipalities should from time to time try and induce their councils not to spend

money on erecting small power stations but should give careful consideration to the taking of supply from neighbouring larger undertakings, where such exist.

Pretoria Municipality, for instance, has applied for and got permission to serve the area contained within a radius of 25 miles from town, which will mean that Pretoria can build a larger and more efficient plant, big enough to supply the needs of everybody within that radius. If all larger Municipalities would think of that I think it would be to the benefit of the smaller communities and therefore to the country as a whole, particularly from an industrial point of view.

Mr. MAIL (Kokstad): The Kokstad Municipality has had considerable discussion and difference of opinion on the matter of providing an adequate Renewals Fund. As the result of six years working we are going to have surplus sufficiently large to show a nett profit of 3½ per cent. on our capital and our auditors say that 1½ per cent. is sufficient for Depreciation and Renewals. At present we levy a 1d. rate—what we call an Electric Light Rate. It is quite a distinct Electric Light Rate.

Councillor LOW (Capetown): I was present at the Durban Convention held some three years ago when the resolution was passed reaffirming the principle that there should be no money taken, in relief of rates, from electricity undertakings. I am sorry that the smaller municipalities should quote Capetown and Durban in this respect. I personally hold the opinion that the principle of requiring contributions to general rates is a bad one and regret that the practice should ever have been started. So far as I know, Capetown started with a £6,000 contribution, and to-day they are contributing £26,000 per annum in relief of rates. You will understand when the contribution has reached such dimensions how exceedingly difficult it is to get the Finance Committee and the Treasurer to agree to a withdrawal of such a large sum, because, of course, you can see how it will affect them in the fixing of the general rate for the year. We in Capetown are endeavouring to look upon the Electricity Undertaking purely as a trading concern. We have made little headway in this matter—in the direction of getting the contribution in relief of rates abolished—but I am hopeful that we will be able to get the Council to see the error of its ways. We are fortunate of course in having a large Reserve Fund at our Disposal, with

which, within recent years, we have been able to develop the undertaking very considerably. I may mention that our revenue in 1917 was £156,000, and with the additional plant we have been able to put in, in 1926 we have raised the revenue to £405,120, or an increase of approximately 160 per cent. You will thus see the advantages that have accrued to the Undertaking by the developments which have taken place. We have contributed during that time a very considerable sum to the Relief of Rates, approximately £200,000, and the balance in the Betterment Fund at present stands at £244,272 being the nett surplus, after meeting all charges and contributing the abovementioned sum in the Relief of Rates. With regard to the question of Depreciation mentioned in the "Weir" report, there they put down the annual contribution to the Depreciation Fund at 3½ per cent. for plant so taking the case of the Kokstad Municipality where they are only allowing 1½ per cent. per annum, it would appear that they are allowing an average of 40 years life for their plant. We in Capetown, I think, allow approximately 5 per cent. per annum as the contribution to the Depreciation Fund. We have other indirect taxation upon the Department in the shape of a charge of 2 per cent. on revenue and ½ per cent. on expenditure to cover services rendered to the undertaking by other departments such as the Town Clerk's and Town Treasurer's. Our street lighting vote is on a very unsatisfactory footing and we have been endeavouring to ascertain on what basis this vote is fixed in other towns in this country as well as in other towns in England. Our vote for street lighting has simply been a block vote, and although we have increased our units consumed for street lighting by approximately 50 per cent., only last year did we get an additional vote of something like £1,500 towards it. Of course with regard to the charge of 2 per cent. on revenue and ½ per cent. on expenditure, I do not know whether that is a reasonable figure or not. It represents a charge on overhead expenditure in regard to the Treasury Department, but of course as our revenue increases year by year, they have benefited very considerably through the contribution to rates.

Mr. WOLLEY DOD (Pretoria): There is one small point which occurs to me and that is in regard to the question of the Depreciation Fund, which perhaps some delegates here may prefer to hear called a Better-

ment Fund. I think it is quite a common practice in many municipalities for a certain sum to be set aside annually and the interest on that fund is bagged by the Town Treasurer and that makes it very unfair to the department. I should like to hear from other councillors whether that is a common practice or not. I rather think it is.

Councillor CLARK (Durban): This is the second time I have been privileged to attend your Convention. Every time that I have been I have learnt something new. I have learnt a little to-day. I have learnt that Pretoria has the right of supplying within a radius of 25 miles from the centre of the town. In Durban we are allowed to supply within a radius of 16 miles, so that when I go back to Durban I shall see why we cannot get the same radius as Pretoria. I have been surprised at several things which I have heard today. One is that some undertakings do not appear to have any Sinking Fund at all for paying off Capital Expenditure on their Plants. I do not know whether this is actually so, but if it is so, it is a blind policy which no business man would care to follow. I can not give you the figures which we work on in Durban at the present time, but I think in any case the contributions to our Depreciation Fund are based upon the life of the plant. If that is done I think it is ample for the purpose. We have a very large amount of Sinking Fund invested and bringing in interest as well. In regard to the contribution in aid of the general rates, it has been said repeatedly that it is one of those questions which is a very ticklish one in so far as municipal councils are concerned. I have always been in favour of municipal trading enterprises being run for the benefit of the people using them, and I believe that the Electricity and Tramways Department as well as Telephones and everything else of the kind should all be run at the cheapest possible cost to the consumer or user, so that they shall get the benefit of that which they themselves are the principal users. I have been surprised to learn that Capetown contributes the enormous sum of £26,000 to the relief of rates. In Durban we should top that by 100 per cent. for this year, in fact, we are budgetting for £47,000. You know that Town Councils and Municipalities are not their own masters any more than are Electrical engineers. We are governed by an Ordinance which lays down that as regards Municipal

trading concerns 4 per cent. on the capital of the undertaking is a maximum and 2 per cent. a minimum contribution to be made to the General Rate Fund of the town. Our Electricity Department always contributes its 4 per cent. in relief of rates. The tramways have at times contributed 4 per cent. and at other times 3 per cent., whilst this year the tramways contribution will be 2 per cent., but I think myself it would be a good thing if uniform legislation could be passed by the Provincial Legislatures or Parliament to put the whole of the municipalities in the Union upon the same basis in regard to these matters, so that we would all know where we stood and be able to make very much more valuable comparisons. This is where many of our difficulties arise, from the diversity of the procedure and the enactments which govern us, and I think it would be a good thing if the Asssociation could get legislation passed along these lines, in regard to the whole of the municipalities in the Union. I wish to express my pleasure again at being here and hearing the problems which you are discussing. We as laymen cannot discuss these problems technically, but though we are getting old we are always learning something, and I hope we shall learn a good deal before this Convention is finished, as I am sure we will.

The PRESIDENT. In the matter of Rate Relief and provision for Depreciation, it has been said that by discussing this at each Annual Convention we are flogging a dead horse. I don't entirely agree with that, because at each Convention we have new members present and new councillor delegates, and, after all, if councillor delegates declare, as one and all have done, their willingness to be educated at our Conventions, we may be able to do some good. We now have in the Union an Electricity Supply Commission; and I understand the primary object for which this body was created was to further the development of the use of Electricity throughout the Union and to ensure electricity being supplied at the lowest charges practicable, which can only be done by seeing that a sound financial policy is adopted in the operation of the sevarl undertakings, it is, in my opinion, and in the opinoin of many speakers, totally unfair that money should be taken for the relief of rates and the benefit of any profits realised not come to the consumer of electricity. How much more unfair and in fact unsound is it when money is taken in relief of rates and no provision is made for depreciation, or, as I prefer to call it, obsolescence?

In the Electricity Act, I think I am right when I say that the Electricity Commission, in regard to its own undertakings, is required to contribute an amount equal to 3 per cent. on its capital, per annum, to reserve fund. I think this is so, so long as the total in the fund does not exceed 15 per cent. of the capital. We, I think, are expected to look to the Electricity Supply Commission in the matter of electricity supply as the supreme body in the Union, and I think we have a right to look to the Commission to take such steps as may be necessary to ensure sound financial conduct of electricity undertakings. I should very much like indeed to hear Mr. Jacobs' views on the subject if he feels free to give them.

Mr. JACOBS (Electricity Supply Commission, Johannesburg): I can assure you that I can speak for the Commission when I say that we greatly appreciate the understanding attitude taken up by your President and expressed in the words appearing in his Address, viz:—"Knowing, as I do, that the Electricity Commission is at all times glad to receive from bodies such as this Association, suggestions having for their object the advancement of the Electricity Supply Industry." That indicates, gentlemen, an attitude which I assure you, we as a Commission are very pleased to know exists. At the same time while I cannot speak from the book in this instance, not having the Act before me, I am afraid that it falls rather outside the domain of the Electricity Commission's work to give a ruling on the financial policies to be followed. Whilst saying that, I want to add that we shall at all times be very glad indeed to co-operate to the limit with this Association in all matters affecting your welfare and the welfare of the undertakings with which your members and delegates are connected. I think it might be appreciated for me to draw the distinction between the Electricity Commission and the Electricity Control Board. The Electricity Control Board is a body which is directly responsible to Government, and to which we stand in much the same relation as every Municipal Electricity Undertaking in the country. We have to go to the Control Board for approval of our plans and proposals and for the promulgation of such Regulations as we may desire to have issued, and in my opinion it is possible that a ruling such as suggested by your President should come from the Electricity Control Board rather than from the Commission. However, we shall be glad indeed to collaborate with

your Association if you feel it is desirable, in approaching the Control Board in connection with obtaining a decision on the important matters mentioned in your President's Address. If my own personal opinion is of any value at all, I would like to say a word or two about the Reserve Fund or Obsolescence Fund as your President prefers to call it. Obviously some sort of provision should be made for replacing plant either at the end of its useful life or before such end, if a catastrophe should overtake it. A boiler may explode or something serious happen to a turbine or to any of your generating machinery. If you have no fund out of which you are able to replace that machinery, then obviously you are faced with the unpleasant necessity of going out and raising fresh capital. I need only mention storage batteries as an instance. You know what is required if you want to keep your battery alive and of continued use. You can put the thing on a moral basis. You can say you have the obligation of keeping your plant in a condition to continue to earn money, out of which you must pay the interest due to your lenders, and out of which you must create and contribute to a fund to repay the loan within a fixed period of time. If you have to keep your plant in working order you must have a certain fund to meet the requirements of your plant in order to keep it in a fit state to earn an income. Where there might be some divergence of opinion is in regard to the amount which should be accumulated. One, and the main arguments used is that there is no good putting aside a Reserve Fund for purchasing a completely new plant at the end of its useful life and thus relieving posterity of the duty of looking after itself. To my mind that is the one extreme of argument, and the other extreme is to make no provision at all. In one instance which I remember I got a reply from a Consulting Engineer when I asked him what provision he desired to make, in which he said "these matters will be attended to as they arise." That is the other extreme, and I imagine he is in for a very unpleasant time. The actual amount set aside would vary from time to time. In a very large and powerful undertaking you would be justified in accumulating a very good fund. I have sometimes been approached by some of my colleagues for recommendations in this matter. I have found it a very useful thing to recommend to them to allow at

least for the replacement of their prime movers at the end of their useful life. If your sales of electricity are such that you can allow for more, it is all to the good. I agree entirely with your President that your Electricity undertakings should stand four square on their own bottoms and should require no assistance from outside. I do not feel that it would be seeming for me to go into the matter of appropriation of profits in relief of rates. That is a matter which can be very ably dealt with by the other gentlemen present.

The PRESIDENT: I suggest as the next subject for discussion that of "Railway carriage on coal." Before dealing with the subject I would like to mention the unavoidable absence of Mr. James Scott and also Mr. Bickell, both of Port Elizabeth. They are suffering from a complaint which we all of us would welcome, viz: that owing to the demand for electricity in Port Elizabeth it has become an urgent matter to increase the capacity of the power station and so Mr. Scott and Mr. Bickell are unable to be here to-day.

Councillor WEIR (Port Elizabeth): I have been asked to take up this matter of rail carriage on coal as it is a very serious one for municipalities, more particularly those situated some considerable distance from the coal mines. I was one of the delegates from the Johannesburg Town Council appointed to interview the Government of the day before the Electricity Act was passed and since the Act was passed we have come under the control of the Electricity Commission and also the Control Board, so we now have a body of men with high technical and business qualifications in control of the supply of electricity in the Union. It appears to me that these are the bodies which we should get to assist us in taking action in the matter of railway rates on coal and that probably the Control Board is the one to deal with these matters. I think the matter is really one of national importance. First of all the Electricity Commission and Control Board are national affairs constituted for promoting the use of electricity throughout the Union of South Africa, and at the same time we have the Railway Adminstration controlling our railways. It appears to me that instead of dealing with the matter as individual municipalities, if the thing were done collectively, probably a tariff could be prepared which would be more equitable than that now in force, particularly for those undertakings far away from the coal mines. If coal

could be delivered at a lower cost then probably the Electricity Commission, in reporting upon proposals for schemes might suggest the use of steam, which through coal, is a product of the country, instead of using crude oil which has to be imported into the country. I do not think I can say anything further on the matter. I think the Convention should pass a resolution that the whole matter be strongly represented to the Electricity Control Board to see what they can do to assist us in this very important matter.

Mr. BOARDMAN (Town Clerk, Barkly East): I should like to tell my friends here our little experience in Barkly East. Coal at present costs us 8/3d. at the pit head. When delivered at the Power Station it costs practically 39/2d. so that you can imagine the disability Barkly East is suffering from at present. You can realise what a burden such a cost is to the ratepayers of the town. Of course our train service to New England is only allowed to take 11 ton trucks and this means increased cost for it means that 16 and 20 ton trucks have all to be off-loaded at Aliwal North and the coal re-loaded into 11 ton trucks. If this Convention can possibly do something for the relief of the smaller municipalities I think it would be of great assistance.

Councillor PRIOR (East London): You, Mr. President, have voiced my opinion in your report, but I do not think we shall hear very much from our friends from Durban and Dundee who get their coal very very cheaply indeed. I agree with my friend from Port Elizabeth that our coal supply should be made a national thing. I maintain that it should be carried by rail at a flat rate. After all is said and done it is for the benefit of the people of the country. I maintain that the Government so far as coal is concerned should carry it at a flat rate. You tell us here that you pay 19/- to the Railway to bring down our coal to East London, and that 5/- per ton is the cost at the pit head. No wonder, Durban, Pretoria, Johannesburg and these different centres can talk about the large profits they make. No wonder, simply because our profits are eaten up in the carrying of our coal from the coal mines to the coast. I do not suppose for one minute that we shall hear any complaints from these centres where they get their coal very cheap. I hope the Convention will take this matter up and see what can be done for the relief of the centres on the coast.

Councillor THOMSON (Bloemfontein): I have listened with great interest to the views of Mr. Prior of East London with regard to a flat rate for the carriage of coal. I must say that so far as Mr. Prior's proposal for a flat rate on coal is concerned, we up-country would be very much against anything of this description. Mr. Prior must not forget that whereas we may obtain our coal at much less cost, those at the coast get water for condensing purposes for nothing whereas our water in Bloemfontein costs us £100 per month for that purpose, so that I suggest that we should have our water carried at a flat rate from the coast to compensate us. I am entirely in agreement with the suggestion that we should endeavour by all the means in our power to get the rates on coal reduced. Natal Coal costs us somewhere about 4/6 per ton at the pit mouth, and, landed in Bloemfontein, in the vicinity of 15/- per ton, a matter of 300 per cent. for railage. I think that it should be the attitude of every member and delegate attending this Convention to advocate a reduction in the cost of carrying coal for electricity supply undertakings.

Mr. SWINGLER (Capetown): Two or three years ago we in Capetown were instrumental in having a deputation go to the late Minister of Railways on this important matter and we also made representations to the Railway Administration. In my opinion the last mentioned are the people we have to get at. I do not think we have to get at the Electricity Control Board. The Railways Administration are the only people we have a hope of getting a reduction through. Sir Wm. Hoy at one time was in favour of a reduction in the rate on coal. There was a flat rate on coal and whilst East London only paid 15/- a ton railage, Capetown paid £1 a ton. Last year we spent on the carriage of our coal over £40,000. This year the Railway Administration will receive £47,000 for railage on Coal to the Capetown Electricity Supply Undertaking. Either the Government or the Railway Administration must bring the price of Bunker Coal down to meet world competition. We have no quarrel about that. In 1917 we paid 19/7 per ton for coal, today we pay 20/- per ton. In Capetown we get bunkering coal down for 17/6 and I do feel that if representations were made by this Association to the Railway Adminstration and it was pointed out that from a national point of view they should give a reduced price on small coal there may be some hope of success. I am

told that 30 per cent. of the coal mined in South Africa today goes to waste, so that if we could argue that this small coal is a national asset and be prepared to say that we would use such small coal, then if they should reduce the railage charge we would be doing some good, and it would result in utilising a national asset which today we are allowing to be entirely wasted. I should like to suggest that we advocate the Railway giving a special rate, a reduced rate and a very favourable rate, for the carriage of small coal, and argue that the use of such will be of real economic benefit to the country. If you have some such proposition to put forward you can appeal to the Government to stop this waste. You can appeal to the Government in the interest of those large users of coal who could use the poorer qualities of coal. It does not at present pay Capetown to buy small coal. The freight on the very best coal from Natal is the same as on the low grade coal. Anyone would be very foolish to pay 25/- a ton for dirt when you can get the highest grade coal for very little more. If we had a rate of 12/6 on a low grade coal, which is about the same price as charged for export coal, we should certainly use the low grade coal instead of it being wasted and the coal mines would benefit thereby. I would like to propose that the Association make representations to the Railway Administration to reduce the carriage on coal, more particularly small coal. We cannot argue that they should reduce the price of oil, for oil, up to now, is imported, whereas coal is a national asset produced in the country. I argue that it is the national asset that you should develop. If you buy coal in the country it is keeping the money in the country. Whilst I do not want to appear to be a dog in the manger, we must put up a sensible case if we are to have any hope of being successful. We should place before the Railways Administration all the information we have—and I will be able to provide you with quite a lot—because as our President knows, we have been hammering at this thing for the past three years. I know the Railway Administration has recommended a reduction but the Railway Board turned it down. If we go to the Railway Administration with a concrete proposal such as I have suggested we may have some hope of success.

Mr. VOWLES (King William's Town): The argument put forward by the Bloemfontein delegate does not hold good in the dozen or more smaller munici-

palities which are situated away from the coast. There is a very much more serious difficulty in the small towns where the cost of coal looms very much more largely than in the bigger towns. When I tell you that we in King William's Town buy coal for 3/- at the pit's mouth and that we pay 19/4 carriage on it you will realise that it is a very serious matter. I move that it be an instruction to the incoming Council of this Association to approach the Electricity Control Board to see if we cannot get their assistance in the matter.

The PRESIDENT: We might add to any resolution in the direction indicated that this Association co-operate with the Commission and other large coal users because the Commission will be one of the largest consumers of coal in the country, for the production of electricity. It would appear to me to be just as much in the interests of the Commission as of the undertakings represented at this Convention.

Mr. RALSTON (Dundee): The coal position does not affect me at all because I happen to be on the spot and pay 6/6 per ton delivered for coal which is a little bigger than peas. When one goes round the Dundee district and sees the enormous amount of waste going on, one sees coal that would give 12,000 B.T. Units per lb. lying on the dumps wasting solely on account of the heavy freight coal consumers have to pay. From a national point of view it is a shame to see all that valuable stuff being wasted. I thing we should move in the direction of trying to get a reduced railway rate on such coal.

Mr. SANKEY (Johannesburg): I would like to support the suggestion which has been made and would put forward this further suggestion as to the ways and means to be adopted in carrying it out. I suggest that this meeting might, before the week is out, appoint a small Committee to collaborate with the Electricity Commission with a view to seeking an interview with the Railway Board to bring this matter definitely and directly before them. I do not personally think that it is any good writing letters and making representations in writing. We should seek a direct interview and at this interview a small Deputation should be there fully representative of the principal interests concerned. Before we go we should get together facts and figures to put before the Railway Board as to the quantities of coal upon which we, as consumers, annually pay carriage, and as to what proportion the cost of coal at the mines bears to the amount paid in

carriage, as well as the anomalies which we suffer by reason of the present railway rates on coal. You might think that Johannesburg is paying a very low price for its coal, so it does in a way, but we are paying 7/3 to 8/6 railage from the Witbank mines to Johannesburg, and I believe the distance varies from something like 80 to 100 miles. It seems to me that the more I hear of to what the coal railage rates actually are the more hopelessely inconsistent do the charges appear to be. When you have tariffs ranging from 8/6 for 100 miles up to something like 20/- for 1,000 miles, there must surely be something fundamentally wrong.

The Railways Administration must know on certain definite routes what is the rock bottom cost of haulage, in the same way as the electricity undertakings are required to know what is the rock bottom price of generating and delivering electricity to a given point. We consider that the South African Railways should be run on business principles, therefore we can hardly advocate that coal should be carried to Capetown, Port Elizabeth or East London at under cost. Nevertheless it does seem that the whole question of coal freight might be gone into by our Association with the Railway Board, with the idea of putting it on a sounder basis. We, in supplying electricity, very often do so on a sliding scale. It is possible that some kind of a scale might be devised in the case of rail carriage on coal whereby we should pay so much for the first 100 miles and so on, but at any rate until we get definite information from the Railways Administration as to the principles which actuate the various rates, it is very difficult for us to discuss rates with them. The present rates are a detriment to the industrial development of the country. Generally speaking, the greatest difficulty which we have in developing the country electrically is the coal question. I would like to suggest for your consideration that before we finish our Convention we should make some definite attempt, pereferably by way of a small committee, to definitely approach the Railway Board on this important question.

The PRESIDENT: I would suggest that we take a resolution on this matter at a later stage. Such a resolution can not be hurriedly worded and can very well be brought up at a later stage.

TUESDAY, 13th SEPTEMBER, 1927.

The Convention resumed its proceedings at 10 a.m., the President (Mr. J. Mordy Lambe) in the Chair, there being also present:—

Members.—T. P. Ashley (Queenstown), G. C. Brown (Middelburg Transvaal), C. H. Baskerville (Salisbury), W. F. Bower (Barkly East), W. H. Blatchford (Greytown), A. S. Chalmers (George), J. G. Clark (Fort Beaufort), A. J. Clemo (Alice), R. D. Coulthard (Oudtshoorn), P. W. Dadswell (Cradock), T. C. Wolley Dod (Pretoria), R. W. Fletcher (Krugersdorp), H. L. Groom (Roodeport-Maraisburg), J. Iverach (Grahamstown), T. Jagger (Ladysmith), S. Lewis (Aliwal North), R. Macaulay (Bloemfontein), W. M. Mail (Kokstad), F. C. D. Mann (Worcester), M. McDonough (Bethlehem), T. Millar (Harrismith), H. A. Morris (Kimberley), P. H. Newcombe (Indwe), I. J. Nicholas (Umtata), E. Poole (Durban), H. A. Prevost (Somerset East), L. Ralston (Dundee), W. D. Ross (Potchefstroom), B. Sankey Johannesburg), T. F. Siebert (Uitenhage), H. G. Simpson (Dordrecht), T. J. Smith (Durban), L. B. Sparks (Pietersburg), R. A. Stoker (Kroonstad), T. Sutcliffe (Benoni), G. H. Swingler (Capetown), J. Vowles (King William's Town), J. Wud (Adelaide), R. A. Young (Bulawayo), J. Younger (Vryheid).

Associate Members.—Nil.

Delegates.—C. Boardman (Town Clerk, Barkly East), Councillors J. W. Bryson (King William's Town), A. L. Clark (Durban), A. R. Davidson (Roodepoort-Maraisburg), M. Freeman (Johannesburg), J. F. Fourie (Pretoria), T. Gibb (Alice), S. H. Hall (Dordrecht), H. H. Hart (Grahamstown), J. D. Low (Capetown), J. Paton (Kroonstad), G. W. Prior (East London), H. Rugg Roodepoort-Maraisburg), D. A. Solomon (Potchefstroom), L. Sparks (Cradock), R. A. Thomson (Bloemfontein), A. Van Heerden (Harrismith), T. Scott Warren (Kokstad), W. G. Wearne (Roodepoort-Maraisburg), R. L. Weir (Port Elizabeth).

Visitors.—A. M. Jacobs (Electricity Supply Commission, Johannesburg), C. Mullins (Chief Inspector of Machinery, Johannesburg), F. C. Stephens (Public Works Department, Pretoria), C. Westaway (East London).

Honorary Secretary and Treasurer, Prescott Adkins (East London).

Announcements.

The PRESIDENT: I have two announcements to make. First of all, I will, for your information, read Clause (3) of the Constitution of our Association, which provides that:—

> "Honorary Members shall be distinguished persons who are or who have been intimately connected with Municipal electrical undertakings, and whom the Association especially desires to honour for exceptionally important services in connection therewith."

You will, I am sure, be pleased to hear that the Council have already elected as first Honorary Member of this Association Dr. Van der Bijl, Chairman of the Electricity Supply Commission. In response, Dr. van der Bijl has been good enough to wire saying that he very much appreciates the honour and I am sure that you, one and all, highly value his accession to our ranks as an Honorary Member.

New Members.

The PRESIDENT: I have pleasure in announcing the election of two new members, Mr. J. G. Clark (Fort Beaufort) and Mr. Balfour (Ficksburg).

Discussion on Presidential Addresses continued.

The PRESIDENT: Our next business will be to continue the discussion on the Presidential Addresses. When we adjourned yesterday (Monday) afternoon, we were discussing freight charges on coal and the possibility of utilising coal which to-day is practically lying waste at the pit mouths. This matter you have agreed to leave to the Council to take action in conjunction with other large users of coal.

The next item for discussion in the Presidential Address is the matter of the adoption of a uniform system of accounts for electricity supply undertakings.

Councillor LOW (Capetown): With regard to the question of the adoption of a uniform system of accounts for electricity undertakings I do not know whether you are aware that there is a meeting being held at Bloemfontein to-day for the purpose of forming an Association of Municipal Accounting Officers. I do not exactly know what the proposed Association, if formed, will be named, but I have little doubt that if the model

set of accounts which have already been prepared by this Association are forwarded to the Association, which we are assuming will be brought into being to-day and their criticism, advice and co-operation invited, some good will result. For my own part, I do not think there will be any difficulty in bringing the municipal Treasurers into line in this regard. After all, as you know the municipal Treasurers are wedded to the "vote" system and they prefer to make their allocations purely on that basis. Really there is very little difficulty in bringing the accounting system of an electricity undertaking into line with the "vote" system. I am quite certain that if the difficulties which they seem to see in the matter were really tackled in a spirit of co-operation they could easily be got over.

Mr. SANKEY (Johannesburg): Having in view the fact that we as an Association drafted a set of Model Forms of Account some three or four years ago and that we have had these published in our proceedings, it seems to me that it would be a good idea for our Association to endeavour to co-operate with the newly formed Municipal Accountants' Association, and we might from this Convention send them a telegram asking whether they would be prepared to co-operate with us and put forward to their Association the form of accounts which we have prepared. Up to now municipal Treasurers have not had an Association of their own as municipal officers, and it seems to me, now that such a body is being formed that they are the people with whom we might co-operate with the possibility of getting our model form of accounts brought into use and possibly, with some amendments made to meet their requirements. I think the time is ripe for co-operation between the two Associations, if the Municipal Accountants' succeed in forming one, and I put forward that suggestion for your consideration.

Mr. POOLE (Durban): I have always been interested in the subject of accounts and have been on Special Committees dealing with this matter. I think the main thing we want to get at is that the municipal years of all South African towns should end at the same time. It would assist in compiling statistics and accounts for after all they go very much together. In our Statistical Tables published annually this Association is unable to give the returns for periods which coincide one town with another. Some municipal years end in March, some in June or September and some in

December—in fact at present they are all over the place. This makes things very difficult and I think we should impress on the Municipal Accountants' Association now being formed the desirability of municipal years throughout the Union ending upon the same date. Another difficulty which I find in regard to accounts taken in conjunction with statistical returns is that the electricity undertakings in each Province are working under different Ordinances. The Provincial Auditors of any one Province will agree to a certain form of accounts for that Province, but it is at present impossible to get them to agree to the same form in any other Province, nor have they any power to do so, in addition to which there are differences of opinion between the municipal Treasurers; in fact there seems to be no unanimity at all. I think up to now the accounts adopted by the principal towns in the Union are lacking in detail as a study of the different subheadings of these accounts will show. It is essential that in matters of detail we should be uniform, then we would have accounts which would be standard throughout the Provinces and we should have statistics compiled on a more businesslike basis and capable of easier and more correct comparison than at present.

Mr. RALSTON (Dundee): I ask for information on a point in regard to the keeping of accounts. What position does the Municipal Auditor take up in this matter? We have had differences of opinion, for instance, as to what money should be laid aside for depreciation.

The PRESIDENT: The discussion is now more on the form of accounts than in regard to depreciation and should be confined to the former. In the Cape Province there is already a form of accounts laid down and gazetted but the Provincial Authorities do not seem to require electricity undertakings to adhere to it.

Mr. SWINGLER (Capetown): If we are to wait until we get the different Ordinances amended and municipal years to all end upon one and the same date, I fear that we will never have any standard form of accounts during our lifetimes. I cannot see Natal, the Transvaal and the Free State altering their Ordinances and forms of accounts to get a standard form of accounts to suit the Association of Municipal Electrical Engineers. It does not follow that in order to have a standard form of accounts the municipal financial

years must end upon the same date. We should hammer away to get a standard form of accounts and it does not matter whether the financial year ends in March or September as long as one year can be compared with another. In an endeavour to get a standard form of accounts this Association has gone to a lot of trouble in preparing a proposed form which has been submitted to all municipal Treasurers in the Union. The form submitted was certainly subject to some criticism, but in the Cape Province the Cape Provincial Section and the Audit Section were in favour of it, in fact I had several interviews with the Provincial Auditor and he was very much in favour of it, and I know that he is prepared to put a standard form of accounts into operation. Port Elizabeth, East London and Capetown have decided that the Provincial Administration shall do their audits, and they have just had an Ordinance to that effect passed. I feel that we should look to the Electricity Supply Commission and Control Board to get a standard form of accounts decided upon. If the Commission helps in advising the different Provincial Authorities to adopt one standard form of accounts, we shall then be able to look to the different Provincial Councils and get them to stipulate that the accounts of all electricity undertakings shall be kept in accordance with the standard form adopted and in fact this is already so in the Cape Province. In the Cape Province the Provincial Authorities stipulate the form in which accounts shall be kept but I understand that there are no Electric Power Ordinances in the other Provinces of the Union. I feel that whilst we are endeavouring to get the co-operation of the newly formed Municipal Treasurers' Association, we should not lose any time in again approaching the several Provincial Authorities to put forward our standard draft form of accounts for criticism and if found acceptable, adoption by all concerned.

Mr. BROWN (Middelburg, Transvaal): A matter of two years ago I tried to introduce a new form of accounts in Middelburg, but the Provincial Auditors said it entailed too much work. We have to keep a certain form of accounts for our own use and another lot for the Provincial Administration, which as you will readily see throws too much work on the Auditors, in fact their work is almost doubled.

The PRESIDENT: Before passing on to the next subject, I would just like to say that I do feel that unless there is co-operation between the Accounting Branch and the Engineering Branch—that is ourselves and the Treasurers and Accountants—we cannot hope to do much good. I feel that the suggestion put forward by our Ex-President is a very good one, i.e. that this Association should offer to co-operate with the Association of Treasurers and Accountants to be formed to-day. I think we should adopt the suggestion and make an offer of our full co-operation and assistance in the framing of a standard form of accounts. I would therefore move in that direction. Seconded by Mr. Young (Bulawayo). Agreed.

The PRESIDENT: I have suggested in my address that this Association offer to co-operate with the Electricity Supply Commission in formulating some scheme whereby those towns in which the pressure of supply to consumers is not in accordance with the standard adopted for the Union by the Electricity Supply Commission may be brought into line in the best and most economical manner possible.

Mr. BASKERVILLE (Salisbury): I beg to move that your proposal be adopted. Seconded by Mr. MACAULY (Bloemfontein). Agreed.

The PRESIDENT: The next subject is one which I hope will provoke a good discussion, i.e. the very important matter of tariffs.

Mr. SPARKS (Pietersburg): In the framing of tariffs in the smaller towns one has to go very carefully. For the first year after I took over the undertaking at Pietersburg we had a deficit on the Electricity Department of about £3,000 per annum. We had to meet that somehow and a tariff had to be devised to enable us to do so. The Town Council was absolutely against increasing the existing tariff, so an idea came to my mind which I see is embodied in one of the papers to be read to us later on at this Convention. My idea was to leave the tariff as it was and impose a supercharge of 2/6 upon each consumer for the first 10 units consumed per month increased by 6d. for every 10 units in excess of the first 10 units per month, and we found that it did not interfere with our business at all. The price of electricity was still 9d. and 3d. per unit. I am contemplating in the future reducing the tariff still further,

bringing it to 9d. and ¾d. per unit, but I am still in favour of putting on a surcharge of 2/6 as at present. The surcharge does not directly affect the price of each unit and the consumer forgets all about it. The consumer gets the idea fixed in his head that the price per unit is 9d. and the surcharge does the trick and has done it with us. Should any of the Engineers of the smaller towns like to try it, I am certain they will find that it will prove a great success and help to reduce, if not eliminate, their deficits. I can strongly recommend some of the engineers of the small towns to put such a scheme into operation.

Mr. MAIL (Kokstad): I would just like to say that two or three people have come to me and complained that my tariff seemed to be complicated and very bulky for such a small town, but the reason I assessed that tariff was because there were only one or two consumers who came under some sections of the tariff. Those drawbacks will be gradually be done away with as the undertaking grows. At present I have an idea of reducing the charge for heating and cooking from 3d. to 2d. and I think such a charge will be considered to be fairly low for a scheme having only 235 consumers. You will note that our consumers have to pay for all services rendered; they do not have to pay to be disconnected, but have to pay a re-connection fee. There are thirteen sections of the electricity tariff in Kokstad, and on some of the sections there is only one consumer. As an instance, in the case of supply to the larger hotels, their current works out at the rate of 7d. per unit—in one case the minimum charge is £5 per month and in another £12 per month—before they come on to the 6d. rate. It works out at practically 7d. per unit every month. The only comparison I have made is with the Durban tariff. I have had one or two travellers who sell electricial appliances remark that the tariff I have worked out is one of the cheapest in the Union for a small town.

Mr. BLATCHFORD (Greytown): Representing one of the small towns in Natal, I have given consideration for several years to the matter of tariffs, and after taking into account the lighting requirements of any individual consumer, we charge them at 3d. a unit. In the case of an hotel say using 180 units per month whatever they use over the minimum is charged for at 3d. per unit which I think will even beat Mr. Mail's tariff at Kokstad. On our present tariff the

charge for the first 10 units is 10d. per unit, the next 25 are charged at 9d. per unit and the balance at 3d. per unit. Power supply is charged for at 3d. per unit for the first 250 units per month, 2½d. per unit for the next 1,000, and 2d. per unit for the remainder. I find that to take as a basis the lighting requirements of the small consumer, that is, to average the consumption for lighting over 12 months and to make a low charge per unit for all consumed in excess of that quantity does away with all necessity for a multiplicity of meters. Even two-rate meters are thus rendered unnecessary.

Mr. NICHOLAS (Umtata): With reference to Mr. Sparks' remarks in regard to putting on a surcharge, the practice means that you really are camouflaging the actual charge per unit. In reality you are not actually charging the low price per unit that would appear at first glance. From my experience it is the highest rate charged per unit which worries the consumers most. A surcharge imposed in the way that is done in Pietersburg will no doubt tend to hide the fact that they are in effect paying a higher rate per unit. There is another way of making good any shortfall in revenue and that is by imposing an Electric Lighting Rate and so distributing the burden upon the whole of the ratepayers. Either way means that you find it necessary to have financial assistance because the electricity undertaking is not self supporting, but by imposing a surcharge the lighting consumer is made to pay instead of the general Ratepayers, but the object is achieved. In the smaller towns the capital charges are so very heavy that one is very hard put to it to make the public realise that it is the capital charges which are killing the small scheme, particularly in the first few years of operation.

Mr. CHALMERS (George): I have found it advisable to follow to some extent the practice which obtains in some of the larger cities of basing the lighting charges on the number of living rooms. In George, we charge for two units per living room at 1/- per unit and all units consumed in excess of this number are charged at 4d. per unit. If the consumer installs apparatus using 1,000 watts or over we come down to 2d. per unit for all units in excess of the room basis units. In this way we can reduce our tariff to three sections only. Hotels and boarding houses come in on the same rate. A very simple tariff like that the man-in-

the-street is able to understand and there is never any quibbling and never any doubt in the consumers mind. In so far as the financial results are concerned I think they fully justify the method of charging adopted.

Councillor WEIR (Port Elizabeth): I am very pleased that this matter has come up for discussion because it gives Councillor Delegates an opportunity of debating the subject from a consumer's point of view. I do think that some of the tariffs in existence in South Africa and elsewhere are rather complicated and very much resemble a Chinese puzzle. I agree with you Mr. President, that it would be better to adopt modern methods and find a simpler and therefore from a consumers point of view, a better way of framing tariffs. This subject also includes the matter of meter rentals, and to my mind such a charge should not be made to the consumer, although it is done in Port Elizabeth. The Electricity Department is getting from the consumers payment for what the consumers received, i.e., electricity, but the Department is also getting the price of the meter over and over again from the consumer in the way of meter rent, which is not a correct business procedure to adopt. As to the first charges being based upon the number of living rooms, this is to my mind an unfair method, and is not a business proposition at all. In the interests of the development of industries municipalities must pay increasing attention to their charges for electricity for power purposes. It is impossible, of course, to frame a tariff to suit every individual consumer, but I do say, that the time has arrived when municipal electrical engineers should recommend to their councils that modern business methods should be adopted in the framing of electricity tariffs.

Mr RALSTON (Dundee): With reference to the matter of tariffs, I am at present in charge of two undertakings, one, Glencoe, supplied by the Electricity Commission and the other one belonging to the Municipality of Dundee. The matter of tariffs and especially the question of uniformity of tariffs is one of the biggest questions we as electrical supply engineers have to face, particularly so when one takes into consideration the difficulties the small municipalities have to contend with. In the case of the smaller towns it boils itself down to the fact that the engineer has to frame a tariff for practically every consumer, which does not occur in the larger municipalities. In con-

nection with the Dundee scheme I worked out a tariff in which the charge for the first 30 units is at 9d. per unit less 1d. discount if paid on or before the 15th of the month, for the next 30 units 6d. per unit and for all over that 4d. per unit. I introduced a domestic tariff of 2d. per unit for electricity used for irons, kettles, etc. In Dundee we have not yet come to stoves. As far as the Glencoe scheme is concerned, we charge for lighting at 7d. per unit on a sliding scale with a 10/- monthly minimum charge, and for the domestic rate, which includes stoves, 1½d. per unit with a 15/- per month minimum charge.

Mr. SIEBERT (Uitenhage): About 2 years ago I had occasion to consider the question of tariffs very seriously. When I took charge at Uitenhage we were selling current at 1/- per unit for lighting and 4½d. for industrial and domestic purposes, and the result was that comparatively very little progress was being made. After discussing many different tariffs we finally decided to adopt the following:—For lighting only a flat rate of 1/- per unit less 33-1/3% with a minimum of 5 units per month, making a cash minimum of 3/4 per month. For heating and cooking we charge a flat rate of 2d. per unit with a minimum charge of 2/6 per month. Our domestic tariff provides for a charge of 1/- per unit less 33-1/3% for the first three units consumed per room per month, with a minimum charge of 6/- per month, all units consumed in excess of 3 units per room per month being charged at 2d. per unit nett. I was rather surprised to find when these tariffs were introduced, that, although they took on very well, a lot of explanation was necessary to get consumers to understand the tariffs, and I feel that every electricity undertaking should make a point of getting into touch with consumers individually and explaining to them the tariffs which are in force as unless this is done they appear to have the idea that they are in someway being "done," and this idea is likely to become more firmly fixed in their minds as time goes on. In Uitenhage we get the same trouble as they appear to have in Kokstad and other small towns as people come from the larger towns like Capetown, Bloemfontein, Johannesburg and Pretoria and throw into our faces the tariffs to which they have been accustomed in those towns, saying "in Capetown we get current for 1d. a unit so why cannot we do so in Uitenhage." For power we sell current at 2d. per

unit for the first 250 units per month and all in excess of 250 units per month at 2d. per unit less 10%, the minimum charge being 5/- per month. In regard to supply to public institutions, hotels, churches and boarding houses, etc., we average their monthly consumption for the previous two years and charge that number of units at 1/- less 33-1/3%, every unit in excess of that number being charged at 2d. per unit.

Councillor CLARK (Durban): This question of tariffs is a very important one from two aspects, namely, from the point of view of the consumer and also from the point of view of the producer. The consumer wants to buy and the producer wants to sell. The producer has got something to sell and wants to sell his goods to best advantage but the consumer wants to buy also to best advantage and at the cheapest possible rates. I know that an electricity department cannot be carried on without charging rates which will make it a paying concern, otherwise of course you will have we laymen coming down upon you engineers for charging a loss upon the general rates of the town. It would appear to me that the lowest possible charges ought to be made and it might be possible to encourage a very much larger consumption of current by the consumers in the different towns represented here if it were possible to reduce the tariffs to the lowest possible charges. That would naturally encourage increased consumption of electricity. After all is said and done it is the thousands of people who want to consume, and not the few, who are going to make the undertaking a paying concern. The more consumers that can be got and the better supply they are given, the better the business will prosper. In my own house, a small house with only 16 lamps, nobody thinks it worth while to switch off the light when going from one room to another, and the reason is because the current is so cheap. Consumption can be encouraged very easily by having current as cheap as possible and so far as Durban is concerned I think we have taken the lead in giving a cheap supply to the people, both for heating and cooking purposes, as well as for power purposes. For bona fide private dwelling houses current is charged at 5d. per unit with a minimum charge based upon the valuation of the property supplied, the minimum charge running up to £1 2s. 6d. per month for a house valued at £4,800. For a house valued at £800 the minimum charge is 24

units at 5d. or 10/- per month. All current consumed over the minimum number of units based upon the valuation is charged at five-eights of a penny per unit, this applying to current used for both lighting and cooking and in fact for any domestic purpose, over and above which a discount of 10% is given if the account is paid within 7 days. Such a tariff encourages people, of course, to use electricity rather than have coal stoves and burn coal. In Durban the lighting tariff for business premises, hotels, boarding houses, shops and residential chambers, is 5d. per unit with a minimum charge of 7/6 per month. On application the Council will install a two-rate meter through which between the hours of 12 midnight and 6 p.m. the charge is 2d. per unit, both scales being subject to a discount of 10%. In regard to heating, current is supplied at all hours of the day and night for cooking purposes at ¾d. per unit subject to a minimum charge of 12/6 per month and no discount. Current is supplied under this heading for residential flats at ¾d. per unit with the usual discount for prompt payment. With reference to power, the minimum charge for current is 7/6 per month per horse power installed up to 20 h.p., the charges for current, subject to the minimum, being on a sliding scale, varying, according to the number of units consumed, from 2d. to ½d. per unit. I think these charges go to show that Durban is out to give the people cheap current. We know the value of that, because the cheaper we have made the current, the more rapidly the consumption has risen, and I am certain that would be the result of cheaper tariffs throughout the country. I know the difficulties to be met with in regard to the small towns, but at the same time I would like to urge all those even in small places to sell their current as cheaply as possible.

Mr. POOLE (Durban): The subject of tariffs is indeed an important and a thorn one, and I feel that it is almost worth a paper of its own. We have, at previous Conventions, already had papers on this question, and I feel that, here and now we can only just touch the fringe of complications in so far as tariffs are concerned. I would like to see yourself, Mr. President, and our Past President more in agreement on this matter. Our Past President says, have as few tariffs as possible, you say have different tariffs for different classes of consumers although you

amplify that by advocating that the number of those classes should be kept as small as possible. In Durban to-day we have twelve classes of tariffs, and it is at the moment on the boards to give consideration to an additional tariff for "off peak" consumption under which we shall be able to give supply at very low rates. An "off peak" tariff might perhaps bring about results very favourable to the supplier or distributor such as, for instance, the more extended use of electricity for water heating and there are other applications which might be similarly dealt with, and so enable that bugbear of all electricity undertakings—the peak load to be kept as low as possible. Mr. Sankey's suggestion of a few tariffs is ideal, but I do not see how it is possible to keep within a few. In regard to private consumers as they are to-day I would like to see one tariff that would cover the lot. With one class of consumer, the domestic class, we in Durban have three tariffs, one for lighting, one for cooking and one for water heating. I do not see that one tariff could not be devised to cover supply for all domestic purposes. The two-part tariff with the primary charge so fixed that it covers the capital and other fixed charges seems to me to be ideal.

Mr. ROSS (Potchefstroom): I find that it is best to make tariffs as simple and as few in number as possible. At one time in Potchefstroom we worked on the room basis, but on several occasions we found that additional rooms had been added to premises, of which additions we had not been notified. We now have three tariffs, one for the private or domestic consumer, one for hotels and business premises and a power tariff. For private houses we charge 7d. per unit for the first 20 units per month and for all over that 4d. per unit. I am just bringing forward a proposal to my committee to reduce the 7d. charge to 6d. We have always found the charging of meter rents a great bugbear to consumers, and it has now been decided to abolish meter rents altogether. This will make a difference of £700 per annum but at the same time I consider that we will come out on the right side. For power purposes, our tariff for the first 250 units per month is 3d. per unit, for the next 250 units 2d., and all over that at 1½d.

Mr. LEWIS (Aliwal North): In the smaller towns of course we all have our own little difficulties, and as pointed out in your address it is essential in the

interests of electrical development that our practice should trend towards standardisation and simplification, but when we come to deal with tariffs we have some very complicated tariffs, in fact, in many cases the only man who understands the tariff is the engineer himself. I do think we ought to try to follow out the advice given in your address, that is to have a little less of the engineer and a little more of the salesman in the framing of tariffs. It seems to be that in the smaller towns the room basis tariff appears to meet all requirements, at any rate in so far as domestic consumption is concerned. It is a very flexible tariff and one can alter either the price of the unit per room or the price of the units used in excess of the basic number. I feel that in applying that tariff there ought to be one meter only to measure the current consumed for all purposes, including lighting and cooking, and have no meter rent whatsoever. Aliwal North's electrical scheme has been in operation for some 22 years now and I find that some meters there that must have been paid for by the consumers, in meter rentals, a dozen times over. When we buy coal we buy at so much per ton inclusive of all charges. When we deal with the consumer we charge him so much per unit for electricity and then add all sorts of other charges which only tend to bewilder and annoy him. In Aliwal North a tariff which we are trying shortly is the one based on rateable value of the premises and requiring one meter only, having rather a high charge for the first number of units based upon the valuation of the premises and as low a charge as possible for all excess units. Then there is the question of charges for power supply. Can we not meet power consumers by doing as the larger towns do and make a fixed charge per horse power installed, to be worked out according to local conditions, and then make a small charge per unit consumed. In so far as hotels and boarding houses are concerned, we could surely institute a tariff having a sliding scale based on the number of rooms in the hotel or boarding house or on the average consumption during say, the past two years. I was very interested in a report I saw recently about shop window lighting in Pretoria. It seems to me that we could get shopkeepers to light up their windows much more than they do at present, by bringing in special charges for this purpose. I feel that simplification and standardisation of tariffs as far as the smaller towns are concerned is a thing we would

all appreciate and one which we should all aim at. I cannot quite agree with Mr. Sparks in regard to the imposition of a surcharge, and he must be fortunate in getting his consumers to swallow it so easily.

Councillor HART (Grahamstown): I understand, Mr. President, that in your address you are really only touching on principles and not on details, and I think that we too should deal with the principles only. In the larger towns it may be argued that it is necessary to have a large number of tariffs, but in the smaller towns it is going to be to the benefit of the electricity departments to have simplicity in their tariffs. I cannot agree with the speaker who said that with low charges people do not mind how much current they consume. This is rather typical of South Africa, at any rate in the past. Surely South Africa is going ahead, and most of us are hoping that the future of South Africa will be improved by a little more economy being instilled into the minds of the people, and we, as a Convention, will certainly not be doing the right thing if we advocate what really is waste. Let us do our best to supply current as cheaply as possible so that the consumer can get the most out of his income. We in Grahamstown have been very careful to go in for a simple tariff, and it will certainly be our object to maintain it so. As a layman I strongly support the proposition brought forward by yourself, Mr. President, that we should endeavour to secure simplicity in electricity tariffs. With reference to Mr. Sparks' remark in regard to making a surcharge I am afraid if that were adopted in Grahamstown we would have a very rough time, because there are a large number of schools and colleges, who would give the engineer and the Council a bad time if it were done.

Mr. SPARKS (Pietersburg): My opinion is that if the tariff is say a 1/- and 3d. per unit and you can afford to reduce it, it is better to reduce it to 9d. and ¾d. and get the increased consumption and increased revenue.

Mr. BASKERVILLE (Salisbury): I have been very interested in listening to all that has been said on the subject of tariffs. We have been rather considered to be robbers in Rhodesia, but you will realise that our expenses and conditions are very different to those of towns down country. I am speaking on behalf of the smaller towns or rather those approaching the medium stage. There are hours when we get a good load on

and pay our way, but there are the slack hours during which we still are prepared to develop the power if it were required, but unfortunately it is not. Our distribution system was evidently laid out to supply lighting only and if we attempted to introduce cookers and the larger heating appliances we should soon be swamped and the increased capital cost of providing heavier mains would have to be borne by someone. I do not thing that it is fair to put it all on to the lighting consumers, and if we charge the cookers a rate sufficiently high to cover the additional capital charges they would not take it on. My difficulty is not so much in regard to our plant, as I find that unless you are able to increase your mains considerably, at of course, comparatively heavy cost, it is impossible to take on these big cookers. We have just introduced a flat rate for all power of 1½d. per unit from 12 midnight to 7 a.m. and on Saturdays and Sundays, without any restrictions. The larger towns have the advantage of factories which run 12 hours a day, if they have plenty of work, but the small towns do not have the advantages which these factories bring in the shape of improved load factor. For power purposes we in Salisbury charge 3d. per unit for the first 500 units, 2½d. for the next 500, and 2d. for everything in excess of one thousand units per month, without any fixed charge per horse power, these rates being for day use. Supply for power during the night is charged at a flat rate of 1½d. per unit, and we find that so far this has caused increase of business. With regard to the surcharge mentioned by Mr. Sparks I am afraid people in Rhodesia are able to figure a bit so would not like to try it on. The difficulty is not going to be so much in regard to the plant but the greatest difficulty is going to be the effect of the heating and cooking load, in which we all see great possibilities for development, in making necessary the expenditure of considerable sums on additional mains and sub-stations.

Mr. YOUNG (Bulawayo): This being my first attendance at one of these Conventions I did not intend to speak at all. I was prepared to listen, but the matter of tariffs is such a vexed question and one which I think appeals to all of us. I am particularly interested in the matter at the moment as I have recently gone through a Council debate on electricity tariffs. After trying several alternatives and taking over a multiplicity of tariffs in Bulawayo I decided to try the room system and decided on 3 units per room per

month as a basis and find that it answers very well indeed, our secondary rate being 1d. per unit. As a matter of fact, since introducing this tariff the consumption has increased substantially, and the revenue has also increased in a very satisfactory manner. Our friends the contractors and dealers have done increased business in the sale of cooking and heating appliances, so that the introduction of the two part tariff has benefitted everybody concerned. With regard to power charges, like Mr. Baskerville, I have a number of consumers doing building contract work and they are not very profitable because of their poor load factors. A man for instance who has a 20 h.p. motor installed and consumes a matter of only 50 or 60 units per month is not a very valuable consumer, and I have therefore recently adopted the system of charging 5/- per month per horse power installed because I have a considerable number of this class of consumers, who do not contribute their fair share of the annual fixed charges incurred in the running of the undertaking, with the result that the other consumers have to bear more than their fair share of these fixed charges through the medium of a higher charge per unit. As in the case of Mr. Baskerville, the institution of the horse power charge gave rise to a good deal of discussion on the part of the consumers affected but I do not think that in the end it will result in us having to go back to the old tariff. By making the charge per horse power I have been able to quote a cheaper rate per unit for power, in fact almost half the price which was formerly charged.

Mr. SWINGLER (Capetown): The question of tariffs is most interesting to all, not only to the smaller towns but to the larger towns as well, and we must all realise that each one of us has our own difficulties to overcome as regards local and climatic conditions and as to the composition of the different Municipal Councils which we are called upon to advise. Mr. Sankey has been fortunate recently in not wanting any business, because he has not had the plant to cope with additional load if it had come along; therefore he has been able to have a few simple tariffs only. If people want a supply of electricity they should be required to pay what is right and proper. If electricity undertakings want additional business then they must go out for it. I think if we had a little more of business methods in the sale of electricity it would be better for all concerned. What is almost as important as the

charges made for electricity is the degree and quality of the service rendered. We who are responsible for the conduct of electricity undertakings must realise that in addition to selling units we are or should be selling service. If our friend from Bulawayo called his fixed charge per horse power a "Ready-to-serve" charge and added to it a small charge per unit consumed it would sound better. Each undertaking requires a certain revenue to defray capital and other fixed charges, and when that has been secured it is quite feasible to make a flat charge per unit sold. In the report of the Advisory Committee on Electricity Supply Tariffs which was appointed to advise the Electricity Commissioners in Great Britain last year on the best method of charging for domestic supplies, you will find that there were thirteen or fourteen different methods in vogue in Great Britain and the Committee after fully investigating all these came down, as some of you may know, to the system on the valuation basis for the primary or "Ready-to-serve" charge, as the best. It is most popular in Great Britain. I feel that we should not give any current at all for the primary charge. We in Capetown adopt the room basis for the fixing of the primary charge. We charge 5 units per room per month at 5d. per unit nett equalling 2/1 per room per month and then we charge 1d. per unit nett for all current consumed in excess of 5 units per room per month. I feel that for a domestic tariff the "Ready-to-serve" charge fixed on the basis of the active floor area of the premises supplied, which, after analysing the tariffs in Great Britain, has been found to be the one most likely to give satisfaction. Of the three classes of tariffs analysed, viz. that on the valuation basis, the room basis and the floor area basis, the one based upon the active floor area has been most satisfactory. The fixed charge per horse power installed is a very good one in some ways, and no doubt it ensures that each consumer pays his fair share of the capital and other fixed charges but if any of you have to do any change over work you will find out how many motors have been installed without your being notified. The imposition of a fixed charge per horse power installed necessitates undertakings setting up something in the nature of a C.I.D. branch to keep track of additional motors which may be installed, and it is apt to result in such frequent visits to consumers premises by the undertakings employees that these become a source of annoyance to the consumer. In Capetown we to-day

sell to large consumers on what is practically a K.V.A. basis and we are now able to obtain satisfactory K.V.A. meters. I think that modern methods of charging must unavoidably include some of the apparent complicated tariffs but they are not really so complicated as appears at first glance. Take a newspaper printing works such as those of the "Cape Argus" which come on with a load of 90 horse power for only two or three hours a day. Surely electricity undertakings must frame charges to cover such cases without loss. In the framing of electricity tariffs there are one or two fundamental principles which must be paid heed to and one of the most important is not to sell electricity cheaper than it is generated at. Durban is a sub-tropical town with a very equable climate and therefore in a town like Durban much less hot water, for instance is required than in say Capetown. We have a duty to the consumer to advise him not to use electricity when it is not profitable and to his advantage to do so. I do not advise consumers in Capetown to go in for hot water installations unless they are told what the cost will be so that they can judge beforehand whether or not they can afford it as to some people an electric hot water system is a luxury, by reason of its cost in proportion to their means. On the other hand we have consumers who are prepared to have an abundant supply of hot water and who can pay 30/- a month for such a supply. If people can pay for it they should have it as a luxury, and those are the people that we get as consumers. Salesmanship is a most important thing. With good service and good salesmen, electricity can be sold without coming down to ridiculously low charges. The giving away of electricity free of charge will not induce people to consume it if it does not give satisfaction. What does it matter if the rate is 3½d. or ¾d. per unit if the service is not satisfactory. Some people have the idea that by cutting the price business can be got but this is not so unless good service is given, viz:—reliability and continuity of supply. In Capetown we have a special rate for shop window lighting of half the ordinary lighting rate. I know that Mr. Tinson, whom you all know as an illuminating expert, is of the opinion that a shop window cannot be satisfactorily lighted from the outside and this I quite agree with. Shop window lighting certainly does augment the street lighting, and it is a good load and should be encouraged. If we could get some better method of arranging

matters we would be prepared to extend our assisted wiring scheme to the wiring of the inside of the shop windows. It is a load we should encourage in every way possible. In Capetown our peak load occurs at nine o'clock in the morning and four o'clock in the afternoon, so that we are anxious to boost our night load. The tariff in one town cannot be compared with that in another unless there are taken into consideration the local conditions and circumstances, but there are however certain fundamentals which should be observed in all cases. Coming now to the matter of charges for heating and cooking, this is a very difficult matter. In a long straggling area like that of Capetown we have to sell energy in Kalk Bay at the same rate per unit as Adderley Street. I cannot see the force of selling electricity for heating and cooking if you do not make both ends meet, simply because other towns are boasting of the way in which they have developed electric heating and cooking at what may on close examination be found to be unremunerative charges.

Mr. RALSTON (Dundee): The question of the charging of meter rentals is a very vexed one, and one on which I am anxious to hear the views of the various members and delegates here present. In the case of the smaller municipalities the sacrificing of the meter rents would result in a serious loss of revenue. I agree with Mr. Swingler's remarks in regard to the necessity for giving good service. The position in regard to the power station is that the plant has always to be in operation and ready to give service at any time it may be called upon to do so, and therefore in my opinion, the standing charge to consumers should be adhered to. We in Dundee charge 10/- per month per horse power installed. At Glencoe the Electricity Supply Commission charges the usual £5 per K.V.A. per annum plus a low charge per unit sold. In Dundee we have been rather generous to users in that we charge £3 per annum per horse power installed, so that we cover ourselves on the horse power instead of the K V.A. rating as is done at Glencoe.

Councillor PRIOR (East London): I have listened carefully to the remarks of a good many of the speakers and I want to say that for domestic premises since we in East London have introduced the minimum charge based upon the valuation of the buildings only, with a secondary charge of 1½d. per unit for all consumed in excess of the number of units covered by

the minimum charge our consumption has gone up considerably. I quite agree with Mr. Poole when he says that once a consumer has consumed the minimum number of units he can keep the lights on all night and it makes no appreciable difference to his monthly account. At one time we used to charge a flat rate per unit consumed with the result that people went to bed with the fowls and did not get up till daylight. They can now afford to burn the current to give them ample light all the time. With regard to the hot water service, I do not agree with Mr. Swingler that this is a luxury. I maintain that a hot water system should be in every house as I believe that cleanliness is next to godliness. I once lived in Capetown and I must confess that I was not too clean when I lived there because hot water was so expensive and so difficult to get. I also lived in Durban, and that is where I changed my habits because hot water was so cheap and so easy to get. I consider that the whole thing hinges on the cost of production. After all is said and done we as Councillors have to be guided by our engineers, and the public are the people we are serving. We have got to study them, and specially must we study the small consumer as well as the larger one. After all is said and done it is the small man who needs it most. I have always argued this because no matter what a business man pays for his electricity the cost eventually comes out of the man who in turn buys his goods. I quite agree with our friends from Durban when they say that the more cheaply people can procure a commodity, the more of that commodity they will use. After you have paid the overhead charges I think you should sell the excess at as near cost as possible.

Mr. SANKEY (Johannesburg): As some of the remarks made have reference to part of my Valedictory Address, there are quite a few points which various speakers have made and to which I would like to reply. The first points are those dealt with by Mr. Sparks and his idea of a surcharge which seems to me to be a very creditable effort on his part and as showing a sense of salesmanship which is what I have been advocating by way of fewer and simpler tariffs. There is no reason why the idea should not be extended somewhat, and instead of levying a surcharge of 2/6 per consumer why not allow your consumer so many coupons if he uses more units and let him redeem them so that he can have his choice in electric kettles or toasters or other appliances. The next point is one

which was raised by Mr. Ralston, of Dundee, when he called attention to the very difficult position in which the engineer of a small town finds himself in the framing and operation of a tariff, owing to the very small number of consumers in any particular class, whereas in the larger towns there are certain well-defined classes of consumers with large numbers of consumers often running into thousands, in each class. In the small town you are confronted with the problem that you might have quite a number of consumers in a particular class. These consumers may represent a very influential section of the population of the town and the engineer will find it very difficult to frame a tariff to please them all and if they are not all pleased then there is very little hope of getting the Council to accept that tariff, which nevertheless may actually be the best and fairest to all concerned. That is one of the many difficulties in the small towns. It is the position which often has to be met in regard to some consumers who think they are hard hit by some particular section of the tariff. In the larger town you meet with the same thing. There are bound to be some consumers to whom a change of tariff means an increase in the price of electricity but they are invariably in a smaller minority, and after shouting loud and long they invariably subside until one hears no more about it. Another factor which the smaller towns have to take into account is what I call the factor of inertia. It is very easy to alter a tariff and in doing so to drop several hundreds of pounds in revenue, which is a very big item in a small undertaking, but it is a great fallacy to expect in many small towns that the result of such a reduction will be an immediate increase in consumption, whereas in the larger towns the increase is almost immediate. In the smaller towns it is months before the public begin to grasp the fact that they are getting electricity cheaper, and that it has therefore become worth their while to use more electricity but in the meantime the engineer is pilloried because the revenue has dropped. One of the chief points which I endeavoured to make in my Valedictory Address was the desirability of having as few tariffs as possible and of keeping them as simple as possible and it would appear that there are one or two towns suffering from guilty consciences in this connection, arising from their having a multiplicity of tariffs and very complicated ones at that. I do not wish to mention any names but I was rather amused in regard to one town where

after quoting 7/8d. and ¾d. per unit plus 10% and less 10% for prompt payment and having some sections of their tariff with discounts and others without discounts, the speaker from this very town got up and urged that tariffs should be as small in number and as simple as possible. Apparently he has seen the error of his ways and is now a convert to the simple life in so far as tariffs are concerned. I remember that in the old days, when it was the fashion to charge on the maximum demand system and a demand indicator had to be installed in every consumers premises, it was a perfectly hopless proposition endeavouring to explain to shop-keepers, householders, etc., why it was only fair to every consumer that he should bear his proper share of the cost of meeting his individual requirements. As you know, many municipalities were forced over to flat rates in order to attain the same object by a much simpler tariff, and one which the consumer could more readily understand. I maintain that exactly the same result is attained by the adoption of a properly framed sliding scale. In regard to power I would undertake to say that if you work out a number of similar consumptions and maximum demands, for certain large consumers in Johannesburg and Capetown respectviely, it will be found that the Johannesburg charges will be almost the same or lower than those in Capetown and that in Johannesburg we attain exactly the same end in a very much simpler manner. I think personally that five tariffs are ample for any one town. As has been mentioned, we in Johannesburg are in the unfortunate position at present of not having sufficient generating plant to meet the demands already made upon us but the demand for heating and cooking is growing so rapidly that unless we very soon get additional plant installed it is difficult to see how on earth we are going to meet the load, let alone be able to go out for new business. What I wish to say is that the Johannesburg tariff as it exists to-day, i.e., for domestic purposes at 5d. per unit for 5 units per room and 1d. per unit afterwards, works out very little more than the Durban tariff going down as it does to 5/8d., the actual difference in monthly cost to the consumer being very small. We could immediately easily reduce our 1d. rate o ¾d. and thus could show up more reasonably as compared with Durban with its 5/8d., but is there the need for it? Tariffs constitute a most difficult and debatable subject, but I strongly agree that some degree

of standardisation is very desirable in the interests of the more rapid development of electricity supply. I think if you look back to the first Durban Convention at which we had a paper on tariffs followed by a very long discussion, you will find on comparing the different tariffs quoted there with the tariffs existing to-day in the different towns in the Union that we are rapidly approaching a degree of standardisation. Almost every speaker to-day has stated that the undertaking he represents is selling electricity, at any rate for domestic purposes, at 1/- or 9d. per unit for a certain specified number of units based on room accomodation or on the rateable value of the premises or some similar basis, all units in excess of this number being sold at low rate of from 3d. down to 1d. and less, so that in this respect we have almost reached standardisation to-day. I think, Mr. President, that we are gradually reaching a degree of standardisation in tariffs, but what I feel we need most of all is the standardisation of supply voltages throughout the Union. We will then be able to get a greater degree of standarisation in tariffs than is possible to-day, and then the difficulty will not be to make ends meet but to get sufficient additional plant and mains to meet the increased demands as they will come along.

The PRESIDENT: Before closing the discussion on tariffs, I would like to invite Mr. Jacobs to let us have his views on this interesting and very contentions subject.

Mr. JACOBS (Electricity Supply Commission, Johannesburg): I did not expect to be asked to say anything on this subject, the discussion on which appears to me to revolve particularly round the application of tariffs in the different towns represented here. The main principles of tariff making appear to be very well understood by everybody who has spoken so far, the chief being that a tariff to be sound and successful must take care of two things, viz:—Annual capital charges plus generating and transmission costs. Speaking for the Electricity Supply Commission, it may be of interest to you to know that in general we have based the primary charge of our two-part tariff upon kilo-volt-amperers of maximum demand. As sellers of electricity on rather a large scale we have found no difficulty whatsoever in introducing this. In regard to our two-part tariff, it will be found that in quite a number of cases we have undertaken the retail selling of electricity in municipalities, and we have had to

simplify the first part of the two-part tariff in a way similar to that which is adopted by most of the municipalities represented here, viz:—instead of imposing a K.V.A. maximum demand charge, we have converted that charge into a minimum charge for the first so many units consumed in each living room in the house. It is merely a simplification of the maximum demand charge figure. The only other point which occurs to me is the question of meter rentals. We have frequently come across proposed charges for meter rentals in dealing with applications sent in by various municipalities for powers to establish electricity supply schemes. We feel that the time has come to abolish this charge and we would welcome it very much indeed if we could see the meter rental charge abolished throughout the Union, because we think that the case for such abolition has been proved up to the hilt.

The PRESIDENT: In dealing with this item in my address I appealed to you to have less of the engineer and more of the salesman in the framing of tariffs. It would appear to me from this discussion that in many cases a start is made from the wrong end in that many engineers and councillors are labouring under the impression that all that is necessary in order to sell a maximum amount of electricity is to cut down the charges in the tariff. An article is worth what it will fetch, but how many of us made every endeavour to sell the maximum amount of current possible at the charges already provided for in our tariffs. The move always seems to be to reduce the charges. Salesmanship, in order to be successful must necessarily have regard to the cost of production and distribution. Therefore to my mind salesmanship must include the framing of tariffs as only one item of it, and I think if we keep as our watchword "Salesmanship" we will develop to very much greater degree than by sitting still and simply cutting down charges. It would be a very sorry day indeed for practically the whole of the industrial concerns of the world who have commodities to sell if they adopted that policy. We have a commodity to sell which we know on its merits is practically unbeatable, but we also know that its comparatively restricted use to-day is mainly due to ignorance on the part of the potential user. On going round the exhibition at present being held in our City Hall I was really very much struck with the appalling amount of ignorance in the lay mind as to the possi-

bilities of the use of electricity for domestic purposes. It is our duty as public servants to see that we lose no opportunity and that we apply every legitimate means for bringing to the public a full knowledge of the benefits resulting from the wider use of electricity. In conclusion, I appeal to you all to keep one word in front of you, and that is "Salesmanship." Study the art and apply it in our industry. We will now pass on to the subject of water heating by electricity.

Mr. POOLE (Durban): Do I understand, Mr. President, that you wish us to confine ourselves to water heating only or is the discussion to include electric heating in general? In one respect Mr. Swingler is quite right. We do not have to bother much about hot water in Durban because of our climatic conditions, whilst we have quite a good demand resulting from water heating it is spread over, in small increments, amongst a large number of consumers. We are rather in trouble with the heavy loads resulting from heating and cooking causing serious distribution troubles on our underground mains and because of this we restrict the use of the ordinary geyser type of electric water heater, this being a type which is not permitted on our mains on account of the very heavy demands which it makes over a very short period. What we do in Durban is to restrict the amount of current used for water heating to a maximum of 12 amperers. In Durban to-day we have water heating apparatus installed on 2,400 premises and connected to our mains. The number of stoves connected at date is 2,961 and I would like in this connection to draw particular attention to the advantages of publicity and exhibitions and advertising of all kinds as a result of which the numbers of cookers and heaters have gone up by leaps and bounds and in this connection I would like to congratulate our President on the very excellent exhibition which has just been opened in the East London City Hall. At present our growth taken from the past 18 months in Durban is running at the rate of 100 stoves and 60 water heaters per month. We have a tariff which is an attractive one. We are in a position that distribution troubles are not a serious item because owing to the many transformer points feeding the overhead network. In Durban all the mains in the residential portion of the town are overhead as is the case in most South African towns so that in a way we in South Africa are in a very fortunate position. We have got

practically no competition in the way of gas, in addition to which we have cheap native labour and we have an ideal climate which does not result in a heavy demand for heating and cooking, at any rate not in the costal towns. I think we have an opportunity here in so far as electric heating and cooking are concerned in which there is a large demand still to be met, and as Mr. Lambe has said in his Presidential Address, the load is coming and we are bound to get it, so the sooner we put our house in order the better because there is no doubt about it that it is coming. From many of the towns I have collected returns dealing with domestic electrical development and in many of the towns they not so far done much in the way of development, apparently because they are such development will bring in its train. They ar, however, all alive to the fact that this demand is coming and they will have to be in a position to meet it. I have taken the towns in which there is a two part tariff in force with a secondary rate of 1d. or less per unit and find that in those towns the development is most rapid. I would like in this connection to congratulate the town of Worcester, which has done remarkably well particularly for a comparatively small town. They introduced a cheap heating rate in 1921, and now they have 51 heaters and 26 stoves installed, which for a little town like Worcester affords cause for congratulation as showing what can be done in the smaller towns by continuous determined effort. Capetown and Pretoria are of course developing very largely in the matter of electric heating and cooking. In Capetown there are 190 heaters and 450 stoves installed, and in Pretoria 103 heaters and 179 stoves and these two towns have only really pushed the heating and cooking business within the last 16 months. Going back to the subject of electric water heating, we in Durban started by introducing a 10 gallon type of heater taking 350 watts and arranged to hire these out at cheap rates, this being the only class of apparatus which we in Durban let out on hire. To-day a heater taking 2,000 watts on a three-heat switch costs in Durban £12 6s. 0d. and we find they answer the purpose very well. It will, I feel sure, be of interest to you all to know of the degree of confidence in the application of electricity for domestic purposes which has been attained in Durban and which is amply demonstrated by the fact that there are to day many houses entirely without chimneys, and Durban can boast of many

"all electric" houses to-day, as also, of course can many towns throughout the Union. We find in Durban that 500 to 600 units per month is the average consumption for an "all electric" house, and the average demand works out at about 2 K.W. per "all electric" house. I took a district of 36 consumers and in each it worked out at 2.4. Of course there are those people who go the whole hog and go in for it entirely. On an average with a consumption of 500 to 600 units in a five roomed house the monthly bill amounts to £1 15s. od. for lighting, cooking and water and other heating, and I think at the figure electricity can compete very well with coal. In regard to the heating of water I notice that several towns have gone in for a fixed charge of 30/- per K.W. installed per month, and in one instance i.e., Worcester, the charge is 20/- per K. W. installed per month. As will be seen from the figures which I have given in regard to the monthly bill of an "all electric" house in Durban 30/- per K.W. is nearly as much as we pay for lighting, cooking and water heating combined and seems to me to be a little excessive, because in many cases at any rate you are forcing on your consumer rather more hot water than he needs. Capetown, Pretoria and one or two other places are giving hot water service for 30/- per K.W. installed per month, and Worcester is doing it for 20/- per month. Port Elizabeth has recently had an electrical exhibition, with the object of demonstrating the manifold uses to which electricity can be put and is about the only town I know of where they are hiring out stoves at 1/6 per month, which possibly may be due to their having a competitor in the shape of a gas undertaking. Bloemfontein is getting ready to introduce a domestic tariff in which the primary charge will be based on the valuation of the premises and the secondary charge is in the neighbourhood of ¾d. per unit. Anyone who can sell electricity at ¾d. can confidently look forward to the rapid and satisfactory development of his cooking and heating business. In regard to apparatus the most popular stoves in Durban are those made by our Canadiain brothers which certainly are very well made and finished and are giving excellent results. The appearance of the Canadian stove is very attractive indeed, which is often a great point with the housewife. King William's Town seems to be doing very well for a small town, having 19 stoves installed and a further 20 about to be installed. Ladysmith has 14 stoves and 9 heaters. East London

is just making a start and with a charge of 1d. per unit for electricity for domestic purposes must go ahead.

Mr. SWINGLER (Capetown): I am glad to learn that in Durban a copper tank heater can be supplied and installed for £12. I am more interested to know that with a 350 watt element in a 10 gallon tank a sufficient supply of hot water can be had for baths for 2 or 3 people at the usual hour for bathing. In regard to the price to be charged for water heating I would point out that electricity cannot be sold for this purpose at a price below the coal cost. How in King William's Town can they sell electricity at ½d. per unit for all over 300 units per month beats me! Mr. Poole tells us that the average "all electric" domestic consumer in Durban takes 500 to 600 units per month. We find we have 450 stoves installed and even with small domestic appliances you can take less than 300 units, but you cannot sell electricity lower than the coal or other fuel costs you. The smaller towns should not be misled into selling electricity at rates lower than their coal or other fuel costs per unit just because the larger towns are doing it at low rates. It is better to take on waterheating, which we in Capetown have developed quite a lot. The water for the Long Street Slipper Baths is heated by electricity, which is charged at ½d. per unit and it has been found to be more economical than the gas system previously in use. We have one or two firms in Capetown supplying and installing continuous water heating systems. It was the old system to heat water as and when required but now, by means of the continuous system, they can have a supply available throughout the whole year. The ideal system of water heating is, to my mind, that which employs small elements continually on with a booster element to meet short period heavy demands. I would urge all present here to do all possible to develop the "off peak" load particularly, as is being done in other parts of the world. The continuously in circuit low loading water heating system alone has not proven very satisfactory. It is not cheap, and, with all due respect to Mr. Prior, I do not see why we should encourage an unprofitable load.

Mr. WOLLEY DOD (Pretoria): I think perhaps it would be as well to explain that we are up on the high veldt in the Transvaal where we have conditions to meet differing very much from those obtaining at the coast. There is one thing which has not been mentioned yet that is that our principal load in the

way of heating is from radiators in offices, more especially in the winter mornings, which is a very useful but at the same time a very "peaky" load. I do not think that there is a single office or store in Pretoria which has not got a radiator installed and in which the radiators is not turned on in the mornings to warm the offices, this being a load which is continually growing. Of course it is a winter load only but is a very useful load to us. Offices in Pretoria are built without any fireplaces, and it is the cleanliness and availability at short notice which makes electricity so popular for this purpose. With regard to the heating of bath water, a 10 gallon heater would be utterly useless in Pretoria as practically every householder in Pretoria requires a minimum of 25 gallons of bath water every morning. If water is heated to only 160 degrees, it is really only tepid and quite useless for a hot bath, though on the other hand it is not economical to heat bath water to too high a temperature. We advocate thermostatic control which suits both consumers and the supply undertaking very well. Of course there is no doubt that in the future a tremendous lot will be done in the storing of hot water but unfortunately this requires a great deal of capital and up to now cannot be done in a small household at a reasonable cost. We also have the ½d. per unit rate for continuous water heating, but it is not very popular. To ensure satisfactory operation a booster is required on the heater but the "all hour" load with a booster is scarcely used at all in Pretoria.

Mr. MANN (Worcester): May I thank Mr. Poole for his kind remarks on the progress which has been made in Worcester in the use of electricity for domestic purposes. I think, however, that it is up to me to explain one or two points to which exception has been taken by previous speakers. Mr. Swingler says we cannot or at least should not sell current below the coal cost per unit. I agree with him. If we ran our plant entirely for water heating obviously the coal used would be chargeable to water heating only. As it is, we have a fair day load and the smaller additional load resulting from water heating, entails a very small increase in our coal bill. In my paper at the Durban Convention it was shown that under the conditions then obtaining the additional units used for water heating were produced for 1lb. of coal per unit so that the cost is very well covered by the price at which we sell current for water heating. Unless a supply of hot

water is made available in houses it will be quite impossible to get any stoves installed in place of coal or wood stoves or to make any real progress with electric cooking. The cheaper rate for water heating therefore can be looked upon as an asset and as being somewhat in the nature of a sprat to catch a mackerel. By supplying electricity at low rates for water heating we have in many cases been able to get stoves and other apparatus installed and it will undoubtedly be the means of bringing on quite a large number of additional stoves. The hot water installations we have put in are all on a 100% load factor. Most people prefer an element of say 250 or 300 watts with a 25 gallon tank. Each town or district has its own peculiarities and characteristics, and what will serve in the larger towns is very often quite unsuitable in the smaller towns. The net result of developing this business has been quite a marked increase in units sold as well as in revenue, and an improvement in the load factor. I do not think that we shall find ourselves "going under" as Mr. Swingler appears to suggest.

Mr. VOWLES (King William's Town): In the matter of water heating, the problem of the small town is totally different to that of the larger towns. If we are to get the number of consumers and to give the service which the people have a right to demand, we must be prepared to supply these amenities at prices which the people are prepared to pay, and when thermostatic and other complicated systems of control are adopted the cost of installation is considerably increased. We have devised a water heater of our own of which we have now had sufficient experience to know that it is meeting the requirements of the people. It is exceedingly simple and we can provide and install a 20 gallon heater for a matter of £10, of which sum the tank accounts for £7 12s. 0d., and the element brings it up to £10. We find it is very successful and before I started this system I got three of the Durban heaters in order to find out how they worked. These were installed in three different houses and within a week we found that our own were giving better results. With the Durban heater it took 15 hours to raise the water to the required temperature and of course it only held 10 gallons. I should mention that in King William's Town it is very cold during the winter. We have the tanks made locally and they are giving great satisfaction. The demand has been so great that we have not been able to keep pace with it. We find for a five roomed house the average number

of units consumed per month for water heating is 400 which costs 13/-, so that we are not very much behind Durban. Our peak loads occurs in the morning and in the afternoon, therefore we can well afford to put on additional night load if people want hot water. The heaters are so loaded that they take from 10 to 12 hours to heat up, the result being that they are switched on at night so that the required supply of hot water is available for the morning baths and sufficient left over to meet the requirements for the rest of the day. I shall be very pleased to show these to members and delegates who come to King William's Town. The system has only been in operation for about four months and the prospects for the future are very encouraging.

Councillor WEIR (Port Elizabeth): As a councillor I have listened very attentively to the discussion on the use of electricity for heating. The information which I have gathered from the discussions is going to be of considerable service to Port Elizabeth. I admit that we might very well take a page out of East London's book in the matter of the very excellent exhibition Mr. Lambe has arranged for us in the City Hall. It is very encouraging to see how it has been done. Last year, just to show that we are waking up to the modern uses of electricity we placed on our annual Estimates a certain sum of money to be used for advertising the advantages of electricity for all purposes, and I hold that it is the duty of the technical head of an electricity department to educate the public in regard to the uses of electricity. There is no use in the electrical contractors shewing goods in their show windows which have been tested, unless these goods are ably and well advertised, and that may best be done by the technical heads of the electricity departments. They should take the matter up and let the public understand what the uses of electricity really are, and what greater comfort and convenience result from its use. The public then feel that they have the assurance of their electrical engineer and they will immediately go more closely into the matter. Following on that the holding of exhibitions such as the one being held in East London to-day is the thing which the public want. In Port Elizabeth we are going still further, Mr. President, and are taking on a technical commercial salesman for the electricity department, which incidentally will be the means of relieving the technical head considerably of much detail work. I agree with Mr. Prior in connection with the supply

of hot water in that we should aim at giving it to the public as cheaply as we possibly can, because from my own point of view I consider it very necessary in the interests of public health. In addition to educating the people in the modern uses of electricity it is going to be a good thing for the benefit of the community as a whole. I would like to say that I do not agree with what one speaker said about Canadian stoves being the best obtainable. I may tell you that the British firms to-day are falling into line in the manufacture of electric stoves, which will be a credit to all concerned.

Mr. SANKEY (Johannesburg): I would like to add a few remarks in regard to water heating on the high veldt, because Johannesburg is considerably colder in winter and not so hot in summer as are say, Durban and the other costal towns. I have had personal experience of living in a block of flats for some 2 or 3 years in which there is a large central water heating apparatus fired by coal or coke. My experience is that for 9 or 10 months of the year there is an ample supply of hot water at all times of the day or night. The heating stove is fired up at night and the boy stirs up the fire again about 5 o'clock in the morning and that makes conditions comfortable. The conditions in winter, when there is three inches of snow outside and a night temperature of 20 degrees Fahr., are however hopeless, as the water is then only luke warm and the fire although stoked night and day, is insufficient to meet the requirements of the large block of flats which it supplies. This shows that the demand for hot water in winter is enormously in excess of what it is in summer, and our experience with electric radiators is much the same, as we have to run up special plant to meet the extra load of some 1,500 kilowatts purely for office radiators coming on at about 8.30 a.m. and lasting till about 10 a.m. that is, up to the time the sun is up. It is obvious from this that the loading of electric water heaters must be very greatly in excess of what is necessary in Durban, which, to my mind, because of its climatic conditions, offers comparatively speaking no very great field for the use of electric radiators or electric water heating. It is obvious that if you are going to do your heating by two sets of elements, one of high loading for use when a short heavy demand for hot water occurs and a lightly loaded element to operate throughout the

whole twenty-four hours the latter need only be a comparatively small element, whereas the automatic high load element must be a pretty large one. No wonder that in the winter time your sale of electricity for water heating is going to be very high, and therefore although comparatively low, the ½d. per unit tariff or 30/- per month does not meet the case nearly so simply as in Durban. I see that our President in his address refers to the dying efforts of the gas advocates. I feel that electricity for water heating depends mainly on the reliability of the automatic high loaded element or at least it certainly does in the colder climate. You must have a heavy element installed and brought into use by automatic means in order to cope successfully with the sudden heavy draughts of hot water which frequently occur in colder climates such as that of Johannesburg. I hope to see quite a lot of these at the exhibition now being held in East London as well as possibly at King William's Town, and I hope that the time is not far distant, if it has not already come, when such an apparatus will be on the market, because until it is I do not think that water heating in Johannesburg is going to be a marketable commodity. The gas mains in Johannesburg are confined to the industrial area covering the centre of the town, but nevertheless, there are in use in flats and similar residential premises a number of "Kays" gas geysers with automatic control, which work remarkably well. When the water is turned on the control of the gas heating is automatic by means of a bye pass burner and the water is rapidly heated as required for baths and other purposes and therefore extreme climatic conditions are satisfactorily provided for. The premises can be shut up for an indefinite length of time and the water will not be overheated, yet at a moment's notice an ample supply of hot water can be had at any hour of the day or night, the apparatus is simple and cheap in first cost and in operation. I am quoting this, not with the idea of showing that the "Kays" geyser is an ideal arrangement, because it is not, for unless properly installed it is a dangerous piece of apparatus. It shows however what can be done with gas and what we have to compete with in supplying electricity for water heating. We must, to have a thoroughly successful apparatus for water heating and if there is such an apparatus on the market which can adequately and efficiently meet the conditions then I can say that in a comparatively cool

climate like that of Johannesburg there is an enormous business for that apparatus. I have only heard of two or three water heaters being installed on our system.

The PRESIDENT: I am sure this discussion has been exceptionally interesting and immensely useful to every one. Do not however let us forget that in dealing with heating by electricity we are dealing with a youngster, very young indeed, but one who, for his age, is to my mind remarkably robust. If one looks back and compares the number of years during which a supply of gas has been available with the number of years during which a supply of electricity has been available on a similar scale one is bound to admit that the youngster "electricity" has developed much more rapidly than gas. Each and every one of us must have faith in the utility of the commodity we produce and offer for sale. We know there are difficulties—there are difficulties in every development—but we must tackle them. It is too early to say whether electricity for water heating and cooking is a failure. That is altogether too sweeping a statement. Let us all be determined that it is going to be successful and by careful and conscientious work and by making every effort to educate the public, who are to be our principal users, bring the use of electricity to the same successful state to which gas heating has been brought. I need not here enumerate the advantages of the use of electricity for all purposes and processes, they are known to *all* of us, but are they known to the public? It is our duty to make them known and to see that the use of electricity for those purposes for which it is suited is pushed by us to the utmost extent.

Civic Luncheon.

At 1.15 p.m. members and delegates were entertained by His Worship the Mayor and City Council of East London at Deal's Central Hotel.

Visit.

In the afternoon a visit was paid to the Sweet Factory of Messrs. Wilson & Co., where members, delegates and friends were shown over the whole works. This visit proved to be most interesting, and surprise was expressed at the size, completeness and cleanliness of the works, where only white persons are engaged in the handling of the sweets so efficiently produced. In the evening the visitors were the guests of the Mayor and City Council at the Vaudette Theatre.

WEDNESDAY, 14th SEPTEMBER, 1927.

The Convention resumed its proceedings at 10 a.m.

The President (Mr. Mordy J. Lambe) was in the Chair, and there being also present:—

Members.—T. P. Ashley (Queenstown), G. C. Brown (Middelburg, T'vl.), C. H. Baskerville (Salisbury), W. F. Bower (Barkly East), W. H. Blatchford (Greytown), A. S. Chalmers (George), J. G. Clark (Fort Beaufort), A. J. Clemo (Alice), R. D. Coulthard (Oudtshoorn), P. W. Dadswell (Cradock), T. C. Wolley Dod (Pretoria), R. W. Fletcher (Krugersdorp), H. L. Groom (Roodepoort-Maraisburg), J. Iverach (Grahamstown), T. Jagger (Ladysmith), S. Lewis (Aliwal North), R. Macaulay (Bloemfontein), W. M. Mail (Kokstad), F. C. D. Mann (Worcester), M. McDonough (Bethlehem), T. Miller (Harrismith), H. A. Morris (Kimberley), P. W. Newcombe (Indwe), I. J. Nicholas (Umtata), E. Poole (Durban), H. A. Prevost (Somerset East), L. Ralston (Dundee), W. D. Ross (Potchefstroom), B. Sankey (Johannesburg), T. F. Siebert (Uitenhage), H. G. Simpson (Dordrecht), T. J. Smith (Durban), L. B. Sparks (Pietersburg), R. A. Stoker (Kroonstad), T. Sutcliffe (Benoni), G. H. Swingler (Capetown), J. Vowles (King William's Town), J. Wud (Adelaide), R. A. Young (Bulawayo), J. Younger (Vryheid).

Associate Members.—Nil.

Delegates.—C. Boardman (Town Clerk, Barkly East), Councillors J. W. Byson (King William's Town), A. L. Clark (Durban), A. R. Davidson (Roodepoort-Maraisburg), M. Freeman (Johannesburg), J. F. Fourie (Pretoria), T. Gibb (Alice), S. H. Hall (Dordrecht), H. H. Hart (Grahamstown), J. D. Low (Cape Town), J. Paton (Kroonstad), G. W. Prior (East London), H. Rugg (Roodepoort-Maraisburg), D. A. Soloman (Potchefstroom), L. Sparks (Cradock), R. A. Thomson (Bloemfontien), A. Van Heerden (Harrismith), T. Scott Warren (Kokstad), W. G. Wearne (Roodepoort-Maraisburg), R. L. Weir (Port Elizabeth).

Visitors.—A. M. Jacobs (Electricity Supply Commission, Johannesburg), C. Mullins, Chief Inspector of Machinery, Johannesburg), F. C. Stephens, Public Works Department, Pretoria), C. Westaway (East London).

Honorary Secretary and Treasurer: Prescott Adkins (East London).

The PRESIDENT: The first item this morning is the reading of the Paper by Mr. Albertyn on "Electricity Meters."

The following paper was then taken as read:—

ELECTRICITY METERS.

By A. Moorrees Albertyn, B.Sc., Test Engineer, Corporation Electricity Department, Cape Town.

The scope of a subject such as the above is naturally very comprehensive and, in view of the limitations of an article of this nature, it will be possible only to touch on the more important factors which ensure that the electricity meters put into service by a Supply Undertaking accurately record the energy consumed.

The necessity for a Supply Authority to have its supplies accurately metered needs no stressing in view of the fact that if not all, then certainly the major portion of the revenue of an undertaking is derived from the registration of the meters installed in service. Moreover, when comparing the relative value to the Supply Undertaking of meter accuracy and overall efficiency of the generating equipment, we find that the former is of primary importance.

Although the utmost importance may be attached to the overall efficiency of the Generating Plant and frequently no trouble or expense spared in procuring additional apparatus which may effect an improvement of, say, only one per cent. in this respect, the fact is very often lost sight of that a one per cent. loss where meter accuracy is concerned more than nullifies this gain.

As a concrete example take the case of a certain steam operated plant. From statistics it has been found that the fuel costs per annum are approximately 15% of the total cost per unit sold. Assume that the overall thermal efficiency of such a station is increased by one per cent. This means that the fuel costs are decreased 1%. The total cost per unit cold, however, is only decreased approximately 0.15%.

From this it will be seen that if the accuracy of the meters used to register the output of the station decrease by a similar percentage, no gain will result, *i.e.*, a loss of 0.15% in metering accuracy suffices to counteract the benefit derived from a 1% gain in station thermal efficiency.

It should also be remembered that obtaining and maintaining a high standard of meter accuracy is within the reach of every supply undertaking, whereas a high degree of thermal efficiency is usually limited to undertakings with large generating units.

The consumers' viewpoint in the matter of meter accuracy should also receive due consideration, and every Supply Authority should endeavour to obtain and maintain their consumers' goodwill by proving that they take an active interest not only in the reading of the meters and the rendering of accounts, but first and foremost in maintaining the accuracy of their meters within the prescribed limits.

The subject matter of this article will be briefly dealt with under the following headings:—

(1) Selecting a suitable meter;
(2) Meter erection;
(3) Metering large supplies;
(4) Maintaining meter accuracy.

(1) Selecting a Suitable Meter.

The intending purchaser of a modern meter is faced with a large variety from which to select, and unless he sets about his business carefully he may find that a meter accepted at a tempting price proves to be a most unsatisfactory article after a short period of service.

The factors which contribute largely to the satisfactory functioning of a meter over an extended period are:—

(*a*) Accurate meshing of all gear wheels; freedom from all unavoidable friction and a fixed meshing position between the worm (or pinion) on the main spindle and the first gear wheel. This latter point cannot be too sufficiently stressed, because a faulty mesh at this part of the wheel train will either result in a slipping dial or one with excessive friction.

(*b*) *Permanency of the so-called permanent magnets, i.e.,* the magnets should be efficiently aged, ensuring that their retentivity will not alter appreciably with the passage of time. This factor cannot be determined by an initial test, and the best guide in this respect is a knowledge of whether the type of meter under consideration has been proved to give satisfaction over an extended period of service.

(c) *Robust Construction.* This applies not only to the meter case, which should be sufficiently strong to safeguard against the possible displacement of the internal parts, which may occur when the meter case is strained by attachment to the meter board, but also to the terminal block, which should be mechanically sound and liberally proportioned, facilitating the erection, removal and routine testing of the meter.

Other refinements, such as micrometer movements for adjusting the full and light load accuracy of the meter, facilities for repairs, *i.e.*, easy replacement of a broken glass, top or lower bearing or a burned-out coil, are also points which should receive due consideration.

The purchase of electricity meters on a £ s. d. basis only, is an exceedingly risky proposition, and although a meter which possesses the properties enumerated above may be somewhat more expensive, yet the increased cost is amply compensated for by the satisfactory service and life obtained.

While the foregoing remarks are equally applicable to Alternating or Direct Current Meters, there are one or two points with regard to D.C. meters which require special consideration.

Due to the basic principle of operation of all A.C. Electricity meters, *viz.*, the interaction between the magnetic fluxes created by the potential and series coils respectively, these meters are all essentially of the watthour type, and as such can be considered as true energy meters, *i.e.*, they measure, if correctly adjusted, the true electrical energy in a circuit irrespective of variation (within reasonable limits) of voltage or current. Hence, when selecting an A.C. meter the principle of operation introduces no difficulty. Not so, however, with regard to a D.C. meter. In this category we have in addition to the watthour meter, the ampere hour type of meter, these again being sub-divided into the mercury motor type and the commutator type.

A few remarks with regard to these meters may therefore not be out of place. While the watthour type of meter, as stated above, can be considered as a true energy meter, the ampere hour type will only register the true energy provided that the voltage of the supply where the meter is installed is constant and equal to the pressure for which the meter was calibrated.

In view of the improbability of any supply undertaking maintaining this pressure at all points of supply,

it is obvious that if ampere hour meters are used, the true energy consumed will be under-registered where the supply voltage is in excess of the declared pressure, and over-registered where the reverse is the case. The extent of this over or under registration will naturally depend on the ability of the supply authority to maintain uniformly over the system the pressure for which the meters have been calibrated.

When comparing the ampere hour type of meter with the watthour type, an argument usually used in favour of the former is the absence of shunt losses, which for the latter type usually vary between 5 and 10 watts per meter (for modern types of meters). If, however, an ampere hour type of meter is calibrated for a supply pressure of 220 volts and is then used on a circuit at 222 volts and, say, 5 amperes is passed through the meter, it will register a consumption at the rate of 5 x 220 = 1,100 watts instead of 5 x 222 = 1,110 watts (the true rate at which energy is actually consumed), *i.e.*, a loss of 10 watts will result from an increase of voltage of only 2 volts, namely, for less than a 1% increase in declared pressure.

Ampere hour meters are certainly much simpler to test and instal than watthour meters. Repairs are also more readily effected and the price as a rule is much below that of a watthour meter.

The commutator type of ampere hour meter consists of a wound armature rotating in the field of a powerful permanent magnet, the armature circuit being connected in parallel with a low resistance shunt which is included in the meter case. These meters usually have a high speed of disc rotation and are sensitive to brush position and contact resistance. The mercury type, on the other hand, has a semi-floating armature, and consequently there is very little wear of the bearings; mercury troubles, however, have to be contended with, and unless particular care is exercised in using pure mercury, amalgamation and disintegration troubles are accelerated. Whichever type of D.C. meter is selected it must be remembered that this type of meter is made of such items as pivots, bearings, commutators, brushes, mercury and mercury chambers.

(2) Meter Erection.

A careful selection should be made of the meter position; bearing in mind that the meter has to be regularly read, inspected and also tested *in situ*. Therefore a position easily accessible at all times (without

inconvenience to the household) efficiently lighted and at a reasonable height (say 5 feet above floor level) should be chosen.

The party responsible for the erection of the meter should be impressed with the delicate nature of the instrument with which he is dealing, and rough handling during transport or erection should be carefully avoided. The weight of the rotating element in the meter is supported by a very small area of contact between pivot and bottom jewel and the strain imposed by a careless jar may be sufficient to damage permanently the accurately machined and polished surfaces. Hence an electricity meter should always receive the same treatment as a delicate timepiece.

When erecting two-wire meters, the meter erector should possess some means of determining which service wire is above earth potential (a test lamp will suffice in most cases), and great care should be exercised to see that this conductor passes through the current coils of the meter. Neglecting this important factor may cause a considerable loss of revenue to the undertaking due to an unscrupulous consumer obtaining "free" energy by secretly earthing one pole of his consuming devices.

The erection of polyphase meters calls for far more attention than single phase or D.C. meters.

Three phase four wire meters are fairly straightforward and, provided that the line and load terminals are correctly connected, no difficulty should be experienced. Makers usually provide a diagram of connections pasted either on the terminal cover or meter cover. Should this, however, not be provided, then it is always a good policy to furnish the erector with a small sketch. It is to be regretted that makers do not adopt a definite system for the terminal arrangement of polyphase meters, and standarisation in this respect would be very much welcomed by all metermen.

Prior to switching on the supply the erector should satisfy himself that the neutral or earth potential wire is correctly connected and continuous between the supply mains and the consumer's distribution board. The writer has in mind a certain well-known type of meter which, although it has four "line" and four "load" terminals, yet lacks continuity between one of these.

It may also be noted that certain polyphase meters are affected by phasesequence, and if wrongly con-

nected in this respect will rotate in a positive direction on no load. On reversing two of the incoming phase wires the rotation will be found to cease.

For metering low tension supplies it will probably be advisable to adopt the three phase four wire meter as a standard. A three phase four wire meter can in the majority of cases be used for metering a three phase three wire load if necessary. In view, however, of the rarity of a consumer having only a three phase three wire consuming device it will hardly be worth while to provide a stock of three phase three wire low tension meters.

Finally, care should be taken that the supply is not metered with a meter of too large a capacity—it is a fairly safe rule to meter all large residential installations with a meter having a current rating of 50% of that of the total connected load and for motor installations comprising 5 or more machines a percentage of 75 will suffice.

The fuses protecting the meter should, moreover, be carefully selected in order to safeguard the meter against damage due to overload.

3. Metering Large Supplies.

The necessity of paying the strictest attention to the accuracy of meters used for metering large supplies, *i.e.*, supplies in excess of, say, 100,000 units per annum, is emphasised by the fact that in a small undertaking it is quite possible that a single large consumer may utilise fully 50% of the total units supplied by the undertaking. Should the meter on such a supply be registering, say, 3% slow, the loss of revenue on such an individual supply will quite outweigh any loss due to the aggregate inaccuracies (if slow in the registration of the other small consumers' meters).

The meters selected for registering a large supply should, therefore, always be of the highest standard. The cost of such a metering equipment is, after all, a very small percentage of the total annual revenue derived from the registrations of the meters, thus false economy should be avoided.

For D.C. supplies a meter of Astatic type, *i.e.*, one that is unaffected by the presence of stray fields, should be installed and at least two meters should be installed, the one acting as a check on the other. A spare meter, accurately tested, should also be held in stock in order to replace any one of the existing meters should it be

found desirable to check the accuracy of the metering equipment.

A.C. supplies may either be metered on the high or low tension side (depending both on the system of supply and the tariff in vogue). In the former case instrument transformers will be required for both current and potential circuits, and in the latter current transformers will usually only be required. As the meters and instrument transformers constitute the metering unit the instrument transformers should be selected with the same care as the meters.

Instrument transformers possess in addition to a ratio error also a phase angle error, these errors being usually accentuated in the cheaper class of instruments, and under certain conditions of load these errors may acquire quite appreciable values. Instrument transformers are rated in volt-amperes, this figure being a guide as to the safe secondary burden which may be imposed without appreciably affecting the ratio and phase angle errors of the transformer. The makers' data and curves should always be asked for and studied. A minimum rating of 15 volt-amperes for current transformers and 100 volt-amperes for potential transformers will be found satisfactory for the majority of cases. It is an unwise policy to use the metering current transformers for operating trip coil circuits, etc. These should in all cases be operated from independent transformers which may be of the less accurate type. The following should make this clear:—The burden imposed by an ordinary watthour meter current coil is in the neighbourhood of 1.5 volt-amperes, whereas a coil operating a trip may require anything in the neighbourhood of 25 volt-amperes.

Having selected suitable meters and instrument transformers, their correct connection now calls for the closest attention. In an article appearing in the *Elektrotechnische Zeitschrift* of September 4th, 1924, it was stated by H. Ziemendorff that assuming that the instrument transformers are properly connected to the line and that they are grounded at the right points, there are 576 different ways to connect these transformers to the meters, of which only 24 connections are right. This refers to metering three phase high tension energy and serves to indicate the numerous pitfalls for the unwary. Happily to say, however, the meterman's lot is not one of the "hit or miss" variety in which a chance shot may either place him amongst the 24 winners or

the 552 losers. It will be necessary, however, to adhere carefully to the rules governing the construction of three phase three wire meters. These may be briefly summarised as follows:—

(1) First determine the common pressure wire, *i.e.*, if the current transformers are in the red and blue phases respectively, then the white phase (assuming red, white and blue as the phase colouring) will be the common pressure wire and the meter element supplied from the red phase current transformer must have its pressure coil energised from the potential transformer connected between the red and white phases respectively.

Similarly, the element supplied from the blue phase current transformer must have its pressure coil energised from the potential transformer connected between the blue and white phases respectively.

(2) Having made sure that the meter elements have been correctly connected as outlined above, it now remains to determine whether each element is producing a torque in the correct direction. In order to do this, a fairly accurate knowledge of the power factor of the supply is essential. If it is possible firstly to obtain a power factor of less than 0.5 lagging and then to increase this to a power factor of 0.8 lagging, say, the correct connections of the meter elements can be readily ascertained. How to establish the power factor of the load must be left to the meter erector's discretion. Bearing in mind that an induction motor running light (*i.e.*, with the belt thrown off) usually has a power factor less than 0.5 lagging and that a pure lighting load approaches unity power factor, the conditions required should not be difficult to obtain.

(3) Having obtained a load condition with power factor less than 0.5 lagging, the potential elements of the meter should be disconnected in turn. If correctly connected the disc of the meter should rotate in a forward direction when only one potential coil is energised and in a backward direction when the other potential circuit only is energised. The backward rotation should be slower than the forward rotation, the mutual effect when both coils are energised

will then be such as to cause a positive rotation. If it is found that both conditions give a forward rotation, then the potential connection of the element which gives the slowest rotation must be reversed.

Having determined the conditions for a power factor of less than 0.5 lagging, a load having a power factor greater than 0.5 lagging should be applied to the meter. On going through the same sequence of tests a positive rotation of both elements should be obtained, the speeds becoming equal at unity power factor.

It is important to note that these tests should be conducted with a load which is fairly well balanced.

Fig. (1) shows the standard diagram of connections for a three phase three wire supply using instrument transformers. Polarity marks are also shown.

Two single phase meters permanently connected, one in each circuit of the two element polyphase meter, should, moreover, be employed as a means of checking the polyphase meter. By determining the disc speeds of these meters and employing a curve as shown in Fig. (2), the power factor of the supply may readily and accurately be determined. The power factor may also be determined from the formula:—

$$\text{P.F.} = \cos \theta = \frac{1}{\sqrt{1 + 3\left(\frac{A-B}{A+B}\right)^2}}$$

where A and B represent the registrations of the fast and slow registering meters respectively.

It should be remembered, however, that the power factor deduced from the readings of two single phase meters (two wattmeter method for measuring the power in a three phase three wire supply) is only correct for balanced loads. Should the load be unbalanced, the meters will still correctly register the total energy, but the power factor of such a supply is no longer defined by the relationship between the readings of the two meters.

Should the circumstances permit, it is always advisable to instal a summation meter in the low tension side of the supply, as this gives a valuable overall check on

the H.T. metering equipment, due allowance of course being made for transformer losses.

By such a system of cross checking as stated above, accuracy can be assured and the Supply Undertaking's revenue safeguarded.

In addition to charging the large consumer per K.W. hour of energy consumed it is customary to include in the tariff of supply a charge based on the rate at which energy is used during periods of maximum load. This constitutes what is known as the Maximum demand charge and it is usual to average this demand over a period of 15 or 30 minutes, thereby allowing a certain degree of latitude in the value of the instantaneous demand.

Although Supply Authorities have always realised that where energy is taken in large quantities it is of the utmost importance that such energy should be taken at or near unity power factor, yet due to the lack of suitable instruments it was found very difficult in the past to instal effective metering equipment for a tariff which would induce the consumer to maintain a high power factor.

This difficulty has now been overcome, however, by the various makes of meters which will register such factors as reactive K.V.A. Hours, K.V.A. of Maximum Demand or the total K.V.A. Hours consumed.

We may therefore look forward to the increasing popularity of the tariff which includes a charge per K.V.A. of Maximum demand and not per K.W. of maximum demand as was customary in the past.

As the instrument employed to register the maximum demand usually forms an integral part of the meter recording the K.W. Hours, a few remarks on this subject may not be amiss.

A clear conception of what the respective meters are required to register may be gathered from Fig. (3).

Assume a load of 100 Kilowatts at a Power Factor of 0.8. The vector representation of this load is as shown in the figure where θ represents the angle of lag and Cos θ =

$$\frac{\text{Kilowatts}}{\text{Kilovolt Amperes}} \text{ ; the P.F.}$$

The Integrating K.W. Hour Meter integrates the portion OA and a demand attachment which records the number of revolutions made by the meter spindle

various tappings being provided in order to compensate for a wide range of power factor.

A third type of meter manufactured by the Aron Meter Company operates on a principle independent of the phase relationship of voltage and current in the circuit to be metered and its registration is consequently proportional to V x A, the index being calibrated in K.V.A. units.

The above is no attempt at any classification, but only serves to indicate the various methods employed by different makers to meter a K.V.A. demand.

Whichever type of demand instrument is installed it should be remembered that although the integrating meter may still register correctly, yet grave errors may arise in the Demand registration. These may be due to a faulty time interval (which is invariably controlled by an independent mechanism) chattering in the contact making gear (in the contact making type of demand meter) or excessive friction in the indicator index. A regular and close inspection of the demand gear is therefore essential and frequent tests, the duration of which should cover the full period of the time interval of the Demand Meter, are necessary.

The Supply Authority should also take an intelligent interest in the Consumers' Demand and endeavour to enlighten him as to the indication of the instruments used for measuring his supply. Advice should, moreover, be given as how effectively to proportion his load in order to reduce his peak of maximum demand.

Reduction of K.V.A. demand by the efficient loading of all induction motors should also be investigated. Such advice naturally goes a long way towards establishing a cordial relationship between Supply Authority and consumer.

*The undermentioned photographic reproductions show typical meter installations for large supply consumers:—

(*a*) Low Tension (3 phase 4 wire 220/380 volts, 50 cycle) ironclad metering cubicle with the following instruments in circuit:—

(1) K.W. Hour polyphase meter with maximum demand indicator (2).

(3) Limited Hour (K.W. Hour) Supply meter operating between the hours of 12 midnight and 6 a.m. controlled by time switch (4).

*To be shown at the Convention.

(5) 3 single phase meters registering the total consumption and used as a check on meters (1) and (3).

(6) Testing Links.

(*b*) Direct Current (220/440 volt, 3 wire) ironclad meter cubicle with the following instruments:—

(1) K.W. Hour meter with Demand Indicator (2).

(3) Limited hour (K.W. Hour) meter operating between the hours of 12 midnight and 6 a.m. controlled by time switch (4).

(*Note.*—The registration of meters (1) and (3) are checked against the consumer's summation meters).

(*c*) High tension (12,000 volt, 3 phase 3 wire, 50 cycle) Reyrolle type metering equipment, showing the following meters:—

(1) K.W. Hour polyphase meter with Demand Indicator (2).

(3) 2 Single phase check meters.
Testing terminals and potential fuses are at the rear of the panel on which the meters are mounted.

(*d*) High tension (6,600 volts, 3 phase 3 wire 50 cycle) outdoor type of metering cubicle (as used by the Electricity Supply Commission). The supply is metered in triplicate by 3 Westinghouse Type R.I. meters, each meter having independent potential and current transformers. The meters integrate K.W. Hours and K.V.A. Hours. They also indicate the average power factor of the supply and further record on a chart the maximum K.W. and K.V.A. demand over a prescribed time interval.

The demand periods are synchronised by means of Warren Synchronous Motors, which are used to determine the time interval.

4. Maintaining Meter Accuracy.

The purchaser of the essential commodities of life usually does so by means of Weight, Volume or Lineal Measure. In each case he deals with a simple method of measurement and can easily satisfy himself that the quantity, if not the quality, of the purchase is correct.

The purchaser of electrical energy, however, although he may know that the quality of his purchase is always up to standard, has no ready means of checking the quantity received and must therefore rely on the integrity of the Supply Authority.

Should a consumer, therefore, query the registration of his meter every endeavour should be made to give satisfaction. A test should be conducted with the least possible delay, the result of this test being communicated to the consumer and, if necessary, an adjustment made to his account in order to compensate for excess registration.

In order to conduct these tests with a reasonable assurance of accuracy, it is necessary that the Supply Authority possess accurately tested sub-standards with which the comparisons can be made.

Although all Supply Undertakings may not possess a testing laboratory equipped with expensive primary standards, yet there is no reason why every Undertaking should not possess a few essential high-grade testing instruments, the accuracy of which can be checked and maintained by periodically referring them to a testing laboratory equipped for such a purpose.

It may be asked, what are the essential instruments required. The answer to this question will naturally depend on the size and diversity of the meters to be tested.

The following may be considered as bare necessities:—

(*a*) *For Testing D.C. Electricity Meters:*

A permanent magnet moving coil combination volt and ammeter with several voltage ranges and a sufficient number of ammeter shunts to cover effectively the range in meter capacities, should be provided. If the work warrants it, two such instruments should be purchased, the one being used only by the Senior Official responsible for testing and kept as a reference standard for checking the other. The instrument chosen should be free from appreciable temperature errors, the moving coil should be effectively shielded from stray magnetic fields and its accuracy should be "Sub Standard" as specified in the B.E.S.A. Report No. 89.

At least two stop watches of reliable make will also be required, and these should regularly be checked

against the pendulum swings of an accurate clock having a suitable movement.

Due to fluctuating conditions of supply pressure on consumers' premises it is difficult to conduct accurate tests on D.C. meters *in situ*. Should this, however, be essential, then several tests should be made and an average taken as the correct value. The services of an assistant are, moreover, essential, as a large number of instrument readings must be taken during the period of a single count.

Whereas when conducting tests on the ampere hour type of direct current meter *in situ* it is only necessary to observe the fluctuations on a single indicating instrument, *viz.*, an ammeter, the test of a watthour type of meter has the additional complication that the average voltage has also to be recorded during the period of the count.

Although a D.C. watthour type of rotating sub-standard is manufactured which by virtue of its principle of operation should offer an ideal means of testing watthour direct current meters *in situ*, yet there is a possibility that this type of instrument may be greatly influenced by stray magnetic fields, and with the type of instrument with which the writer is acquainted it was found that even the earth's magnetic field caused a variation of approximately 1% in the registration of the instrument when tested in two positions displaced by 90deg. Hence, unless great care is exercised in the selection and use of this type of instrument, serious errors may result. It is, therefore, the writer's opinion that it may be a more satisfactory proposition to instal an accurately tested check meter (of similar type to the meter being tested) in circuit with the meter to be tested. The accuracy of the meter in question is then determined by a comparison of the readings of the two meters. Alternatively, the meter may be sealed in the consumer's presence, removed to the Station and accurately tested there under steady conditions of load.

(b) For Testing Alternating Current Electricity Meters:

A ready and accurate means for testing these meters either *in situ* or at the Station is provided for by the use of a rotating sub-standard. As this instrument is inappreciably affected by stray magnetic fields the difficulty mentioned above is absent. There are various makes obtainable, the principle of operation in each case being similar. The instrument selected should be

robust and possess a high degree of accuracy, and, as in the case of the D.C. testing set, periodic checks should be made by a testing laboratory.

Rotating Sub-standards are usually started and stopped by means of a potential switch attached to the instrument with a length of flexible conductor.

Experience has shown that due to continual usage trouble is likely to be experienced in the switch or its connections and the tester should therefore always satisfy himself before conducting a test that this portion of the equipment is in order.

To establish an artificial load on conusmers' premises, some type of load resistance is essential. There are several reliable makes of portable resistances which have a large range of loads (from 0.25 to 14 amperes, say). These load resistances are suitable for either A.C. or D.C. tests.

Their only disadvantage is that the energy is consumed at supply pressure, which for the larger types of meters represents an appreciable wastage. This difficulty can be overcome in the case of A.C. meter testing by using a so-called "phantom load"—this is in principle a small step down transformer, the primary of which is energised by line voltage the secondary being used for energising the meter current coils. As the secondary current is obtained at a low potential, the total energy consumed will be small.

Indicating ammeters, voltmeters and an accurate wattmeter should also be purchased. A stop watch, if not already purchased for D.C. meter testing, is also essential, for, although the use of a rotating Sub-standard eliminates the use of a stop watch in testing an A.C. meter, yet there are many instances where its use cannot be dispensed with, *e.g.*, for timing demand meter intervals, the rate of creep of a meter which runs on no load, etc. To mention another use, an accurate watthour meter installed in a consumer's premises can always be used as a wattmeter for determining the load at any particular period. The load in K.W. being obtained from the formula K.W. $= \frac{K \times R \times 3.6}{T}$ where

K = meter constant expressed in watthours per revolution of the disc, R = number of revolutons counted of meter disc and T = the time in seconds (determined by the stop watch) in which these revolutions were made.

Possessing the necessary instrument wherewith to test electricity meters, the question now arises as to when it will be necessary to conduct these tests.

Firstly, all meters whether new or otherwise should receive an initial test before erection of the consumers' premises. Although a meter may have been accurately tested before leaving the maker, its accuracy on arrival at the Supply Undertaking's Works can never be guaranteed to be the same, and a preliminary test and adjustment, if necessary, should therefore always be made.

Secondly, routine tests and periodic inspections should be made at definite time intervals.

The following are suggested arrangements for equipping a small Test Room so as to facilitate the testing and overhaul of Electricity Meters:—

(*a*) TEST RACKS.

Fig. (4) shows a test rack with control board for testing D.C. Meters either mercury ampere hour type or watthour meters. The wiring diagram is shown in Fig. 4 (*a*).

The test rack (Fig. 4), approximate dimensions of which are given, is energised from two sets of storage cells, *viz.*, A and B. The A battery should consist of a set of cells capable of supplying the maximum current required for the largest type of meter to be tested and preferably arranged for series parallel operation, *i.e.*, say 8 cells giving either 16 or 8 volts depending on the method of connection.

Battery B may be either the station battery or a battery consisting of a sufficient number of small capacity cells to provide the necessary potential for energising the shunt circuits of the watthour meters.

Regulating cells, as shown, should be provided in order to facilitate potential regulation.

A and V are a switchboard pattern Ammeter and Voltmeter which merely serve an an indication and need not possess a high degree of accuracy.

The meter current coils are connected in series with the terminals (*b*) and current regulation is obtained by means of suitably chosen leading resistances, "r." A carbon pile rheostat must also be included in the circuit in order to obtain fine regulation.

The meter potential connections are made by means of plugs and sockets (3 ampere type) shown

at C and voltage regulation as mentioned before is obtained by means of the regulating cells.

For conducting single phase tests on Alternating Current Meters a test rack similar to that shown in Fig. (4) can be employed. A well as shown at "e" into which the rotating sub-standard may be placed will be found a great convenience.

The wiring diagram Fig. (5) shows the method of obtaining current and potential excitation.

T1 and T2 are step down Transformers, T1 for exciting the current coils of the meters and T2 for obtaining a 110 Volt potential when testing 110 Volt meters, *i.e.*, meters used with instrument transformers for metering H.T. supplies.

Transformer T1 should have a rating of approximately 500 Watts with a secondary voltage of, say, 20 Volts. A secondary wound in two halves which can be connected either in series (20 Volt) or parallel (10 Volt) is decidedly useful in view of the greater current range and flexibility. Transformer T2 need only be of small capacity, say, 100 Watt, as it will only be used for exciting the potential coils of the 110 Volt Meters. Both transformers are controlled on their primary side with double pole switches and fuses.

The various loads for the current coil excitation of the meters can again be obtained by means of suitable loading resistances (r2r2), an ammeter "A" (switchboard pattern type) being used to indicate the value of the current.

The potential coils are excited by means of plug receptacles as in the case of the D.C. Meters.

The potential buses terminate in a plug T which may either be plugged into the socket V (220 Volt excitation) or U (110 Volt excitation).

The type of test rack as shown above can be erected at a small expense and its utility will amply compensate the time devoted to its erection.

With regard to routine tests the Electrical Department of the Corporation of the City of Capetown have fixed the routine test period for all medium sized house service type A.C. Meters after 3 years and for D.C. Meters after 2 years' service. As stated above the test of D.C. Meters on a consumer's premises is rather a laborious process and this type of meter is consequently changed for test and overhaul at the testing laboratory.

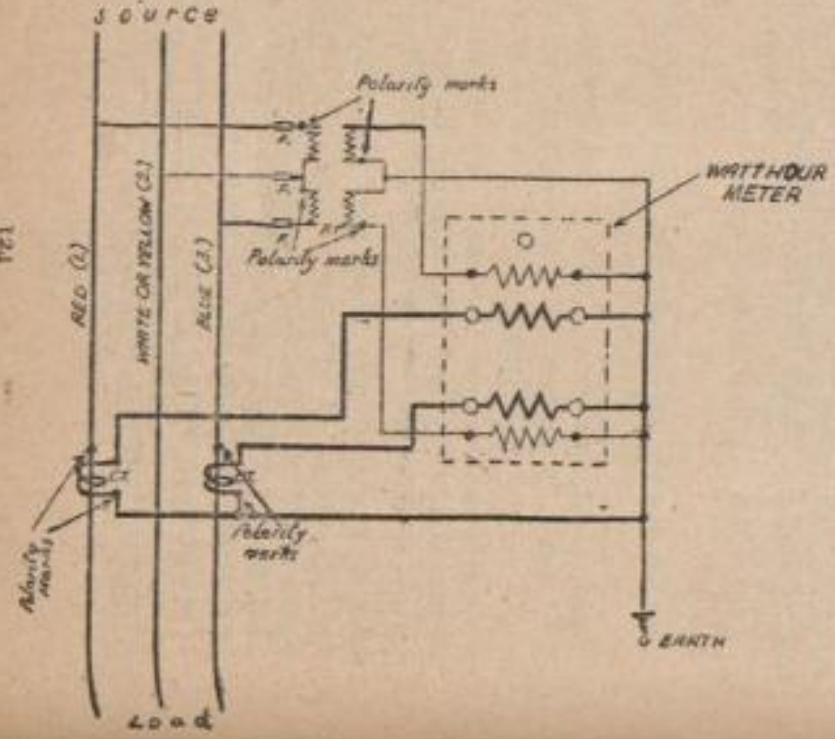
A.C. Meters are tested *in situ* and adjusted if found inaccurate.

Routine tests include a careful examination of the meter dial train, bearings, etc., and a special report on any defects which cannot be remedied on the spot. Large supply meters are inspected weekly and routine tests made every 4 months, *i.e.*, 3 per annum. This work is handled by specially trained testeers and naturally demands the strictest attention.

It may be argued that routine testing may not necessarily effect an improvement in the revenue of the Supply Undertaking, that is in such cases where the aggregate accuracy of all meters tested does not show a negative error. No Supply Undertaking, however, no matter how limited its number of consumers may be, should undertake to supply and erect meters without offering reasonable assurance to its consumers that these meters are registering correctly, and only by the regular and systematic testing of all meters in service can this essential obligation be fulfilled.

In conclusion, a set of curves are given (see Fig. (6) which indicate the percentage of meters, both old and new which, when tested year by year, are found to be within the limits of accuracy of 2%. These curves serve to emphasise the necessity of testing all new meters and also those that have been in service.

Fig. ①



RATIO OF METER DISC SPEEDS
SLOW MOVING TO FAST MOVING

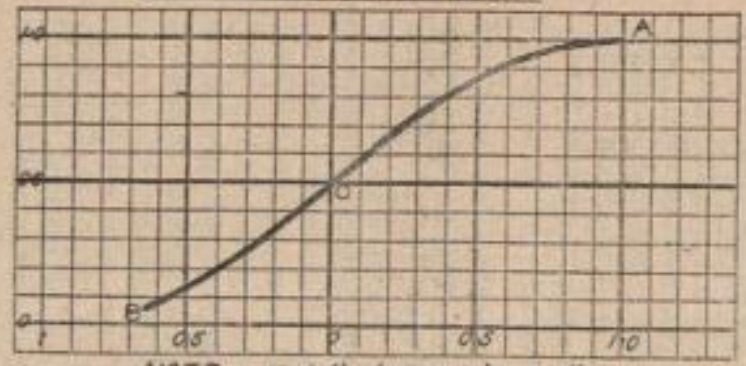


Fig. ②

NOTE If both discs revolve in the same direction use curve OA if in opposite direction use curve OB

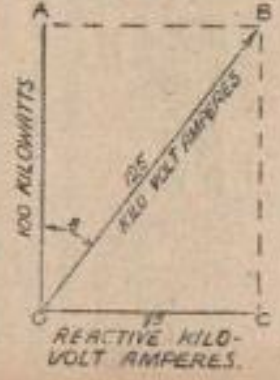


Fig. ③

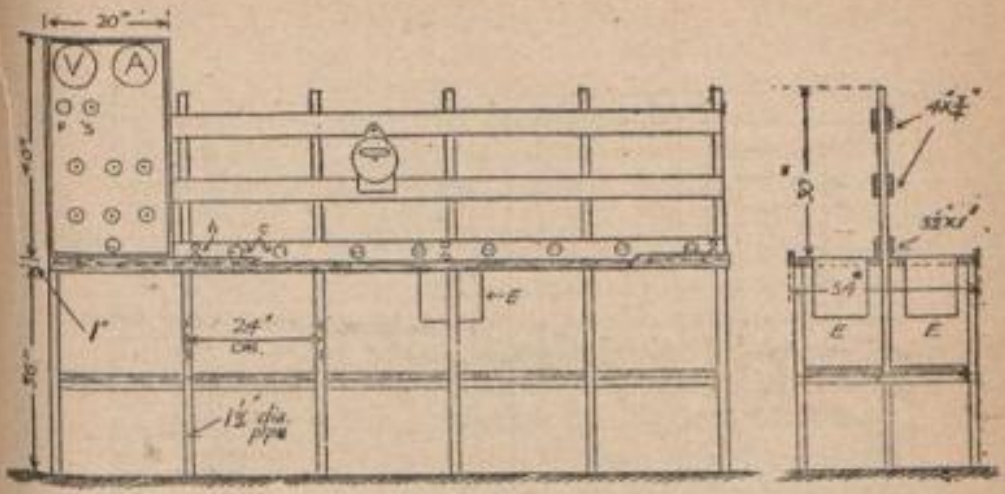


FIG. 4.

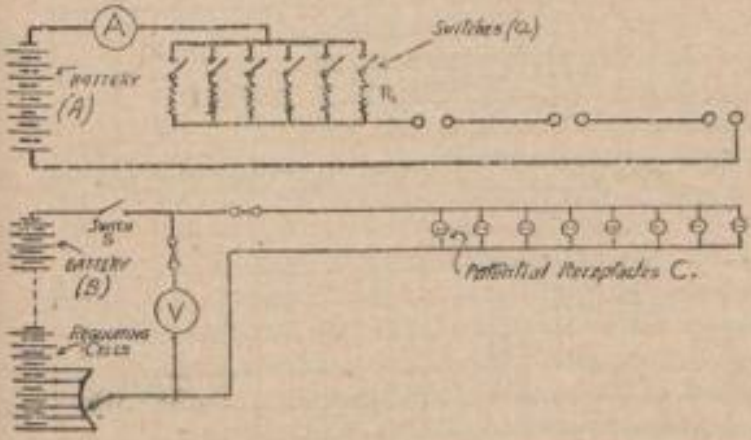


FIG. 4 A.

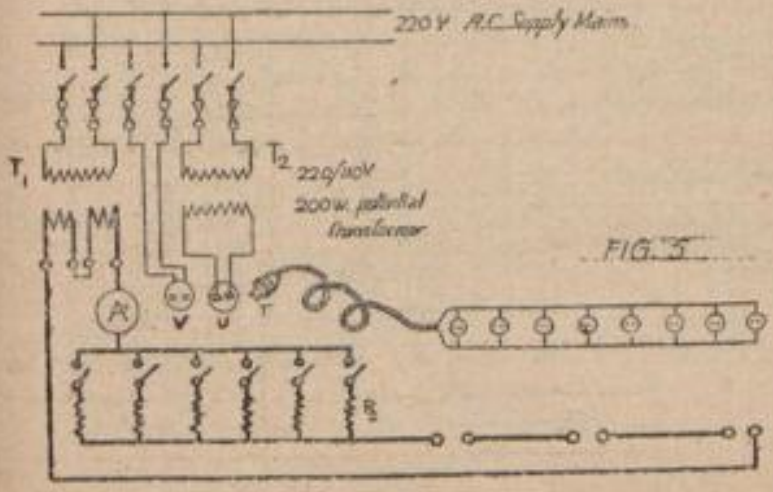
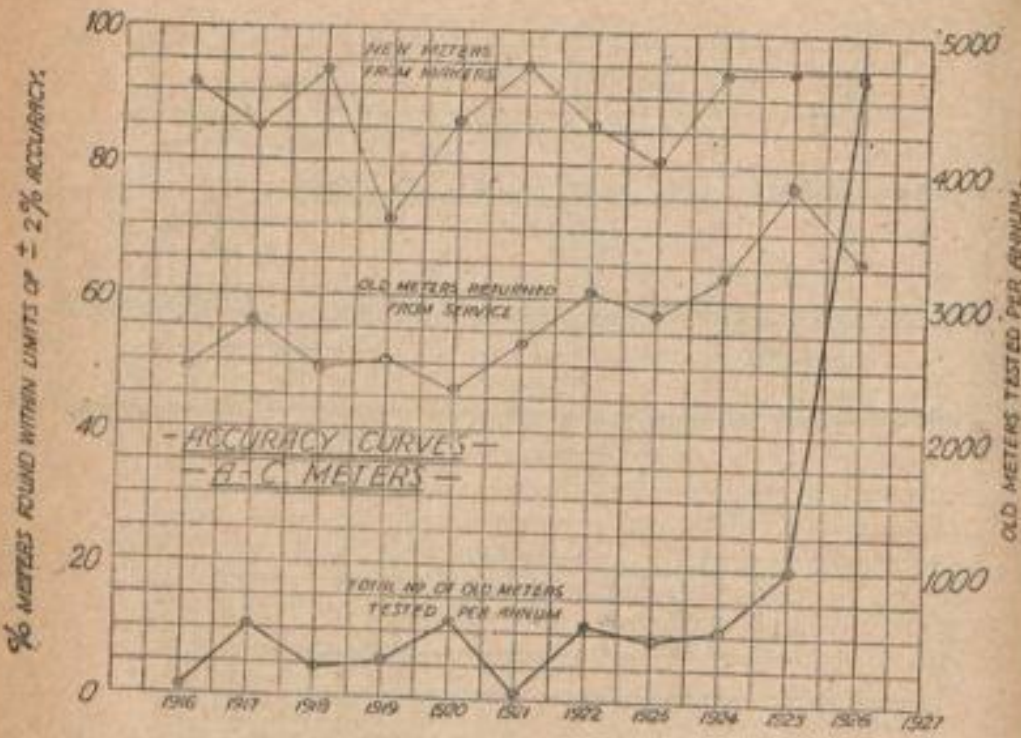
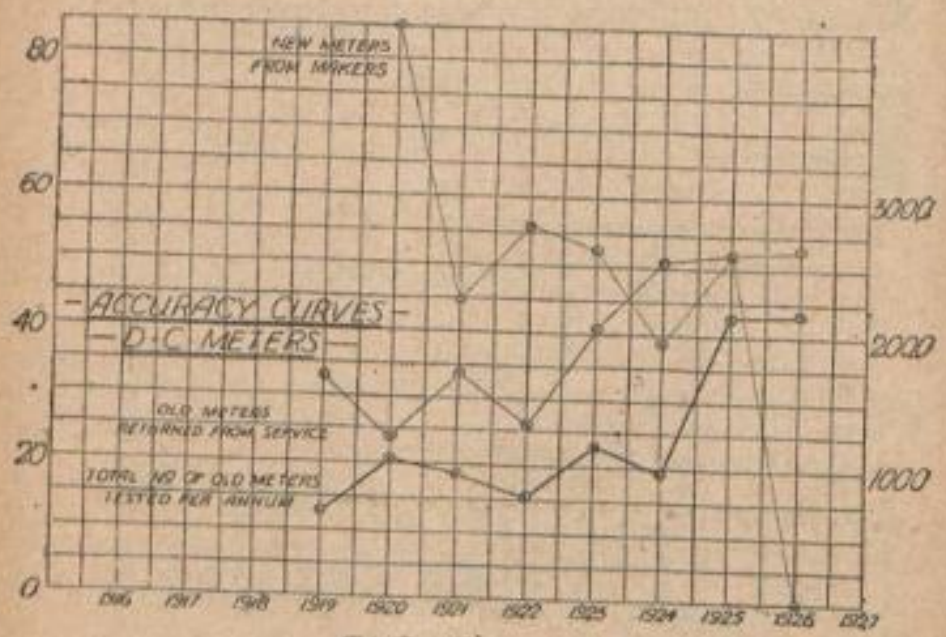


FIG. 5.


% METERS FOUND WITHIN LIMITS OF ± 2% ACCURACY.
OLD METERS TESTED PER ANNUM.
NEW METERS FROM MAKERS
OLD METERS RETURNED FROM SERVICE
TOTAL NO OF OLD METERS TESTED PER ANNUM
-ACCURACY CURVES-
-A.C. METERS-
100
80
60
40
20
0
5000
4000
3000
2000
1000
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927


NEW METERS FROM MAKERS
-ACCURACY CURVES-
-D.C. METERS-
OLD METERS RETURNED FROM SERVICE
TOTAL NO OF OLD METERS TESTED PER ANNUM
80
60
40
20
0
3000
2000
1000
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927

-FIG. 6.-

Mr. SWINGLER (Cape Town): Mr. Albertyn's idea was to provide a paper that might be of use to members of the Association at a later date; not so much with the object of creating a discussion at this Convention but to be useful to many of the smaller towns as well as to those desiring supply in bulk for purposes of reference. I hope Mr. Albertyn has succeeded in giving you a useful and interesting paper, and if there is any information I can give on any question arising out of the paper, I will be only too pleased to do so. Mr. Albertyn first of all points out the importance of the accuracy of meters. All of us go to a lot of trouble and expense in trying to produce and distribute electricity at the lowest possible cost and then lose a good proportion of the revenue which the sale of such electricity should produce by using inaccurate meters. It is important not only from the supply authorities point of view but also from the consumers' point of view that every effort should be made to have accurate meters to and maintain them accurate. It is absolutely essential that one should carefully look after electricity meters just as it is essential in the public interest for the Government to make people look after their scales and other weighing and measuring appliances in order that both parties to a transaction should have a square deal. The paper also deals with the question of the purchase of meters, and advises engineers and others concerned not to purchase a meter because the price is the lowest but to consider carefully the matter of quality in order to ensure that the best is obtained for the money expended. It is important that only reliable makes should be purchased and a good meter represents money well spent. If once a consumer loses confidence in an electricity supply undertaking, then that undertaking will have endless trouble, not only with that particular consumer, but with others who may be influenced by him.

Mr. Albertyn also goes into the different difficulties met with in the calibration and operation of alternating current and direct current meters. Our experience in Capetown has been that we have had much less trouble with the alternating current than with the direct current meters, because after all the alternating current meter is a very much simpler and more robust piece of apparatus than is the direct current meter, and therefore capable of maintaining a higher degree of accuracy. On page (5) the author deals with the high drop in

pressure through some meters, and on page (6) with the erection of meters. The proper erection of meters is a very important point, and Mr. Albertyn rightly points out that care must be taken with the connecting up of meters. At the bottom of page (6) he deals with 3-phase 4-wire meters and 3-phase meters generally, and points out the pitfalls which await the unwary principally in connection with the leads to and from such meters, and suggests that erectors of 3-phase 4-wire meters and 3-phase meters should be furnished with diagrams of connections in order to facilitate their work and to ensure the meters being correctly connected up. The important question of the sizes of meters for different installations is also dealt with on page (8). On pages (9), (10) and (11) there is dealt with the question of instrument transformers, and the author emphasises the fact that many points in regard to current transformers are just as important as the meter themselves and he gives a warning against installing too small a transformer. On one hand it is not good practice to instal too large a meter, on the other hand too small a transformer must not be used. With 3-phase meters there are about 576 different methods of connecting the current transformers to the meters, of which only 24 connections are correct. He describes the different methods of connecting and suggests how with an induction motor running light a power factor of below .5 can be obtained, which is a very good method of checking the connections on 3-phase meters. On page (12) mention is made of the 2-wattmeter method for ascertaining the average power factor, assuming that the load is balanced. If at a later date any member desires to obtain information on any point in regard to his metering problems a letter to Mr. Albertyn on the subject will be replied to. On page (13) he deals with the matter of K.V.A. and mentions the fact that it has now become the practice of supply authorities to charge per K.V.A. of maximum demand and not per K.W. of maximum demand. On poge (15) there are given a number of illustrations and particulars of meters known to the author, but he is careful to say that he does not wish to make any attempt to classify the different makes of meters. He cannot enter into relative merits of particular makes of meters. As you will readily realise it would not be wise to do so, but of the meters mentioned there we know nothing particularly bad. Some have better points than others but no attempt has been made to classify them. On

page (16) the author points out that oue should be very careful of the demand registration time interval which is an important factor in accurate metering and must be watched as carefully as the meter itself. A very important point in metering is the necessity for ing for electricity. On page (18) the need for maintain-educating consumers in the different methods of charging the accuracy of meters is stressed, as also is the importance of satisfying consumers, so that every endeavour should be made to do so. Mr. Albertyn also shows how the smaller undertakings and particularly those supplying alternating current can check meters in position on consumers premises with very little difficulty. On page (19) there is given the minimum number of meters or instruments necessary for a meter test room. Page (21) deals with the establishing of artificial loads on consumers' premises, and the methods of testing new meters before installation, the practice in Capetown being to test all new meters. Page (24) deals with the routine tests made in Capetown every 3 years on alternating current meters and every 2 years on direct current meters. We have found that maintenance of a continuous check on the operation of meters very beneficial in safeguarding the revenue of the undertaking. We generally instal our meters 2 per cent. fast and by the time they come back they are usually running a shade slow. On page (25) the author again mentions the necessity of giving to consumers a reasonable assurance that the meters installed upon their premises are registering correctly. The first principle in honest dealing is to play the game to your consumers. If a consumer's meter is found to be wrong that consumer's account should be adjusted and the consumer given full credit of any over registration which may have taken place. If a consumer makes a complaint over the 'phone about the inaccuracy of his meter a test meter is installed as a first check. We have all new meters tested on a test rack (shown in Fig. 4) before they go into service. Between 1925 and 1926, when we inaugurated this system of continuous routine testing, it will be noticed that the average accuracy of the meters improved very considerably. We have certainly found by these methods that age or time in service tells very much against the accuracy of meters. We hope the paper will be of some value to those interested.

The PRESIDENT: I know that you will greatly appreciate Mr. Swingler's offer in stating that a com-

munication addressed to the Electricity Department, Capetown, will bring such information as you desire at any time after you leave this Convention, and I would suggest that you take full advantage of that offer.

Discussion.

Mr. JAGGER (Ladysmith): We are very much indebted to Mr. Albertyn for his very useful and interesting paper on meters, which will be a great help to the engineers of small undertakings. It is very often the case in the smaller towns that so long as the meter keeps on recording, the accuracy of the meter is taken for granted. In the change over from the direct current system to the alternating current system of supply in Ladysmith some months ago we changed all meters. The first complete month's meter readings after the change showed a very large reduction in the number of units lost in distribution. I was very much surprised at this and at first thought that some mistake had been made in meter readings. Where the distribution losses are in the region of perhaps 5, 6 or 7% the greater portion of these losses are most likely due to defective meters, and if the engineers would only get into the habit of testing, say 10%, of the meters every month, very much good would result, especially to the revenue of their undertakings. There are many undertakings at the present time showing a loss which by careful testing and adjustment of the meters could perhaps reverse the position and show a small profit. The increase in revenue to the Ladysmith Municipality by the installation of new meters as a result of the change of the system of supply from direct current to alternating current is something like £40 per month. I must say that in Mr. Albertyn's paper there are one or two very valuable hints which I hope to put into practice when I go back to Ladysmith, and thereby prevent distribution losses increasing to any great extent in the future.

Mr. FLETCHER (Krugersdorp): In Krugersdorp we have direct current meters of both the ampere-hour and the watt-hour type and we find that although the watt-hour meter is more correct in registration it will not stand up to the severe lightning storms which we have so frequently. The author suggests that 3-phase 4-wire meters may be adopted as a standard. I do not quite follow this, because I take it that most consumers require both power and lighting and their power loads would probably be many times what their

lighting loads would be, so that it would appear to me that a 3-phase 4-wire meter would be best for metering the power load and a single-phase meter for the lighting load. I have had very useful results from the use of a recording instrument on consumers' premises to show when the actual load comes on. In the matter of the capital expenditure involved in the purchase of suitable reliable meters, it has been my experience that in the preparation of estimates of cost for new undertakings adequate provision for the purchase of meters has in many cases actually been entirely overlooked, as also has the matter of providing suitable testing equipment, with the result that the engineer in charge of the undertaking has usually had to devise some makeshift method of testing because there is no money left for the purchase of proper testing instruments. A really good testing equipment should be provided for in every scheme, because unless the metering equipment is accurate when installed and is kept accurate it is almost certain that the undertaking will come out on the wrong side.

Mr. POOLE (Durban): The undertakings in the larger towns are mostly equipped with adequate equipment for the testing of meters. The plant required for the testing of meters is an expensive one, and I have often wondered why some central body could not be established in South Africa to deal with the testing and checking of consumers' electricity meters, especially for the smaller towns, in addition to which power station meters and other instruments such as voltmeters and ammeters, etc., could be tested. Perhaps the Engineering Standards Association, on which our Association is represented, could be induced to do something in the direction of the appointment of some central authority for carrying out the testing of meters and such other similar work as may be required by electricity supply and similar undertakings.

Mr. SPARKS (Pietersburg): I would like a little information as to whether any of the engineers of the smaller up-country towns suffer from meters being damaged by lightning? As a result of every severe lightning storm which occurs we have three or four meters put out of commission, mostly due to shunt coils and other parts being damaged by lightning. There is another point in Mr. Albertyn's paper in which I am very much interested and that is the question of the metering of current at the power station. I think

that a lot of so-called "line losses" or "units unaccounted for," are probably due to the fact that the meters on station switchboards are not in good order and registering accurately. If good results in every respect are to be obtained it is essential that power station instruments as well as consumers' meters should be accurate and reliable. If consumers grumble about their accounts being too high, I have a test of the consumer's meter made by installing a check meter for a suitable time. I have done this in every case in which the consumer is not satisfied with the account rendered to him.

Mr. RALSTON (Dundee): I find that in some small towns they have been fortunate enough to have standardised on one make and type of meter. When, however, one is unfortunate enough to take over a comparatively small undertaking in which there are twelve different makes of meters in use, the work of testing and maintenance becomes very difficult, especially with the small staff available in such a concern. In special cases I have at times written to the larger municipalities asking them to undertake meter tests for me, but this method has the disadvantage that the meter tested is liable to be upset in transit after the test has been made. I think that it would be very helpful, especially to the smaller towns, if some arrangement on the lines suggested by Mr. Poole could be brought about.

Mr. JAGGER (Ladysmith): It is only a question of installing a duplicate set of meters to overcome the difficulty.

Mr. WESTAWAY (Electricity Department, East London): I must certainly compliment Mr. Albertyn on his paper, which will appeal most to those in charge of the larger undertakings. Seeing that this Convention is largely composed of representatives of the smaller towns, it would have perhaps been better had Mr. Albertyn's valuable knowledge been directed to helping those in charge of these smaller concerns—men who have not at their disposal the money or the staff to provide and run a well-equipped test room. I certainly agree that meters should not be bought on price alone, but there are many of the cheaper meters which give equally as good service as the more expensive types. The meters to be avoided are those that are not fitted with micrometer adjusting device for the full load adjustment, as it is still quite common practice in

many makes to poise the main magnets on 3 grub screws, and there is nothing more irritating than trying to adjust such a magnet, as the whole of the alignment is upset on releasing these screws and the ultimate correction takes up too much time and trouble. As regards the examination of the dial train, my experience has been that a long run test on a very light load is the best method of finding any defects in the dial. One delegate has mentioned the difficulty of proving the maker's certified starting currents of meters without the use of expensive instruments, which most of the smaller undertakings cannot afford to get. In my opinion every small alternating current supply station should have a rotary sub-standard test meter. The department of which I am in charge has several of these, all of them made by the General Electric Co. of America, and they are very reliable. These meters are fitted with 1, 10 and 20 ampere coils. Now to ascertain the starting current of a meter, it is only necessary to put, say 10 meters in series (without removing the potential bridges), and let this load run through the 1 amp. coil, and divide the result by 10, which will give the average starting current, but the more practical method is to give the meter a load of say 10 watts, which represents the smallest lamp that one can get for general use, and if the meter is O.K. on this load, the starting current is of little account. This test will also serve the purpose of proving the mechanical correctness of the dial train, as the load is so light that the least irregularity will stop the meter.

Another difficulty has been mentioned, viz., the measuring of loads without the aid of a lot of instruments. Well, this can easily be done by taking the revolutions of a meter for, say, two minutes and multiplying by 30 to make the equivalent of one hour and then comparing this figure with the revolutions on the duty plate of meter, which will give fairly accurately the correct load.

With regard to the systematic testing of meters, I particularly allude to domestic supplies, and regret that Mr. Albertyn is not here to reply, as this is a most interesting subject. Personally, I contend that it should be done after a certain number of units have been registered, and not, as is generally done, after a certain period of time, inasmuch as some consumers use many times more units than others, and in a general sense it is only wear and tear that makes a meter defective.

Then again, is it the most efficient way of testing to send a tester round a district to test and correct the meters *in situ*? As a rule meters are in positions which make accurate testing very awkward, in addition to which the time taken is considerable, and because of this I contend that it is cheaper and more reliable to change the meters, which only takes a few minutes, and to test them in the test room, where everything is convenient and where conditions make accurate testing more easy.

The PRESIDENT: In closing the discussion on the exceedingly interesting and useful paper which Mr. Albertyn has contributed, I would say that the suggestion made by Mr. Chalmers, of George, to the effect that we as an Association might very well, in the interests of municipalities, and more particularly of the smaller towns, give consideration to the appointment of travelling inspectors to undertake the testing of meters. If the Government of the country deems it necessary to establish an assize department to keep a check on the correctness of scales and weighing machines, why should it not be possible to adopt some similar system for the testing of electricity meters? Mr. Poole has suggested the creation of a central authority for the testing of meters from all parts of South Africa. It would appear to me likely that the cost of carriage and the risk of damage to meters whilst in transit to and from such central authority would largely nullify the benefits resulting from the adoption of such a proposal. In the interests of the revenue of every electricity undertaking as apart from the maintenance of good relation between customers and the supply authority, regular routine testing is essential. I fell bound to stress necessity for each and all of us paying close attention to the financial aspect of electricity supply, because I hold the view that we are all in the business on a £ s. d. basis. We may have the very finest plants obtainable and we may have the finest undertaking as a whole, but I do not think we are likely to be very much appreciated by our respective municipal councils unless we can show satisfactory financial results, due regard being had of course to local conditions and circumstances. This is well worth turning over in your minds. This aspect of electricity supply is one which should be brought prominently before each and every Convention held by this Association.

I will now ask Mr. Swingler to reply to the discussion on Mr. Albertyn's paper.

Mr. SWINGLER (Capetown): There is no real necessity for me to do so, but I may say my idea was that in the paper which has just been discussed, intricate technicalities should, as far as possible, be avoided, and I was responsible for cutting out certain technical matters in Mr. Albertyn's paper, as I did not think that a highly technical paper would be so acceptable to our members and delegates. In regard to the question of watthourmeters, I would point out that those undertakings which supply A.C. must use watthourmeters. We fortunately do not have lightning storms at Capetown and so have not had any experience in the matter of damage to meters by lightning. In reply to the question asked by Mr. Fletcher as to whether it is advisable to put a single three-phase four-wire meter for combined lighting and heating and cooking installations instead of a three-phase four-wire meter for the heavy heating and cooking load and a comparatively small capacity single-phase meter for the lighting load. I would say that in the case of consumers having lighting as well as heating and cooking, the former load being only a very small fraction of the latter, the supply undertaking must take a certain amount of risk in metering rather than go to the expense of double metering equipment. Fortunately alternating current meters have a very high overload and low starting capacity and in the sizes generally used will start up on the lowest lamp ordinarily in use, so that the risk is not very great. Consumers do not cut down the size of their lamps when taking current for both lighting and heating, but the use of electricity for cooking and heating necessitates the use of higher capacity meters, such as the 25 ampere size.

I agree that the integrating check meter would be better suited for use by the smaller undertakings. The portable rotary sub-standard as made by several good firms is satisfactory for use as a check, but I would suggest to the smaller undertakings that they use an integrating wattmeter and instal it upon the consumer's premises for a sufficiently long period of time in order to satisfy the consumer. The engineer can satisfy himself by means of a rotary sub-standard, but it does not necessarily follow that the consumer is satisfied, because as a rule he is not, simply because he does not understand what is being done.

In regard to the expense to be incurred in the testing of meters, I hold that money properly spent on meter testing is money well spent.

There is nothing so good for safeguarding the revenue of an undertaking as the testing of meters, and it is therefore highly important that meters register correctly. In reply to the question raised by Mr. Poole as to the setting up of some central authority to undertake the testing of meters, I would point out that anybody in Johannesburg can have sub-standard meters checked, either by the municipal council or the University. Certainly in due course the Electricity Supply Commission should be the body to undertake this duty, but with any system embodying a central depot there is still the difficulty arising from the long distances over which meters would have to be transported, with consequent risk of damage.

In my opinion separate current transformers should be installed for metering and for the tripping of circuit breakers. For instance, the use of time limit fuses connected in shunt to circuit breaker trip coils may adversely affect the accuracy of any meters connected to the same transformer. There are such things as double wound current transformers. I would recommend that anybody who has to provide for both circuit breaker tripping and metering should employ double wound current transformers having one secondary winding suitable for meters and instruments and the other for tripping.

Anyone who uses the rating stamped on an incandescent lamp as a basis for calculating the current consumption of the lamp is very likely to find the result of his calculation very far out as compared with the registration of an integrating wattmeter, and the consumer who did so would probably consider that the supply authority had been overcharging him. The ratings of lamps as stamped on them by many makers are very unsatisfactory, and very misleading. One should be very careful about accepting the wattage of lamps as being that marked on them, and all lamps should therefore be tested and where thought advisable the test made in front of the consumer concerned.

In regard to the installation of three integrating wattmeters in series for metering bulk supply loads, in my opinion this is only justified in the case of very large consumers. In Capetown we have been very successful in satisfying the managers and accountants

of one of our largest consumers, the Imperial Cold Storage Co., by the provision of only two meters in series.

We do, however, put in a testing connection in order to be able to instal a third meter if and when required as a check. It is somewhat difficult to do this on direct current, but on alternating current it is quite easily done.

The PRESIDENT: Gentlemen, I feel sure that the full value of and the benefits to be derived from Mr. Albertyn's very valuable paper, particularly to those engineers controlling the smaller electricity undertakings, will not be realised now in this room nor in East London, but will only be realised when each of us is back in our own town. It will to most of us constitute a valuable work of reference and a very useful guide in one of the most important branches of our work. It is my pleasing duty to tender to Mr. Albertyn through Mr. Swingler, a hearty vote of thanks for his valuable contribution to our Convention. Carried by acclamation.

The next business is the paper kindly contributed by Mr. Mortimer Mail on

RUNNING CONDITIONS OF A SMALL D.C. STEAM PLANT WITH BATTERIES, GIVING 24 HOURS' SUPPLY.

By W. Mortimer Mail, Town Electrical Engineer, Kokstad, East Griqualand.

In bringing up this paper, the writer has in mind small undertakings of under 200 Kilowatt capacity, being of the opinion that plants of a larger size than this are able to produce current on more favourable terms, as the overhead expenses are practically the same and the running costs are nearly the same, except for the price of fuel in the larger plant. In Kokstad there are now 235 consumers, including two large and four small motors and the Municipal stone-breaker. Excluding coloured people and poor whites, there are only 20 houses not connected to the supply, and as this, so far, is not an industrial district but a farming and health resort, the plant is loaded to about its probable maximum load for some time to come, but, as will be shown further on in regard to its present heating load, this is the branch which is being fostered, and so far 75% of the consumers are using some small heating appliance such as irons, kettles, toasters and hot plates.

Size of Plant:

Two sets Bellis & Morcom, 40 Kilowatt each. Two sets Babcock boilers superheated steam and condensing plant.

Batteries:

240 cells A.F.A. 290 amp. hour.

Voltage:

220/440 volts D.C.

Number of Consumers:

235.

Number of Motors:

6.

Tariff. (As attached).

Number of Street Lights:

160 of 80 watt, and 100 watt half-watt lamps.

Scheme Cost:

£18,714 10s. 8d.

Municipality:

Carries out installations on cash system or assisted wiring schemes and charges 30s. a point for plain fittings. All wiring in steel tubing.

Connection Fee:

£4 4s. up to 40 ft. for underground service. Most of the scheme is underground due to numbers of trees in the town. Overhead wires outside of town.

Meter System:

Free.

Area of Distribution:

848 acres. *Cables in streets:* 22 miles.

Power Station:

Comprises a brick building with 14in. walls, divided into boiler room, engine room, battery room, workshop and spare room, which is used by the Improver Shift Engineer for sleeping accommodation. There is also a large

verandah under which the boiler feed tank and condensing plant is erected.

The Boiler Room contains two Babcock & Wilcox portable type boilers fitted with wrought steel casing and chimneys 67 feet from floor level. Each of these has a heating surface of 270 sq. feet and a grate area of 15 sq. feet, rated at 60 H.P. maximum at a pressure of 165 lbs. per sq. inch. Superheaters are fitted, bringing the temperature of steam to 550deg. F. at the stop valve of the engine. There are two boiler feed pumps supplying water through feed heaters. The water temperature entering the pumps is during summer months 60deg. F., which is the average; three months at 60deg., entering boiler at 170deg., and the three months of winter at 40deg., entering the boiler at 150deg. Through numerous nights in June the water was down to 33deg. F. Coal is weighed every night and on some occasions the consumption has been 4.5 lbs. per unit, but, as will be noticed further on, the average for six months' run is 6.02 lbs. per unit generated, weighed every day, and 8.98 lbs. per unit sold. This difference between 4.5 lbs. and 6.02 lbs. average is accounted for by the fact that since running this plant, great trouble has been experienced in getting suitable boys as firemen, as this is a closed district for Indians, consequently local natives have been employed who are most unsuitable for this kind of work. In this six months' run there have been three changes. In my opinion, this trouble could be avoided by mechanical stokers being fitted, as this would obviate the fire-door being opened so frequently, allowing an excess of cold air rushing in and at once bringing the temperature of the fire down, as the steam will drop on this size of boiler 15 lbs. in three minutes with door open on full load and takes 15 minutes to regain this. *Re* coal used, the figures given are for coal actually used by weight, but the figures for coal by weight as paid for to the colliery are also given, which works out at 1 lb. per unit more. So far it has been impossible to find out where this leakage actually occurs, but it is known that pilfering does take place, and only during June a conviction was obtained in the Court against four Europeans for theft of coal from trucks at the siding, and there is now a claim in against the railway for shortage of two tons on an eleven ton truck arrived short. As we have no weighbridge at this end and it is impossible to weigh every truck, one can only find serious shortage on six

months' run by weighing storage bin on 1st January and again on 30th June, and checking on each night's weighing for same period.

The firebars now fitted are not asoriginally fitted, as these were unsuitable for Natal coal, and we have now bars ¾in. thick and ¾in. air space. These keep cooler and cleaner fires and are not so liable to clinker. Boilers are cleaned out thoroughly three times a week and blown with steam jet every day, but even then great difficulty is found in keeping them thoroughly clean externally, as in this size of boiler it is very difficult to get to all parts with steam jet, and every three months they are laid off for cleaning between tubes and in the corners. Another mistake in this plant is that each boiler is the exact size, 60 H.P. working at the best efficiency to supply steam to a 60 H.P. engine working on full load conditions for the full period run, so that everything has to be kept in first-class order to be able to keep steam up to full pressure, and it is found also that to pump 1 inch of water into the boiler by gauge glass means a drop of 50 lbs. pressure, hence the pump has to be watched continually so that a constant level is kept. Only one boiler is used, and is changed over every three months for overhaul and cleaning.

Water for boiler feed is taken from the town main; the charge for same is balanced against current supplied for stone-breaking plant and supervision by Electrical Department.

Engine Room comprises two 40 kilowatt sets Bellis & Morcom with Swedish General Electric generators, three wire, 440 volt D.C. and transformer balancer. There is also a booster set for charging batteries. Only one generating set is used at a time, changing over every three months when the boiler is changed over. The average run per day is 12 hours. Starting up at midday, it runs until midnight, and the batteries are charged in addition to running the town supply. The starting time each day is taken according to the discharge of the battery, which is completely discharged each day. During peak load each evening, between 6.30 and 8.30 p.m., the battery is floated on the line helping engine. The battery comprises 240 cells A.F.A. 290 amp. hour and on six months' working, after three years, works out at 69.2% and deposit at bottom of jars maximum three inches. So far, the battery has done one-third of

the town lighting since starting up. There is also a distilling plant which supplies all water for batteries and also for sale to chemists, garages and hotels in the district at 2s. per gallon. This was originally for hand firing, but has been converted to use steam from the boilers. The engine exhausts into a Ledward & Beckett's Ejector Condenser, giving 23 inches vacuum with water supplied by motor centrifugal pump from the dam. The altitude here is 5,000 feet.

The engine room is fitted with a girder over each engine to take a two-tone block and tackle to facilitate repairs.

The workshop is well equipped with lathe drilling machine, emery stone, driven by electric motor, where all repairs are done for Power Station and outside distribution, and numerous jobs are done for other Municipal works free of charge.

Outside Distribution is by seven 0.06 sq. inch and 0.04 sq. inch three core underground cables from Power Station fed to eight overhead distribution boxes and then out again by 0.025 and 0.01 and 0.0045 three core cables and then twin cable in outlying parts of the town. On the outskirts of the town, house mains and street lighting are run overhead, No. 12 bare copper wire on black wattle poles. At important crossings steel poles are used. So far, these are working quite satisfactorily, the difference in price being: wattle poles, 20 feet long, 3s. each, and steel poles, £4 (landed at Kokstad). The reason underground cables are used here is because of the numerous large oak trees in all the streets, and overhead can only be used in the outlying parts where there are no trees. The disadvantage of underground cables is that for heavy heating and lighting loads, the carrying capacity of the cable is fixed and not so flexible as overhead, where copper can be added very quickly and, in the event of a fault occurring underground, with a small staff, there is a chance of service being interrupted, but this is being obviated by linking up boxes wherever possible. Another thing with underground cable is that balance has to be safeguarded with three wire system. Wherever the load is at all large, a three wire service is run and balanced in the building. The overhead distribution box used is one adapted from the simplex cast iron type, that is used for inside buildings, by taking out the middle row of fuses and using top and bottom, joining neutrals solid and earthing same to box and lead of cables.

All buildings are wired in simplex grip fittings earthed to roof and water pipe. Open wiring is only allowed in special circumstances. One meter only is installed and current is given on a sliding scale so that the minimum pays for service rendered and the cheaper tariff for consumption. It has been divided into 13 scales to fit all sections in, and to make it fair to everybody. This has proved correct, as there are 75% using irons and kettles. In fact, on Tuesday mornings (ironing day) from 9.30 a.m. to 1.0 p.m., the load is 25 kilowatts, and at 11.0 a.m. every morning (tea time) the load for half-an-hour is up to 30 kilowatts, which, with only 235 consumers, shows the amount of kettles on the load. Unfortunately, trouble has been experienced with elements burning out, and as these improve and get cheaper, this is the load that wants developing in small towns. Enquiries have been received for ten stoves so far, but these have been refused as not a payable proposition with small mains and plant.

Street Lighting comprises 160 of 80 watt and 100 watt half-watt lamps, fed and switched on from Power Station in two circuits underground cables fed to four distribution boxes. Every street corner of the town has the lamp in the centre of the road suspended from two 27ft. steel poles and stay wire across, and, in addition, one lamp in the middle of every block in the town. The two main streets have two in each block. These are on the side walk on 18ft. steel poles. The street lighting is kept on till 11.0 p.m. each evening and later on special occasions.

Time Signal.—Each evening the lights are dimmed at 8.0 p.m., the time being checked by wireless from either Durban or Johannesburg.

The total scheme cost £18,714 10s. 8d. The cost was higher than it would have been had the railway been here sooner, as the whole of the plant and cable had to be transported by ox wagon 25 miles from railhead. An amount of 1d. in the £ on the rates is imposed, which is a charge for street lighting, construction, maintenace and current, which is credited to Electric Light Revenue Account, which then, with its own revenue for current sales, can pay all loan monies and working costs and show a profit on the year's working. There is also an assisted wiring scheme which ratepayers can avail themselves of.

Date of opening.	Population.		Units sold.	Units per annum per inhabitant: Whites plus .02 Coloured.
	Whites.	Coloured.		
1924	1,340	3,300	88,000	44

Battery Figures (on six months' working). Working rate 29 amps. for 10 hours.
240 cells. 290 amp. hour. A.F.A. (3 years' old).

Total since start.	Six months.	Battery hours.	Efficiency.	Discharge Rate per day.	Distilled water.	Equalising charge.	Remarks.
65,081	7,730	2,172	69.2	Full discharge daily	240 galls.	Monthly.	For periods of 30 minutes batteries discharge at 30 amps.

Expenses on Total Scheme (six months' working).

Scheme cost.	Revenue.	Total Expenses.	Interest and Redemption.	Cost per Unit.	
				Generated.	Sold.
£18,714 10s. 8d.	£2,094	£1,921 10s. 10d.	£1,350	6.9d.	10.4d.

Scale (6): *Garages, Butchers and Power Users* up to 4.75 H.P.

A minimum monthly charge (covering up to 16 units) of 20/-
Thereafter at the rate of ..... 4d. per unit

Scale (7): *Public Institutions*, as Hospital, Hostel and Convent.

A minimum monthly charge (covering up to 40 units) of 50/-
For the next 100 units at the rate of 6d. per unit
Thereafter at the rate of ..... 4d. ,,

Scale (8): *Balmoral Hotel.*

A minimum monthly charge (covering up to 80 units) of 100/-
For the next 200 units at the rate of 6d. per unit
For the next 240 units at the rate of 4d. ,,
Thereafter at the rate of ..... 3d. ,,

Scale (9): *Royal Hotel.*

A minimum monthly charge (covering up to 192 units) of 240/-
For the next 308 units at the rate of 6d. per unit
For the next 500 units at the rate of 4d. ,,
Thereafter at the rate of ..... 3d. ,,

Scale (10): Alternate Scale to be allocated by Council if consumer wishes.

A minimum monthly charge (covering up to to 10 units) of 10/-
And each unit thereafter used at the rate of ..... 1/- per unit

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Scale (11): *Power*—5 H.P. and over.

Five shillings (5/-) per H.P. minimum charge per month, covering 5 units per H.P. minimum charge. Thereafter at ... 3d. per unit
To be used in the daytime only.

Scale (12): *Bioscope.*

Per performance Night time at 10/-
Ditto Day time at 5/-
Monthly rent for motor generator 40/-

The Corporation reserves the right to include under this Tariff any apparatus not provided for in the foregoing definitions.

Mr. MAIL (Kokstad): The first portion of the paper is mainly descriptive of the electric lighting plant in Kokstad, a town on the eastern border of Griqualand having a population of approximately 1,300 Europeans. As Kokstad is not an industrial centre but is a health resort situated in the heart of a large and productive farming area, there is not much electric power business existing or in prospect, there being a total of only six motors installed.

There are a total of 235 consumers taking supply, and only twenty houses in the town are not connected up, and the plant is therefore operating almost entirely on a lighting load, but as Kokstad is situate at a height of over 5,000 feet above sea level, the evenings are cool all the year round and the days and evenings decidedly cool in winter, so that in proportion to the capacity of the plant there is a fair prospect for electric heating.

As will be seen from the Paper, the system of supply is three-wire direct current, the generating plant being steam operated. The plant is unique in one respect, in that "Babcock & Wilcox Portable Type" boilers are installed, these being two in number, superheaters and feed water heaters also being provided, the station operating non-condensing. On the electrical side static balances are employed and a storage battery is installed. In the town proper, underground distribution mains have been adopted, on account of the number of trees and the frequency of lightning storms. On the outskirts of the town overhead lines are carried on black wattle poles, which so far give every indication of being satisfactory.

There being no electrical contractors in Kokstad, the electricity department carries out the wiring of consumers' premises.

Street lighting is affected by 160-80 and 100 watt half watt lamps controlled from the power station, the lamps at street intersections being suspended from overhead span wires.

It may interest those present to know that the practice in vogue in Durban of giving a daily time signal by dimming the lights at 8 p.m. is carried out in Kokstad, the time being checked by wireless from either Durban or Johannesburg.

The total cost of the scheme was £18,714 10s. 8d. for a total installed plant capacity of 80 Kilowatts.

the cost of construction having been considerably increased by the fact that the whole of the plant and materials had to be transported by ox wagon, a distance of 25 miles from the nearest railhead.

In the General Rate of the town is included an amount of 1d. in the £ in order to cover the cost of street lighting, construction, maintenance and the current consumed, which amount enables the undertaking to come out with a profit on the year's working.

The PRESIDENT: I am sure we are all indebted to Mr. Mail for the clear resume of his Paper, which is now open for discussion.

Discussion.

Councillor PRIOR (East London): It would appear to me that some, at any rate, of Mr. Mail's troubles arise from the fact that he employs native labour in his boiler room. Surely it would be possible for him to obtain the services of suitable white men as firemen. I would like to advise him to try this, as I feel sure that he would get more satisfactory results.

Mr. MAIL (Kokstad): I have tried poor whites.

Councillor PRIOR (East London): A man who is a good fireman certainly is not a poor white.

Mr. MAIL (Kokstad): The plant cannot stand the wages that should have to be paid to competent white firemen.

Councillor PRIOR (East London): Surely every municipal electrical engineer expects to receive a living wage himself, and if a municipality cannot pay a living wage then it has no right to run a power station.

Mr. SPARKS (Pitersburg): I thank Mr. Mail for his paper and for the trouble he must have gone to in preparing the large amount of detailed figures in it. Mr. Mail seems to have had more than a fair share of trouble. We all have troubles in regard to the operation and maintenance of boilers, especially in the smaller towns. We have yet to solve the problem of replacing local native labour by white labour, particularly as firemen. I am quite in favour of having a station staff all white—not half white and half black—and the time must come when this will be done. The trouble with native labour is that no sooner does a native boy get a thorough knowledge of the work and becomes skilled at it, then he wants to go off to his home every six months, which makes it impossible to

secure a maximum efficiency in the operation of a plant on which native labour is engaged on such work as the firing of boilers.

It appears to me that Mr. Mail is able to get his capital rather cheaply, as he pays only £600 per annum in Interest and Redemption. Surely a small sum in proportion to the capital involved, as we in Pietersburg for instance, have to pay under these two heads, an average of 10 per cent. on the capital cost of the scheme. Fixed annual charges in the shape of Interest and Redemption appear to me the most important item that electricity schemes in the smaller towns have to contend with.

Mr. Mail's provision for renewals—£150—also appears to be very small, particularly in view of the fact that he has a storage battery installed, the average life of which in South Africa is somewhere in the neighbourhood of only 5 years. The provision of only £60 per annum for battery renewals appears to me be totally inadequate.

Mr. BASKERVILLE (Salisbury): I read Mr. Mail's paper yesterday, and whilst I am not acquainted with local conditions other than the knowledge gained from reading the paper. I understand that Kokstad is 5,000 feet above sea level, and therefore has very cold nights, which, as Mr. Mail states, results in a fairly heavy heating load, yet the running plant in Kokstad is closed down at midnight, the boiler fires being drawn each night and lighted up again next day.

Mr. Mail's storage battery appears to be giving only 69 per cent. efficiency, so that for every unit given out of the battery, one-and-a-half units have to be generated and put into it, so that the steam plant has to be called upon to assist the battery on the evening loads and started up again after breakfast time in the morning in order to re-charge the battery. It is quite evident to me that the battery will have to be entirely renewed, at any rate in so far as the plates are concerned, at a comparatively early date.

With reference to the coal figures furnished in Mr. Mail's paper, I think it would be better if coal figures were based on the coal actually purchased, as I notice that in some of the annual returns prepared by the Association, the coal figures are based upon the coal actually consumed, which in some plants is a very different matter.

In regard to the trouble which Mr. Mail has with native firemen, I too can testify to the unsatisfactory class of native firemen we in Salisbury get from Nyassaland. In Salisbury we have 37 Swaheli boys who take fairly well to that class of work, and so long as they are not mixed with members of other tribes, they tackle the job very well and make quite good firemen, being entirely unaffected by the heat.

In regard to the matter of tariffs, I agree with what other members have said previously at this Convention, that three or four tariffs could be made to meet the conditions obtaining in Kokstad.

Mr. RALSTON (Dundee): I feel that Mr. Mail is to be congratulated on the paper which he has presented. I don't think many members really fully appreciate what it means to engineers from the smaller towns to get up and take part in the discussion on a paper of this description, situated as many of us are in towns remote from the larger centres and therefore having no opportunity of keeping in touch by actual observation with the latest developments and practice.

I would like to ask Mr. Mail if the sum of £60 set down for the maintenance of his storage battery includes the provision of acid and water, and also if the sum of £7 8s. is his total expenditure on water for the period of six months covered by the costs given in his paper. If this is so then he is to be congratulated on being able to get water so cheaply.

In the matter of poles, it occurs to me whether it is actually cheaper to use wooden poles in place of steel poles in view of the very much shorter life of wooden poles. Of course, as yet, realiable figures are not available as to the life of wooden poles in South Africa, and their employment may well be justified in the earlier stages of a scheme and on routes where the possibility of an adequate revenue return is not indicated.

In my opinion, if Mr. Mail could persuade his Council to instal chain grate stokers on his boilers in place of hand-firing, he would be doing a very good thing in the interests of more trouble, free operation and reduced maintenance costs. In Dundee we have recently changed over from hand-firing to chain grate stokers, and the results have been exceedingly satisfactory.

Mr. BLATCHFORD (Greytown): I sympathise with Mr. Mail in having to be the "head cook and bottle washer" which every Engineer has to be who takes charge of a small electric supply station.

In regard to the matter of his storage battery, I do not see how Mr. Mail is going to be able to replace the battery when the time arrives for this to be done without having specially set aside 20 per cent. per annum on its first cost for replacements and renewals.

I would also like to ask how he can maintain steam at a pressure of 165 lbs. per square inch throughout the night when he draws the fires at midnight? Would it not be better for Mr. Mail to make provision for banking his fires between 12 midnight and the time at which he starts running next morning.

As I mentioned during the discussion which we previously had on tariffs, I think it would be better for Mr. Mail to adopt the practice now being adopted very widely, to charge for say the first 10 units at a rate sufficiently high to cover all Capital and other fixed charges, and to sell all units in excess of that number at a rate slightly exceeding the actual cost of production.

I notice that Mr. Mail's Capital Charges are £1,350 per annum on a scheme which cost approximately £18,700. This seems to me a very small proportion, and I do not know how a small Municipality such as that of Kokstad is able to borrow money so cheaply.

Mr. MULLINS (Chief Inspector of Machinery, Johannesburg): The Department of which I am in charge has under its care some 8,000 boilers, but amongst these I have not so far found any of the "Babcock & Wilcox Portable Type." I would like a little more information from Mr. Mail as to what this particular type of boiler is like? It does seem to me rather extraordinary that this type of boiler requires to be cleaned three times per week, and certainly the closing down of the boilers and the drawing of the fires every night seem to me rather drastic treatment for a water tube boiler, and cannot but have detrimental effects upon the tubes.

Mr. MAIL (Kokstad): The drawing of the boiler fires every night is not considered to be harmful, as the boilers are of small capacity and the brickwork with which the combustion chambers are lined retains the heat sufficiently long to prevent the boilers

being entirely cooled down, the inlet and outlet dampers of course being closed. This procedure makes the cleaning of the tubes much easier. The Government Boiler Inspector of course examines the boilers and has expressed the opinion that the procedure adopted is, in the circumstances, quite a correct one. Of course by cleaning of tubes is meant the removal of the soot around the tubes and other parts of the boilers, and not internal cleaning.

The amount provided for renewals is for six months only and is not on the whole scheme but on the power station alone. The total annual expenses on the whole scheme, including the power station, are £3,271 for the period of six months, for which the figures given relate.

The storage battery is at present in first class condition, and there is every indication that it will have a seven years useful life, £120 per annum being allowed for storage battery plate renewals. The renewals contribution of £150 per annum is for replacements of plant in the power station only.

In reply to Mr. Ralston, I may say that the sum of £60 provided does not include the provision of acid. The department supplies distilled water to all garages and Delco-light sets in the town and neighbourhood at 4d. per bottle. The revenue from which is set against the cost of water purchased. At the same time I would point out that water in Kokstad is very cheap, being drawn from furrows which run through the town, the supply for the power station being diverted into a dam close to the station.

We have adopted wooden poles on account of the very much lower cost of these as compared with steel poles, though on asthetic and other grounds we would have preferred steel poles. There are no white ants in Kokstad and the wooden poles already installed have every appearance of being good for another four years life.

In regard to the matter of white labour, no doubt we would all like to have an all white staff, but in the operation of the smaller electrical schemes, in order to make ends meet, it is necessary to have labour at the lowest price available. I may mention that in Kokstad native firemen are paid £3 per month.

The PRESIDENT: I am sure you will join with me in thanking Mr. Mail for providing us with such

an interesting paper and one which has provoked such a useful discussion. I would like to see Mr. Mail, as well as many more of our members from the smaller towns, take a more prominent part in our Convention. I suggest, Gentlemen, we now adjourn for lunch and would remind you that at 2.30 p.m. an official group photograph of members and delegates attending this Convention will be taken at the City Hall, and that, thereafter, we will visit the Municipal Power Station, travelling there by municipal motor buses from the City Hall.

OFFICIAL PHOTOGRAPH.

At 2.30 p.m. an Official Photograph of members and Delegates was taken at the City Hall.

VISITS.

In the afternoon a visit was made to the Municipal Power Station on the West Bank of the Buffalo River, Members and Delegates being conveyed to and from by Municipal Buses. After inspecting the Power Station the visitors were entertained to tea.

THURSDAY, 15th SEPTEMBER, 1927.

The Convention resumed its proceedings at 10 a.m. The President (Mr. J. Mordy Lambe), being in the Chair, and there being also present:—

Members.—T. P. Ashley (Queenstown), G. C. Brown (Middelburg, Transvaal), C. H. Baskerville (Salisbury), W. F. Bower (Barkly East), W. H. Blatchford (Greytown), A. S. Chalmers (George), A. J. Clemo (Alice), R. D. Coulthard (Oudtshoorn), T. C. Wolley Dod (Pretoria), R. W. Fletcher (Krugersdorp), H. L. Groom (Roodepoort-Maraisburg), J. Iverach (Grahamstown), T. Jagger (Ladysmith), S. Lewis (Aliwal North), R. Macaulay (Bloemfontein), W. M. Mail (Kokstad), F. C. D. Mann (Worcester), M. McDonough (Bethlehem), T. Millar (Harrismith), H. A. Morris (Kimberley), P. W. Newcombe (Indwe), I. J. Nicholas (Umtata), E. Poole (Durban), H. A. Prevost (Somerset East), L. Ralston (Dundee), W. D. Ross (Potchefstroom), B. Sankey (Johannesburg), T. F. Siebert (Uitenhage), H. G. Simpson (Dordrecht), T. J. Smith (Durban), L. B. Sparks (Pietersburg), R. A. Stoker (Kroonstad), T. Sutcliffe (Benoni), G. H. Swingler (Capetown), J. Wud (Adelaide), R. A. Young (Bulawayo), J. Younger (Vryheid).

Associate Members.—Nil.

Delegates.—C. Boardman (Town Clerk), Barkly East.

Councillors.—J. W. Bryson (King William's Town), A. L. Clark (Durban), A. R. Davidson (Roodepoort-Maraisburg), M. Freeman (Johannesburg), J. F. Fourie (Pretoria), T. Gibb (Alice), H. H. Hart (Grahamstown), J. D. Low (Cape Town), J. Paton (Kroonstad), G. W. Prior (East London), H. Rugg (Roodepoort-Maraisburg), R. A. Thomson (Bloemfontein), A. van Heerden (Harrismith), W. G. Wearne (Roodepoort-Maraisburg), R. L. Weir (Port Elizabeth).

Visitors.—A. M. Jacobs (Electricity Supply Commission, Johannesburg), C. Mullins (Chief Inspector of Machinery, Johannesburg), F. C. Stephens (Public Works Department, Pretoria).

Honorary Secretary and Treasurer.—Prescott Adkins (East London).

VENUE OF NEXT CONVENTION.

The PRESIDENT: Before proceeding with our ordinary business, that is, the presentation of the Paper by Mr. Nicholas of Umtata, I propose to take one item which was ordered to stand over until today, namely, the venue of our next Convention.

Councillor THOMPSON (Bloemfontein): I should like to ask you, on behalf of the Municipality of Bloemfontein, to hold your next Convention in that centre. I feel that my Municipality has been somewhat lax in not having made this offer before, but I realise of course, that in doing so we are taking on a very big job, more especially after the generous treatment which has been meted out to the members and delegates at this Convention. We further realise that we have a very different town to the one in which we are now assembled, and we know that in Bloemfontein we have not all the numerous attractions of a coast town. We do not look upon ours as an industrial town and we have no sweet or jam factories. However, we have other items of interest to members and delegates, and if you decide upon Bloemfontein as the venue of your next Convention, Bloemfontein will go all out to reciprocate the wonderful hospitality accorded their representatives attending this Convention by the East London Municipality. We have very fine Railway Workshops, and we have one of the finest printing works in the Union. We also have an up-to-date power station, with all due deference to yours, Mr. President. In addition we have very fine waterworks situate in very pleasant surroundings and one of the few electrically operated water boosting plants operating in connection with these works. We also have a very fine and up-to-date brewery, which fact I do not think need deter any from attending the Convention in Bloemfontein, because the brewery is closed down. There is another feature about Bloemfontein in regard to which we refuse to take second place; our girls are second to none. I hope, Mr. President, that the Association will make a point of selecting Bloemfontein as the venue for the next Convention. I am sure Mr. Macaulay will give you a most hearty welcome, and as our Municipal Departments are simply like one huge family, everyone will put themselves out to make your Convention a success. By that means we may be able to return a few of the kindnesses and courtesies meted out to us in East London. I have to thank you, Sir,

and all concerned for a most pleasant time spent in your city.

Mr. MILLAR (Harrismith): After all the good things we have heard from Councillor Thompson, I formally move that the next Convention be held at Bloemfontein at a date to be decided upon later.

Mr. STOKER (Kroonstad): I have pleasure in seconding the proposal that our next Convention be held in Bloemfontein as I know what they are capable of doing in Bloemfontein in the way of providing other things, besides water.

The PRESIDENT: I think you will all feel, after the warm sincerity and genuineness evident in every word of Councillor Thompson's invitation extended on behalf of the city of Bloemfontein, that we will indeed have a very fine welcome in Bloemfontein. If there is no other proposition, I will put it to you that we accept the kind invitation of the Municipality of Bloemfontein. Will those in favour of the proposition please signify in the usual way. Carried unanimously.

The next item on the Agenda is the Paper kindly contributed by Mr. I. J. Nicholas, Municipal Electrical Engineer, Umtata, on

"DISTRIBUTION PROBLEMS IN SMALL TOWNS."

Mr. Nicholas will first summarise his paper as was done in accordance with your wishes in connection with Mr. Albertyn's and Mr. Mails Papers.

DISTRIBUTION PROBLEMS IN SMALL TOWNS.

By I. J. Nicholas, Municipal Electrical Engineer, Umtata, Transkei.

This paper is intended to deal with some of the Distribution problems arising in small towns having a population of about 2,000.

To my mind there are several important points to be considered:—

(*a*) System of wiring street lighting.

(*b*) Method of effecting a balance at Power Station.

(*c*) Bonding or earthing wires.

(*d*) Protection to mains and house service leads.

(*e*) Transmission losses and their effect on cost per unit sold.

(*f*) Tariffs.

It is assumed that most of the smaller towns are placed in a similar position to Umtata which is heavily capitilized and consequently burdened with heavy overhead charges with only a few consumers and consequent high cost per unit sold.

The position is also different from larger towns in that we have no money to play with, and generally show a deficit and so Councils place a very heavy check on the Engineer as regards spending any further monies on Capital Account whatsoever, and the consequence is that although the Engineer knows perfectly well that he has a big voltage drop he is unable to do anything until the position becomes so acute that he is practically forced to demand more feeders, and then he does not get what he wants, but only a portion. Hence bad distribution pressure and heavy mains losses are not always the fault of the Engineer.

The system here is a direct current, three wire system with a declared pressure of 440/220 volts using Static Balancing and overhead line Feeders and Distribution and having a present Peak load of 73 Kilowatts.

(*a*) System of Wiring Street Lighting.

The standard arrangement of overhead lines is as follows:—

Positive. Neutral. Street Lighting Switch Wire. Negative.

The same neutral is used for both House lighting and Street lighting. This may appear quite suitable but the proportion of load caused by the Street lighting in some circuits is over one third of the total load on the main wires feeding the houses.

The consequence is that although a good balance is maintained in each individual circuit without the street lights the balance is upset as soon as the street lights are switched on and the neutral must carry the out of balance right back to the station. The consequence is that those con-

nected on the heavily loaded side have an increased drop while those of the other side actually get a slightly higher voltage (usually 6 to 8 volts).

The remedy is found by running an extra neutral for the street lights only, and so a balance can be maintained on the main circuit independent of street lighting.

(*b*) Methods of Effecting a Balance at the Power Station.

Still further use can be made of the street lights when once they have their own external wiring and that is instead of, on the switchboard, having the usual D.P. knife switch, that each circuit of street lights be controlled by a S.P. change over switch. The centre is connected to the street lighting switch while the two outer terminals of the switch are respectively Positive and Negative. It can be seen that switching in can be made either Positive or Negative or if at any period of the night the total load on the station shows an out of balance of 20 amps then one of the street lighting circuits (say 8 amps) can be changed from the lightly loaded side and so the out of balance would be only 4 amps. With static balancers it is desirable to keep within 10 amps out of balance if possible.

(*c*) Bonding or Earthing Wires.

The bonding wire, that is Galvanised wire from pole to pole, which is directly connected to each pole as well as being earthed, is a matter of considerable interest and one or two experiments have been carried out with success.

Originally when this wire was placed 9 inches above the main copper wires, the circuit breakers gave a lot of trouble by coming out for the least static discharge and in fact on one occasion a heavy flash of lightning occurring some distance away put the town in darkness. The thunder was too far away to be audible.

It was then decided to drop the cross arms in order to increase the clearance between the bonding wire and main copper wires and this was done making the distance double and since then no further trouble has been experienced and the circuit breaker only comes out when a direct hit from lightning occurs and forms a partial short over the arresters.

(*d*) Protection of Mains and House Service Leads.

In a town supplied entirely by means of overhead mains the question of protection necessary to prevent disturbance on the distribution system from faults in houses and house services is an important one. For many years the writer has contended that there is a tendency to have far too much multiplication of fuses and that far simpler and more reliable operation can be obtained by limiting the number of main fuses to one only on the whole installation, and that that one fuse should be a Municipal fuse on the pole (flying fuse). Contractors should be forbidden to have any main fuse in the consumer's premises and only permitted to have distribution circuit fuses to prevent the Municipal main fuse blowing when a short circuit occurs on individual circuits. It has recently come to the writer's notice that there is one town in England, viz., Chelsea, where a similar regulation is in force and an enquiry has been sent to ascertain how the system works.

The following is an extract from *Electrical Times*, 27th January, 1927:—

> "Consumers' Fuses: I have an interesting question from another correspondent. The supply authority is providing a 220 volt D.C. system not earthed. On an installation there is the ordinary D.P. house service fuse sealed with the Company's seal. Is the consumer bound under the I.E.E. Regulations to provide another main fuse?
>
> The answer is in the affirmative, but it is a question of actual wording of the regulations. Regulation 64 1 A (a), (i) calls for either a D.P. circuit breaker or a D.P. linked switch and fuse on each pole for such an installation. Regulation 94 A makes it necessary for such controlling apparatus to be easily accessible to the consumer; and Regulation 94 B says that if the Supply Undertaking provide and instal the controlling apparatus, and this is under the control of the consumer, it need not be duplicated by him unless so required by the Supply Undertaking. Consequently the whole point is whether the sealed fuse can be taken as being

under the control of the consumer. I do not think it can. To get further enlightenment on this point if we turn to No. 26 of the Electricity Commissioners Regulations for Securing the Safety of the Public, we find that the service fuse must be contained within a suitable locked or sealed receptacle. A seal is thus assumed to be more or less equivalent to a lock and I think it can be taken therefore that the sealed fuse cannot be taken as under the control of the consumer. There is, however, just this doubt, namely, whether the addition of a double pole switch puts the sealed fuse under his control. It will certainly be accessible to the consumer, but if put on his side of the one and only main fuse will not comply with the I.E.E. Rules, and no Supply Undertaking I think would allow it to be put on the supply side as the service could be short-circuited or earthed by a breakdown of the switch, if there is no fuse to protect it. Leaving I.E.E. Rules apart, however, I can see no possible objection to the omission of the Consumer's fuse by arrangement with the Supply Undertaking if the consumer is prepared to risk having to pay a fee for replacing fuses blown through his fault."

The following appeared in the *Electrical Times* of 10th February, 1927:—

"THE CONSUMER'S FUSE (in reply to the above): Sir, Referring to your paragraph "The Consumer's Fuse" in the issue of January 27th, 1927, you may be interested to know that at lease one supply authority *definitely* forbids the use of consumer's main fuses. The authority in question is the Chelsea Supply Co. I had occasion recently to inspect an old installation in Chelsea District and was surprised to find that although at one time there had apparently been consumers' main fuses, these had since been removed. Following this up, I obtained copies of the rules issued by the Supply Company and these include the following:—

The Contractor must not fix main fuses in addition to those provided by the Company, but all circuit fuses must be of the correct size

to efficiently protect their respective circuits, so that there may be no possibility of the Company's main fuses being blown by a short circuit on any of the branch circuits.

From inquiries I made I gathered that the arrangement worked very well as the consumers in nearly every case send for the Supply Company in the event of a main fuse blowing and do not appear to grudge the payment of the fee. In some other districts I am afraid they would not be so complacent. Yours faithfully, Provincial. January 31st, 1927."

From the foregoing it will be seen that as long as we have one set of main fuses it affords ample protection, and where the only means of house service connection is by overhead wires with flying fuses on the pole I see no reason why these flying fuses could not be accepted as the one and only main fuses. They are as good as locked, being completely out of the consumer's control. The consumer will still have control of his circuit fuses by means of the D.P. switch placed on his side of the meter. In any case the main switch could be placed on the service side of the meter as the main service fuses will still be on the srvice side of the switch, provided the switch is properly sealed.

In this paper the question of feeders has not been touched upon for the simple reason that mains are usually run direct out of the station and the further the distance the smaller become the wires and the corresponding drop in volts. Actually no feeder exists, only distribution wires direct from Power Station switchboard.

(*c*) Transmission Losses and their Effect on Cost per Unit Sold.

The question of transmission losses and their effect on the actual cost of units sold is an important one in small towns. Each year costs are required to be made up on the basis of units sold. This is a point in which the operation of a direct current supply should be very carefully watched. If the bus bar supply voltage is the same as the voltage of the D.C. house service ampere hour meter and the main switch board is equipped with watt hour meters and all house meters are correct then it is impossible to show any transmission

losses at all for although the main watt hour meter records units the H.S. meter only records ampere hours with a suitable gearing to convert amp. hours to units and will record true units when the voltage delivered is the same as that on the name plate.

To picture the position more clearly, take the case where 10 amps are leaving the Power Station at 100 volts. At the other end of the line you have voltage drop of 10 volts and this current is being consumed through one meter at the far end of the line.

The position is as follows:—

(a) Leaving the Power Station we have 10 amps at 100 volts .. 1,000 watts.

(b) Received by the consumer we have 10 amps at 90 volts .. 900 watts.

(c) The consumer pays for 10 amps at 100 volts .. .. .. 1,000 watts.

In this case the consumer receives at the rate of 900 watts per hour, and actually pays for 1,000 watts per hour, whilst the units generated, as recorded at the Station, are the same as the units sold as recorded against the consumer and there are apparently no mains losses at all.

This brings out the point that transmission losses in the above case are not reliable, but are very misleading and the engineer might think himself lucky, or even give himself credit for showing no losses, but he has one consolation and that is, he is generating at the declared distribution voltage and has made no allowances for drop in volts in the transmission by generating at a higher bus bar pressure than the declared distribution voltage.

Affecting the cost of units sold, with amp. hour meters in the consumers premises, the consumer pays for 1,000 watts, whereas if watt hour meters were installed then the consumer would pay for only 900 watts. Therefore in working out the cost per unit sold under same conditions the amp. hour man sells 1,000 watts as against the watt hour man's 900 watts and consequently the watt hour man records less units at a higher cost per unit. I have used round figures purely to bring out my point clearly.

This is a big question to many engineers as most small towns show a large voltage drop and with few exceptions deliver on peak load below standard pressure.

This is the case at Umtata but it is hoped during the next twelve months to put same in order for we are changing over to A.C. and will have to answer very dearly for having excessive transmission losses, these losses are here to-day but do not reveal themselves with amp. hour meters, but will not forget to do so with watt hour A.C. meters.

(*f*) Tariffs.

With reference to tariffs, the writer has always had a hankering for a tariff with a primary and secondary charge. The primary charge to be in the form of a rate proportional to the load each respective consumer can put on the Power Station in order to pay for all overhead and capital charges, but not to include any units at all. The secondary charge can then be based on the actual cost of generation, wages, fuel, stores, but excluding capital charges.

The difficulty here is that on account of the high capital cost per consumer the primary charge will be high, but these charges must be met and why should the selling price of units be made unduly high by including the capital charges. This primary charge could be viewed as an electric rate and once having met this rate the consumer can be charged half the price per unit, or less, thereby encouraging the consumption of more units.

The most valuable point of all is that the selling price per unit is directly proportional to the cost of generation. If a unit costs 5.86d. to generate, it can be sold at 6d. and 0.14d. profit made, as all capital charges are paid for by electric rate.

As a rule capital charges are fixed, and so the primary charge would be fixed, but there always comes a time when extensions are carried out and as a rule they are in the direction of new plant which places the undertaking in a position to reduce the generating costs.

The rate might rise slightly in order to cover the extra capital charges on the new plant, but the

selling price of the unit would drop considerably as the extra capital does not affect the generation costs.

Taking a normal consumr's consumption, it does not affect him at all; he may pay the same either as a flat rate, or as the suggested tariff above. But take the man who wants to use electricity, 1/- is prohibitive, but if he pays his primary charge and thereafter gets all his units for 6d. or less, he is not going to stint.

At Umtata, with the above tariff in force, it would require a primary charge of about £8 per annum per consumer on the average but thereafter a charge of 6d. instead of 1/- per unit.

Now add the water power scheme whereby the annual capital charges increase by £700, but running costs fall by £1,400 annually.

The primary rate would have to be £10 per annum but the selling price per unit would be 2½d. and would be a payable proposition. At 2½d. per unit no one is going to worry about an extra 10 or even 20 units per month for they will get good value for it.

With the primary charges paid and a unit rate of 2½d. per unit a profit is assured, but with the old way of charging 1/- per unit flat rate there is always the risk of a deficit. The general estimates show say £400 contribution to Electric Fund. Why not have an electric rate right away, and run your Electric Department at a small profit instead of at a loss and with such a low tariff there is infinitely more chance of building the load and increasing the units sold year by year, so that the tariff drops accordingly instead of remaining fixed.

As an alternative there could be a flat rate which could be kept high in order to force the consumer to come under the primary and secondary charge to get cheaper units (or else have a general electric rate).

Before a scheme can be made a success, the capital charges must be met, so why not charge an electric rate; the generation costs must be met and the more units sold the sooner it will be met, and so the cheaper the units, the faster will be the increase, hence the advantage of devising a tariff whereby the actual selling price per unit is low.

In Umtata the primary charges would probably be higher than most other towns, due to the fact that we have spent a very large amount (£24,000) on our scheme, which the water power scheme will bring up to £30,000, and there are only about 340 consumers, which is about £90 per consumer actual capital spent.

At present our tariff is: we assess the average light-units as a minimum charge per consumer: this varies greatly with each consumer, but thereafter he can get the next 20 units at 6d., and all over this at 3d., all through one meter. The lighting rate is 1s., which rate he has to pay for the units assessed as his minimum.

The suggested primary and secondary tariff is actually in force, to a certain extent, in many towns for power purposes where they charge a certain figure as a minimum rate per H.P. and all units charged at low power rates; this minimum charge is equivalent to the primary charge or electric rate, and once paid the consumer gets the benefit of the lower rates.

Mr. NICHOLAS (Umtata): My Paper, as indicated by its title, is intended to deal with some of the distribution problems which arise in small towns with a population of about 2,000. It is pointed out how different is the position in a small town as compared with that in the larger towns, because in the small town the incurring of additional Capital expenditure is a very serious matter and any proposal to do so arouses a good deal of opposition from ratepayers and councillors, particularly as in many small towns the undertaking shows a loss, and although the Engineer knows that he has very heavy voltage drops on his distribution system he is unable to get the money necessary to put in order, so that all the blame for this should not be placed at the door of the engineer.

The system of supply in Umtata is 440/220 volts Direct Current three-wire with static balances and overhead feeders and mains throughout, the present maximum load being 73 Kilowatts. In the distribution net work the same neutral is used for both distribution and street lighting, which is not entirely satisfactory on such small system as it results in excessive pressure variation on the net work. In order to remedy this a separate neutral for street lighting only has been provided in certain parts of the town. A separate galvanised iron wire is run from pole to pole as a bounding and earthing wire, and our experience with this wire when first erected may be of interest. At that time the wire was placed nine-inches above the mains, and the circuit breakers gave quite a lot of trouble by opening as a result of static discharges from the mains to the earthed wire. The distance between the mains and the earthed wire was doubled and the trouble disappeared.

There is also dealt with in my paper the matter of the necessity for such large numbers of fuses for the protection of consumers' installations as is generally the practice today, and I advocate the provision of only one set of main fuses for each installation which could very well be the fly fuse on the pole.

The matter of distribution losses and their effect on the actual cost of units sold is also referred to.

In regard to tariffs, I am very much in favour of a tariff with a primary and secondary charge, the primary charge to be based on the load of each consumer, and the secondary charge on the cost of generation, etc., but not including Capital Charges.

The PRESIDENT: We all, I know very much appreciate the manner in which Mr. Nicholas has given us a resume of his Paper which we will now proceed to discuss.

Discussion.

Mr. STOKER (Kroonstad): So far my only contribution to the various discussions at this Convention has been to second a resolution.

Dealing with the matter of transmission losses, more particularly on a Direct Current system, it will be found that the extra annual capital charges resulting from the provision of larger size mains are generally more than offset by the reduced distribution losses, and of course by the very much greater satisfaction to consumers because of the improved pressure of supply. After all the copper in the overhead distribution system is not the most expensive portion of the installation, as practically the same sized poles, cross arms and insulators, as well as the same amount of labour, are required, no matter what size copper is installed, i.e., within reasonable limits.

In regard to fuses, I am afraid I cannot quite agree with the writer of the paper when he expressed the opinion that the provision of fly fuses only for each installation connected is sufficient protection for the installation and supply system. In our part of the world we find that the fly fuses on the poles suffer a good deal from wastage due to corrosion, with the result that such fuses have to be much heavier than the load supplied through them calls for. I contend that there should be main fuses installed upon each consumers premises and that these fuses should be sealed and under the control of the Municipality.

Mr. CHALMERS (George): I would like to draw the attention of the Convention to the question of utilizing more largely the natural products of the country, and particularly to the use of wooden poles in the outlying districts of our towns, both from an asthetic and economical point of view. In George we have carried out a considerable amount of experimental work with the various eucalyptus trees which have been impregnated at the Government Sleeper Factory and the results have so far been very satisfactory. Gum poles suitable for use on electrical distribution systems can be purchased from the Government Forestry Department at fixed prices per cube foot, and the postal

authorities are using these for telephone lines in outlying districts with satisfactory results. Although there is no doubt that creosoted wooden poles imported from overseas give very good results, I do think that we should make every endeavour to support our own natural products.

Mr. POOLE (Durban): The last speaker is quite correct in his statements that creosoted wooden poles imported from overseas have given very satisfactory results. Our experience of this class of pole has been such that we are quite satisfied with it in certain situations as a means of avoiding corrosion troubles inherent in the use of steel poles, particularly close to the sea coast. There is no rotting at the ground line, and on cutting through the poles we have noticed that the creosote had penetrated very deep into the timber. We have not, however, had any experience with South African timbers.

In the matter of fuses, I quite agree with Mr. Stoker that the fly fuse is not the fuse to be relied upon and a means of protection against overload on consumers' installations, and sealed service fuses getatable without the use of a ladder and properly proportioned to the load to be carried, should in my opinion be installed on the premises of every consumer.

Mr. BROWN (Middelburg): On the question of pole fuses, in my opinion the aerial fuse should not be looked upon so much as a protection to the consumers installation but more as a protection to the supply system as a whole, as it is not possible to rate a fly fuse as closely as an indoor type service fuse.

Mr. RALSTON (Dundee): The charginig of an electrical "rate" mentioned by Mr. Nicholls as well as by several others who have spoken as this Convention, is in my view, worthy of deep consideration. If the Provincial Administrators will allow such a rate to be charged, it would certainly appear to be one way of meeting the financial difficulties with which the smaller towns are faced in connection with their electrical schemes.

With regard to distribution losses and the question of increasing the size of copper in small towns, I think consideration must be given to the time when the peak load is on, which, in such towns is always in the evening, so that the additional copper is in use for a very few hours per day, say two or three at the most.

I agree with Mr. Stoker and Mr. Poole that the fly type of fuse is very unsatisfactory and is a most unreliable piece of electrical apparatus. It is in my opinion absolutely necessary to have service fuses provided on each consumers premises, which fuses should be under the seal of the Municipality.

Mr. JAGGER (Ladysmith): I notice that Mr. Nicholas is having some trouble in balancing the load on his three-wire system owing to street lighting. I would like to put forward a suggestion in this matter, and that is to run another street light switch wire instead of running a neutral wire. This additional street light switch wire would be controlled from the Power Station and every alternate street light would be connected to each of the two switch wires so that with changeover switches in the power station it would be a very simple matter to balance the load to within a small fraction. I think that Mr. Nicholas would find this system quite a big improvement.

Mr. SPARKS (Pietersburg): To me one of the most interesting points is that of the bonding and earthing wire, as I cannot quite understand why this wire should cause the circuit breakers to trip, excepting of course when it comes directly into contract with the distribution mains. In Pietersburg when the overhead distribution system was first installed, we had guard wires provided over every line and we had no trouble such as Mr. Nicholas mentions. I think that the guard or bonding wire, whichever they are called, should be thoroughly well bonded to all metal work such as poles, cross arms, backstays, and in addition should be earthed to earth plates or water mains wherever possible.

We have tried wooden poles in Pietersburg and have had some of them in use for as long as 10 years with satisfactory results.

A point I would like some information on is in regard to the earthing of the neutral, and whether this earthing should be done continuously or only at certain points. We find the neutral conductor is the biggest offender causing pressure drops in our mains.

The charging of an electric "Rate" seems quite a satisfactory way of making up any deficit on the scheme, but we would have to vary it with different consumers, as a large consumer of electricity might be occupying premises valued at a comparatively low

figure and so would escape paying his proper share of the rate.

Mr. SWINGLER (Capetown): The question of using wooden poles has cropped up and it may be of interest to you to learn of our experience in Cape Town with creosoted wooden poles. In 1915 we extended our lines to Paarl and Milnerton and we imported for the purpose, wooden poles thoroughly creosoted, and about 3 years ago we had occasion to take some down which had been in position for approximately 10 years, which appears to be about their useful life in the Cape Peninsula. In a suburb of Cape Town named Pinelands, wooden poles were installed and within 3 years we had to substitute steel poles. Our experience is that the properly creosoted wooden pole has a life of about 10 years in Capetown.

With reference to the matter of charging an electricity "rate," I think that we should not use the term "rate" but should call this charge the "ready-to-serve" charge, as it seems to me an extraordinary proposal to increase the general rate of the town in order to make the electricity undertaking come out all square. The method of taking the past average consumption of consumers in order to ascertain the number of units to be covered by the ready-to-serve charge as for instance, by averaging the consumption for the last 12 months, adding 10 per cent. to it and taking the result as the primary charge, is not, in my opinion, a satisfactory method and is one which I strongly recommend members to avoid. In practice this method gives endless trouble and the more consumers you get the more trouble you have.

In regard to pole fuses, it seems to be that these are largely affected by climatic conditions, and in towns away from the sea coast fly fuses should give no trouble due to wastage from corrosion.

Mr. RALSTON (Dundee): In reply to the question asked by Mr. Sparks in regard to the earthing of the neutral, I would advise that in every case that the neutral conductor be run back to the power station where it should be earthed, all other neutrals for instance, on branch lines should be connected to this neutral.

Mr. YOUNG (Bulawayo): I would like to touch upon the question of pole fuses. In Bulawayo we have had considerable trouble with house service

leads crossing and short circuiting. We are at the present time using a type of fuse made by Henley's, Ltd.; it is a combined strain insulator and fuse, and we find them very satisfactory indeed.

The PRESIDENT: In response to the point raised by Mr. Sparks in regard to the earthing of the neutral conductor, I may say that as far as I know, East London is the only town in the Union in which the neutral is continuously earthed. As you know, the Regulations require the bonding of all poles by means of a coninuous earth wire, so what we have done in East London is to make the neutral and the earthed wire one and the same, this wire being bonded to each steel cross arm which in turn is carried by a steel pole. Our system is three-phase four-wire and we employ only a single pole fly fuse on the phase lead of the consumers connection and a single pole sealed service fuse on the consumers premises. Mainly owing to our extreme climatic conditions and the salt moisture laden air at East London we have had a great deal of trouble with fly fuses. We have tried several types of screw plug fuses for use in place of fly fuses, but in our climate such fuses after being installed from 3 to 6 months are found to be so salted up that they cannot be removed.

In regard to the continuously earthed neutral, the only trouble which was anticipated from this practice, viz: interference with telephones, has not materialised.

I would now ask Mr. Nicholas to reply to the discussion.

Mr. NICHOLAS (Umtata): I have listened with a good deal of interest to the different opinions expressed as to the unreliability of the fly fuse which appears to be mainly due to corrosion. In addition to this the replacing of fly fuses during the hours of darkness and in wet weather is a problem to be considered.

In Umtata we have had a certain number of wooden poles in use which we cut and prepared by ourselves and the life of these poles has been approximately six years.

One advantage in using service fuses installed on the consumers premises is that they provide an easy means of discontinuing supply when necessary, although when access to premises cannot be obtained the fly fuse is available for this purpose.

that it will be a very difficult matter for me to attend any deliberations of the Council, but I will endeavour to do my best. I would almost have preferred to see Mr. Baskerville undertake the duty, but can only thank you again, and reiterate I will do my best.

The Council was then declared to consist of the following members:—President: J. Mordy Lambe (East London); Vice-President: R. Macaulay (Bloemfontein); Past Presidents: John Roberts (Durban), B. Sankey (Johannesburg). Members: E. Poole (Durban), L. F. Bickell (Port Elizabeth), T. Millar (Harrismith), R. A. Young (Bulawayo).

The PRESIDENT: The next item is the matter of Papers to the next Convention. In this connection I am going to throw out two suggestions. At this Convention, as well as at previous Conventions, the matter of the accounting side of Electricity Undertakings has been prominent, and I am therefore going to invite one of our Councillor delegates to furnish us with a Paper on this important subject at our next Convention. I refer to Mr. Councillor Low of Capetown, as this is a subject with which Mr. Councillor Low is very well equipped to deal, and I feel sure that he can give us a useful and instructive paper.

The second suggestion which I have to make is in regard to one of our Members. I refer to Mr. Smith of Durban, and am going to invite him to contribute at our next Convention a Paper on a subject of increasing importance, particularly in the minds of the engineers of the smaller undertakings, viz:—"Boilers and Boiler Troubles." I know you will agree with me that Mr. Smith is more properly equipped of anyone sitting here to-day to give us a paper on the subject, certainly on the operating and maintenance aspects of it.

Councillor LOW (Capetown): My time is fairly fully occupied with my public duties and in the odd minutes which I have to spare I endeavour to make a living. However, if I can possibly see my way to assist the Association in the way which has been suggested, I shall take the matter into serious consideration and make every endeavour to meet your wishes.

Mr. SMITH (Durban): I do not know how to thank you for asking me to contribute a Paper at the next Convention, but I do hope if I give a paper that it will be bilingual. I am very pleased indeed to have received the invitation and will endeavour to respond.

The PRESIDENT: We as an Association are out to advance the supply and use of electricity, and in that work come into contact with those who are appointed to control us in some degree, so that we are fortunate in having with us at this Convention, Mr. Jacobs, a member of the Electricity Commission and Chief Engineer to the Commission; Mr. Mullins, Chief Inspector of Machinery and Mr. Stevens, Chief Electrical Engineer of the Public Works Department. I hold the view that the best results are always obtained by team work and feel sure that everyone will leave this gathering with a different idea of the work and attitude of the Electricity Commission. I personally am leaving this Convention with a very much altered idea of the work of the Commission, and I am sure Mr. Jacobs must have similar feelings in regard to the work of Municipal Electricity Supply Undertakings, as also must Mr. Mullins and Mr. Stevens. By united effort we can advance the production and use of electricity to the utmost degree. Isolated from one another we cannot do much and I do not think we can do other than look upon the three gentlemen mentioned as members of the Electricity Supply "team."

Mr. JACOBS (Electricity Supply Commission, Johannesburg): I feel sure that I can speak for my colleagues, Mr. Mullins and Mr. Stevens, when I say that we have greatly appreciated your kind invitation to attend your deliberations and that we have had a thoroughly good time. It has been an education to me to come here and listen to the different points of view of members and to hear all their experiences and troubles. We greatly feel our responsibilities and wish to help everybody, so that the more we know of their particular problems the better equipped are we to lend a hand. Mr. President, other and more able speakers have already spoken of East London's generous hospitality. We know that such things do not happen by themselves, and I feel sure that I am voicing the sentiments of your guests when I say that we owe a great debt of obligation to you personally for making our visit as pleasant as it has been. I only hope that your Association will favour me with an invitation to attend future Conventions so as to enable me to maintain contact with your present members and to get to know new members as they arrive.

Mr. WOLLEY DOD (Pretoria): I have very great pleasure in asking you to pass a hearty vote of thanks to the Mayor and Councillors of East London

for their hospitality and for the way they have looked after us during out visit here. They have done everything possible for us, free transport, free bathing, golf and even bowls, accompanied by every possible variety of weather which East London could give. They have indeed given us a real hearty welcome. I should like at the same time to congratulate Councillor Prior, Chairman of the Electricity Committee, on his election as Deputy-Mayor of East London. After hearing Mr. Prior's views on the employment of Europeans instead of Natives, I have a very grave suspicion that Mr. Prior is responsible for the remarkable piece of naive flattery on the eastern portion of East London's really beautiful beach. I noticed that on a certain bathing shed were the words "Coloured Ladies," while nearer the "Orient" end of the beach was the ungarnished statement "European Women." I would also like to include in our vote of thanks the very efficient staff of our President at the Power Station, as well as the very excellent contribution to the discussion on meters given by a member of his staff, Mr. Westaway. I ask you all to pass a hearty vote of thanks to the Mayor and Councillors of East London, to our President, and to the staff of the Electricity Supply Department of East London for what they have done for us during our visit here.

Councillor CLARK (Durban): As one of the Councillor delegates here. I have very great pleasure indeed in seconding the vote which has been so ably proposed by Mr. Wolley Dod. I think that the treatment that we have received since we arrived in East London from the Corporation and from everyone concerned, is almost as good as we could have done in Durban. I know you have been to Durban, but I do not think that at that time the Association was of the value that it is to-day, otherwise I should have taken every opportunity to attend many of your sittings. I can assure you that I have enjoyed myself since I have been here in East London and we have been greatly impressed by the many and varied forms of hospitality extended to us by the Municipality. I need not mention these as they have all been detailed to you by Mr. Wolley Dod. I would, however, like to say something in regard to Councillor Delegates attending meetings like these. I think that for Councillors to learn and to make it known to their respective Councils that the Municipal Electrical Engineers throughout the length and breadth of the Union are all

out for one thing, and that is to discuss the problems of their profession and to give the best service they can towards solving these problems, not for their own benefit, but for the benefit of the Municipalities who employ them. It all goes to show the loyalty and devoted service which the engineers of the different Municipalities are giving to their Corporations. As far as my Municipality is concerned I shall endeavour to tell them so. There are Councils who look upon these Conferences as excuses for councillor delegates to be sent along with the engineers in order to have a nice holiday and a joy ride. This is continually being said, but it is said in ignorance, because those who say it do not realise that there is a great deal of useful information to be picked up by attending Conferences like this. To that extent I hope and trust that the Municipalities, if they have not been doing so in the past, will after this Conference assist the Association by taking a sufficient number of copies of your proceedings and by giving you some donations to the funds of your Association, because I know an Association of this kind can do a great deal if it has funds. I think that councillor delegates should put that view before their council and get them to subscribe in the way I have mentioned. I have to thank the City Council of East London and yourself for the way in which we have been treated since we came here and also for the way in which the Municipality has provided for our every want.

Councillor GIBB (Alice): As a Councillor delegate from one of the smaller Municipalities I would just like to express my satisfaction at having been present at this Convention. I am certainly going to come again. I have particularly enjoyed the papers on installations in the smaller towns, better than probably discussions on the like of Cape Town and other large centres, because the smaller towns are more in line with our own installation. I certainly now have a better understanding of the difficulties under which electrical engineers in the smaller Municipalities have to work. I can say that I have got many matters much more clearly in my head now, and I hope when I get back with my engineer friend here I shall be able to assist my Council in their electric light discussions. I would like to also express my appreciation of the hospitality of East London.

Vote of Thanks.

It is now our very pleasant duty to thank those whose assistance has gone very far to make this Convention a success. The first are the Trustees of the Trinity Wesleyan Church who have been so very kind as to let us have this hall, without charge, for the sittings of our Convention. Next we have to thank the East London Golf Club whose course I understand has been a source of considerable pleasure to many of the members and has been the cause of interesting differences of opinion. Then we pass on to the Committee of the East London Club who so kindly extended to us the privileges of the Club. I would also mention the East London Bowling Club, the scene of very bad defeats of some of our visiting members. Also to Messrs. Wilson & Co., Sweet Manufacturers, of this town for their great kindness in permitting us to visit their Factory and see their operations in full swing. Our thanks are also due to the African Films Trust for courtesies extended to us. We are also greatly indebted to The Union-Castle Co. for a very enjoyable trip over the Bar in their launch "Stork" which is to take place this evening, but in this case it is perhaps to give thanks in advance of the event. I am sure that each one here feels that he is going away from the Convention having learned something, and if they have only learned to have a better understanding of one another, they have gained a lot. The Engineer Delegates have, I think, gained considerable knowledge in so far as technical matters are concerned, especially those from the smaller undertakings. I have endeavoured to make them feel that they too, have their place in the sun. You are I know all pleased to have heard the remarks passed by councillor delegates, and especially do I appreciate one remark by Mr. Councillor Clark, namely, that we as engineers personally have very little to gain from attending these Conventions and do so for the benefit of those who employ us, having in mind one object and one object only and that is the advancement of the business of electricity supply on a sound basis. I hope you will all have a very pleasant trip back to your homes with very pleasant recollections of the City you are in. There is, however, one vote of thanks which we seem to have overlooked. I refer to the "East London Daily Dispatch." I do not think that any previous Convention of this Association has had more space devoted to the commodity which it is

our business to produce and sell, than we have had during this week of our Convention. I think everyone of us must have been pleasurably surprised at the amount of space given to us in last Tuesday's paper. There is due to the "East London Daily Dispatch" an expression of our deepest gratitude for the work they have done and the publicity they have given us.

CONCLUSION OF BUSINESS.

The President announced that special 'buses would leave the City Hall at 9.30 a.m. on Friday, 16th September, for King William's Town.

FRIDAY, 16th SEPTEMBER, 1927.

At 9.30 a.m. members and councillor delegates were conveyed by Municipal motor 'buses and motor cars to King William's Town, being met en route and entertained to tea at Berlin by His Worship the Mayor of King William's Town.

On arrival at King William's Town, a visit was paid to the War Memorial of which the town is so justly proud, and which is undoubtedly one of the finest monuments of its kind in South Africa. Before leaving the town in the afternoon, the President laid a wreath at the foot of the Memorial.

The visitors were the guests of the Mayor and Council of King William's Town at a civic luncheon, after which a visit was paid to the Municipal Power Station.

Before leaving King William's Town a hearty vote of thanks was passed to the Mayor and Councillors of King William's Town for the hospitality and many courtesies extended to the visitors. A vote of thanks was also unanimously passed to the Borough Electrical Engineer of King William's Town—Mr. Julian Vowles—for his kindness in arranging the visit and for having so largely contributed by his efforts to a most interesting and enjoyable visit.

The party returned to East London via the West Bank Road.

ASSOCIATION OF
Municipal Electrical Engineers

(Union of South Africa and Rhodesia).

MEMBERSHIP LIST AS AT SEPTEMBER 16th, 1927.

Members.

ASHLEY, T. P., Queenstown.
BALFOUR, J., Ficksburg.
BASKERVILLE, C. H. V., Salisbury.
BICKELL, L. F., Pt. Elizabeth (*Member of Council*).
BLATCHFORD, W. H., Greytown.
BOWER, W. F., Barkly East.
BROWN, C. G., Middelburg (Transvaal).
CHALMERS, A. S., George.
COETZEE, J. A., Ladybrand.
CLARK, J. G., Fort Beaufort.
CLEMO, A. J., Alice.
COULTHARD, R. D., Oudtshoorn.
DADSWELL, P. W., Cradock.
DANCE, W., Humansdorp.
DAVISON, J. G., Mafeking.
DOD, T. C. WOLLEY, Pretoria.
EASTMAN, H. A., Cape Town.
FLETCHER, R. W., Krugersdorp.
GROOM, H. L., Roodepoort-Maraisburg.
HARVEY, A. Q., Tarkastad.
HORRELL, L. L., Pretoria.
IVERACH, J., Grahamstown.
JAGGER, T., Ladysmith.
KERSTEN, P. G., Windhoek.
LARTER, R. D., Standerton.
LAMBE, J. MORDY, East London (*President*).

LEWIS, S. V. R., Aliwal North.
MACAULAY, R., Bloemfontein (*Vice-President*).
MAIL, W. M., Kokstad.
MANN, F. C. D., Worcester.
McCOMB, C. M., Springs.
McDONOUGH, M., Bethlehem.
MILLAR, T., Harrismith (*Member of Council*).
MORRIS, H. A., Kimberley.
MULLER, H. M. S., Beaufort West.
MUNRO, A. S., Pietermaritzburg.
NEWCOMBE, P. H., Indwe.
NICHOLAS, I. J., Umtata.
PENTZ, J. O., Frankfort, O.F.S.
POOLE, E., Durban (*Member of Council*).
PREVOST, H. A., Somerset West.
RALSTON, L., Dundee.
RELIHAN, H. J., Paarl.
ROBERTS, J., Durban (*Member of Council*).
RODWELL, A. T., Johannesburg.
ROSS, W. D., Potchefstroom.
ROYLE, R., Rustenburg.
SANKEY, B., Johannesburg (*Member of Council*).
SIEBERT, T. F., Uitenhage.
SIMPSON, H. G., Dordrecht.
SMITH, J. T., Durban.
SPANG, K. F., Brandfort.
SPARKS, L. B., Pietersburg.
STOKER, R. A., Kroonstad.
SUTCLIFFE, T., Benoni.
SWINGLER, G. H., Cape Town.
SYERS, F. E., Umtali.
TUBB, B. H. J., Salisbury.
VOWLES, J., King William's Town.
WALKER, D., Mafeking.
WUD, J. J., Adelaide.
YOUNG, R. A., Bulawayo (*Member of Council*).
YOUNGER, J., Vryheid.

Associate Members.

CASTLE, F. Cape Town.
DOBSON, J. H., Johannesburg.
HAMLIN, Dr. E. J., Johannesburg.
HODGE, W. A., Standerton.
MARCHAND, B., Witbank.
MORRIS, R. J., Wakkerstroom.
PRICE, E. T., Johannesburg.
PROCTOR, L. B., Johannesburg.
SARGENT, B. H., Vryheid.
STEWART, G. A., Johannesburg.

Honorary Member.

VAN DER BYL, Dr., Johannesburg.

Honorary Secretary and Treasurer.

ADKINS, PRESCOTT, Electricity and Tramways Department, East London.