

PROCEEDINGS
OF THE
Fifth Annual Convention
OF THE
**ASSOCIATION OF MUNICIPAL
ELECTRICAL ENGINEERS**
(UNION OF SOUTH AFRICA).



Held at CAPE TOWN,
From Monday, 20th November, to Friday,
24th November, 1922.

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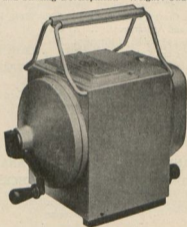
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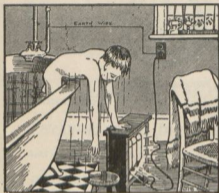
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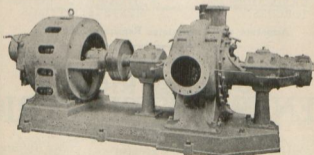
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INDEX TO ADVERTISERS.

Advertiser.	Page
British Agencies, Ltd.	i
Cape Explosives Works, Ltd.	ii
Cape Portland Cement Co., Ltd.	iii
English Electric Co., Ltd.	iv
Henley's (S.A.) Telegraph Works, Ltd.	v
Hubert Davies and Co., Ltd.	vi
Ingersoll Rand Co. (South Africa), Ltd.	xiii
S.A. General Electric Co., Ltd.	vii
S. Sykes and Co., Ltd.	viii
The Telegraph Manufacturing Co. (Colonial), Ltd.	ix
Texas Oil Co. (South Africa), Ltd.	x
Vacuum Oil Co., Ltd., of South Africa	xi
Wilson and Herd, Ltd.	xii

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INDEX.

	PAGE.
Index to Advertisers	xiii
Rules and Constitution	xvi
Programme of Proceedings	xviii
Civic Welcome to Convention	2
Report by Hon. Sec. and Treasurer	3
Retiring President's Address (Mr. T. C. Wolley-Dod)	6
Discussion on Retiring President's Address	9
Presidential Address (Mr. G. H. Swingler)	12
Discussion on Presidential Address	23
"The Supply of Current for Electric Heating from Central Stations" (Mr. Jno. Roberts)	32
Discussion on Mr. Roberts' Paper	54
"Notes on the Electricity Act" (T. C. Wolley-Dod)	67
Discussion on Mr. Roberts' Paper cont.	73
"Some Difficulties and Hopes of Smaller Towns with Regard to the Installation of Electric Schemes" (P. D. Cluver)	81
Discussion on Mr. Wolley-Dod's Paper	86
Memorandum on Introduction of Electricity Act (1922)	102
Place of Next Convention	105
Affiliation with Incorporated Municipal Electrical Engineers' Association	106
Report of Sub-Committee on Statistics and Accounts	107
Report by Representative on British Engineering Standards Committee	122

Proceedings of the Association of Municipal Electrical Engineers

(Union of South Africa).

FOUNDED 1915.

EXECUTIVE COUNCIL.

President:

G. H. SWINGLER (Cape Town).

Vice-President:

B. SANKEY (Johannesburg).

Members of Council:

Past President: T. C. WOLLEY-DOD (Pretoria).

Cape Province: L. F. BICKELL (Port Elizabeth).

Orange Free State: T. MILLAR (Harrismith).

Transvaal: R. W. FLETCHER (Krugersdorp).

Natal: JNO. ROBERTS (Durban).

Hon. Secretary and Treasurer:

H. A. EASTMAN (Cape Town).

Rules and Constitution

OF THE
ASSOCIATION OF MUNICIPAL ELECTRICAL
ENGINEERS
(UNION OF SOUTH AFRICA).

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

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

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 whom 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, 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 2/- for Chief Engineers and their Chief Assistants and £1 1/- 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 the 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 at 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).

FIFTH ANNUAL CONVENTION
CAPE TOWN, NOVEMBER, 1922.

PROGRAMME OF PROCEEDINGS.

Monday, 20th November, 1922.

- 10.30 a.m. Welcome by His Worship the Mayor (Mr. Councillor R. J. Verster) of Cape Town and formal opening of the Convention. Valedictory Address by the Retiring President. Election of Officers and other formal business. Presidential Address.
- 2.30 p.m. Visits to Messrs. Jagger's Factory, Buchanan's Factory, and the South African Woollen Mills.

Tuesday, 21st November, 1922.

- 9.30 a.m. Paper by Mr. Jno. Roberts, "Current for Electric Heating," and discussion.
- 1 p.m. Luncheon at the City Club by kind invitation of His Worship the Mayor (Mr. Councillor R. J. Verster).
- 2.15 p.m. Official Photograph.
- 2.30 p.m. Paper by Mr. T. C. Wolley-Dod, "Some Notes on the Electricity Act, 1922." Discussion on paper by Mr. Roberts.

Wednesday, 22nd November, 1922.

- 10.30 a.m. Meeting at the Y.M.C.A. Hall, Stellenbosch. Welcome by His Worship the Mayor of Stellenbosch (Mr. Councillor C. M. Neethling) and paper by Mr. Councillor P. D. Cluver, "Some difficulties and hopes of smaller towns with regard to the installation of electric schemes." Discussion. Luncheon, by kind invitation of the Ladies of Stellenbosch.
- 2.30 p.m. Visit to Messrs. the Cape Explosives Works, Ltd.

Thursday, 23rd November, 1922.

- 9.30 a.m. Discussion on Mr. T. C. Wolley-Dod's paper. Election of Council, Reports of Sub-Committees, etc.
- 2.30 p.m. Visit to the Graaff Electric Light Station, Dock Road.
- 8 p.m. Orchestral Concert at the City Hall, by kind invitation of His Worship the Mayor.

Friday, 24th November, 1922.

- 11 a.m. Visit to H.M. Royal Naval Dockyard, Simon's Town.
- 1 p.m. Visit to Cape Point.
- 7.30 p.m. Dinner at the City Hall, by kind invitation of His Worship the Mayor and Council.



*Back Row—F. C. D. Mann
Worcester*

*Councillor R. M. Scholtz
Bethlehem*

*H. A. Eastman
Cape Town*

*Dr. E. J. Hamlin
Stellenbosch*

*Second Row—W. H. Blatchford
Greytown*

*P. Finlayson
Marritzburg*

*T. Sutcliffe
Benoni*

*T. P. Ashley
Queenstown*

*F. Castle
Cape Town*

*M. MacDonough
Bethlehem*

*Third Row—Cnclr. T. Ericson
Kimberley*

*T. Jagter
Ladysmith*

*T. Millar
Harrismith*

*R. Macaulay
Bloemfontein*

*R. W. Fletcher
Krugersdorp*

*Cnclr. T. C. Shearer
Durban*

*Cnclr. A. Linton
Port Elizabeth*

*F. T. Stokes
Johannesburg*

*Front Row—Cnclr. H. Solomon
Kimberley*

*G. M. Clark
Johannesburg*

*T. Wolley-Dod
Pretoria*

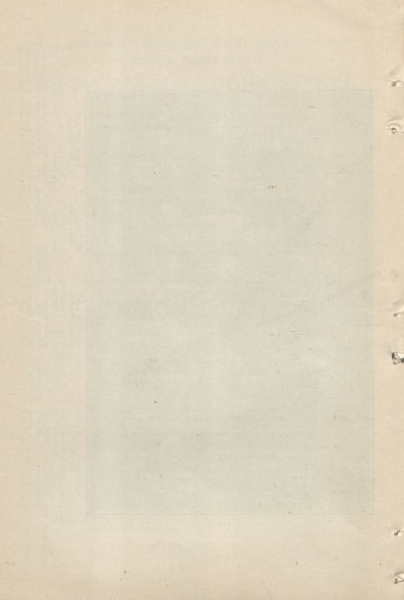
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Proceedings
OF THE
Fifth Annual Convention
OF THE
ASSOCIATION OF MUNICIPAL ELECTRICAL ENGINEERS
(UNION OF SOUTH AFRICA).

CAPE TOWN, NOVEMBER 20th to 24th inclusive, 1922.

MONDAY, 20th NOVEMBER, 1922.

The fifth annual Convention of the Association of Municipal Electrical Engineers of the Union of South Africa was opened in the City Hall, Cape Town, at 10.30 a.m., on Monday, November 20th, 1922.

The President, Mr. T. C. Wolley-Dod, was in the chair, and there were also present:—

Members:

G. H. Swingler (Cape Town) Vice-President, T. P. Ashley (Queens-town), L. F. Bickell (Port Elizabeth), W. H. Blatchford (Greytown), R. D. Coulthard (Oudtshoorn), P. Finlayson (Maritzburg), R. W. Fletcher (Krugersdorp), E. J. Hamlin (Stellenbosch), T. Jagger (Ladysmith), R. Macaulay (Bloemfontein), F. C. D. Mann (Worcester), M. McDonough (Bethlehem), T. Millar (Harrismith), Jno. Roberts (Durban), F. T. Stokes (Johannesburg), T. Sutcliffe (Benoni), and H. A. Eastman (Cape Town).

Associate Members:

W. Bellad-Ellis (Queenstown), F. Castle (Cape Town).

Delegates:

Councillors T. Ericson (Kimberley), E. Hopper (Cape Town), Maj. C. E. S. King (Johannesburg), A. Linton (Port Elizabeth), R. W. Scholtz (Bethlehem), D. Shearer (Ladysmith), T. C. Shearer (Durban), H. Solomon (Kimberley).

Visitors:

Messrs. W. F. Long, G. M. Clark, and others.

CIVIC WELCOME.

His Worship the Mayor of Cape Town, Mr. Councillor R. J. VERSTER, on behalf of the City of Cape Town, extended a cordial welcome to the Members and Delegates to the City on the occasion of the Fifth Convention of the Association. The gathering being composed not only of the Electrical Engineers, but also the Chairman of many of the Municipal Electricity Committees, and therefore of supporters of local self-government, he was proud to be able to greet them in the City from which the whole fabric of local self-government in the Union had radiated. It was there that the burghers had received authority to govern themselves and it was there also that the first municipal electrical installation was erected and worked, so far back as 1893, when local self-government in other parts of the Union had scarcely got into its stride. The fact that the Council, without all the supervisory control of higher authorities under statute or ordinance, were able to equip and work an electricity undertaking to the advantage of the citizens and the City—for in those days Cape Town enjoyed absolute freedom of action in regard to electricity—was one of those things which made it felt that absolute autonomy should be given to large municipalities in the administration of the affairs of the City, yet, at the same time, it was realised that the country as a whole was on the eve of enormous development in the electrical industry.

In declaring the Convention open, he wished all present every success in their deliberations, and trusted that they would carry back with them to their several spheres of labour very pleasant memories of their stay in the Peninsula.

The President (Mr. T. C. WOLLEY-DOD), on behalf of the Association, thanked His Worship the Mayor very cordially for his kind welcome to Cape Town, the Mother City of South Africa. Members had looked forward very anxiously and with great anticipation to those meetings, and it was most unfortunate that, owing to unforeseen circumstances, the Convention had had to be postponed for a year. Now that the Convention had actually begun, however, he hoped that the anticipation would be met by realisation, and that the whole of the deliberations would be for the benefit of municipal enterprise throughout the whole of the Union.

BUSINESS MEETING.

The PRESIDENT, on behalf of the Association, welcomed the Councillor delegates who had come down to Cape Town to join in the deliberations, and regretted that the fact of the Municipal Elections having then only recently taken place prevented a delegate from Pretoria from being present. He also extended a cordial welcome to Mr. W. F. Long, who was an old member of the Council of the Association, and to Messrs. G. M. Clark and others.

Confirmation of Minutes.

In view of the fact that the Minutes of the previous Convention had been published in the proceedings of the year 1920, these were taken as read.

REPORT BY THE HON. SECRETARY AND TREASURER.

In the absence of the Hon. Secretary and Treasurer, Mr. L. L. Horrell, Mr. H. A. EASTMAN read the Hon. Secretary and Treasurer's Report.

Mr. President and Gentlemen,

In following my predecessors and in accordance with Clauses 18 and 19 of the Rules and Constitution of the Association, I have pleasure in submitting my Report and Balance Sheet for the period I have held the office of Hon. Secretary and Treasurer.

The membership of the Association stands at 41, made up with:

Members	.. .. .	35
Associate Members	.. .. .	6

During the period under review six new members have been elected and six members were transferred from members to Associate Members on account of their having left Municipal Service, two have resigned and one has ceased to be a member on account of his leaving Municipal Service.

On the financial side, you will notice that the Credit Balance is not quite so large as shown in the previous balance sheet. This is chiefly due to the heavy cost of printing and typing the various reports, etc., that have been issued from time to time. The account for the typist is also much larger

than in former years, but it includes the sum of £5 which was voted by the Council at the Pretoria Convention to the typist in Durban; the balance was paid to the typist in Pretoria when she left the Service to get married.

Our thanks are due to the Town Councils who donated various sums towards the expenses of the Association—viz., Johannesburg £25, Bethlehem £10, Ermelo £2 2s.

You will notice that about half of the towns in South Africa who have electrical undertakings have adopted the regulations that were passed at the Pretoria Conference. This undoubtedly is a great compliment to the Association, and is in itself enough to show that useful work is being done. One hopes that in time all the Town Councils who have electrical undertakings will realise this and contribute towards the funds of the Association.

As my term of office has come to an end, I would like to tender my thanks to the President, Vice-President, and members of the Council for their kind co-operation in connection with the carrying out of my duties.

I am, Mr. President and Gentlemen,

Yours faithfully,

Hon. Secretary and Treasurer.

L. L. HORRELL.

REVENUE and EXPENDITURE ACCOUNT.

PERIOD 27th SEPTEMBER, 1920—8th NOVEMBER, 1922.

Expenditure.	Revenue.
Printing and Stationery .. £80 18 6	By Balance £47 14 2
Stamps and Telegrams .. 19 19 2	Subscriptions received £86 8 0
Typist 12 7 0	Outstanding .. 2 2 0
Sundries:	
Hire of Hall .. £2 2 0	
Secretary's expenses 2 2 0	Subscription for dinner .. 37 16 6
Railage on boxes 3 6 0	Grants and contributions 45 10 0
Paper for decorations 0 15 0	Advertisements in Journal 11 1 7
Photo 0 5 0	Receipts: Sale
	of Bye-Laws £26 8 0
	Due by Bloemfontein .. 3 10 0
	29 18 0
Bank Charges 3 19 2	Proceedings 0 5 0
Printing Bye-Laws 32 0 0	Payment for Mr. Mercier's photograph .. 0 13 0
Subscription to Engineering in South Africa .. 2 10 0	Payment for Mr. Mercier's extra copies of paper 1 15 6
Teas during 1920 Convention 2 18 6	
Reporter 12 12 0	
Dinner 37 16 0	
Photograph for English Press 0 11 0	
Mr. Mercier's photograph. 0 13 0	
214 14 4	
Balance 48 9 5	
£263 3 9	£263 3 9

BALANCE SHEET.

Liabilities.	Assets.
Revenue and Expenditure Account £48 9 5	Cash in hand £42 17 5
	Due by Town Council, Bloemfontein 3 10 0
	Outstanding subscription 2 2 0
£48 9 5	£48 9 5

I hereby certify that I have examined the Account Book and Vouchers of the Association of Municipal Electrical Engineers (Union of South Africa), and in my opinion the above statement of Revenue and Expenditure is properly drawn up and reflects the true position of the Association as at 27th September, 1922.

Signed,

L. L. HORRELL,
Hon. Secretary and Treasurer.

Signed,

J. POLLOCK,
Registered Public Accountant.

Arising out of the Report, Mr. ROBERTS wished to know how the list of municipal contributions towards the expenses of the Association compared with previous years, and expressed his opinion that members of the Association should personally endeavour to induce their respective Town Councils to make annual contributions. He raised the point so that those who had not hitherto put this matter before their Councils would bear it in mind.

The PRESIDENT pointed out that in the Report the Municipal contributions were shown as £42 17s. for the previous year as compared with £37 2s. for the year covered by the report just read.

On the motion of the President, seconded by Mr. T. MILLAR, the Hon. Secretary and Treasurer's Report and Accounts were adopted unanimously.

The Retiring President (Mr. T. C. WOLLEY-DOD) then read his address:—

Retiring President's Address.

(By Mr. T. C. WOLLEY-DOD, Pretoria.)

Gentlemen,

On behalf of your retiring Council, it is my duty to give you a short resumé of our activities during our term of office.

As you will remember, our principal work at our last Convention held in Pretoria was the adoption of Standard Bye-Laws, Conditions of Supply and Wiring Regulations for Municipal Electric Supply concerns.

I understand that these have been definitely adopted by eleven Municipalities and that two others are working under existing Regulations that are practically similar. It will be interesting to hear whether members working under these have any flaws or difficulties in their application. The Convention also adopted a set of Bye-Laws for the licensing of Electricians, and I believe that these or similar Bye-Laws are in use in several Municipalities. However, when the Municipality of Pretoria submitted them for the approval of the Administrator, the following letter was received, and in the face of this they were not adopted:

LICENSING OF ELECTRICIANS AND REGISTRATION OF ELECTRIC WIRING CONTRACTORS.

I have the honour to state, for the information of Councils who have framed Bye-Laws on the above subject and those who have draft Bye-Laws under consideration, that the following legal opinion has been given on the question of the powers of Council in regard to the Licensing of Electricians under Section 157 (9) of the Local Government Ordinance, 1912:—

The only authority empowering the Provincial Council to legislate in respect of the above matter is the general authority contained in Section 85 (vi.) of the South Africa Act, to make ordinances in relation to "Municipal Institutions" and to impose "punishment by fine, penalty or imprisonment" in accordance with Section 85 (xi.) for contraventions of the provisions of such ordinances. The Financial Relations Act, 1913, has not affected the position in any way so far as this matter is concerned.

Ordinance 9 of 1912 must be read as being subject to the limitations imposed upon the Provincial Council. The Licensing of Electricians under Section 157 (9) could only be a licensing for the purposes of "Municipal Institutions," e.g., licensing and registration, so that the names and addresses of persons carrying on business might be known. The "regulating" of such electricians seems to relate to the supervision of their work by municipal inspectors who could refuse to certify that installations are suitable for connection with the main system unless conforming to certain requirements deemed necessary for common safety. The "prohibiting" of unlicensed persons from carrying on the business of electricians refers to the imposition of penalties upon those who fail to take out a licence. But the Provincial Council cannot itself control the business of electricians by prescribing the qualifications deemed necessary, nor can it disqualify persons already engaged in the business, the only competent punishment, in cases of transgression, being "fine, penalty or imprisonment." Having no power to legislate in that behalf, the Provincial Council cannot delegate to a Town Council a power which it does not itself possess.

It follows that the draft Bye-Laws submitted are in their present form *ultra vires*. Regard being had to the limited scope of the Provincial Council's power of legislation in this matter, it is doubtful what meaning the term "electricians" was intended to have—whether to include only skilled workmen or wiring contractors. As qualifications of skill do not come up for consideration, I incline to the view that the power of licensing and regulating electricians for municipal purposes relates to individuals and firms carrying on the business of electricians—i.e., to wiring contractors rather than to the skilled workmen. The draft Bye-Laws referred to in the opinion are those submitted by the Association of Municipal Electrical Engineers and which Councils generally have followed in the framing of codes to this office.

The question of the status of Engineers in charge of small Municipal Electric Supply concerns and the advisability of their admittance to the Association has arisen since the last

Convention, and your Council thought it best to leave this to be dealt with by this Convention.

The Official Magazine that was adopted in 1920 has unfortunately ceased to exist, and with the exception of the statistics which we supply to the publishers of the Municipal Year Book, of which they present us with sufficient copies for circulation to members, we have no means of publication beyond the proceedings of the Conventions.

The principal event of interest to Electrical Engineers in the Union recently has been the passing of the Electricity Act.

A copy of the Bill was sent to this Association for comment, and your Council was hurriedly convened in Johannesburg and spent the best part of a week in drafting an elaborate criticism of the Bill, a copy of which was forwarded to the Department concerned, and which formed the basis of representations by sundry municipal deputations objecting to certain provisions in the Draft Bill.

The original draft was withdrawn and the Act now passed will be discussed at a later stage of these proceedings.

Mr. Sankey has handed in a short report on the work of the Electrical Section of the South African branch of the British Engineering Standards Association, of which you all have a copy.

I have to express my grateful appreciation of the cordial co-operation of the members of the Council and of the Hon. Secretary and Treasurer during my period of office, and in vacating the chair in favour of my successor I can only wish him the same help and courtesy that has been my good fortune to experience.

Election of President.

Mr. BICKELL moved, seconded by Mr. MILLAR, that Mr. G. H. Swingler be President of the Association for the ensuing year, which was unanimously agreed to.

The retiring President thereupon vacated the chair in favour of Mr. Swingler and congratulated him upon his election.

Mr. SWINGLER briefly thanked the Association for the honour conferred upon him by his election as their President.

**Admission of Mr. H. A. Eastman as a member of the Association, and
Appointment as Hon. Secretary and Treasurer.**

The PRESIDENT reported that, at a Council meeting held earlier in the morning, it was decided to recommend to the Convention the admission of Mr. H. A. Eastman as a member of the Association, and proposed that he be elected.

Mr. WOLLEY-DOD seconded the motion, and Mr. Eastman was duly admitted as a member of the Association.

Mr. WOLLEY-DOD moved, seconded by Mr. ROBERTS, that Mr. Eastman be appointed Hon. Secretary and Treasurer of the Association. The motion was unanimously agreed to.

Election of New Council.

In view of the fact that most of the members had only arrived at Cape Town on the 20th and that the election of members of the Council was more or less a matter of arrangement between the representatives of the Provinces for which no opportunity had so far been available, Mr. WOLLEY-DOD, seconded by Mr. ROBERTS, moved that the election of the Council stand over until the meeting on the following day.

The motion was agreed to unanimously, it being understood that the existing Council hold office until the new Council is elected.

Discussion on Retiring President's Address.

Mr. JNO. ROBERTS (Durban): In regard to the by-laws adopted for the licensing of electricians, I think it is a great pity that a point of law should stand in the way of what is recognised as a desirable measure. Years ago when the idea was first mooted, I was against it, because I did not see what good purpose it would serve, but since then my views have changed and I am glad to see, as a result of the recommendations and the rules drawn up in connection with the matter at last year's Convention, that we certainly consider that the matter should be enforced. At Durban the first meeting of the Examining Board has been held, and as a result I think about 70 certificates or licences will be issued. In Durban everyone is in favour of it—the working electricians, the Town Council and the consumers, who depend, of course, on the satisfactory way in which the wiring of their installations is carried out. I do not think we should let the matter of

difficulties in regard to enforcing the regulations in the Transvaal rest, and I would like to suggest that this should be referred to the general Council with a view to ascertaining what steps can be taken in that Province, where there are so many municipalities and where so much wiring is carried out. We should thereby get suggestions as to how the matter should be got over, and I move accordingly.

Mr. WOLLEY-DOD (Pretoria): I may say that I was quite put out when this legal opinion was given, and I discussed the matter in order to see what it really meant. I was told that the legal officers were of opinion that the object of licensing was merely that a man should register his address and his place of business, so that, if he infringed the bye-laws or any laws, one would know where to serve a summons upon him and he could then be proceeded against; the law of the land did not allow you to put a man out of his trade; you have no right to say to a man, "You shall be allowed to carry on your trade" or "You shall not be allowed to carry on your trade." If a man does not comply with the municipal regulations, you can condemn his work and, under the regulations, fine him, and that seems to me to be the only course we can pursue. I am aware of the fact that some municipalities in the Transvaal have sanctioned the regulations, and they have been approved by the Administrator and gazetted. It was subsequently that the Administrator thought it would be advisable for him to obtain legal advice, on doing which he circulated this to the various municipalities and which I take to mean as a warning that these bye-laws were *ultra vires*.

Mr. W. BELLAD-ELLIS: Personally, I would like to second Mr. Roberts' motion, but not being a member of the Association I am not entitled to do so. It occurs to me that, before you can proceed with Mr. Roberts' proposal, you might look to the Control Board which has now come into being and which can, we are given to understand, override anything the Administrator might do. The latter acts purely in regard to the financial side of everything and the technical side of things go to the Control Board. We cannot blink our eyes to the fact that the Electricity Act, as an Act and not a Bill, is now law. Therefore, it seems to me that this is a case where the Control Board should be applied to. Under the Act they have not the power to make this law.

Mr. MILLER (Harrismith): I have much pleasure in seconding this proposition. So far as the small municipalities are concerned, I do not think it applies to them, as most of them do their own wiring. I am certainly of the opinion that the large municipalities should be protected in some way.

Mr. STOKES (Johannesburg): The examinations are taking place at the end of this month, and in spite of the regulations being *ultra vires* we are going on with them.

Mr. BICKELL (Port Elizabeth): The regulations in Port Elizabeth are working quite satisfactorily and we are examining all the men. We have turned down two or three, but no objection has been raised. In the Cape Province, municipalities are compelled to frame regulations within a certain time.

The PRESIDENT: The Administrator of the Cape Province must be satisfied with the legality of the matter. If you do not frame regulations within six months, he will do so for you. Personally, I cannot see any objection to the proposal.

Mr. Roberts' motion that the matter be referred to the Council was then put and agreed to.

Presidential Address.

(By Mr. G. H. SWINGLER, Cape Town.)

My first personal duty in taking the chair at this Convention is to express my thanks and deep appreciation of the honour you have done me in electing me President of your Association for the ensuing year.

The present year is one which marks the commencement of a new era in the generation and supply of electricity in this country by the passing of the Electricity Act, 1922, while the following year will see the beginning of the operations of the Control Board and Electricity Commission created under the Act. I feel, therefore, that for this reason additional responsibilities may attach to the position than heretofore, and I sincerely hope that the trust you have reposed in me will be justified. In this connection I can but assure you that I will endeavour to the best of my ability to further the interests of the Association during my tenure of office, and have every confidence that, with the assistance of your Council, still further progress in the direction of its aims and objects will be shown.

It will probably be remembered that the original intention was to hold the 5th Annual Convention in October of 1921. Towards that date, however, it became apparent that the re-draft of the Electricity (Supply) Bill, the original of which had in the first instance been discussed with the Drafting Committee by representatives of your Association and others in April of that year, would shortly be available again for criticism prior to being placed before Parliament. In order to give all members the opportunity of a joint discussion of this most important matter, it was considered desirable by your Council to include this in the proceedings of the Convention, and to postpone the latter until more definite information could be obtained as to the actual date of the preliminary publication of the Bill. When it finally became evident that the re-draft would be available in March of this year, arrangements were accordingly made for the Convention to be held at the end of that month. It is very regrettable that this decision could not be carried out after all, by reason of the serious industrial upheaval which took place then, causing

practically all who had notified their intention of being present to cancel those arrangements.

The essential difference between an Address and a Paper is that, whereas the latter concerns one main subject only and is in the nature of a thesis, it is usual in the former to refer in general terms to some of the subjects of mutual interest to members, and I propose to follow the example of your worthy Past Presidents in this respect. On reading their addresses, I have been struck by the constant reference to the necessity of some form of control by the Government for the development of the Electrical Industry in the Union.

It is an axiom that the national life of every civilised country is closely associated with the provision of a cheap and abundant supply of electricity, and that this applies with all the greater force to those countries containing actual or potential facilities for the development of large industrial enterprises.

While South Africa contains very large areas which, for various reasons, it is difficult to believe would be capable of supporting any large manufacturing industry, there are nevertheless huge tracts of undeveloped ground whose value in this respect is only now being realised. I refer particularly to the enormous extent of the coal and iron deposits which have of recent years been proved in the Transvaal and Natal, while further extension of the existing base metals and gold industries may also be confidently looked forward to in the future. And one sincerely hopes that an oil shale industry will materialise in this country, for it is well known a company has now been floated to develop this, and I trust the efforts of the promoters will meet with the success they deserve.

The extent to which the Union is already a manufacturing country is not generally realised.

Recent progress in this respect is shown in the following table published in the Official Year Book for the Union of South Africa, 1910-1920:—

Year	No of Establishments.	Hands Employed.	Salaries and Wages paid.	Value of Machinery, Land and Buildings.	Value of Material used.	Value added by Manufacturers.	Value of Output.
			£	£	£	£	£
1915-1916	3,998	101,178	8,912,857	24,537,449	22,315,587	18,119,295	40,434,882
1916-1917	5,305	123,842	10,436,694	28,598,521	28,023,948	21,433,466	49,457,414
1917-1918	5,918	134,211	12,227,700	31,959,399	34,248,341	26,558,569	60,806,910
1918-1919	5,968	143,088	14,475,648	33,713,880	41,010,680	29,914,418	70,934,098
1919-1920	6,890	175,520	19,119,090	37,886,851	53,851,256	39,062,588	92,913,844

While undoubtedly the remarkable increase in the value of the output during the years 1915-1920—viz., 130 per cent.—is possibly due to inflation of prices due to war conditions, it should be noted that in the same period the number of establishments has increased to the extent of 73 per cent., and it may safely be assumed that many of these have come to stay and further development is only a matter of time.

Unfortunately, the climatic conditions of the country are not suited to the establishment of hydro-electric schemes unless developed on an enormous scale whereby through inter-linking the generating stations the effect of a drought in one district may be counterbalanced by the rainfall which is generally to be found taking place at the same time in another, or by the provision of steam generating stations as stand-by plant to tide them over drought periods.

It would appear, therefore, that the immediate future of the electricity supply industry in the Union is intimately bound up with a cheap supply of coal.

Even with the use of good coal burnt under conditions for maximum overall thermal efficiency and used in conjunction with the latest type generating machinery, at least four-fifths of the heat energy in the coal is lost. Further, the conditions under which the coal is mined and the formation of the seams in the principal collieries lead to an enormous waste of this most valuable material. Considering the Witbank Colliery District, the principal source of coal from the Transvaal where five seams aggregating 56 feet in thickness are present, the method of mining in use is such that only about 14 per cent. of this is actually worked, and of this amount only about one-half is eventually marketed. The remainder is either dumped as waste or left in the mine, in both cases being lost for ever.

It is true that some attempt to make use of the poorer quality of coal has been made at the Witbank Colliery, where a coke oven bye-product plant has been erected for the recovery of tar, while at the Tweefontein Colliery in the same district, where a very large proportion of coal is mined—which is quite unsuited for steam generation in ordinary boiler plant—in order to obtain marketable coal—a bye-product recovery plant has been installed consisting for the present of two Lymn producers gasifying 60 tons of waste coal per 24 hours. Tar and ammonium sulphate are extracted from the gases leaving the producers, and these then are

burnt as required in some of the boilers used in connection with the power plant installed on the mine. The plant has been put down primarily as an experiment to determine the possibility of the use of this very low grade coal by means of producers of this type for the generation of power, ultimately, on a large scale for distribution of electric energy to neighbouring collieries, and the results of the experiment will be watched with great interest by all concerned in the conservation of coal.

A large Mond type of producer plant, representing a total capital outlay of nearly half a million pounds, was started up during the war for the production of ammonium sulphate by the Natal Ammonium, Ltd., using a semi-anthracitic coal mined on the site. Unfortunately, however, it was found that, with the close of the war, the price of sulphate fell below that at which it could be manufactured on account of there being no market or use for the surplus gases resulting from the process and no other bye-products available due to the nature of the coal used, and the plant has, therefore, now been closed down.

Other plants for the extraction of coal bye-products and the manufacture of calcium carbide, and various other chemical and electro-chemical industries have also been started, and I think we may confidently anticipate that in the next 15 or 20 years South Africa will be taking a prominent position in the world as a manufacturing country.

It was after consideration of the probably immediate development of the resources of the country, and having in view also the necessity of alleviating the present congestion, as well as of providing for future better handling of traffic on certain main railway routes, that the Government engaged the services of the well-known firm of consulting engineers, Messrs. Merz and McLellan, to advise them generally on the supply of electric power in the Union. Their recommendations were ultimately submitted in a report dated April, 1920. Acting upon one of the recommendations in that report, the present Electricity Act, 1922, was drafted by the Government and is now in force.

While not wishing in this address to elaborate on the details of the provisions of the Act, a matter forming the subject of a paper to be read by Mr. T. C. Wolley-Dod, I feel that I cannot entirely ignore it.

It will be agreed by all of us, I think, that any public service must necessarily be subject to some degree of control.

The important matter is that this control should be directed with understanding and sympathy. Hitherto some form of control has been exercised by the Provincial Administrations under Ordinances promulgated by the Provincial Councils themselves, but unfortunately the provision of these Ordinances vary from each other in a number of details.

Although it may be argued that the organization of the Control established by the Act is top heavy, and that the probable formation of a new Government Department to deal with these matters will cause additional difficulties in the development and administration generally of Municipal Electricity Undertakings, I feel that, because the Act appears to be a serious attempt on the part of the Government to co-ordinate the existing systems of supply and to provide for almost unlimited development of the electrical industry in the Union generally, we should do our utmost as an Association to further its objects in every way.

From a comparison of the evidence given before the Select Committee and the Act as finally promulgated, it will be observed that, notwithstanding the representations made, the Select Committee did not see its way to fall in with the views of the Association with regard to compensation of officials who might suffer pecuniary loss owing to the operation of the Act, notwithstanding the precedent established in this direction when the unification of Municipalities in the Cape Peninsula took place in 1913. Without being aware as to what influenced the Select Committee in its decision, it may be stated that cases may arise as the result of this Act where distinct hardships might be inflicted on employees who have given of their best, and as the result of the passing of the Act find their status lowered or lose their positions altogether without any compensation. It will be noted under clause 49 of the Act that in any proceedings arising out of damage or injury caused by induction or electrolysis or otherwise by means of electricity generated, transmitted or escaping from electric plant, that there is no obligation on the plaintiff to prove that the damage or injury was caused by the negligence of the defendant. This clause was of such a drastic nature that strong representations were made to the Select Committee to amend same, but these representations were not given effect to.

The majority of Municipalities provided with electric energy generate same themselves. Unfortunately, however,

most of our stations are of comparatively small capacity, and the cost of production necessarily great, however efficiently and economically the plant and equipment may be worked. Where a number of these are erected close together or within reasonable distance of a super-station designed possibly primarily for traction supply it would clearly be to the benefit of the Municipalities concerned to purchase their supplies in bulk from some such central station, whether run by the Commission or any other body, for by the possession of a large station equipped with up-to-date machinery, it would be in a position to supply energy at a lower rate than the individual Municipalities could possibly reach. Where, however, municipal and privately owned generating stations are in existence containing up-to-date machinery run at the maximum possible efficiency or where the load of the Company or Municipality exceeds that for traction purposes, I do not consider it likely, taking into consideration the experience gained in this matter by those responsible for these results, that the Commission to be appointed under the Act could attain any greater efficiency by the introduction of another organization for the generation of electricity only, whilst the distribution and sale are in the hands of the local authority or Company. The overhead charges are sure to be more than would be the case if one authority only conducted the whole business. In this connection I feel very strongly that at least the same opportunities for continuing and extending their supply should be given to those who have in the first instance developed the business, and who are now in just as favourable a position to extend their undertakings to meet the increased demand as any other body—in fact, more so.

It would appear that the principal objection on the part of the Railways Administration to taking a supply for railway traction purposes from a municipal or privately owned generating station is based upon the fear that industrial disputes, whether arising internally or by disaffection from outside, may at any time stop or curtail the supply. The additional overhead charges, and in many cases increased capital expenditure which would obtain if a new station was erected and run by the Commission or a Government Department surely outweigh such a remote possibility, for in the history of your local undertaking no such thing has ever occurred. In fact, the nearest approach to a total shut down was caused by the shortage of coal due to the Railway Strike

in 1913 and the Administration's inability to supply that commodity due to the disaffection caused by outside influence at times of other industrial disputes.

Given coal and adequate protection for the employees, there is no fear of any stoppage occurring at the Power Station just because it is owned by a Municipality or private Company, the more likely place being on the track and transmission lines—for example, the recent happenings in the Transvaal. Continuity of supply is just as essential to the Public as to the Railways, for most of the industries here take their power supplies from the Council, and the pumping of the sewage of the southern portion of the City depends entirely on our Electricity Supply. The results we are obtaining to-day show that Municipal undertakings can be operated as efficiently as those owned by any other body.

Whatever may develop from the operation of the Act in regard to the expropriation of generating stations, transmission lines, etc., it would appear that the actual sale and distribution of electricity within the area of jurisdiction of an urban local authority will remain undisturbed except when for some special reason the Commission or any other body referred to desires to undertake this, when, however, the consent of the local authority must be obtained. It behoves us, in any case, to continue to do our utmost to extend the use of electricity to the fullest degree.

In the larger centres some assistance is gained to this end by the competitive efforts of the local wiring contractors and manufacturers' agents, whereas in the smaller towns the sole responsibility for this devolves upon the Municipal Electrical Engineer. In the former, however, far more should be done than obtains at present by active co-operation of the Electricity Department with the contractors and dealers in explaining to the general public the advantages and benefits accruing from the use of electricity for domestic and power purposes. It is found in the majority of cases that conservatism based on ignorance of facts forms the principal difficulty in obtaining new consumers. This can only be overcome by persistent propaganda in the form of advertisement, personal influence, and by the display of the greatest possible publicity of actual results obtained. The following recent efforts by the Cape Town Corporation may be of interest.

During the war the normal development of the undertaking was seriously handicapped by the impossibility of

obtaining suitable generating plant to cope with the demands of existing and intending consumers. This difficulty having been surmounted, at least for a few years to come, the recent severe slump in trade tended to cause a further set back to the growth in demand which had been anticipated. The immediate result of the slump was a corresponding falling off in the consumption of energy for power purposes by consumers then connected, and a reduction in the number of applications received for new connections. Even had it been possible to attempt to meet the former by a decrease in tariffs, this would not have had the desired effect in increasing the consumption, this being simply proportional to the amount of trade actually conducted by the consumers, and it was evident that any increase in load on the station could only be obtained for the time being by providing greater facilities for the connection of new consumers requiring energy for domestic use only.

For a number of years the Cape Town Electricity Department has had in operation a scheme known as the "Assisted Wiring Scheme," under which the initial cost of the installation is advanced by the Corporation, and this, plus 5 per cent on the outlay, is repaid by the consumer in twelve monthly instalments. The Corporation acts as Consulting Engineer for the work, inasmuch as it prepares the necessary specification and calls for tenders and supervises the installational work while in progress. While this has been found to be a popular arrangement ever since it was inaugurated, it was deemed desirable in March of this year to attract more consumers by the re-introduction of the so-called "Free Wiring Scheme." This scheme was first introduced in 1913, and it was found to be a popular way of obtaining new consumers.

Under this arrangement approved Electrical Wiring Contractors are paid by the Corporation a fixed sum per point installed in the premises, the amount of which is determined by mutual agreement according to the market value of the materials required under the specification. This sum the consumer guarantees to repay in monthly instalments over twelve consecutive months. The present price per point installed is 40s., and it is part of the agreement with the consumer that he guarantees the payment of 4s. 6d. per point per month for twelve months, which charge, however, includes also the supply of electric energy up to the total value of his instalments per month. It will be seen that at the end of the

first year, although the cost of the installation has been repaid, when the cost of energy consumed and interest on the capital outlay has been taken into account, the actual net profit to the Corporation is small. The object in gaining an additional consumer, however, has been attained, and the Corporation benefits in succeeding years by reason of the observed fact that a person having once experienced the convenience of electric lighting and the use of electricity for domestic purposes generally will seldom be found to revert willingly to any other system.

The popularity of this scheme is evident when it is seen that the total amount of no less than £20,000 was required by the Corporation within ten months of the last introduction of the scheme to pay for the number of new connections applied for under this arrangement.

Apart from special methods of this type in obtaining new consumers, the saving in labour and other benefits accruing by the extended use of electricity should be constantly brought before those on the books at the time. A method of doing this, which is found to meet with great success in centres in Great Britain, is the introduction of show-rooms where the latest and improved types of lighting and heating apparatus are exhibited and their uses explained to actual and prospective consumers. While this is perhaps a proposition which could only be made a success by the larger undertakings in this country, a lot could still be done by co-operation between the Departments and the Contractors themselves in this way in the smaller municipalities.

In Cape Town, with a view to fostering the interest of the consumer in the undertaking, a printed slip in the form of an advertisement bringing home to him some telling facts relating to the supply is enclosed with each account, but I have no doubt that various other methods of attaining the same ends will occur to you according to your ideas on the subject.

The report on the Draft Regulations for the licensing of Electricians, which was approved at the last Convention, has been adopted as a standard in the Cape Province and promulgated as Municipal Regulations in an almost identical form to the original for Cape Town and Port Elizabeth.

In order to introduce these as Municipal Regulations, it was found necessary to amend the Cape Provincial Ordinance No. 6 of 1911, which relates to the Supply of Electricity in

the Province so as to provide the Municipalities with the necessary powers.

The wording of the amendment is to the effect that all urban local authorities in the Cape Province supplied with electric energy must formulate similar regulations within four months of its promulgation or the Administrator would himself in default cause such regulations to be brought into force. This period has now expired, but I understand that the matter is under consideration by a number of Municipalities, though I am aware at present of only the two referred to above, which have actually brought the regulations into effect.

It was found on careful inquiry into local conditions that by the immediate enforcement of the regulations as originally framed a very large proportion of applications would require rejection by reason of the poor standard of education and workmanship which unfortunately prevails among many of those working here as wiremen. It was, therefore, considered necessary, in order to avoid the infliction of undue hardship on these, by summarily depriving them of their means of livelihood by Municipal Regulation, to issue provisional local licences for a limited period to this type of wireman, which, however, would be subject to cancellation or renewal at such times as the Board of Examiners may determine. The ordinary licence, however, is issued to such persons as the Board considers properly trained wiremen qualified to undertake in a proper manner any class of wiring work. As might have been expected, considerable difficulties have been found in discriminating between those considered worthy of the issue of Ordinary Licences and those to whom only Provisional Local Licences should be granted, and the results of two examinations hitherto held have been extremely disappointing.

A further amendment to the original form of the regulations has been introduced by the Cape Town Municipality whereby all Ordinary Licences expire automatically on December 31st of every year, and are renewed annually as from the 1st January on the return of the expiring licence, but without any charge for the renewal. By this means it is hoped a more accurate check will be possible on the actual number of licences working in the area of supply.

It will undoubtedly take some time for the benefits to appear which it is anticipated will accrue, not only to the Supply Authorities, but also the consumers by the introduction

of these Regulations, but the general consensus of opinion among local electrical contractors and the better class of wiremen themselves is that these regulations have long been required.

These Regulations, together with Municipal Electricity Supply Regulations based on those adopted as a standard at the Fourth Annual Convention, have also recently been introduced at Cape Town with only slight modifications to suit local conditions, and I am pleased to be able to state that by their strict enforcement a material improvement in the standard of electrical installation work has already been obtained.

On account of the great distance between centres, a serious difficulty is found in this country in keeping members of an Association such as ours in sufficiently close touch with each other to allow of that interchange of views and ideas which we all desire and for which the Association has been formed. The promotion of interests of Municipal Electricity Undertakings is the primary object of the formation of the Association, and while the difficulty due to distance is undoubtedly an important one, I would suggest for your earnest consideration the possibility of greater co-operation between members in the dissemination of information on matters of particular interest in the supply and generation of electric energy under local conditions by means if necessary of short papers. These could be distributed to members through the Hon. Secretary in the course of the year and could be published in the minutes of the proceedings of the following Convention for record purposes if not actually read at that time on account of the business also on hand.

In view of the introduction of the Electricity Act, legislation which affects the very foundations of the existing Electricity Supply Undertakings, it is of the utmost importance that all members should take a still greater interest in the work of this Association to ensure that it will be so developed as to become not only of greater utility to them themselves, but will also have a real influence in the conduct of the supply of electricity generally in the Union.

DISCUSSION ON PRESIDENTIAL ADDRESS.

Mr. JNO. ROBERTS: I would like, on behalf of the Association, to thank you for your very valuable paper, and to take this opportunity of congratulating you on the honour

which has been bestowed upon you in being elected as President of the Association of Municipal Electrical Engineers of the Union of South Africa. There are one or two points in your address which will bear discussion. One is the idea in regard to the dissemination of information on matters of particular interest in the supply and generation of electrical energy under local conditions, by means of distribution to members, through the Hon. Secretary, in the course of the year. My experience of Conventions in the past is that, though they extend over a period of a week, we have not had full opportunity for the fullest discussion on the many questions which are constantly arising in our business. I have been a little disappointed at the sparse number of papers contributed to the Convention, and we must remember that these Conventions cost our municipalities a fair amount of money, and it is due to them that we should show some practical fruits of their work. Last year at Pretoria we did some valuable work. We adopted standard bye-laws and conditions of supply and wiring regulations, and it would be interesting to know how many of the municipalities have carried these out and how much fruit has been borne from those efforts. A great deal of our time will be taken up with the discussion of the Electricity Act, but that I think we should leave until we have heard Mr. Wolley-Dod's paper.

I congratulate the President on his very able summing up of the electrical situation as we see it to-day, and I consider his address a model Presidential one.

Mr. WOLLEY-DOD: There is just one point on which I would like some information, and that is in regard to the free wiring scheme obtaining in Cape Town. You say that the present price per point installed is 40s., and it is part of the agreement with the consumer that he guarantees the payment of 4s. 6d. per point per month for 12 months, which charge, however, includes also the supply of electricity up to the total value of his instalments per month. I cannot quite follow what that means.

The PRESIDENT: Assuming a 4-point installation, the consumer would be required to pay 18s. per month for twelve months and would be entitled during that time to 18s. worth of electric energy at 77d. per unit per month without extra cost to him.

Mr. WOLLEY-DOD: And the wiring you give for nothing? It is really free wiring.

The PRESIDENT: Yes, if you use 18s. worth of electricity per month.

Mr. WOLLEY-DOD: Does that include cooking current?

The PRESIDENT: Yes. Mr. Long was responsible for the introduction of this system; it is really "Assisted Wiring," and has been most successful since its inception. From March of this year we have connected 1,100 consumers under this scheme. A prospective consumer in an eight-roomed house who cannot afford to wire the whole of his premises at his own expense may, if he wishes, instal only four points under this scheme and the remainder thus at his own expense. We not only get the smaller consumers with three or four points, but we also have many large consumers with ten and twelve points each.

Mr. W. A. BLATCHFORD (Greytown): As a representative of one of the smaller municipalities, I have great pleasure in seconding Mr. Roberts' motion. In regard to the carrying out of the Licensing of Electricians bye-laws and wiring regulations, the majority of the young assistants in the smaller municipalities think it a very good means of education for them and endeavour as far as possible to make a study of the regulations.

Mr. WOLLEY-DOD: In regard to the wiring regulations, I hope we shall hear a little more about the difficulties that have arisen in Pretoria. We have interpreted them according to the strict letter of the law. One special point has arisen in regard to this—namely, that it is laid down that lampholders shall be in accordance with the British Engineering Standards Specification. I do not know whether the British Standard Specification has been altered, but a revision is under consideration, although it has not yet appeared. Owing to this strict interpretation, I in Pretoria have forbidden the use of the Edison screw-holder and I am adhering to the old British specification. I would like to know what other members have to say in regard to the matter.

The PRESIDENT: Prior to and during the short time we have had the model regulations recommended by the Association in use, we have had this matter before us, and in my opinion we should not forbid the use of Edison screw holders, for it is very questionable if they are not better than the British standard specification holder. I think they are. In the use of small appliances, such as kettles and irons, the

Edison holder is, in my opinion, a valuable asset, as it will carry a load of 600 watts satisfactorily, which is not possible with most bayonet holders. My predecessors have always used Edison holders in street lamps and for other similar purposes, but this was more or less a method for preventing the theft of street lamps. I propose to recommend the amendment of the Cape Town Wiring Regulations to permit or even enforce the use of Edison type of holder for private consumers.

Mr. W. A. BLATCHFORD: I may mention that I have tried a Lesco holder with a spiral spring. I would like to have the opinion of other members in regard to this piece of apparatus.

Mr. MANN (Worcester): From my experience the "Lesco" holder is more satisfactory than the bayonet type and that the former offers a successful alternative to the bayonet holder. We have often had trouble with the ordinary holder and, generally speaking, people, when putting in plug circuits, have found that the "Lesco" has been satisfactory. There are one or two points in the address which interest me particularly. The first is the development of further load by the pushing of current sales, and this is very well put in the first paragraph of the President's address. In regard to local wiring, the contractor in the small town is incapable of pushing sales intelligently, and, therefore, everything the engineer can do in this way is all that can be done. Then there is also the question of show rooms and co-operation between other members. It seems to me it might reasonably be asked of this Association to co-ordinate and distribute useful propaganda dealing with the results obtained and the experience with apparatus which are in use. You mention that the ignorance of facts forms the principal difficulty in obtaining new consumers. That is largely so, and the engineer in a small dorp is hard put to find any facts to overcome this. Therefore, anything that can be passed on by larger centres who are using apparatus and are able to publish results would be very welcome indeed. We find that the chief objection at the present time is the cost of apparatus or the uncertainty of the cost when in use. Bigger centres could carry on experiments—and they have done so—and could give specimen municipal accounts showing what is in use, so that we can tell with a reasonable degree of accuracy what a particular thing would cost or what it could do. These are lines, I suggest, which might be co-ordinated from the various centres to the smaller towns.

Mr. JNO. ROBERTS: If the Edison lamp holder really is better than the bayonet holder, it would be advisable to discontinue the use of the latter, but that is a difficult question to settle. One of the greatest difficulties which we have to meet is found in the different types of plugs, etc., which are already in use. If we could get a standard plug, a user could depend upon it fitting into the socket; this would give a great impetus to the use of small heating apparatus. The present system gives a miserable method of connection and frequently leads to trouble. It is these small difficulties in regard to the connectors with electrical heating devices that cause more dissatisfaction than anything else. We ourselves do not appreciate these small troubles, and if there is trouble at a lamp holder we get our pocket knives and fix it up, but to the lady using it, if there is a bad connection, as far as she is concerned, the whole apparatus is out of order. I myself would not encourage steps being taken to encourage the use of kettles and irons from lamp holders. It is a quick and easy way of doing it—slovenly ways are so easy. There can be no doubt about that, if it were found that kettles and irons could be run from lamp holders, you would also find heavier utensils being used from them, thereby overloading the flexible conductor. In Durban, as far as possible, we induce consumers to fix a plug in the dining-room and two or three in the kitchen, and I am certain it is the right policy in the end. I am sorry I cannot support any idea of departing from the good old English bayonet lamp holders.

Mr. JAGGER (Ladysmith): I think the suggestion in regard to using screw holders a good one. I find that in our little municipality many public lamps are stolen, and if we introduce the screw holder it would eliminate the possibility of stealing the lamps for private use. At the same time, I must support Mr. Roberts in advocating the fixing of extra plugs wherever possible. I have introduced a system of wiring plugs at one-half the actual cost, the municipality bearing the other half so as to encourage the use of 2-point plugs.

The PRESIDENT: In our standard regulations and by-laws it is provided that no heating or electrical appliance is allowed to be connected to lamp holders. I would like to know what the Johannesburg Municipality thinks about the screw holder. In view of the fact that the latter is universally used on the Continent and America, the "good old" British device is not necessarily considered to be the best.

Mr. STOKES (Johannesburg): There are almost as many screw holders in Johannesburg as bayonet holders, but I would not like to express a general opinion.

Councillor Major KING: I am not an electrical engineer, but in Johannesburg we are not trying to push electricity because we cannot supply the demand at the present time. We are handicapped for the want of a larger power station, and the question of augmenting the supply at the power station is now being considered by the Council. We hope to pass a scheme in the near future, because there is a great demand for electricity both in the suburbs, which are extending every day, and by manufacturers who are calling for electrical power and which we cannot supply. In some cases we have had to allow manufacturers to obtain power direct from the Victoria Falls Power Company. Therefore, a proposition has been placed before the Town Council by the Committee on the subject, which will shortly be considered—a proposition to enter into a contract with the Victoria Falls Power Company for a supply of electrical power for five years. This will give us time to go into the whole matter of an adequate power station for Johannesburg, and that we hope to put through. Not being a technical man, I have come here to listen and not to speak, but I was rather interested in the remarks of Mr. Roberts and in your Presidential address in regard to cooking by electricity. I would like to hear later on some discussion as to whether cooking by coal gas is not much cheaper and a more popular way than by electricity. From what I have heard, I understand that cooking by electricity is much more expensive than with gas. That is another matter which is at present before the Johannesburg Town Council. The demand for coal gas is increasing every day. It is pointed out to us that the coal gas system is not only cheaper than electricity, but that it is more popular and people understand it better, and they also point out the advantages of having a clean house through not having dust and so on. I would like to hear you discussing which is the cheaper and the better system for the working man or to the man where every penny counts. They are a working community in Johannesburg; it is a large population and we want to cater for the wants of the population. I would like to hear that aspect discussed. I have to thank you, Mr. President, for your presidential address, in which I was very interested.

Mr. Councillor E. ERICSEN: I take this opportunity of congratulating you on being elected President of such an important body as the Municipal Electrical Engineers' Association of South Africa, and I must also congratulate the Association on obtaining the services of such an able engineer as President. I desire further to congratulate the President on the very able address which he has delivered to this meeting. It is full of important subjects. I feel sure it will take the whole of to-day and to-morrow to discuss it. There is one important point in connection with lamp holders. I agree to a certain extent in the Edison screw holder, but not for commercial purposes; for street lighting there is nothing to beat it. In connection with ordinary household purposes, I agree with Mr. Roberts, who has had experience of them. In Kimberley the ordinary bayonet holder is universally used, and it is found that consumers will connect apparatus consuming 1,000 to 1,500 watts to these, with the natural consequences known to you all. We should standardise the two-point plug, and I feel sure that, if regulations were framed to that effect, you will, with standard wiring, convert householders, and the number of consumers would increase enormously. I have pleasure in supporting Mr. Roberts in advocating the ordinary bayonet holder and to standardise the two-point plug. In Great Britain and the Dominions they have the standard bayonet holder, and it would be a great hardship on the proprietors of buildings who have installed the bayonet holder to have to instal the Edison screw holder. The bayonet holder is so universally in use.

Mr. Councillor A. LINTON: I desire to offer you my hearty thanks for the able address you have given us this morning. I was interested to hear what you had to say in regard to your free and assisted wiring scheme. It would appear to me to be an unpayable proposition. It is impossible for the user of a four-point system to use anything up to 4s. 6d. worth of light per point per month, but the advantage from the business point of view is obvious. I would like to know what limitations are placed on it. Is the number of points to be installed in any one place limited in number? Further, is it confined to domestic users only, and, thirdly, whether there were applications from householders since the system has been installed, other than those under the assisted wiring scheme? The other point that struck me was the clause in the Electricity Act where the onus of proving negligence in an action for damages is not placed upon the one

suing for damages. When the Electricity Bill was under consideration, that point struck me as being unjust; it was placing municipal electric concerns outside the common law, but on further reflection I think it was not so unjust after all. After all, if any person suffers injury, the onus of proving negligence on the part of the Corporation would be a very difficult one, and it is fair and just for the onus of proving negligence to be placed on the person claiming damages. I mention that point because it controverts the view you expressed. At Port Elizabeth our demand is so heavy that we cannot supply consumers, but still we are taking time by the forelock. We have a 3,000 kilowatt set and we are calling for tenders for another 3,000 kilowatt set within a fortnight or three weeks. I support the vote of thanks to the President.

Dr. HAMLIN (Stellenbosch): I wish to congratulate you, Mr. President, on your election to the leadership of this Association and to thank you for your interesting and instructive address. As far as Stellenbosch is concerned, there is a clause in our regulations which gives the engineer power to allow Edison screw holders. I understand from the Railway Authorities that they will not allow anything else but Edison holders on the two stations at Stellenbosch. I have also allowed this class of holder for the University, in order to prevent students taking the lamps for use in their rooms. Whilst realising, Mr. President, that super-stations are the ideal, although Simonstown is only seven miles from the Cape Town boundary, the cost per unit delivered at Simonstown from Cape Town was 1s. 3d. per unit. I had, therefore, to advise my clients to buy direct from the Admiralty. I think a longer view could have been taken, such as was taken by Mr. Long in 1913, when the Cape Town Corporation made its offer to Stellenbosch—an offer my Council has never ceased to regret. I wish to support Mr. Mann in his suggestion that there should be a circularisation of views between members, for the engineers in the smaller towns would then be able to keep in touch with matters and in return would be able to give their views on the subjects from a small town's standpoint.

The PRESIDENT: I question if Mr. Long would have been able to have made a better offer to Simonstown in 1920/1 (at the time of the peak of high costs of materials) than was made—viz., £7 10s. per kilowatt yearly maximum demand, plus 2½d. per kilowatt hour consumed. Taking into

consideration the fact that the point of supply was to be 18 miles from the Generating Station and that the consumption would be less than 100,000 units per annum, with very little diversity of the load, I think it will be conceded that the proposed charges were not excessive.

Mr. Councillor T. C. SHEARER (Durban): I have listened with great pleasure to your address. With regard to the issue of certificates or licences to electricians, we in Durban realise it is a step in the right direction. A large number of houses are being built in Durban and we are endeavouring to protect people from amateurs. In regard to free wiring, I may say that in Durban we go a step further and put in free cables. We put in cables to factories and in three years' time they are paid for by the amount of current consumed.

Mr. WOLLEY-DOD: With regard to this question of free wiring, I am not suggesting for a moment the possibility of there being any dishonest person in Cape Town, but I have heard of dishonest people in the world, and I should like to know whether you have any protection against a man who builds a house, gets free wiring and undertakes to pay during the year under the system you have outlined, and within a week or two after the agreement has been entered into sells the house. What recourse have you?

The PRESIDENT: The owner must agree to have the wires put in and he must leave them there when he leaves, and we also provide for a guarantor to pay. First, we have the application from the tenant, which is guaranteed by the landlord, and he in turn agrees to allow the house to be wired and the tenant agrees to leave the wires in the house.

Mr. WOLLEY-DOD: If the landlord sells the house, you have no recourse against the purchaser. The man who purchases the house has no onus to pay.

The PRESIDENT: The system has been in operation for some time now, and that point has never cropped up. In any case, it is well worth the risk, and all I can say is that it is a very popular way of increasing your number of lighting consumers.

Before the meeting adjourned the President explained certain unavoidable alterations to the programme which had been made.

In the afternoon the members and delegates visited Messrs. Jagger's Tannery and Boot Factory, Messrs. Buchanan's Factory, and the South African Woollen Mills.

TUESDAY, 21st NOVEMBER, 1922.

The Convention resumed its proceedings at 9.30 a.m., the President (Mr. G. H. Swingler) being in the chair.

Members Present: The President (G. H. Swingler), T. P. Ashley, L. F. Bickell, W. H. Blatchford, R. D. Coulthard, T. C. Wolley-Dod, H. A. Eastman, P. Finlayson, R. W. Fletcher, E. J. Hamlin, T. Jagger, R. Macaulay, F. C. D. Mann, M. McDonough, T. Millar, J. Roberts, F. T. Stokes, T. Sutcliffe.

Delegates Present: Councillors T. Ericsen, A. Linton, R. M. Scholtz, T. C. Shearer, H. Solomon.

At the request of the Chairman, Mr. JNO. ROBERTS read his paper, "Current for Electric Heating."

SUPPLY OF CURRENT FOR ELECTRIC HEATING FROM CENTRAL STATIONS.

Introductory.

* The object of this paper is to endeavour to show that the supply of electricity for domestic purposes, including heating, to every consumer is a practical proposition. There is a disposition among certain Electric Supply Engineers to discourage attempts to give electric service in the home. It is feared that the large quantities of current needed cannot be supplied at rates low enough to encourage people to adopt electric stoves. It is hoped to demonstrate in this paper that electricity can be supplied to compete with any other form of heating, including gas.

Synopsis of the Paper.

The present position of electrical development in South Africa is first reviewed.

Reasons why electric heating should be used extensively in this country are given.

The general advantages of electric heating are pointed out. The reasons of the slow progress of electric heating are then enumerated.

Then follow remarks on the great development of the use of gas for heating, though not in South Africa.

The efficiency of gas and electric heating on a calorific basis is then compared.

The cost of the necessary electric plant to supply every domestic consumer with current for heating is then gone into. The cost of the distribution is worked out for the case of an actual Durban residential area of about 63 acres, comprising 234 consumers.

The maximum demand and consumption of current was calculated from recording ammeter charts of 12 firemen's quarters, in which electric cooking has been exclusively used for some years.

The system of transmitting and distributing the heavy load demanded is fully described.

The cost, including capital charges, of supplying 15,000 consumers with electric heating current is then determined, together with the revenue derived at present rates for current in Durban.

The capital cost is found to be £1,080,000.

Revenue is	£237,800
Cost of production	£215,700
Profit	£22,000

A number of charts taken from a recording ammeter of actual current consumptions are given, also charts showing the system of transmission and distribution, as well as photographs of various forms of sub-stations.

Review of the Electrical Position in South Africa.

Looking over the position which electrical development has attained in South Africa, we notice the following outstanding facts:—

1. That there has been very little competition from gas. There are only three or four undertakings supplying gas, the principal being in Cape Town and Port Elizabeth (company owned) and in Johannesburg (owned by the Municipality), and these appear to show very little growth.
2. Practically every town in the Union, down to quite small communities, has its own Municipal electrical undertaking, there being only one or two cases of company-owned plants, and electric lighting is practically universal.
3. All the large towns operate more or less extensive electric tramway systems.
4. The larger towns also cater energetically for electric power, and tariffs for current are low enough to encourage the extensive use of electricity in all classes of industrial establishments.
5. Electric power is employed on a very large scale on the mines of the Witwatersrand, the current being supplied by a private Company, and electricity is also used freely by other mines and isolated industrial concerns in the Union operating their own generating plants.
6. A commencement is being made by the Government on the electrification of the South African railways.
7. It may be stated that all sections of the South African public are alive to the advantages of the use of electricity and the development of the country will go hand in hand with the growth of the electrical industry.
8. There is, however, one electrical field which is scarcely touched, and that concerns the employment of electricity in the home for purposes other than lighting.

It is most important to try and arrive at the reason for the fact that domestic electric appliances are so backward in coming into use in a country where electricity is otherwise so popular, and to see whether the obstacles which must be present, whatever they may be, cannot be overcome. There are many reasons why, indeed, electric heating should be in more common use in South Africa than elsewhere:

1. There is very little competition from gas. In most other countries domestic heating is catered for by the gas undertakings, and in England tremendous strides have been made in recent years.
2. The South African climate is such that there is no need for fires, apart from cooking, for a great part of the year. To heat economically a house by electricity is acknowledged to be difficult.
3. The price of coal for domestic purposes is somewhat high.
4. The servant question is troublesome and electric cooking would render the poorer housewife largely independent of outside help for labour in connection with the kitchen fire.
5. The hot climate makes cooking by the usual kitchen fire a most trying and arduous task.

Furthermore, electric heat has many advantages over heat derived in other ways, as is well known, though these advantages are not generally fully appreciated, and these advantages are by no means confined to heating on a small scale at moderate temperatures such as is all that is required for domestic purposes.

In all fields of heating electricity is certainly the best, if not the cheapest.

1. For the heating of muffles and for treating the most refractory substances, such as is required by the assayer and chemist, electric furnaces give the best results and are most easily worked.
2. For the heating of incubators electric heat is more easily controlled than by means of oil lamps, and for a time-switch the lowering of the temperature at the proper intervals is automatically performed, thus eliminating all labour, except the turning of the eggs.
3. For domestic use, electricity is by far the best, but this branch of the subject will be dealt with at greater length specially.
4. For bakers' ovens and for large Japanning Stoves, electricity has proved itself to be superior to the older methods, as well as cheaper, if current is obtainable at reasonable rates.
5. For such heavy work as steel furnaces, experience in Sheffield during the late war proved that a better and more uniform product could be obtained than in other furnaces, and the speed with which new electric methods were adopted went far to solve the difficulties of turning out the enormous amount of high quality steel needed for all kinds of munitions of war.

Some of the reasons why electricity is so superior to other forms of heat may be touched upon:—

1. **Cleanliness.**—In most heating processes cleanliness is of importance, if not absolutely essential. It is unnecessary to enlarge on the point in domestic heating and cooking. It is often difficult to prevent

contamination of food with a smoky fire; the room itself gets dirty with the coal and ashes, and the cook is bound to soil her hands in making up and cleaning the fire.

2. **Ease of Control of the Temperature.**—Most forms of heating have to be carried out at a certain temperature, which must only vary with narrow limits if the best results are to be obtained. This applies to roasting of meats and to cooking of pastry and bread in particular. The electric oven is often fitted with a thermometer, so that perfect regulation can be obtained by switching on and off part of the heating elements. This perfection of temperature regulation is advantageous not only in domestic heating, but also in industrial heating processes such as bread and biscuit bakeries, and in japanning ovens.

3. **Efficiency.**—The high efficiency of electric heat, especially of self-contained utensils such as kettles and of the electric oven, is one of its most valuable features; not only is all the heat utilized on the work, but very little is radiated so as to cause an unpleasant rise of temperature in the vicinity. An electric stove and an ice chest may stand side by side in the kitchen without serious detriment to the duties of either.

4. **Freedom in Arrangement of Appliances and Buildings.**—When heating is carried out by means of a fire, the location and general disposition of the oven or other appliances are greatly tied down to suit the conditions which have to be met where coal and ashes have to be handled.

Electric cooking and heating in the home permits of quite radical alterations in the design of the home. The kitchen is bound almost to be an offensive place as long as coal has to be brought in and ashes taken away. The coal cellar or coal bin, moreover, has to be specially accommodated so as not to create a nuisance or an eyesore. A separate pantry where food and crockery are stored has to be provided. One room, however, is all that is required when electricity is used, and so long as precautions are taken to minimise the smell of cooking reaching the living rooms, the kitchen need not be particularly screened and hidden. It can, therefore, be placed nearer the dining-room than can often be otherwise arranged, and when architects become accustomed to the new freedom in design brought about by electricity in the kitchen, we shall have great improvements introduced into domestic architecture.

Electric heat in the factory can be similarly applied to suit manufacturing conditions to get a better general lay out of the plant where electricity is employed.

It is worth while to enlarge on this point, as it applies to bread and biscuit bakeries, etc., particularly. Bread baking should be carried out with scrupulous cleanliness. Most modern bakers use electricity for motive power, and the engine and boiler room are thus eliminated, but there still remains the coal-fired oven, and this introduces a most undesirable source of possible defilement. Further, the business always entails delivery work on a more or less extensive scale, and a common adjunct is therefore a large stable and wagon shed, constituting another danger of pollution and certainly obviating the spotless cleanliness which should characterize the precincts as well as the interior of the premises where the staff of life is made. Electric ovens would be found to be profitable if current could be bought at $\frac{1}{2}$ d. per unit, and electric

delivery vans are cheaper than other forms of traction with current at even higher figures, as witness the number of such vehicles in use by the business firms of Cape Town. The saving of space by the elimination of the stable, the coal storage and furnaces, is alone a great consideration where ground is valuable, and I am convinced that a large bakery would not only turn out a highly superior product if electric throughout, but would work at the minimum cost.

5. **Absence of Fire Risk.**—Safety from the point of view of fire is too well known in the case of electric heating to need more than the briefest mention. The use of an electric kettle, for instance, avoids the remotest danger of the tragic happening in Durban a few days ago when a young girl lost her life in using a methylated spirit stove when making tea in an office building. It would be, in fact, somewhat difficult to cause a fire with the ordinary heating utensils. They are essentially safe, for if left on circuit inadvertently, a short will generally occur and blow the fuse, cutting off the current.

6. **Adaptability to Special Purposes.**—Electricity can be employed by application in a special way to special machines to perform special tasks, of which one or two will be mentioned.

Rivet Heating.—At the expenditure of quite a small amount of power, rivets can be heated better by electric heat and quicker, too, than by the usual coke breeze fire.

Die Heating.—As an illustration of the great convenience of electricity, may be mentioned the heating of dies for brick-making machinery. In a local (Durban) brick works, which is entirely electric driven, a small boiler had at first to be retained after the steam engines were superseded, to heat the dies of the brick presses. An electric heating element was designed for the work and an expensive steam boiler and piping system finally cleared out. The bill for heating was infinitesimal.

Heating of Steel Tyres.—Anyone who has had experience of the method commonly employed in tramway shops of heating tyres by means of paraffin burners must have realised how expensive and objectionable it is from every point of view. A new method has recently been devised of heating the tyres by induction, on the principle of one form of steel furnace of which there is an example on the Rand. The writer has seen this furnace, now in use some years, and can testify to its, at any rate, apparent satisfaction, for it was very well spoken of by its users.

Electric Welding.—This branch of heating is introduced simply to be mentioned, for it is a subject now with a literature of its own. Electric welding is undoubtedly the coming method of uniting steel parts, being likely to supersede all other forms of welding, as well as a good deal of attachment by other methods such as rivetting. A few welding machines are now in use in Durban for spot welding and for the making of tin containers for various materials, and when we read of ocean-going vessels being electrically welded throughout, we can imagine the vast range of applications lying between two such diverse operations.

Electric heat, in fact, is proving itself to be the best, just as electric light first established itself as the cleanest, safest, most efficient, most easily adapted and controlled of all illuminants. And just as electric

power proved itself likewise to be cleanest, safest and most adaptable and controllable form of power, just as electric lighting commenced in a small way in the home and eventually was applied to the most powerful beams of the lighthouses, and just as the electric motor won its way from the small workshop till it now drives the battleship and the railway train, so electric heat will just as surely win its way to the premier place as the universal heating agent. That there are difficulties to be overcome is undoubted, but that they will be overcome is as certain.

With so many advantages of electric heating already demonstrated, it is surprising to observe the comparatively slow progress made, and it is necessary to go into the reasons for this. They may be enumerated as follows:—

1. Inefficiency of Electricity Production Thermo-dynamically.—

Although the conversion of electricity into heat is easily done at very high efficiency, its actual production from coal is attended by great waste, being in the very best stations not less than 80 per cent. A pound of good coal burnt in a domestic fire is capable of yielding 14,000 B.T.U.'s, but in the most economical power house it takes 1½ lbs. of coal to make a unit of current, which has a heating value of only 3,400 B.T.U.'s if used at 100 per cent. efficiency. This disadvantage is greatly counterbalanced, however, as is referred to later.

2. Imperfections of Electric Utensils.—A temporary brake on progress has been the imperfect utensils turned out in the early stages, but defects are being rapidly overcome.

3. Energetic Competition by the Gas Concerns.—The complete defeat of gas in the field of lighting has driven the gas undertakings to introduce great improvements in gas heaters of all kinds, and the great bulk of the business consequently remains in their hands. Electric competition in lighting has been, in fact, a blessing in disguise. For every cubic foot loss in sales for lighting, ten have been gained in sales for heating. Stoves are sold cheaply or hired out at a nominal cost. So far as South Africa is concerned, however, this reason for the backwardness of electric heating does not apply.

4. Price of Current.—It is undoubtedly the fact that many supply authorities are not selling current low enough to make it pay a customer to adopt electricity for heating, and it is hoped that this paper will demonstrate that this obstacle should be removed. It has to be admitted, however, that no reference is made herein to the heating of dwellings, and in cold climates the problem is a different one, but it is worthy of remark that electric hot water radiators are found to be a commercial success in at least one large London theatre, worked with current from the public supply mains.

Gas.—The author would be the last to refuse credit for, or to deprecate the tremendous progress which has been made in the last fifty years, and particularly in the last twenty years, in the application of gas to heating. It is stated in a recent text book on the subject that in the year 1916 the total amount of coal carbonized in gas works in the United Kingdom was 17.5 million tons. If only half of the amount of gas produced was used for heating, the gas heating industry was at that time tremendous. The amount of gas available per ton of coal is about 12,000 cubic feet, each cubic foot has a calorific value of about 550 B.T.U.

The total B.T.U.'s sold is therefore $17.5 \times 12 \times 55 \times 10^{10}$. Now the heating value of one unit of electricity is 3,400 B.T.U.'s and the equivalent number of units of current which would have to be produced to give the same amount of heat would be $\frac{17.5 \times 12 \times 55 \times 10^{10}}{3.4} = 3,400 \times 10^7$

or the tremendous total of 34,000 million kilowatt hours. Of course, a large reducing factor would have to be applied on account of the great superiority in efficiency of electricity. It would probably be quite safe to divide the figure by 4, but even then we get a very large figure indeed.

Of course, it is no use blinking the fact that, though the conversion of electricity to heat can be performed if desired at an efficiency approaching 100 per cent., the production of the current from coal, as previously stated, is attended by great waste, and though large improvements are steadily being made, the best figure that has so far been realised is not better than about 20 per cent. A power station burns, say, $1\frac{1}{2}$ lbs. of coal at 13,000 B.T.U.'s, or expends, say, 19,500 B.T.U.'s to produce one kilowatt hour, equal to 3,400 B.T.U.'s. That is the gasman's best card and a very good card it is, but it can be countered, for unless the price of gas is brought down very much below what is being charged in South Africa, electricity can make quite a respectable showing even on a B.T.U. basis, as will be seen by the following:—

In Durban, before the war, current was sold to the householder (after a certain minimum had been paid for) at a $\frac{1}{2}$ d. per unit, the heat value being 3,400 B.T.U.'s. Gas with a calorific value of 450 B.T.U.'s (a common figure) might possibly be sold at 5s. per 1,000 cubic feet. This would be equivalent to 3,700 B.T.U.'s for one halfpenny, and considering the vastly greater efficiency of the electric kettle and the electric stove over the gas ring and the gas stove, the consumer gets much more heat from electric service than from gas for the same money.

There is no doubt that the secret of the success of the electric method is the efficiency of utensils. Comparisons with the ordinary coal fire show an extraordinary superiority in efficiency by the electric method. A moderate-sized family can do quite well (including hot water supply) on 500 units per month, theoretically equal to 1.7 million B.T.U.'s. The same family would have to use at least half a ton of coal to do the same work, and reckoning a calorific value of 12,000 B.T.U.'s per lb., the available heat units are 12 millions, or six times as many. It follows, therefore, that over 80 per cent. of the coal is rejected up the chimney or radiated into the room or thrown out unburnt.

It is outside the scope of this paper to enter into exhaustive comparisons between electric heat and gas. The object of this cursory reference to the subject is just to hearten up those electrical men who may be discouraged by the tremendous hold the gas industry has on the heating business, and we may not always have such harmless competitors as the South African gas concerns are at present.

Our arguments are—

1. The superiority of electricity in cleanliness, safety, efficiency and simplicity.
2. That the efficiency of electric production is steadily on the increase and that power station performances are improving.

3. That, as electric production is co-ordinated and unified on a national basis, water powers will become available and inferior coal deposits brought into use, thus steadily reducing costs.

All the foregoing is introductory to the main object of this paper, being to show that electric heating is fundamentally sound, and that we are acting in the interests of consumers in pushing it, and it now remains to show that the business pays us—the people supplying the current.

Electric Cooking to Every Consumer.—There are those, even among electric supply engineers, who are of the opinion that no electricity undertaking dare undertake to seriously cater for electric heating on a really large scale, as for instance if every domestic customer had an electric stove, but unless we are really prepared to do this, then the business should be left alone or confined to the supply of current to kettles and irons. But those who hold these views must be very careful not to introduce such low tariffs as will make it at all reasonably possible for people to do much cooking by electricity, because after the use of the small utensils, others such as grills and even small ovens begin to make their appearance or, to speak more correctly, show signs of their presence, and a taste will be cultivated which it will be difficult to check or even to refuse to encourage.

With the electric cooking business, therefore, it must be all or none, and I hope to show in this paper that it is possible to supply profitably in South Africa at such a low figure as, say, 1d. per unit, even if every domestic customer installed his stove.

It is useless, of course, to attempt to tackle the question without re-casting entirely our present ideas of the distribution problem. The total consumption of the average domestic customer, as well as his maximum demand, are of an entirely different order to what they are at present, especially since the advent of the half watt lamp. Many distribution systems which are quite suitable for electric lighting service are useless commercially for electric heating. The currents to be supplied at the usual pressures are such as to so overload the network and cause intolerable drop of pressure. It seems to the writer that the only solution is by the use of alternating current with a transmission pressure in the neighbourhood of 6,000 volts.

In order to reduce the subject from the general to the particular, I have taken an actual Durban residential district and gone into the figures of capital cost as well as cost of maintenance on the basis of every consumer using electricity for all his cooking, and a full treatment requires consideration of the following points:—

1. Maximum demand per consumer.
2. Total consumption per consumer.
3. Cost of generating plant.
4. Cost of transmission plant.
5. Cost of transforming plant.
6. Cost of distribution and service connections.
7. Cost of production of current.

The district which has been taken as a typical case has the following particulars:—

Total area	63 acres.
No. of consumers	234.
Mileage of roads	5.3 miles.
Average frontage of properties	168 feet.
Average area of property ..	.275 acres.

The district is, of course, now actually supplied with current, every resident being a consumer, and is of the middle class of Durban, the average valuation of the houses, not including the land, being £850.

Estimate of Maximum Demand and Consumption of Current.

The figure of maximum load which it is necessary to arrive at before the cost of the generating plant, as well as the distribution plant, can be determined, is, of course, very important. Electric cooking is not yet adopted by consumers on such a scale as will allow of this figure being arrived at from observation of the load on the mains, and, of course, the actual demand for current calculated from the heating appliances installed is valueless, as no account is taken of the diversity factor of the consumers' own appliances, nor what is more important, on the diversity factor of a large group of consumers.

Fortunately, the Town Council has installed complete cooking outfits in a block of buildings used as firemen's quarters adjoining the fire station. Twelve families live in the block and recording ammeter charts have been taken extending over a long enough period and total watt-hours measured, so that the maximum load per consumer, total consumption, and load factor of the supply is known. The appliances installed are as follows:—

One oven	2,000 watts
Two hot plates	1,800 "
One water heater	1,200 "
Total	5,000 "

After extended observations, the following data were obtained:—

Consumption of Current.

Average monthly consumption of all the flats taken over six months	287 units.
Lowest average consumption of a flat over six months ..	188 "
Highest average consumption of a flat over six months ..	410 "

Maximum Demand.

Total maximum load on Sundays 130 amps on 200 volts..	36 K.W.
Total maximum load on week-days, 92 ditto ..	18.4 "
Average maximum load per consumer on Sundays 11 ditto ..	2.2 "
Ditto ditto week-days 8 ditto ..	1.6 "

From the above observations the necessary information can be deduced to base calculations for our typical district.

It was judged that the average income and spending power in the typical district was rather higher than in the flats in which the observations were made. But, on the other hand, it was judged that the diversity factor in 234 dwellings would be much better than in 12 dwellings whose occupants live under very similar conditions. The diversity factor, I am convinced, is very much better in electric cooking loads than at first sight would be thought. Even in the twelve flats the maximum load on Sundays (26.4 K.W.), when every stove and utensil is in use, is less than half the total capacity installed (60 K.W.). Though it is an ingrained custom of the Englishman to eat heartily of hot food on Sunday about mid-day, everyone by no means sits down at one o'clock precisely, and the meal spreads out from 12.30 to 2.30, and the use of cooking utensils spreads out accordingly. Moreover, some people go out the whole day on Sunday and some eat cold food, and I have therefore assumed that the maximum load of the 234 houses, though better class, will not be greater on the average than in the flats, but to be on the safe side 10 per cent. increase has been allowed.

Moreover, the recording ammeter showed that the period of the maximum demand on Sunday was extremely brief, some days apparently for not more than a few minutes, and certainly never for more than half an hour, and it was assumed that transformers, mains and meters would all stand the brief overload, especially considering that the load from one o'clock till next morning is very light and gives all plant a good chance to cool down. It was decided, therefore, to calculate the transmission and distribution system on the week-day maximum, namely, 1.6 kilowatts and allowing an extra ten per cent. (to be on the safe side), say, 1.8 kilowatts, or 9 amperes at 200 volts.

Incidentally, it may be remarked that this maximum is about four to five times what would be the maximum of the district on a purely lighting supply. So far as the maximum load on the generating plant is concerned, it is obviously necessary to take note of the week-day maximum only, as on Sundays there is plenty of spare plant available owing to absence of industrial loads on the station.

Load Factor.—The load factor, taking into account the Sunday maximum load, is 16 per cent., but taking only the week-day maximum load, is 23 per cent. Remembering that we are assuming the distribution plant will carry the Sunday overload safely and that there is no need to provide for the generating plant on Sunday, it is quite fair to take the higher figure and, assuming a greater diversity in a large district, it will be correct to reckon on a still better load factor than in the twelve flats. Over the whole town the load factor will be still better.

System of Generation and Supply of Current.—It is necessary in our calculations of plant and mains to assume a certain method of generation of current and also of transmission and distribution. These calculations of the requirements will be based on the Durban system, because in most respects it is standard and, moreover, seems now to be well adapted to the conditions, though it has been slowly evolved in a somewhat round-about way.

It might first of all be explained that the system was first designed single phase, both generation and distribution, 2,500 volts to 400/200 volts. Generation is now being changed over to the more standard 6,600 volts 3-phase system, but the old system of 2,500 volt concentric high tension mains has been retained on account of their great extent. Conversion

from 6,600 volts 3-phase to 2,500 volts single phase is carried out by transforming from 3-phase to 2-phase and connecting the single phase feeders to one phase of the two phases, some districts being on one of the phases and the remaining districts on the other phase. At first the three to two phase transformation was done entirely at the Power Station, the single-phase feeders, which were originally fed from single-phase generators, being then connected to the transformers. But a further step has now been made and 6,600-volt three-phase feeders are led out to main sub-stations at which 3 to 2-phase transformers are installed. From these sub-stations the single-phase 2,500-volt mains lead to the local sub-stations or transformer boxes and low tension distribution is carried out on the 3-wire 400/200-volt system. It will probably be agreed that the system is economical in copper. A point which, however, might be criticised is the double transformation, and in a new system a completely 3-phase system of generation and distribution might be better, but it is considered that there are advantages in having a somewhat lower pressure than 6,600 volts at the distribution transformers, principally from the point of view of the switchgear, as will be explained later on. The various parts of the plant as generally outlined above will now be described.

Generating Plant.—No time need be taken by describing this. It is what has now been developed as the standard steam generating machinery for moderate-sized stations. The boilers are fitted with chain grate stokers, superheaters and economisers for burning slack coal and deliver steam at 160 lbs. pressure and 100 to 150 degrees F. superheat. The largest turbines are 3,000 kilowatt, 3,000 revolutions condensing type, with alternators yielding 3-phase 50-cycle current at 6,600 volts. When some old plant is shut down and all the generation carried out by turbine alternators similar to the above, the coal consumption will be about 2½ lbs. per K.W. hour delivered to the mains.

Switchgear.—Each feeder, which is .1 sq. inch J-core, capable of transmitting 1,000 K.W., is controlled by the usual form of switchgear with adjustably delayed overload protection.

E.H.T. Feeders.—The main three-phase feeders are of the usual paper insulated type, earth shielded, lead sheathed, bitumen covered, armoured over all and laid direct in the ground. Only one feeder will be laid to each sub-station, but the sub-stations will be interlinked so that, in case of a main feeder failing, others can be brought to bear on emergency. There is no special form of protection proposed such as the Merz-Price. For residential conditions it is not considered that absolute continuity of service is sufficiently vital to warrant the complication and expense. It must, however, be borne in mind that the provision of cooking service renders continuity of the supply much more important in the day-time than before, and nearly all work on distributors must be done without cutting current off.

6,600-volt Three-phase to 2,500-volt Single-phase Transformation.—This is carried out in the main sub-station either in two banks of 500 K.W. capacity each, or preferably in one bank of two 500 K.W. transformers. At present plain overload switchgear is employed on the E.H.T. side with no switchgear on the 2,500-volt side, as so far only one bank is used in each sub-station. The ultimate arrangement of switchgear is not yet determined. Where only one bank of transformers is

installed, the idea of cutting out all switchgear except a plain oil switch on each side of the transformer is seriously considered, thus making a high tension main with its transformers a unit in itself so far as switching is concerned, and such an arrangement will appear to have great advantages, though arrangements are, of course, required for switching off a feeder and bringing a stand-by feeder into commission. The alternative is to protect a bank of transformers with Merz-Price gear, though a careful examination does not reveal many advantages. On no account, however, will the overload protection at the sub-station remain as a permanent feature.

A special form of sub-station for this 3 to 2-phase transformation has been designed, but something simpler and cheaper will probably be involved with outdoor transformers as a feature. These sub-stations will be about one-and-a-half miles apart, depending on the density of the load.

2,500-volt Single-phase System.—The single-phase H.T. feeders are of the concentric, paper-insulated, lead-covered and armoured type, laid direct in the ground. The usual size is 19/16, but they will probably be laid in future of size .075 to conform to standards, and will carry 200 kilowatts maximum. Ultimately, a still larger size may be employed. They are controlled in the sub-stations by switchgear of the drawout pedestal type common in industrial plants, with overload protection. The outer conductor of the mains being grounded, the switch itself is only single pole.

Distribution Transformers.—To provide the power wanted for cooking service, a large equipment of these transformers is essential on the system, and to economise in copper they must be placed quite close together. With 100 kilowatts as a standard size for the distributing transformer, about 60 consumers can be dealt with from each centre. In the typical district for which the cost is to be worked out there are five such centres, two, however, being on the edge of the area and partially used on the area adjoining. It is in the provision of the proper accommodation for these transforming facilities that difficulty has been experienced. Many forms of sub-station, box and pillar, have been used, and in the hope that our experience in Durban may be helpful and also in view of the importance of this feature of the system, the subject is herein dealt with at some length.

All kinds of housings for transformers and their switchgear have been used, from a brick building to a cast-iron box standing on the kerb line with switchgear in the base. It is often impossible, however, to secure a site for a building at except quite prohibitive expense in the way of land, and width of footpaths very often precludes the use of anything bigger than a switchpillar. Underground sub-stations are not satisfactory for many reasons, chiefly because of the difficulties of ventilation. In one or two cases in Durban transformers have been removed from the sub-stations below ground and placed above the sub-station under a specially constructed shelter to provide ventilation and surrounded by kerbing to form an island in the centre of the roadway, but this is only possible in fairly wide thoroughfares, which Durban fortunately possesses in the business districts. A plan coming into favour with us is to hire basement accommodation under large buildings, and the owners, if properly approached, generally fall in with reasonable request. One special

solution of the difficulty was to build a small wooden kiosk and place it on the kerb line of the footpath, in dimensions 5 ft. 0 in. long, 3 ft. 9 in. broad, 5 ft. 0 in. high, with the transformer, 50 K.W., in the centre, the high tension switchpanel at one end, and the low tension panel at the other. (See Fig. No. 3.) Some difficulty was encountered in getting permission for this from the Town Council and from property owners who were afraid of their windows being obscured from across the street. A similar sort of thing placed on an island in the centre of a wide roadway is a very high convenient and satisfactory solution of the curb line, large enough for two 50 K.W. transformers, and covered transformer sub-station question. (See Fig. No. 2.) In the residential parts, a different method was tried. A pit was built in the footpath on which chequer plating carried on a wrought-iron frame to stand reasonable weights. A pillar at each end of the pit was put up on the kerb line for the high and low tension switchgear. In order to avoid the risk of the pit getting flooded in time of very heavy rain, which is common in Durban, such a fall, for instance of five inches in 24 hours—a location on a slope is always selected and drainage provided into the gutter, perhaps a hundred or so feet away. The Berea slopes of the town give this facility quite commonly. Incidentally some ventilation takes place by means of this outlet, which becomes an inlet for fresh air. Some scores of these pits are now in use. What will be found to be the best in the end, if a standard can be reached, cannot even now be said. It is a matter for the ingenuity of those concerned in adaptations to local conditions. But assuming that alternating current will supersede direct current, at any rate, for suburban and residential supply, the transformer question will always offer opportunities for such ingenuity. I do not think that the American practice of putting the transformer overhead on poles would be appreciated here. The total number of transforming points in Durban is now 88.

Low Tension Distribution.—While the 6,600 volt and the 2,500 volt systems are almost entirely underground, distribution in the residential area is almost entirely overhead, except for short lengths of cable led from the low-tension distributing point to the overhead work. These short lengths are used to avoid the unsightly congestion of overhead wires at these places, and they also avoid overhead street crossings at important intersections. A short length is, of course, needed, in any case, to join up to the switchgear.

The switchgear on both high and low tension sides of the distribution transformers is of the simplest. On the high tension, switch fuses properly protected against accidental contact are used. They are placed in the transformer primary and in incoming and outgoing mains. They rarely operate as fuses, but are used rather as convenient connecting and disconnecting links. A bad fault causes the switchgear back at the main sub-station to work. More elaborate gear in switch boxes, such as oil switches, would require far larger housing and would greatly add to the present difficulties of finding accommodation. In practice the system is quite satisfactory and properly laid mains and good transformers rarely give trouble, though Durban does not boast of particularly great freedom from faults, for some of the mains have now been in use 25 years and cannot completely defy attacks by sewer main layers and other criminals of that kind. The switchgear on the low tension side is also reduced to the greatest simplicity, there being a switch fuse on the outer of the three wires. There is, however, a growing need of

ammeters in low-tension circuits, as loads are apt to grow unexpectedly on certain circuits and currents should be checked occasionally. It is contemplated to insert an ammeter shunt in each outgoing main with a convenient plug or clip so that one ammeter fixed in the box can be quickly plugged in. What would be still better and well worth a reasonable sum would be a maximum demand type of ammeter of which one type is already on the market, but is only made so far in small sizes.

Overhead Low-tension Mains.—There is no need to describe this, as it is the same as is seen throughout South Africa from Cape Town to Bulawayo. It may be well to mention, however, that the services are also carried overhead, unlike some systems in that respect. The sizes of the mains are uniform at 19/16 S.W.G. throughout. It is better not to try to economise by tapering the sizes, because as the load grows it is always found the best to deal with it by cutting in new transformer feeding points and the mains do not then have to be interfered with. One can never afford to put up an electric distributing system for a very long time ahead, because one is never certain how and when the load will grow, especially in South African towns. The aim must be, therefore, to lay down a scheme which is elastic and acceptable of easy extension and increase in demands upon it.

Capital Cost.—I now give an estimate of the cost of the necessary plant to supply the district.

Cost of generating plant: Maximum demand of 234 consumers at 1.8 K.W. per consumer=420 K.W. at £20 per K.W.	£8,400
Part cost of .1 sq. in. 6,600-volt feeder, 3,200 yards long, from Power Station to Main Sub-station	1,400
Part cost of 3-phase to 2-phase transforming sub-station of 1,000 K.W. capacity	1,625
3,000 yards of 2,500-volt cable from Main Sub-station to five transforming points	1,275
Cost of three transforming points and half cost of two others (transformers in pits with two switchpillars each)	1,400
Underground Low Tension three-core feeder cables to overhead work	324
Low tension distribution, 217 poles, insulators, mains and labour erecting	2,409
234 house services	945
	<hr/>
	£17,778

(This works out at £40 per kilowatt and cannot be said to be too low, especially in view of a decidedly drooping market.) The capital charges on this amount of plant, being 5 per cent. interest and 4 per cent. depreciation, will be 9 per cent., or £1,600 per annum.

The next information required will be cost of production of current. It is, of course, incorrect to make out a general case, such as the present one, on to-day's figures of cost. Fuel, labour, materials required in maintenance, though not by any means so high as they have been, are steadily falling, but we are not even yet down to a figure which is midway

between pre-war costs and the maximum figure which was reached. There are good grounds for thinking that we may approach a figure not higher than, say, 25 per cent. above pre-war prices.

There is also another and still more important point to be borne in mind, and that is, that when the object we are pursuing is realised—namely, universal electric heating—the output will be greatly increased and the cost of production consequently lowered. There are now about 10,000 consumers in Durban using an average of 800 units per annum. We are, however, contemplating an average consumption of at least 3,600 units by, say, 15,000 consumers, allowing for natural increase in number of connections. This is an increase of from 8,000,000 to 54,000,000 units per annum, and is going to bring down the cost of production at the switchboard to a figure not in excess of .30 pence per unit on a conservative basis, making the cost of the consumer's terminals, say, .4 pence per unit. Before the war, on an output half what it is to-day, the cost at the switchboard was in the region of .4 pence per unit.

The tariffs in use in Durban for charging for domestic supply are two in number at the consumer's option. The first is the straight flat rate of 5 pence per unit without any minimum charge, the second is the well-known Norwich system. The customer guarantees for the year a minimum monthly sum depending on the valuation of his house (without the land it stands on), and is then charged 3d. per unit for current.

Now, in the typical residential area on which the cost has been worked out of supplying heating current to every house, the average valuation is such that, if everyone was on the Norwich System, the revenue derived would be 12s. per month=£1,684 per annum.

We are now in a position to arrive at the financial result of giving a supply of current for heating at the terms now being offered in Durban and which are proved to be low enough to bring about a steady growth of current for cooking, and would make the business boom if a better supply of stoves was procurable.

Data.

Number of Domestic Consumers	...	...	...	15,000
Average Consumption per annum	...	...	...	3,600 units
Total Consumption	...	...	...	54,000,000 units
Average Maximum Load	...	...	...	1.8 KW.
Total Maximum Load	..	...	...	27,000 KW.
Cost of Plant per KW.	...	...	...	£40
Total Cost of Plant	...	...	...	£1,080,000
Cost of the Unit delivered	...	..	...	0.4d.
Units lost in transmission	...	...	...	15 per cent.

Expenditure.

Interest and depreciation, 9 per cent. on £1,080,000	.. ..	£97,200
Production—54 million units, plus 15 per cent., at 4d.	.. ..	103,500
Management and general expenses	.. .. .	15,000
		<hr/>
		£215,700

Revenue.

Minimum charge of 12s. per month to 15,000 consumers, including supply of 29 units at 5d.	£111,000
Supply of 3,600 units at ½d., less 348 units supplied as a minimum charge to each consumer, equals 48,780,000 units at ½d.	126,800
	<hr/>
	£237,800

It will be seen that there is a profit of £22,100 on the supply, but it must also be remembered that the system will have a great deal of other business, such as supply at much more remunerative rates to hotels and business premises, besides motive power customers, which will greatly swell the revenue account and which will go towards administration and other costs, only £15,000 of these latter costs being debited against the domestic supply department of the concern. Taking into account the extra profit which will accrue from these other supplies, I firmly believe that ½d. per unit will be a practicable figure at which to supply domestic demands. The point will, of course, be made that in the early stages production costs will be greater than when the business has developed. There are two replies to this:

1. Electric heating is a matter of steady growth and does not call for very large expenditure immediately, for it is presumed that plant can be added to and capacity of mains increased as the business develops.
2. It is necessary to take a long view and be prepared for perhaps a small loss while the demand is being cultivated.
3. High prices to cover all costs in the early stages of a concern will not cultivate the demand and the business will never grow, and this is probably something to do with the slow development and small output of South African electrical undertakings.

Effect of Low Tariffs on Demand for Current.—The following table, showing growth of the consumption among lighting customers in Durban of all classes (not domestic only), shows how demand responds to low charges, and this is in spite of the introduction of the half-watt lamp, which has come into very general use among business people. (With the low Durban charges it is doubtful, however, whether shopkeepers have not rather increased the amount of their lighting than cut down their use of electricity.)

Year.	Total Lighting Units at all rates.	No. of Consumers.	Average Units per Consumer per annum.
1907-1908	1,382,799	3,931	351
1909-1910	1,417,089	4,438	319
1913-1914	2,570,941	6,446	398
1917-1918	5,042,634	8,026	628
1920-1921	7,815,068	9,663	808

Of the above consumption the amount used at the lowest rates (now id. and entirely by domestic customers) has grown as indicated in the following:—

Year 1913/14	.. .. .	339,559 units.
" 1918/19	.. .. .	1,584,887 "
" 1920/21	.. .. .	3,362,746 "

In the first of the above two tables the reduction in the average consumption per consumer from 1907/8 to 1909/10 will be observed being accounted for partly by the great extension of the use of current among small domestic consumers, but also by the increasing use of the metal filament lamp. Shortly after that time the Norwich system of charging was introduced with the result shown.

Diagrams and Photographs.

Chart No. 1. Records of Current Consumption.—This chart is a reproduction of recording ammeter charts to a shorter horizontal scale of the total current consumption of the 12 firemen's quarters from which data were taken. The records of three weeks are given with corresponding days of the week super-imposed, to show what variations from week to week occur. It will be noticed that:

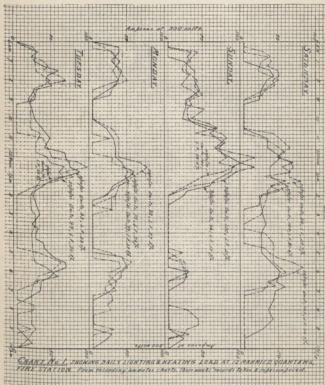
1. The load factor as apparent to the eye is good.
2. The correspondence between the three Sundays is good and the high maximum between 12 and 1 o'clock is conspicuous.
3. The maximum Sunday load is only on for a few minutes.
4. Tuesday is a heavy day largely due to ironing.
5. Saturday is also rather heavy due to preparatory week-end cooking.
6. The daily peak in the winter between 5 and 6 will overlap the lighting peak.

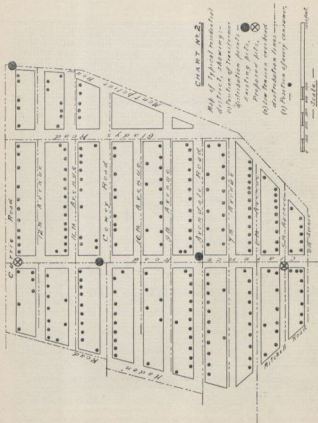
Chart No. 2. Map of Typical Residential District.—This map, drawn to scale, shows the arrangement of low tension circuits from the various transformer feeding points. Every consumer is also shown.

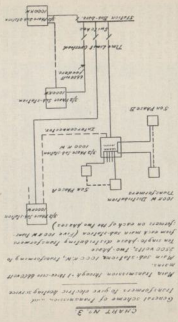
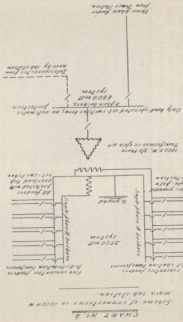
Chart No. 3. General Scheme of Transmission and Transformation.—This chart is a general outline of the scheme which is now being evolved in Durban for the purpose of applying the 6,600-volt generation system to the distribution of single-phase 200-volt current for electric heating.

Chart No. 4.—This is a connection diagram and layout for 1,000 K.W. main sub-station for transforming from 6,600-volt 3-phase to 2,500-volt two-phase for single-phase distribution. It should first of all be noted that there is no automatic protection in the 6,600-volt side in these sub-stations. In case of a fault on the supply feeder or the transformers, the oil switch back at the Power Station operates.

Each outgoing 2,500-volt single-phase feeder is a concentric cable with the outer grounded and a safety drawout type switch pillar is fitted with overload protection on each feeder.







Photographs of Sub-stations.

Fig. 1 shows a very exceptional form of kiosk cut down to the lowest limit in size for housing a 50 K.W. transformer and switchgear. It is placed on the footpath in a busy part of the main street of the town.

Fig. 2. This shows our favourite type of transforming point for the town proper where streets are high enough. Transformers are in the centre portion with high tension switchgear in one end and low tension gear in the other. The heavy posts are to protect against collisions from passing vehicles.

Fig. 3 shows a solution in a suburban part of the town. The two transformers (50 K.W. each) are placed in a pit covered with chequer plating and the high and low tension switch pillars are seen one at each end of the pit on the kerb line.

Since writing the foregoing paper, which was prepared for the March Convention, unavoidably postponed, I should like to be allowed to supplement it by some further matter suggested by developments which have taken place since then.

Progress of Electric Heating in America.

A valuable article from the "Electrical World," September 16th, 1922, gives some account of the progress of Electric Heating on a large scale, such as for large ovens used for japanning motor car parts in that enormous American industry. In this particular application of electricity as in motive power, it was first thought that, while electricity was better than other forms of power for driving small motors, it would never displace the large pumping engine, mine winding engine, or heavy steam locomotive. It is apparent that our recently held belief that the electric heating field is restricted to such devices as kettles, irons, etc., on account of their convenience must now go by the board, for it has been proved by hard consideration of *£ s. d.* that the bigger the job the better will electricity show up against its rivals—gas, coke, coal or steam.

I give some quotations from the article referred to, entitled "Status of Electric Furnaces."

"One of the largest users of the electric oven is the automobile industry, which has found it invaluable in baking the japan used on auto bodies, fenders and various small parts. The largest individual oven is in an auto plant, and forms a connected load of 13,000 K.W. It has been found that the cleanliness of the atmosphere in and about an electric oven has had a great influence on the perfection of the finished product, rejections having been reduced from 20 per cent. to sometimes a fraction of 1 per cent. Ovens applied to core baking have not only increased the actual production to three times that of the fuel ovens that preceded them, but turn out cores of greater strength and uniformity."

"Just as the gas oven superseded the electric oven, although more expensive from a fuel standpoint, so the electric has superseded the gas and oil oven for substantially the same reason—long run economy."

"From the Power Company's standpoint, the load is free from rapid fluctuations and the power factor may be high, as has been explained."



1



2



3

These quotations, giving actual facts concerning heating on a large scale, must make the electrical sceptic who would relinquish the heating field to gas, pause and consider. They also make a very good reply to an energetic exponent of the gas interests who is at the present moment travelling about the country asking for gas concessions from the municipalities, claiming that their electric concerns cannot cater for industrial heating.

The Relative Cost of Electric Heat and Heat from Gas in Cape Town.

There appears in the issue of the "Cape Times" of the 18th November an advertisement by the Cape Town and District Gas Light and Coke Co., Ltd., announcing a scale of reduced charges for gas subject to payment within 30 days. The charge for the use of between 15,000 and 20,000 cubic feet monthly is to be from the first of January, 9s. 10d. per 1,000 feet, less 5 per cent. As at this rate 15,000 feet would cost about £11, the further reductions for higher quantities would not interest the householder, and will not be given. The price for quantities less than 15,000 cubic feet per month is not given. Presumably it is as nearly as possible 10s. per 1,000 feet. Reckoning that the calorific value of Cape Town gas is 550 B.T.U.'s per cubic foot, then the number of heat units delivered for one penny comes to 4.533. Now the progressive Electrical Department of the Corporation under Mr. Swingler is supplying electricity at a special rate for water heating of three farthings per unit. A unit of electricity being equal to 3,400 B.T.U.'s, the heat available for one penny is 4.533 or almost exactly the same number. Taking into account the far greater efficiency of electricity, it is a conservative estimate to make that the heating value of the Corporation's electricity sold for one penny is twice as much as one pennyworth of the local Company's gas, and it is unnecessary to enlarge on the superiority of the electric method from the points of view of safety, convenience and cleanliness.

DISCUSSION ON MR. ROBERTS' PAPER.

The PRESIDENT: We have to thank Mr. Roberts very heartily for his excellent paper. Mr. Roberts has had more and a "better" experience in connection with electrical heating and cooking in South Africa than most of us. I shall reserve my comments until we have had some discussion. I may here mention, however, that we sell K.W.H. at $\frac{1}{4}$ d., but this tariff is on a 100 per cent. load factor basis.

Mr. WOLLEY-DOD: I desire to congratulate Mr. Roberts on his extremely interesting paper. I may say that I am not out to criticise at present, as we have done very little in the way of heating and cooking by electricity in Pretoria. We find a difficulty from the consumers' point of view, as the expenditure involved is very much more than the actual cost of the current. That has been our experience in Pretoria. That is a point on which we would like to hear Mr. Roberts when he replies, and especially in regard to the ovens.

Mr. JNO. ROBERTS: I think the discussion will be more interesting if I reply to points as they arise, and that will elucidate further discussion as the replies are made.

On the question of repairs I admit we have not got down to what the electrical stove is going to be. The oven is generally one of the most reliable classes of apparatus, the reason being that the element consists mostly of a strip of mica on which wire is wound and the protection of this non-corrodible metal, as long as it is not subjected to any mechanical damage or to grease getting on to it. It is thus very reliable, because you do not get the difficulty obtaining in heating plates—namely, expansion and contraction. It is a flexible thing and free to expand and contract so long as trouble at the terminals is eliminated, but the makers have still to make a more businesslike and engineering job of this apparatus. On some stoves there are no connections within the ovens; the wire is taken in a continuous way to connections outside, where the temperature is low. In those ovens the repairs are practically nil.

Mr. G. M. CLARK: I have to thank you for inviting me to be present at this Convention at Cape Town. Although I have been in this country as an electrical engineer more years than most of you, it is the first occasion I have had the opportunity of attending one of your Conventions. I am sorry I cannot add anything to the discussion at the moment, as I only got a copy of Mr. Roberts' paper this morning and I arrived too late to hear the paper read. The discussion on electric cooking turns on the merits of gas and electricity. Gradually, the price of electricity and gas are approximating towards each other and Mr. Roberts has shown that it is possible, under certain circumstances, for the price in regard to the B.T.U.'s to be practically the same in the two. Although they coincide, as they must do, in both cases, those prices are so extremely flexible that it is certain they cannot coincide in other respects. Mr. Roberts gives the price of gas as 10s. per thousand cubic feet. This is by no means a fixture and might go down to 2s. 6d. In that case the electrical charge would be one-fifth of a penny. A great deal cannot be gained from the comparison of prices, except to show that the one is not more unreasonable than the other. So far as the general question is concerned, no doubt in ordinary households the real difficulty is in connection with the nature of cooking. A great deal of domestic stability takes place from the use of electricity more than

from the use of gas. In using gas the current is always on, but with electricity it can be turned off. I thank Mr. Roberts for his interesting paper.

Mr. STOKES: As you are aware, Johannesburg has a gas and electricity supply department—not purely electricity—and we run it not in competition with each other, but we try to run it for the combined good of the town. We have 26,000 electric consumers and 600 gas consumers using gas entirely for cooking and heating. The town has engaged a consulting gas engineer, and it is proposed to spend £700,000 on a new gas works. The lighting load on the Power Station is at 7 p.m., and that also is the dinner hour, and it occurs to me that the electric heating load would overlap this lighting load, which is a serious matter. The price of gas in Johannesburg is 6s. per thousand cubic feet, but Mr. Roberts, I think, assumes 10s. in his paper, which makes a big difference in the financial comparison. I would like to ask Mr. Roberts for figures in regard to water heating, as that has been a big difficulty in Johannesburg. We have noticed that people who do a lot of cooking with electricity employ gas for hot baths. I am sorry I cannot say much more, as I only got a copy of the paper last night, but I may have more to say.

Mr. JNO. ROBERTS: In regard to the gas concern in Johannesburg, it must be 25 years since it was established, and if gas is such a wonderful thing I am surprised they have only 600 customers. I note with a good deal of interest that there is a proposition to spend £700,000 on a new gas works in Johannesburg, especially in view of the fact that we are told that the mains of the department in Johannesburg are not large enough to supply current for electrical cooking. It would seem to me to be worth while, first of all, before spending that £700,000, which would involve two separate sets of mains, two separate departments in the Johannesburg municipality, and two separate staffs whose duties are entirely different, to make a careful examination of what the effect would be of spending such a large amount of money on the distribution account of the Electricity Department, to see whether that money could not better be spent in connection with electrical cooking. If there is any reasonable prospect of doing this, you would have great advantages in having one system to look after, to say nothing of the expense to every consumer.

On the question of the "peak" at 7 o'clock, when people are sitting down to dinner, 7 o'clock is not the time when the cooking commences; it starts at about 5 o'clock, and again electricity is not the only sufferer from "peak," because the Gas Company also suffers, and if all the people in Johannesburg were cooking simultaneously at 7 o'clock the Gas Company would also feel a very big strain on that "peak." If everybody cooked with gas, it would be an insuperable difficulty to deal with a "peak." In Glasgow, during a certain celebrated fog about two years ago, and which lasted for two days, when the demand for both electricity and gas was extraordinary, the Gas Company broke down and the electricity department carried through; gas production could not stand up to this "peak" and the gas petered out. With the modern boiler and with the modern turbine, which will give you 50 to 80 per cent. overload, and with good mains, you are really in a better position to deal with occasional overloads with an electric than with a gas system. Gas cannot be turned out as expeditiously as electricity. With electricity, a few people on the Control Board speed up a few motors on the condensers and boilers and increase the speed of the grates, and more energy is available immediately. Consequently, I think we must not be afraid of this electric "peak" and regard it as a bugbear.

In regard to water heating, I have not had to bother much about it. Some years ago, after we got our cheap rate for current into operation in Durban, a resident on the Berea used to worry me to tell him what was the best type of water heater to use in his bath-room. He was a man who had to get his hot water bath, and he wanted to know whether it could be done by electricity. I said, "Yes, easily; several contractors will supply you with a heater"; and away he went. He came back to me and said that they had shown him catalogues of heaters they could get in England. He could not wait and asked me to do what I could for him. I got an ordinary galvanized iron tank holding about 15 gallons, and I put some elements under it, as in an electric kettle, and a week afterwards he nearly fell round my neck. We made half-a-dozen of them and put them out, but, as I am not a believer in doing work of this nature, I did not make any more. One contractor has supplied from 300 to 400 water heaters. They have standardised them to go into the corner of the bath-room—triangular in shape. You will find them in Durban by the score. I cannot give you any information in regard

to the cost, but I do know that they use them and are very pleased with them. In fact, there is such a demand for them that lately I determined to get the Town Council to hire them, and we are now fixing up a contract to have 100 made in Durban. The contract is £10 for the heaters with a capacity of 14 gallons. They have been costing from £20 to £25, and on account of this large expense I determined to ask the Council to have them made in bulk, in order to reduce the cost. One cannot say what they really cost in operation, because according to the number in the family some families might have four or five baths a day. In regard to repairs, I am informed by the contractors, who supplied 300, that they only went back to one to repair it. The temperature never attains boiling point and, consequently, the elements are always kept at a low temperature and run indefinitely.

The PRESIDENT: What do you consider the efficiency of, say, a pot made specially for the purpose placed upon a hot plate? I have just had tested this morning an electricity hot plate supplied by the "Tricity" people, and using four pints of water in one of their own utensils I find that an efficiency of only 53 per cent. is obtained. A two-pint kettle was also tested and gave an efficiency of 76 per cent. If an ordinary pot had been used on the hot plate, the efficiency would have been less than 53 per cent., but with a gas ring any type of utensil can be used with almost equal economy. We figure on 20 gallons for a bath, and at the temperature of the water from the tap to-day 1.73 kilowatt hours would be required to provide a bath of hot water, providing that an immersion type of heater is used, and which we find is very suitable and highly efficient for operation up to 120 degs. F.

Mr. JNO. ROBERTS: I am surprised to hear that one would get as high as 53 per cent. from a cold plate. I would guarantee next time the hot plate was tested after being warmed up that you would get a considerably higher efficiency. For a hot plate I am surprised it is round the neighbourhood of 53 per cent. I have taken efficiency tests myself, and I agree that with water heating the efficiency up to moderate temperatures is practically 100 per cent. when the boiler attains a heat of 120 or 140 degrees. Up to a high temperature the efficiency does not fall below 75 per cent. In regard to gas, a statement has been handed to me by Mr. Wolley-Dod in which there is some data to show that the efficiency of a gas oven which was tested

by a man in a position to know worked out at $13\frac{1}{2}$ per cent. I should think that the efficiency of a gas ring would be considerably less than that, because it is a crude method of heating; you could not get a cruder method; the flame gets into contact with the bottom of the vessel. From the construction of all gas utensils you must provide for a large amount of gas at high temperature being carried away and a large quantity of heat being wasted. You cannot get with a gas ring or with any other gas utensil a 100 per cent. efficiency, because air is burned with it and it has to be rejected at a certain temperature and, consequently, it would be futile to expect an efficiency approximating 100. Electricity is essentially 100 per cent. efficient. If you put an oven in a vacuum you get 100 per cent. efficiency practically, whereas with a gas arrangement it would be impossible to put it inside a vacuum. One method is a proper scientific device for heat and the other is a primitive method, which is really only a development of the way in which the savage used to boil his pot over a few sticks.

The PRESIDENT: We cannot afford to brush aside the gas ring in such a manner as Mr. Roberts suggests. I notice in the report on the Coal Gas and Electric Supply Industries of the United Kingdom, by Sir Dugald Clark and others, that for heating rooms the ratio of thermal efficiency in favour of gas is given as 4.15; for boiling water, 9.5; for cooking in an oven, 5.6; and for metal heating, 3.5. It is apparently only in lighting that electricity can easily beat gas. Whilst we Electricity Supply people do not admit it, I feel that gas will take a lot of beating in the cooking field, for I have had some sorry experiences with electric cooking. The charge for energy may be low, but still the cost of the service is high due to the excessive cost of new elements. In regard to the half-watt lamp, its adoption has increased the consumer's account. The so-called half-watt lamp in the smaller sizes up to 100 watts consumes more watts per candle power than the ordinary vacuum class of lamp. It is admitted that if we go in for electrical cooking on an extensive scale we will have to face an increase in capital expenditure of four to five times that now invested in mains. I would, therefore, rather encourage the use of electricity for motive power purposes at very little or no profit, and thereby attract local industries, than spend so much money on a service that requires the heating elements to be so much more

improved and made sufficiently robust to place in the hands of the average South African domestic servant. The cheapest way to cook is the same way as that in which you generate your steam at the Power Station—with coal. Mr. Roberts points out that one can get 20 per cent. thermal efficiency out of coal we use. The most efficient station in Great Britain to-day is only able to obtain 17.2 per cent. thermal efficiency, and most municipal stations in South Africa to-day do not attain one-half of the figure mentioned. The point is, "What is your thermal efficiency at the consumers' terminals? A gas undertaking can obtain at the consumers' terminals twice Mr. Roberts' figure of 20 per cent. of the heat in the coal, which is a great pull over electricity for heating and cooking. The Victoria Falls Power Co. get their coal very much cheaper than the Durban Electricity Undertaking, and yet their best price to consumers on a load factor basis of charge at 70 per cent. load factor and above is 0.52d. per unit. Notwithstanding this, Mr. Roberts maintains that we can sell energy in small quantities and at low load factors at .5d. per unit.

Mr. JNO. ROBERTS: When you want to hear what another man has to say about certain subjects, you take the opposite point of view to bring out his arguments. In regard to the charge of $\frac{1}{2}$ d. a unit, the answer is that the domestic consumer does not pay $\frac{1}{2}$ d. per unit. He pays first of all on a large number of units at 5d. In the paper you will see we get a minimum charge of 12s. from 15,000 consumers, including the supply of 29 units at 5d., and they thereby pay nearly all our capital and standing charges. Each consumer has guaranteed to take a supply for a year. The Victoria Falls Power Company have no such corresponding charges. (The PRESIDENT: They are in the load factor tariff.) Our average cost is considerably more than $\frac{1}{2}$ d.; in many cases considerably more than a 1d., because in these charges you must make sure of your standing charges before you venture to make a charge like $\frac{1}{2}$ d. for current actually consumed. In regard to the paper read by Sir Dugald Clark, he is an advocate of the Gas Companies and has been put up by them. They are beginning to feel that their position in the lighting field has gone completely. They put up Sir Dugald Clark to make this report, which contains the most ex parte statements and unfair comparisons between gas and electricity which anyone could imagine. It first of all, in arriving at the calorific value of electricity, includes the whole of the power stations, many of

the smaller ones operating on a low state of efficiency, which is disgraceful. Dalmarnock is not the last word in stations, and I believe within the next twelve months we shall have increased in efficiency in power stations so that this will reach 20 per cent. I believe that figure has been exceeded in special cases. I was very sorry to hear Mr. Swingler say that he considered the best way of applying heat was by means of burning coal in the good old-fashioned way. I hope we are going to carry out our industrial and domestic operations in a more human and civilized manner than that. A home will not be a civilised place as long as the coal fire is in it. Mr. Swingler also says that he would rather cater for industries. I look at it from an entirely different point of view. Our electricity concerns are built by the ratepayers and for their benefit and the industrial portion of the ratepayers are a small proportion of the whole. The people who contribute to the coffers of the town are the householders, and if electrical men cannot do what they profess in all their propaganda, then I think they are hoodwinking the public and should not do it. If electricity cannot do what is claimed for it, then we should retire from the field and recommend them to go in for gas. I have told my Council that if electricity cannot do everything gas can do, then I would recommend them to give a concession to a gas company because domestic people cannot be catered for. I am of the firm opinion that it can be done. I think the profession that can devise an electric locomotive to get over the miserable difficulties of the electric stove in regard to repairs and so forth. They are being improved daily and our experience in Durban is that householders even at the present stage are willing to put up with it—bad as it is. In regard to heating by coal or gas, I have people coming to me—very few though—saying, "If you could only let us have a stove that does not cost so much in repairs," but even then they still go in for it. Electric cooking has to come and houses are being built in Durban installed with electrical appliances for cooking. I take the stand that we can supply the current. Gas companies are becoming quite concerned at electric undertakings, and if, as I read to you in my paper, a motor car factory can find it more economical to use electricity in this roundabout way where capital cost is nothing, surely for a little stove taking five kilowatts it also ought to be the best. I cannot see why, if it is economical to burn electricity commercially in thousands of kilowatts, it ought not to be the same on a small scale. In regard to the half-watt lamp, I agree that in

the household it has not had much effect in cutting down the account, but in stores and big businesses it probably would.

Dr. HAMLIN: I desire to thank Mr. Roberts for his very interesting paper, which is full of interest for all of us, but I question whether we of the small fry can use it very much until the time comes when we get the electrification of the railways and when we may possibly get power very much cheaper than at the present time. In Stellenbosch there is a certain amount of cooking load. The authorities have just arranged hostels there for the students, and there is no other method of cooking than by electricity, and when they came along and asked if I was prepared to supply them, I said, "Yes, certainly, under conditions." During the day we have a fairly good load, because during that time the business premises use a fair amount of power. Just when they shut down after the dinner time, students come away from the university and do their cooking, and some also at night time. I question whether it would be a good thing as a small municipality to endeavour to compete with the present method of cooking and substitute electricity. The ordinary family of five can all have their hot baths at a maximum of 8d. a month by using an ordinary copper geyser and getting three bags of cones. If we could supply energy at 1d. a unit, which we cannot, it would mean about £2 a month for baths, and I doubt whether people working in shops and offices, or professors, can afford £2 a month for their bathing, and if we sold energy at 2d. a unit, this would cost about £4 a month. There is something to be said for the old coal fire too, even with its efficiency of 10 per cent. Coal is delivered at Stellenbosch at £2 a ton, and even if you do get an efficiency of 10 per cent. you are getting a reasonable amount of heat for just under a penny, and we cannot compete with it electrically. Not only that, I think it is our duty as engineers to protect every ratepayer, and where it is advisable for us to advise our municipalities to go in for a plant so that we are able to supply electricity for cooking, I do not think it would be honest to tell the public that it is going to be cheaper. I do not think our conditions are comparable to a big town, because in all places like Stellenbosch I do not suppose we use as much coal the whole year round as Mr. Roberts does in an hour, because the majority of heating is done by wood and bath water is heated with ordinary fir cones. I do not think South Africa is comparable with England, because many young men in this country know

to their sorrow that the conditions of living are not the same. There is not the same family life and one necessarily goes back to the boarding house type of life; therefore, for a small place like Stellenbosch, for example, it would not pay to introduce electricity for cooking. I do not think it is a good time to introduce it now. I find that people with kettles and irons, if they use the ordinary bayonet holder and break the circuit at the holder without previously switching off the arc formed, frequently caused a short circuit. This further caused a certain amount of carbonisation or oxidation of the commutator of the watt hour meters, and they register slowly after that and sometimes even stop. Recently whilst in Germany I discussed the question with Siemens, who told me that they found it difficult to get an alloy to stand all those conditions, and therefore we have periodically to give them a cleaning up, and immediately I do so my revenue goes up. Once more I would like to thank Mr. Roberts for his interesting paper, and as some of us are only young people—we hope to get into bigger towns some day—his paper will be of use to us, but speaking as a small man, I do not think the time has yet come with small installations that we can turn out current at such a figure that will make electrical cooking a commercial proposition, except perhaps for the newly-weds, and when their little troubles come along they will not be able to afford it.

Mr. JNO. ROBERTS: I quite agree that the problem of the small municipality is different from the big one. I have said before that the amount of judgment and engineering skill required in connection with small municipalities to make them pay is, if not of a higher order, equal to that of the large municipality, because they have a very limited source of revenue to work with. The designing of small plant is a very highly scientific and technical job, but I cannot help thinking some beginning might be made in the small towns. If not to go straight out for it, as can be done on a large plant, where you have a diverse load, I still think it possible that something can be done. I have taken an interest in small plants, and on visiting them I have been struck in those cases where the plant is running all day and where batteries are not employed by the fact that the plant during the day time is doing nothing and might as well be usefully employed. I do not say you can give straight out a penny tariff unrestricted, but I do think a beginning can be made. I was in a station not so long ago which has been fitted up with mechanical stokers, but the load

during the day was so light that their job was to keep the steam back, and they had to keep the hoppers open to prevent the coal firing back, because it was rather high in calorific. It seemed to me, in a case like that, that some tariff might, at any rate, be given to save the grates being burnt away. Supposing you charged 1½d. per unit, or twice as much as the coal cost, and restricted the supply during the period of peak demand and put in a time switch so that the consumer could not get any lighting when the heating was on? It would still be possible to sell energy for a certain amount of ironing and water heating. It seems to me a wicked business to see a power station running and no current in use because the price was too high.

Dr. HAMLIN: At Stellenbosch we had a lot of cooking by University students. One point I thought was not perhaps a fair comparison, but it has been answered really. The ordinary man in the street likes gas because he can get it at any hour of the day and only pays for it as he uses it. Mr. Swingler has informed us that his hot water rate is charged for 100 per cent. load factor, and it has therefore to be a continuous supply, and, if it were not, I believe the rate was 2d. for the first 100 and 1½d. all over. The comparison would be much greater in England and I think in South Africa we should have gas very much cheaper. It came to me as a shock to know in South Africa the cost is at least four times as much as in England, whereas electricity can be turned out in some stations at the same price. I think if a comparison could have been made between Cape Town for a service of electricity at any time and Cape Town with a service of gas at any time, then Cape Town would be found to be the most expensive place in South Africa for gas.

Mr. MANN: I desire to express my appreciation of Mr. Roberts' paper, which gives us all a very good lead. I may say that I feel it is up to the engineer of any station, however small, to spread the uses of electricity in every possible direction. The application of electric motors is obvious, but the use of electricity for domestic purposes is not so obvious, and it requires a lot of spade work in educating people as to what can be done and how it can be done. Without doubt it will not be many years before practically everything will be done electrically in the home as it is now done in the factory, and we should all try to help that on. The demand will never come unless we are ready to supply. People will not migrate

to small towns who are in the bigger towns. It is, therefore, our duty to do what we can to help it on. Those not using electricity do not realise the difference it makes; it means that the kitchen, which it now a most unpleasant place, is practically done away with and the kitchen can then be as clean and nice a room as any in the house, and that means a tremendous lot to the house work generally, because it reduces labour. I may say that I am living in a four-roomed house near the power station. One room I use as both kitchen and living-room, but the ordinary visitor to my house is unaware of the fact. My cooking is done electrically and there is hardly any sign of cooking; there is no dust and no discolouration. In comparison with coal and gas the work is mostly done by time, and that alone relieves the housewife from constant duties inseparable from coal cooking. The ironing, which is a light duty with the electric iron, means a heavy day without it; washing clothes becomes a very simple matter in the house; it saves a tremendous lot of expense in labour and in wear and tear if you have your own machine. You can wash clothes when and where you like. There are many other appliances which have not yet come in which may mean greater benefits. They all will come and must come in the future. From the point of view of the small station engineer, if he is running any plant at all during the day, he usually has to run it for some commercial undertaking and is bound to have surplus plant available to supply; he need not be afraid that it will suddenly jump on. It takes quite a lot of work to educate people, especially in the Dorps, where they are slow to spend money, but quite a useful load can be obtained for hot plates and small things which will make only a small demand on the station. We find in Worcester, although there are several ovens and stoves installed, that the load which is more obvious on Sunday is never high, and in the ordinary week-day is hardly noticed. There is a steady demand which at the end of the month shows increased revenue. Otherwise it makes no demand except in winter. If one then allows fires and radiators, which come along at any time, that means crowding on "peak" hours the other load. Those should be provided for if possible. To my mind it is well worth spending a certain amount of money to encourage these things and not discourage them. If we refuse the use of radiators during a few months, my experience is that people will be inclined to keep off everything else, because the first consideration is an absolutely reliable supply and

steady voltage. It might be difficult to attain this in some cases and may involve additional expenditure on mains, but again it is worth it. Those who have only direct current should by arranging their feeders cater for the demand first until larger developments are necessary and then develop to alternating current. The demand by any individual, I find, works out roughly at 1½d. per unit per person per day for kettles, hot plate and ovens. Those using ovens of the hot point type seem to be rather more efficient and use less energy. The consumption, therefore, for a family would run from 300 to 400 units a month for five persons. It is difficult to make it cheaper than wood or coal and I do not think we can very well claim that, but there are some families in every Dorp who are quite prepared to pay a little more for their electric cooking than for their coal fires. There are many who will not pay more for electricity than wood and would rather use wood than pay for electricity. It is hardly fair to take water heating by itself. Generally, water heating at a cheap rate is thrown in to bring on a better paying load, and every endeavour should be made, in my mind, to give a supply of hot water at the cheapest rate possible to induce people to get rid of their coal stoves. Many will discard their geysers if they could get another system of supply. There are many other points, Mr. President, I would like to speak on in connection with this paper, and I cannot too strongly urge on all and sundry, who have any plant at all to spare, to do their utmost to encourage the use of electricity for domestic purposes.

At the conclusion of the morning session, members and delegates were entertained to luncheon by His Worship the Mayor, following which the official photograph shown on page xix. was taken.

The Convention resumed its proceedings at 2.30 p.m., at which Mr. T. C. WOLLEY-DOD read a paper, "Some Notes on the Electricity Act, 1922."

Members Present:—G. H. Swingler (Chairman), T. P. Ashley, L. F. Bickell, W. H. Blatchford, R. D. Coulthard, T. C. Wolley-Dod, H. A. Eastman, P. Finlayson, R. W. Fletcher, T. Jagger, R. Macaulay, F. C. D. Mann, T. Millar, M. McDonough, J. Roberts, F. T. Stokes, T. Sutcliffe.

Associate Member Present:—F. Castle.

Delegates Present:—Councillors T. Ericsen, A. Linton, T. C. Shearer, D. Shearer, R. M. Scholtz.

Upon the request of the Chairman, Mr. T. C. WOLLEY-DOD proceeded to read his paper:—

SOME NOTES ON THE ELECTRICITY ACT, 1922. UNION OF SOUTH AFRICA.

(By T. C. WOLLEY-DOD.)

This paper does not pretend to be an exhaustive review of the Electricity Act which has recently come into operation, but is intended to draw attention to some of the salient points in order to open discussions on the Act.

It is unnecessary to trace the history of the Bill; what we are concerned with is the Act as now in force.

It naturally takes precedence of the Provincial Laws and Ordinances, but where these are not overruled they will remain in force.

The Act establishes two distinct bodies which are responsible for its administration: An Electricity Supply Commission and a Board of Control.

Chapter I. of the Act deals with the Electricity Supply Commission.

This will consist of from three to five Commissioners to be appointed by the Governor-General, whose principal functions will be to establish and work Electricity Supply undertakings and to investigate facilities for, and stimulate the provision of, Electricity Supply.

Chapter II. deals with the Board of Control.

This consists of from three to five persons designated by the Minister for Mines and Industries, who may be officials of the Public Service.

From the fact that no provision is made in the Act for the remuneration of the members of the Board, it is obviously contemplated that they shall be officials of the Public Service.

The functions of the Board are to control the supply of electricity by the Commission or by any private undertaking.

This control is maintained by a system of compulsory licences or permits issued by the Board, setting forth the obligations and powers of the licensee.

The following are exempted from licences or permits:—

- (a) Government Departments, the Railway Administration and persons generating for their own use, provided that they do not supply more than one million units to other persons.
- (b) Urban local authorities.
- (c) Undertakings with less than 500 kilowatts of plant.
- (d) Persons supplying one consumer only (at the option of the Board).

It is important to realise the difference in the constitution and functions of the Commission and the Board.

The Board is purely a Control Board and is not concerned to any extent with the investigations of technical matters.

In the exercise of its functions it is contemplated that it will be guided by regulations, provided for in Sec. 53, which regulations will be made by the Governor presumably on the advice, as far as technical matters are concerned, of the Commission.

Although the Act provides for the Commission employing and remunerating officers, workmen and servants, no such provision is made with reference to the Board, which appears to be a branch of the Department of Mines and Industries.

The Board will control such matters as the verification of meters and the settlement of disputes as to measurements of power and limits of error.

The Commission is a Corporate body appointed by the Governor-General.

The reason for its separate entity is probably the fact that the large power stations of the immediate future will be primarily for railway electrification, and that such stations will be in a favourable position to supply to local authorities and others.

There has been considerable opposition to such stations being under the control of the Railway Administration, seeing that it will be an interested party as a consumer.

An independent body has therefore been created, such as was foreshadowed in the writer's Presidential address in 1920, to undertake the General Supply to all parties under the control of the Board.

The Commission, if granted a licence by the Board, and if the Minister approves of the scheme, and if the Governor-General authorises the necessary loan, may erect and work power stations in accordance with the terms of the licence and of the special provisions in the Act.

The conditions under which the Commission operates differ considerably from those under which a private undertaker operates, as will be pointed out later.

Before establishing any new undertaking, the Commission must call for tenders for the establishment and working of the undertaking, and five years after the commencement of supply by the Commission it must call for tenders for the acquisition or working of the undertaking, and it must also call for tenders at any subsequent time that the Minister may decide.

Upon receipt of such tenders, the Commission shall report on the tenders to the Minister and state whether in its opinion it would be in the interest of the public to accept any tender, and the Minister shall refer the report to the Board of Control and to the Railway Administration, if they are a consumer.

The Board may be instructed by the Minister to take expert advice in the matter.

The whole of the reports will then be referred to the Governor-General, who will decide what is to be done.

The Commission, therefore, appears to have no permanency of tenure of any undertaking.

Any other licensee has a fixed tenure of at least 40 years before the undertaking can be expropriated, except in case of default.

Any time after 38 years, the Governor-General may, after obtaining reports from the Commission and the Board, give the Licensee two years' notice that the Commission will expropriate the undertaking at its existing value, and then five years after it has taken over, the Commission will have to call for tenders under Clause 6 for the acquisition or working of the undertaking.

On the face of it this procedure looks like a careful and elaborate protection against a monopoly by the Commission.

In practice it will be found that the Commission has actually a monopoly with regard to new Power Stations.

The crux of the position lies in the different conditions under which the Commission and a private licensee operate.

The Commission must as far as practicable carry on at neither a profit nor a loss, and it is laid down in the Act that if there is either a surplus or a deficit on any year's working, that allowance shall be made, therefore, in adjusting the charges for electricity to be supplied the following year.

Such surplus or deficit is reckoned after the following expenditure has been provided for:

- (a) The cost of production, distribution, maintenance and administration;
- (b) The amounts required for interest on loans or advances and the redemption of securities for loans and expenses incidental thereto;
- (c) reserve and replacement funds.

Now, it is obvious that this almost amounts to a guarantee of interest on and redemption of the capital.

There is no such security for the interest and capital of a private undertaker.

He is certainly secured against excessive profits, but not against loss.

The licence lays down what interest he may pay on share capital and debentures, and he has to distribute 25 per cent. of any surplus to his consumers, but is not allowed to adjust his sale prices to make good losses.

There is a revision of prices by the Board after seven years and thereafter every three years (or less), but there is no provision to compel the Board to allow a rise in prices if the concern has worked at a loss.

It is stipulated in the Act that in the event of a tender for the working of an undertaking established by the Commission being accepted, then all the provisions which govern private undertakings apply to it, and the security of the automatic adjustment of prices disappears.

It is not likely that private capital will be found to compete with the Commission under the circumstances.

Chapter III. deals with the supply of electricity in urban areas, and local authorities are given a limited monopoly of sale and distribution in their own areas.

They do not require a licence or permit.

The Railway Administration may obtain supply for power purposes from any source without the permission of the local authority.

If any person, Government Department or the Railway Administration for lighting only, wishes to obtain supply from any source without the consent of the local authority, the Board, after a public hearing, will decide whether such consent has been unreasonably withheld, and if it so decides, such supply may be permitted and the necessary transmission or distribution lines may be constructed in the area.

The final appeal from a decision of the Board is to the Minister of Mines and Industries, except in cases of revocation of a licence, when the appeal is to the High Court.

Section 38 provides for an application to the Administrator when a local authority intends either to establish an undertaking or to extend an existing undertaking to an extent of 10 per cent. of its rated generating capacity, and such an application must be accompanied by a full report of its Consulting Engineer.

The Administrator then passes the application on to the Commission (or until the Commission has been appointed to the Board) for report as to what in its opinion is the best course for the local authority to pursue, and in particular whether the Commission itself can supply with advantage to the ratepayers and consumers, and, if so, on what terms. The Act does not lay down what shall follow this procedure, but it can be inferred that the consent of the Administrator must be obtained before the local authority can act, and his consent will obviously depend on the report of the Commission.

This means that no new undertaking or addition to any existing generating plant by a local authority can be carried out without giving the Commission the option to supply the local authority themselves.

I say advisedly *no* addition to the generating plant, as I cannot conceive of any addition being made to a generating plant of less than 10 per cent. of its output.

The proviso that the application of a local authority must be accompanied by a full report of a Consulting Engineer certainly strengthens the force of the application.

It is no business of the Commission to prepare schemes for local authorities, and usually the Executive Electrical Engineer of a local authority and his staff have, or should have, their work cut out in efficiently running the undertaking, and unless the concern is very much overstaffed, they have neither the necessary time nor the staff to properly prepare any extensive scheme without the assistance of a Consulting Engineer. The object of this cause is undoubtedly to give the ratepayers and consumers every possible assurance that the best course will be followed in their interest.

Supposing the Administration decides that the supply for a local authority will be best obtained either from the Commission or from an outside undertaker, the sale and distribution will remain in the hands of the local authority with the exceptions already noted.

Neither the Commission or the Board can in any way control the charges made by the local authority except in so far as dealing with the application of an outside undertaker under Clause 40.

A local authority cannot supply outside its area without the permission of the Board, and if any objection is raised to such permission being granted, the Board will decide after a public hearing of the case.

No one can compel a local authority to supply outside its area.

Though the undertakings of local authorities are exempted from licences, they are subject to inspection, both technical and statistical, by the Board.

Section 47 deals with the establishment of the ownership of the property of an undertaker on premises not in his possession, and stipulates that lines, meters, fittings and apparatus shall be free from landlords hypothec for rent or execution in legal proceedings against the owner or occupier of the premises, provided they have distinguishing metal plates, or other brands or marks, or other reasonable and visible indication of their ownership is given on the premises.

I fancy that in many of the older municipalities there are thousands of unmarked meters and other properties on private premises, and it would involve no small expense to brand them. Probably, however, sufficient protection already exists under Municipal By-Laws, Regulations and Contracts, and the clause is more for the benefit of undertakers who are not already protected.

The Act provides for the unlawful abstraction or diversion of current, or the use of current known to have been so abstracted or diverted being classified as theft.

Illegal interference with generating, transmitting, or distribution plant is punishable by a maximum fine of £1,000 or twelve months' imprisonment.

The Act unfortunately does not authorise an undertaker to erect and work the necessary telephonic communications between generating and sub-stations without the permission of the Post Office.

It is futile to compare the Act under discussion with the Electricity Supply Act in the Old Country. There the main object is to rectify the unsatisfactory state of affairs that exists owing to want of suitable legislation in the past.

In the Union of South Africa there is so small a past and so great a future that we may say that it is the future and not the past that has to be dealt with.

With one exception there is no power station of any importance selling electrical energy in the Union of South Africa except the Municipalities.

The main object of the Act is to ensure that the future of electric supply will be developed in the general interest of the community, rather than to meet the expediency of the moment for one section of the community, and I submit that the Act substantially ensures this.

Under the provisions of the Act the Commission will be in a position to raise capital at rates of interest below those that would be expected on the capital of the less favoured private undertaker, and the Commission is not a Government Department, bound by Civil Service rules and red tape, but is in an equally favourable position with the private undertaker with regard to freedom of employment.

Although the Commission has a practical monopoly of the future large generating stations in the Union, it will be difficult for it to abuse that monopoly.

In regard to section 49 of the Act, which provides that in any proceedings against an undertaker arising out of damage or injury caused by induction or electrolysis or otherwise by means of electricity generated or transmitted by or escaping from the electrical plant or machinery, it shall not be necessary for the plaintiff to prove that the damage or injury was caused by the negligence of the defendant, I must confess I am not a lawyer, but I do not take the very pessimistic view the President takes of this clause. You must not read more into it than really exists. It is merely removing the onus from the injured person of proving negligence, but it does not mean that the fact that you were not negligent is ruled out. It is competent for you to prove that you were not negligent. I do not see very much wrong with it. It has obviously been put in by the Post Office people. This clause was taken from the Transvaal Act of 1910, and in that it was perhaps a little better explained, but it was really tautology. The Transvaal Act provides that it shall not be necessary for the plaintiff to prove that the damage or injury was caused by the negligence of the defendant, but the burden of proving that all due diligence was used by him shall lie upon the defendant. You are not excluded from the fact that you are at liberty to show you were not negligent, and then you get your judgment. Perhaps other members might like to discuss the matter.

THE PRESIDENT: I have to thank Mr. Wolley-Dod for his interesting notes on the Electricity Act and to congratulate him on the thorough manner he has gone into the provisions of the Act, and I shall be glad if the meeting will discuss the matter fully and also to have the remarks of Councillor Delegates and those of our late Mayor, Councillor Gardener, who is familiar with this Act.

Mr. Councillor GARDENER: I really did not come here with the intention of making a speech on the Act; in fact, I did not know you were discussing this matter this afternoon; but now that I have a copy of Mr. Wolley-Dod's notes I will be able to study it. His notes cover very largely the provisions of the Act and I was very pleased to listen to his remarks.

Mr. JNO. ROBERTS: As we shall have another opportunity of discussing this Bill, I think it would be better not to rush it, and it would give us more time to think over what Mr. Dod has explained to us this afternoon. Perhaps now that the paper I gave this morning is fresh in the minds of members, we might go on with that discussion for a time.

The PRESIDENT: Before lunch I made the suggestion that the engineers would like to have the views of some Councillor Delegates on this matter. A good deal has been said by the engineers and we would like to know what Councillor Delegates think of cooking and heating by electricity. Other members have not spoken and I hope they will keep the meeting going this afternoon with their opinions.

DISCUSSION ON MR. ROBERTS' PAPER CONTINUED.

Mr. FLETCHER: Unless we can get current much cheaper than we do, we shall not be able to supply it for heating and cooking purposes. At Durban they charge a price of $\frac{3}{4}$ d. plus 12/- minimum, which includes a number of units at ordinary lighting rates, and, as far as I can find out it will average between 1.1d. and 1.2d. per unit consumed. I cannot see how we are going to be able to sell at $\frac{3}{4}$ d. per unit. Mr. Roberts gave some figures *re* the consumption of energy. I was trying to make out that the average monthly consumption was 287 units for the six months. That I worked out at 12/- as the minimum, or rather the basis charge, but it came to 18/6. If you take the Johannesburg tariff, which is six units per room per house, and take a five-roomed house, that would come to 37/6, and if you take it at $1\frac{1}{4}$ d., which is the charge in small municipalities, it would come to about 47/- a month, and 47/- a month is a lot for a small man to pay for his light and cooking. His lighting in a small house would not cost him more than 10/-, and if he can get coal or wood, it should not cost him more than 12/6 or 15/-. Is he going to put in cooking apparatus and pay 47/- for it, or even 37/-? If Mr. Roberts can explain that, I would be glad.

Mr. JNO. ROBERTS: I am glad that particular aspect of the question has been raised—i.e., the case of those Municipalities who might have to buy in bulk. This point of view has interested me because Durban may in the immediate future come to some arrangement with the Government to buy power from a Government Power Station which may be put up in Durban, although we hope to be able to put up a case that we can generate current cheaper ourselves.

I have also quite recently had to consider the case of a Municipality who proposed to buy current from a neighbouring mining plant, and I suggested a tariff which, while profit-

able to both seller and purchaser, still enabled current to be sold to the consumer at a very low rate.

It is no use trying to fix up a flat rate of so much per unit. The only correct plan is to follow the well-laid-down principles recognised for many years—i.e., to pay a fixed charge depending on the demand, plus a charge per unit for current actually consumed.

In Mr. Fletcher's case, he should negotiate with the Victoria Falls Power Company on those lines—namely, to pay a fixed charge or rental on the amount of plant which the Company would have to allocate for his supply, and he would be entitled to expect the Company to sell him the current he actually consumes at a little over the actual cost of production. If, for instance, the cost of production to the Company was .4d., and they sold it to him at .6d., then he would be able to sell it to his consumers at 1d. and make a profit, for he would have first allocated the standing charges he pays to the Victoria Falls Power Company among his various consumers according to their demands. I suggest that he should charge lighting consumers a minimum charge of, say, 10/- to 15/- per month, which would reimburse him for the fixed charges paid to the Company, and he would then find that his electric cooking demands would be well catered for by selling current at 1d.

Such a method is much better than paying an average price of, say, 1½d. or 2d. per unit, for you would have to charge some consumers more and other consumers less, which would be sure to cause arguments and dissatisfaction. Whereas, if you split up the standing charges among consumers, whether they be lighting or power, you could give everyone then the benefit of the low price at which you bought from the supply company. You would further be likely to encourage the demand from all classes of consumers and preserve good relations with your customers.

The PRESIDENT: Most people know that the Victoria Falls Power Company have what one might call "the most-favoured nation clause." If they reduce the price to meet Mr. Roberts' case, they would also have to reduce the price to all the mines, and that is why their hands are tied. They cannot quote for loads which would suit them. While you have your own station you can arrange your tariff to get the full benefit of the diversity factor, but when you buy from other people they get the benefit of the diversity factor, in

addition to the profit made from your supply. The Victoria Falls Power Company is purely a commercial enterprise, and they only buy at the lowest and sell at the highest prices. With a municipal undertaking the Council can attract industries to their municipalities by selling electricity at little below cost if they like. It is merely a matter of policy on the part of the Council concerned, but when you buy from an outside undertaker the position is quite different. Under those circumstances Municipalities would not be able to adopt such a flexible policy as when they own their own plant. When one can sell at twice the coal costs, as suggested by Mr. Roberts, I would inform him that our 1920 cost for coal was only 4d. and the thermal efficiency of Cape Town Generating Station is not lower than that of any other station. As a matter of fact, I think the overall thermal efficiency is the highest of any Municipal Station, and will soon be equal to that of the Victoria Falls Power Company Generating Station. We should, according to him, then be selling at 8d., whereas we are actually supplying energy on 100 per cent. load factor at .68d. per kilowatt hour, and for a limited hour supply I would recommend even a lower rate still.

Mr. JNO. ROBERTS: That is exactly what I have tried to explain, that unless we can get from the suppliers some differential charge, splitting it up between capital charges and cost of production, it would be difficult to sell it at a rock-bottom price. We are not tied up with the method of charging from the Commission, and when we deal with the Commission this question of tariff will have to be thrashed out.

Mr. JAGGER: In the near future some municipalities may have to buy current from Government suppliers. The question of buying in bulk from, say, the Railway Administration is a point I have considered for the last 12 months from various points of view, but under the circumstances Mr. Roberts has placed before us, I think this point would be well worth consideration when the question of paying for current for municipal consumption is brought before the Railway Administration or the Government Commission. At the present time our cost of energy amounts to just over a 1d. per unit. We are in the favourable position of being able to get coal at a cheap rate, but still the Railways will be in the same position, and they will also be able to produce current which will enable us to supply consumers at a very low figure for heating and cooking, and, for this purpose, it has to be considered whether

or not I should advise my Council to go in for a hire-purchase system for heating and cooking appliances, charging perhaps a small monthly amount for repairs, which could be a standing charge each month, say, 2/6 a month. I think my Council will favourably consider this point when it arises for discussion. Referring back to Mr. Roberts' suggestion in regard to purchase, I am sure the Government Commission will only be too pleased to go into any suggestion which will be favourable to the purchase of current by municipalities for heating and cooking.

Mr. McDONOUGH: It is very interesting to listen to this discussion on the subject of cooking and heating. I am inclined to agree with what Mr. Roberts said this morning—namely, that the people who are able to devise improvements in machines, switch gear and the different turbine appliances which have come in during the last two years, are still capable of going further in regard to minor things in connection with heating and cooking apparatus. The comparisons between gas and electric cooking are more or less in regard to the appliances at the moment, and I think gas appliances have reached their maximum efficiency. I think there is still quite a lot of improvement to be made in electric heating and cooking appliances, and I think every engineer should, as far as possible, push these things in his own particular district, because there is a field for this which has not been seriously tapped, and I am inclined to think that there will be a lot of it. Mr. Roberts has rightly said it is a question for the manufacturers. Municipalities will not sell cheap current and the appliances are also not too good. If the matter were considered seriously by engineers all over the world, cheap and efficient appliances could be produced. I do not suppose we here have very much influence with manufacturers, but we may express our views. I think it is the duty of every engineer to do everything he can to further the business of heating and cooking by electricity.

Mr. CASTLE: I am absolutely in sympathy with electric cooking and heating and I have used it for the last eight years. If I were running a power station for a limited company I would not be so keen, but when you run a power station as a municipal concern, you are there for the benefit of the public and to give them the best service. My experience is that cooking by electricity is better than cooking by gas. As

I said, we are here for the benefit of the public, and there is no doubt that electric cooking is the best system, but it is all a question of tariff. With the gas companies they, of course, make money in connection with their bye-products, and if they did not they could not supply gas so cheaply. I may mention that at Oudtshoorn we had a hire system for cooking utensils.

The PRESIDENT: Mr. Roberts seems to think that people who generate and supply electricity should not offer any criticism on this matter, but in a gathering such as ours we must be frank, and we also require someone in opposition in order to create constructive discussion. I may say I have here the tariffs of 24 towns in Great Britain and compared with Cape Town. Birmingham is selling energy for cooking at 2.67d. (they have the Norwich system); they sell current for lighting at 5.7d. and their coal costs them 17/4½ per ton of 2,240 lbs. In Glasgow, which is one of the, if not the most up-to-date generating stations in Great Britain, and where they sell 180 million units per annum, their lowest price was 2d. for heating and 4½d. for lighting. In Manchester they have a flat rate of 2.25d. for heating, and with them gas is in a much better position than in Cape Town, for it is sold at about 1/3, the rate obtaining here. In some of the principal thoroughfares of London, however, they still have high pressure gas lamps, which at first sight give one the impression of being half-watt type lamps. So we must not run away with the idea that gas for street lighting is entirely out of the field.

Mr. Councillor T. C. SHEARER: It has been an education for me the last few days to attend the meetings of the Convention. The question of heating and cooking by electricity is in its infancy, and to make it a success and make it popular it is essential to have cheap current and to have up-to-date and reliable stoves and appliances. One thing that goes against the householder is that there are a lot of cheap utensils on the market to-day, the upkeep of which is very expensive, and that discourages householders at the very start. An appliance might go all right for a month, and then the elements go wrong, necessitating the calling in of an electrician, and then the charges go up. Years ago, when gas was first introduced, people were prejudiced against it, and the same applies to cooking by electricity. People kept on using coal and paraffin

instead of using gas; they seemed frightened that by using gas there might be an explosion. In Glasgow it took years to get people to cook with gas. Now electricity is superseding gas. One thing against pushing and advocating the use of gas in this country is the want of suitable coal for producing it. There is only a small quantity of gas coal in South Africa—a very small seam. In this country the production of gas is not the primary object, but the production of bye-products. For municipalities with their own electricity power stations to allow gas companies to come in is taking a backward step and putting the clock back. To enable people to go in more for electrical cooking, municipalities should open show rooms and exhibit electrical appliances and stoves. Very few municipalities have taken that step. In Durban we intend to get show-rooms with a view to educating the public in regard to the best stoves which can be purchased for electric cooking.

Mr. Councillor T. ERICSEN: I would like to add a few words of appreciation for the valuable paper by Mr. Roberts, and so ably read and placed before us. Personally, I am not in the same position as you are to contradict Mr. Roberts on so many points, but I am a great optimist in regard to heating and cooking by electricity, and I feel sure that it is going to be the future method in the domestic affairs of this country. As far as Kimberley is concerned, we are not in the happy position of being able to supply current for this purpose, because it is too expensive. We do a lot in heating with small appliances, but as far as cooking stoves are concerned we have made very little progress, because 2½d. a unit for current is too expensive. My friend Councillor T. C. Shearer has hit the nail on the head. There are four salient points in regard to the future of cooking and heating in South Africa. You want cheap power and reliable appliances and people to know how to use them. In regard to show-rooms, that is nothing new. The system is adopted extensively in other parts of the world and in this country; it has also been proved a success in selling apparatus and educating people in the use of them. As far as cheap power is concerned, that entirely rests with such a body of men as are assembled here in this Convention. They can do more to cheapen power for cooking and heating, and it rests entirely in their hands. With regard to reliable apparatus, I know of quite a number. Some people have mentioned other countries, and I am a bit modest of mentioning my own country, but in the country I come from electrical cooking and

heating is used in practically every home, for the simple reason that the power is abnormally cheap; you get 40 to 50 units for a penny. I could mention one reliable American stove, but it is rather expensive. We have installed one in Kimberley and it has been running for two years. The elements are entirely enclosed so that nothing can touch them, and that is the type of stove you want in this country, especially where we have servants who do not know how to handle electric appliances properly; but, as I have said, it is rather an expensive stove and out of the reach of the ordinary householder—it cost £120—but the problem of reliable stoves has been solved. Expensive switchboards have been eliminated and we only use outside sub-stations. I feel sure that the system can be adopted in this country, where we have such a beautiful climate, and that is one point which really would assist engineers here to bring down the cost of current. We put too much polish on everything, get marble switchboards and so on, with the result that you have to figure interest and redemption on that enormous expense; simpler schemes ought to be adopted. One gentleman touched upon the hire-purchase system of stoves, but I do not agree with that until you can adopt a more reliable stove and eliminate the maintenance costs. I think the present stoves we have, and I think you will agree with me, cost more in upkeep and repairs than the revenue derived. We want more reliable apparatus. I wish to congratulate Mr. Roberts in bringing this paper before the Convention, which I am sure will bear fruit, and you will all go back to where you came from and endeavour to extend the system of heating and cooking by electricity. I am sure it will be the forerunner of establishing a solid basis for cheap power and also to cheapen the cost of living in this country. I have much pleasure in supporting Mr. Roberts in his endeavour to bring this prominently before the Convention.

Mr. Councillor A. LINTON: I would like to thank Mr. Roberts for his exceedingly interesting paper on current for heating and cooking. What strikes me in regard to this discussion is that the matter of supplying electricity for cooking purposes must in the nature of things be more or less an individual problem in each town, and while the matter of heating is one that has been considered in a mild way by myself, I must confess that the figures as presented to me, under our conditions, have never been able to show capital, interest and redemption charges, and also the capital expenses

involved. That may be owing to the kind of tariff we have in force at Port Elizabeth, which is the Norwich system. Taking what I consider the most likely district in Port Elizabeth in which to instal cooking apparatus on a large scale, and taking into consideration the capital cost of the heavier cable required and the transformers that would be required to cover that area, I could not find that at 1.3d. a sufficient return would be received for the capital expenditure involved, quite apart from the cost of coal for generating the power. In regard to radiators, we found from the position at Port Elizabeth that to instal plant necessary for radiators, the capital cost itself could not be recovered. That, of course, was from the strictly financial point of view, but I wish to emphasise what has been emphasised by other speakers, that we as municipalities must never forget that our primary duty is not to produce a profit, but to supply service, and the rate-payers when they pay for light must be considered first and foremost. Nobody can take up an American magazine without being amazed at the extent to which electricity has entered into the American home, and its use is being extended in other directions. In a country such as ours, with its heat and efficiency of service, if we can do anything at a small loss to increase home comforts, I think it will be amply compensated by the increased comfort given to the ratepayers. With regard to the discussion which has taken place this afternoon, there is a strange familiarity about it. When it was first proposed to instal electric light in Port Elizabeth, the gas companies were up in arms, and they produced reliable figures to show that we could never compete with gas and that we would lose money for a number of years, and so we did, but to-day they are out of the market. I think it is up to every member of the Town Councils who takes an interest in electricity matters to prepare for the day when we must see we are ready to take advantage of the demand and supply the ratepayers with the comforts they require in the way of electric energy for heating, cooking and so on.

Mr. Councillor H. SOLOMON: I have to thank Mr. Roberts for his very interesting paper. At Kimberley we are not in a position to supply current for heating and cooking purposes owing to the high price of energy. I have been very much interested in the discussion this afternoon, and we might in the future be able to go in for it. I only want to add my quota of thanks to Mr. Roberts for his very interesting paper.

The PRESIDENT: I would like to have Mr. Roberts' view regarding the higher pressure used in South Africa compared with the States. I think this has a lot to do with the short life of the elements. An element designed for 110 volts is much more robust than ours at 220 volts.

Mr. JNO. ROBERTS: Reverting further to cooking apparatus, it is unfortunately the case that they are not perfect just now. Our experience in Durban is that when once a contractor has sold a stove, he has lost further interest in the thing and wants to make profits out of the repairs. In the interest of everybody, it would be better for the Municipality to establish a little department to do this work, for they could afford a man who is more or less an expert and keep him on the job. In am fully convinced, when we have our power station in a position to cater for cooking and heating, we will have to open a special repair department. It would be a good thing to have a heating element which is readily replaceable, so that it would be practicable to give a consumer one or two spare parts he could put in without having to use screwdrivers to replace the old part, which he could bring back to us for repairs.

The Convention then adjourned.

WEDNESDAY, 22nd NOVEMBER, 1922.

The members and delegates were motored to Stellenbosch, where in the Y.M.C.A. Hall they were welcomed by His Worship the Mayor, and a paper, "Some difficulties and hopes of smaller towns with regard to the installation of electric schemes," was read by Mr. Councillor-PAUL D. CLUVER.

SOME DIFFICULTIES AND HOPES OF SMALLER TOWNS WITH REGARD TO THE INSTALLATION OF ELECTRIC SCHEMES.

(By PAUL D. CLUVER.)

In the earlier part of the year we read a glowing account of a Farm in New Zealand, where a large Dairy and other operations were carried on with great success by a farmer, his wife, with no other assistance than that of his two children.

This was made possible by turning the forces of nature in the shape of a waterfall into the service of the farmer by means of an electric

dynamo. With the help of electricity the cow-stalls were cleaned, the cows curry-combed, the lucerne cut up, even the milking of many of the cows, was done by an electric appliance. This silent partner helped the housewife to bake bread, to wash and iron, to scrub, sweep and dust. When the farmer, who was an early riser, required his early breakfast, no servant had to be awakened, his bread was toasted, and the water for his tea was heated, whilst he was dressing.

The New Zealand experience was an inspiration, and the thought came, why can South Africa not have the same advantages. True, there are few waterfalls available, and the supply of water is intermittent, but there is an abundance of coal, and moreover, many of the water schemes, such as Steenbras, should, one would have thought, easily provide the necessary power. But these are problems to which this Conference will no doubt furnish clear replies.

When we turn to the towns, the picture is not bright. The experience of the smaller Municipalities is distinctly discouraging, as the following will show.

Last month the public Press provided the following particulars of a disastrous enterprise:—

"A meeting of ratepayers was held last night to consider the financial position of the electric light scheme, originally estimated to cost £8,500. It actually cost £15,285. In spite of rigid economies that have been introduced, the scheme has been running at a loss of £100 a month, and the present indebtedness, after allowing for stock in hand and outstanding accounts, is £17,500."

This the South African example is as disheartening as that of New Zealand is encouraging. True, the one had all the advantages connected with individual enterprise. If the venture had been a failure, the farmer would have lost his own money. He, therefore, took care not only to get the best advice as to the suitability of the plant, but also to get thorough instructions as how best to run and protect the plant. The Municipality was also able to get sound advice, but there was not the same driving force—the financial interest of the individual ratepayer in the Municipal venture was comparatively small. On the other hand, the Council and the ratepayers, when they sanctioned the scheme, thought that they had adequate protection in the form of thorough scrutiny by experienced Government officials without whose consent the scheme could not have been undertaken.

The foregoing—and other instances—make it clear that this protection is very much overrated and of little real practical value. What does it really mean? In this case apparently the Authorities had before them the rateable valuation, which amounted to £110,000. As the scheme was estimated to cost £8,500, there was a sufficient margin, especially as the Technical Adviser of the Municipality estimated that there would be sufficient demand for light and power to ensure its payability, everything appeared satisfactory to the Provincial Authorities, who in turn relied on the Government Electrical Engineer. He apparently found that the scheme was properly designed, and passed it, in this case with disastrous results.

That the present system is not working well even with larger Municipalities is evident from the following:—

An important Municipality in the Eastern part of this Province had the following experience:—The Consulting Engineer advised two 100 H.P. Diesel Engines. The Government Technical Adviser urged that they were too large and that two 50 H.P. Engines would be all that was required. After many interviews and much correspondence, he withdrew his objection. Within eighteen months another engine of 100 H.P. had to be ordered, and now after 12 years two more engines of approximately 100 H.P. each have had to be installed. Thus, in a scheme only 12 years old, the generating plant has been increased by 200%, yet the Government Technical Adviser held that the original scheme was 50% too big for the town. Evidently unfortunate optimism ruled in regard to the small village whilst a pessimistic official dealt with the large town.

The remarks by the Electrical Engineer in that excellent publication, "The Architect, Builder and Engineer," provide instructive reading. We find a reference to a midland town which obtains its Electrical Power by means of a direct current derived from a Motor Generator from the Railway three-phase supply, which the Editor, even before installation, condemned as an unsound principle. He now states that a few months' running have shown that, although the Council pays the Railways 4½d. per unit, the actual cost per unit used by the consumer, owing to the loss between the railway meters and the consumer (50%) is 8½d., and therefore the fair selling price to the town consumer should be in the neighbourhood of 1/3 per unit. Then, too, it is suggested that the Electrolytic house meters are of a type long since discredited in normal climates and quite unsuited to the town, and that they will have to be scrapped.

In the same issue reference is made to a large city in the Union, with the following criticism:—

"The laying of miles of high tension cable through the sandy waste is sheer and typical extravagance, and what is more, it was quite unnecessary. The existing 3,000-volt line could have been duplicated to operate at a higher voltage at one tithe of the cost of laying the underground cable with equally satisfactory service. That the rates in this city rank among the highest in the country is no longer to be wondered at."

When Councillors read such criticisms in the Public Press they are bound to become nervous. Moreover, such serious statements in an engineering organ of standing are a sign that responsible engineers are profoundly dissatisfied with the present system. Whether such criticisms are justified or not is not a matter for this paper! What concerns the smaller Municipalities is how adequate protection is to be provided for the progressive towns which wish to give its ratepayers the comforts of electric light and power. Our experiences as Municipal Councillors lead us to the following conclusions:—

1. That a strong warning should be issued to the smaller Municipalities, that the greatest care should be exercised before adopting an electric scheme.
2. That the first essential is a good and pure drinkwater supply. The comfort of electric light and power will neither attract permanent residents nor those wishing to develop local industries. The first consideration must be the health of both visitors and workers.
3. That it is difficult for the average Municipality to run an electric plant profitably if it has to provide its own power. That it is far safer

to secure power from large industrial concerns; that we should look to the electrification of the Railways to provide both townsmen and farmers with cheap light and power. South Africa has cheap coal in abundance, and if our legislators could take the long view, they would realise that it would be in the interests of the country not to allow a single empty truck to return from the neighbourhood of the coal mines to the coast without its load of coal for large power stations which should be erected along the railway lines where power could be produced at very low cost.

4. That the aim of the smaller Municipality should primarily be, the supply of light, that the supply of power should be of secondary importance and limited to day use.

5. That with regard to small villages it would be best to rely on private enterprise. A few enterprising hotel-keepers could easily provide their immediate neighbourhood with light from their own installation. The sooner the small town or village realises that an electric power station cannot be run in a slipshod way, but requires a skilled, reliable and well-paid electrician, the better.

The new Electricity Act, which was passed through Parliament during the present year, gives Government great powers, and if the Act be wisely administered, and if the Control Board consists of men of great ability and sufficient vision, a great future should be before South Africa.

We look forward to the discussions at this Conference to show in what way the measure may be made most effective and to indicate in which direction the Act should be amended so as to be of real practical value to the country. If this is done, the ideal of smokeless factories, with healthy industries, by means of which the raw products of South Africa will be converted into manufactured goods, will be capable of realisation.

It is to the electrical engineer that we look for the solution of many of our problems. His is the branch of industry which is not looked upon with disfavour by the white youth who now looks upon manual work as something degrading.

The sound development of electric enterprise can do much to secure a large, prosperous and contented population for South Africa.

On the conclusion of the reading of the paper,

Mr. JNO. ROBERTS referred in appreciative terms to the fact of the Chairman of the Stellenbosch Electricity Committee interesting himself so much in this matter as to read a paper at the Convention, and proposed a hearty vote of thanks to Mr. Cluver, which was supported by Mr. T. C. Wolley-Dod.

A short discussion on the paper ensued, in which

Mr. FLETCHER criticised the reference in the paper to the primary object of small Municipal Electrical enterprises being the supply of lighting load, and showed the importance of obtaining also a good proportion of load for power purposes.

Mr. G. M. CLARK (visitor) referred to the paper from the Consulting Engineers' point of view, and pointed out some of

the difficulties experienced by Consultants when dealing with the smaller Municipalities as well as the paucity of Consulting Engineers qualified to undertake such work.

Mr. W. H. BLATCHFORD showed, by taking certain existing undertakings, how, notwithstanding the high cost of fuel due to the position of the Municipality from main lines, etc., how by careful attention to detail a small municipality can make a success of its electricity scheme.

Mr. G. H. SWINGLER referred to the rapid and unexpected growth in demand which frequently occurred to numbers of the smaller municipalities in the Union, and pointed out the vital necessity of looking far enough ahead in the design of the undertaking to allow of almost unlimited expansion as the occasion arises, and showed that the expenditure of a somewhat greater capital sum in the first instance was amply repaid by results within a comparatively short time.

Mr. Councillor LINTON also supported very heartily Mr. Roberts' vote of thanks to Mr. Cluver. He described the utmost importance of Municipalities when considering the inauguration of an Electricity Undertaking of obtaining the most expert advice possible, and not, as was frequently the present-day tendency in some instances, to rely on Government Technical Officials for this, who were necessarily bound by red tape and therefore unable to view the matter in the same perspective as the professional consultant.

Mr. CLUVER, in reply to the discussion, criticised severely the Government's present method of dealing with applications by Municipalities for the installation of electrical plant and equipment, and especially in regard to the type of plant.

Members and Delegates then visited the farm, "Schoongezicht," where they were welcomed and hospitably entertained by the Right Hon. J. X. Merriman, P.C., and were later entertained to lunch in the Agricultural Show Grounds by the ladies of Stellenbosch.

A visit was paid in the afternoon to Messrs. The Cape Explosives Works, Ltd., where they were shown over the principal manufacturing departments and were entertained to tea by the management.

THURSDAY, 23rd NOVEMBER, 1922.

The Convention resumed its proceedings in the City Hall Buildings at 9.30 a.m., the President being in the chair.

The Convention immediately proceeded to the consideration of Mr. T. C. Wolley-Dod's notes on the provisions of the Electricity Act, 1922.

Mr. G. M. CLARK: I was away in England at the time the Electricity Bill was before the House of Assembly and I took no part in the work of the Select Committee or in considering the Bill. It would appear to me, from what I could gather, that it was almost incredible that a Bill of such importance should have been put through so hurriedly and without a great deal more discussion and more time devoted to the various clauses of the Bill. I belonged to what was then the Board of Science and Industries, which was appointed to advise the Government in regard to matters such as this. On that Committee is also Mr. Bernard Price, who represents the largest producers of electricity in the country, Mr. Elsdon Dew, and myself, and between us, with our years of experience, we could put up a case from the larger standpoint, and I am sure that, had we been given time to consider this measure, we would have been able to produce a better Act than is now the law of the country. The Bill was only available for a short time for discussion, and the Select Committee could not have done the work properly within the time at their disposal. The Act appears to me not only hurried legislation, but in many respects it seems to me rather a bad piece of legislation, because in my opinion, whilst those responsible have been able to see the mote that exists in the eye of the electrical engineer, they do not see the beam in their own eyes. One of the things objectionable in the Act is that which deals with the functions of the Government—the Government of a free country. A free country is one where the people govern themselves, and as far as the electrical industry is concerned, those responsible have been governing exceedingly well, and the Government should only be called upon to deal with these matters when those who are affected by the working of a particular section of the community—in this case the electrical engineers—and when some disability exists and there is no remedy. This country has suffered no disability in the way the electrical industry has been carried on, no disability of a material kind. We heard yesterday of the difficulties of small municipalities—

the acorn which has not grown into an oak. Another point is that we have too many Acts; it seems to me to be a sort of Act factory. This Act especially, and many others, are imported from overseas, and because they happen to fit certain overseas conditions, it does not follow that they fit the conditions we have to deal with in this country. I have seen what they are doing in England and I am perfectly convinced that the South African electrical engineer can deal with the affairs of this country just as well as people brought in from other countries, and it would be a good thing for those in authority over us to recognise the good work which is being done in this country. There is no standard of comparison. If one has been overseas, one can see that the man in this country can hold his own. If a Conference had been called from amongst members of the Electrical Engineers' Association, a far better Bill would have been placed before Parliament. The South African electrical engineer has nothing to be ashamed of. Another point is that, in governing a country, one does not wish the Government to set a standard of social conditions and frame a Bill on communistic authorities. This Bill in a certain form contains the views of communism. It is for the people themselves to develop and grow under the freedom they possess and for the Government to step in as little as possible. I am perfectly convinced in my own mind that the best work is produced when there is the greatest stimulation behind it, and I am sure private undertakings, who have a great deal of stimulus behind them, are certainly conducted in a better manner than those run by the State and from whom the stimulus of competition has been removed. There was a discussion on this point before the Select Committee, and no good work can be done without stimulus; all good work and private enterprise is probably the best way to deal with these things. There are certain functions that the State must fill, but the development of a new industry should not be pigeon-holed by a State department. Next to private enterprise, I am quite sure that the next best thing is municipal enterprise, a sort of half-way house between private and State enterprise, and sufficient stimulus should be given to engineers in charge of these undertakings. Whether municipal control or municipal running of power stations is the best conceivable is a question open to discussion. The function of a municipality is the delegated duty of the State to govern and not necessarily to run undertakings themselves. It is quite a

debatable point whether the function-delegated Government—that is, a municipality—in regard to power stations, should be one for the control of the undertaking rather than the running of the station itself. These views were expressed some years ago by well-known engineers who were running a large undertaking of the London County Council for lighting London, and it seemed at that time doubtful whether the Council should run the undertaking themselves or control it. These are some of the points that have occurred to me, and although this Bill has become an Act, and it might in some respects be an academic matter to discuss an Act, one nevertheless feels that the Act will have to be amended in a good many respects before it becomes a workable proposition. In the control of electrical undertakings we have Commissioners and Control Boards, and the Administrator has a further say in the matter, and, although a great deal of machinery is provided, it is not quite certain whether the machinery will work in harmony, and the simplification of that side of it might be of greatly more value than the application. We will have to think who will have to sit on this Board and see how the job is run, not after their term of office has expired, but before that. In the appointment of a Commissioner, his duty should be to act in a better capacity than a Government electrical engineer. I hope that, when a Commissioner is appointed, he will be appointed from one of yourselves, because I think a man who has had years of experience of lighting and municipal work is the right type of man to be a Commissioner. I do not think it is necessary for him to have high technical knowledge, but what we need is a man with practical experience, sound judgment, and a good business man, who knows the language of electricity. The highly technical man is not the best for such a post. I hope we shall all have an opportunity of discussing together an amended Bill when it is placed before us.

Mr. JNO. ROBERTS: I consider it is very necessary that this Bill should be discussed by this Convention, and, although it is an Act and not a Bill, seeing it is the first time we have met together since the Act came into force, it is necessary now that it should not be discussed in an academic way, but that a stand should be taken up and that the Convention should decide what that stand should be. As you know, we have had this Bill rushed on to us without any opportunity of expressing our opinions, and I think it is not right that we should simply sit down and take the situation as one beyond our control. What we could do is a matter for the Convention to decide,

but at any rate it is necessary that we should express our views strongly, either in favour or against this Act. It is true, I think, as Mr. Clark has said, that amendments will undoubtedly have to be made. The way the Act has been drafted and its very working indicates that the person responsible for the Act did not know the fundamental facts. He did not know the difference between a kilowatt and a kilowatt hour; there was no technical advice to the Government, and I think such legislation is unique. I have heard of Coal Commissions being appointed to advise the Government—a Commission on pooling coal—but in this particular case the policy was entirely different, and efforts were made to keep the Bill dark before it was introduced into the House. The difficulty we engineers had was that the matter was so technical that it was difficult to get our town councillors interested in it unless we could place a finger on one clause which was so outrageous that a Councillor could criticise it.

I have a few suggestions to make. We should make some representations on this Bill and as time is getting short—this is the last day available for business—I suggest that the Council of the Convention should be asked to draw up a memorandum on lines which we can approve of this morning, and that it should be circulated among the various Town Councils of the country and handed to the Press for publication. That, I think, will be expected from us. We are down here to consider these matters, and if we go back to our Councils and only say we have discussed the Bill, that will be a futile sort of thing to do. They require a lead from us, and at any rate if we get nothing in the way of amending the Act, we can put our Councils wise as to the policy which the Government has adopted in regard to this matter and to say that they will not be allowed to continue year after year to go on dealing with one of the most important municipal enterprises. We must have something concrete to place before our Councils. They want to know in what respects the Bill is bad and so on.

It has not been generally realised it is quite possible that the electrical supply of this country can fall into the hands of private undertakers. Take a concrete case: We have put in an application to the Administrator in terms of the Bill. The application is sent to the Commissioner, and the Control Board, acting in the capacity of Commissioners, consider the desirability of establishing a new power station first, but before

doing so the Act provides they must call for tenders from private parties, and if these tenders are satisfactory then they might let out the power station to a private party to operate, and, consequently, the Durban Municipality might find itself without any right to express any opinion on the subject and find themselves having to take current from a private generating station erected in Durban. There is nothing in the Act to provide that the Durban Town Council shall have a say in the matter, and the same thing may apply to any other power station, and when a private party has one or two stations they will be in a better position to tender than anybody else. Under the Act, one private concern may obtain the whole control in South Africa. I take it that municipal enterprise, which has done the job with credit and to the satisfaction of the consumers, should be considered; it is not right that the Government should step in and take away that right and place us in the position of having to reverse our entire policy of the past.

We have had very little time this week to discuss matters, and I do think it is up to us to put our views in the form of some memorandum to show that we are a live people and to protect the work which we have built up in the course of years and which is now proposed to be ignored by the Government.

Mr. T. C. WOLLEY-DOD: Dealing with Mr. Roberts' remarks, an interesting point opens up as to whether we shall put up a memorandum expressing our opinion of this Bill. So far as he has gone, he has only suggested certain grievances, but no remedies; the difficulty is to find the remedies. It rather strikes me that Mr. Roberts anticipates bad administration of the Act, and I do not know whether he would be justified in doing that. After all, in the points he has mentioned, all you have done is to substitute a Commission for the Government Electrical Engineer as regards municipalities, and I do not feel that the substitution is to our disadvantage. At the present moment, if you want to put up a plant or extend your existing plant, you have to go to the Administrator. The Administrator's adviser is the Government Electrical Engineer. Surely, you would sooner leave that matter in the hands of Commissioners of business men and not in the hands of one man who is bound down by red tape. I think we are in a better position than we were before. In regard to the personnel of the Board, the Board comes more into the position of a factory inspector; it is the Commission which has to deal

with these technical matters. The Board has simply to see to the carrying out of the regulations, and I do not think, under those circumstances, that you could have a better Board than the Board which is the same in regard to the greatest industry in the country—namely, the mines. These points have struck me in regard to Mr. Roberts' remarks.

Mr. MILLAR: While in sympathy with Mr. Dod's remarks, I may say I have much pleasure in supporting Mr. Roberts, and I think it is up to we engineers to see that municipal engineers should have some say in this matter. After all, it might not apply to small municipalities, but it may one day, and I think this motion by Mr. Roberts should have the support of all.

Councillor Major KING: I would like to say a few words in regard to the undue haste in putting through this Bill. We heard of it in Johannesburg, but no one had a copy of the Bill and could not obtain one. We immediately wired to the Minister in charge of the Bill to the effect that we would come to Cape Town to make representations in regard to the matter. Legislation of this kind does not appeal to any man in the country; legislation passed in a haphazard way and without receiving technical advice. I was one of the deputation sent down from Johannesburg (I am not a technical man), and when we got here the Minister of Mines and Industries met us in a cordial and encouraging manner, and when I saw the Act which had been passed and compared it with the draft we had, it was a great improvement on what we saw of the Bill, and I think it was due to the representations of all municipalities who came down here and used their influence. They got a great deal of redress, and that would encourage me to urge on others if there are things detrimental to municipalities and users of electricity generally. Matters should be placed before them strongly and we should go on battling until we get what we want. I was struck with what Mr. Clark said—the way people in this country have of overlooking the brains and intelligence we have in the country and looking to America and England to tell us what is right; men who have not had the opportunity of studying local conditions and whom I contend are in most cases wanting in experience with the conditions in this country. They come over here and write reports, whereas we have men who have had a great deal of experience in the country and who have studied local conditions for years and who have a large interest in the country. I am

a man who, when South African stuff is available, takes it in preference to other stuff, and in my household I have only a little Scotch whiskey which is imported, and that we keep for friends. (Laughter.) We must be South African and band ourselves together to see that proper use is made of the brains and intellect in the country. It is the old saying that a prophet is without honour in his own country. Here, if an expert is required for anything, they never come to a man in the country, but always want a man from overseas, which is the greatest mistake they can make. In regard to Mr. Roberts' remarks, if I may be allowed to say so, I think it is somewhat early to criticise the operations of this Act. With regard to the Board and the Commission, as Mr. Dod has pointed out, this Board is only for the purpose of seeing that the Act is carried out; it is the composition of the Commission we must see to, unless the Government appoint a Commission which will bear the whole confidence of the country. If it is going to be a hole-and-corner business, they will not carry the confidence of the country. They can get men to serve on this Commission without pay, in the same way as they serve on the Rand Water Board, men who are not in Government service. I contend they will have good men to serve on this Commission. We must see that it is not entirely composed of members of the Government service, but composed of electrical engineers in the country who have a large and practical experience of local conditions in this country. At the same time, of course, we must have the Act framed in such a way that no injustice can be done, and I for one suggest that we get to work on the Act until we have had it in such a form as to give satisfaction to our technical men, and it is our duty as Councillors to back them up to secure the right thing.

MR. COUNCILLOR T. C. SHEARER: I agree with what Major King has stated and I also feel that this Act has been put through Parliament in a hasty manner. Another Durban Councillor and myself consulted Mr. Roberts, who explained the whole matter, and we then realised the seriousness of this Bill. We then asked the Council to allow Mr. Roberts to go to Cape Town and endeavour to remedy what we thought were the evils of the Bill, but the Town Council of Durban did not seem to worry about it. The Town Council did not take an interest in matters until these evils came home to them, and they then realised that they might have taken steps to remedy matters. The Durban Municipality has a power station

second to none, and we realise in Durban that the demand from outside is greater than we can supply and our accommodation for adding to the present power station is limited. We are looking forward to getting a new power station in Durban, but our hands will now be practically tied, as this Electricity Act puts us in an awkward position. We do not know whether the Government is going to take over the control of electricity in Durban or not, and up to the present we have not had a satisfactory reply from them. I think it is right that this Convention should put the matter before the Government as it appeals to the municipalities. There is a danger, and a grave danger, of the electrical supply of the country being controlled by private enterprise. The Government will call for tenders and no one knows how a Government is going to act. Governments are curious institutions; outside influence is sometimes brought to bear on a member of the Government for the benefit of private enterprise. This has been done before, not only in South Africa, but all over the world. We in Durban, I think, are in the proud position of being able to supply electricity cheaper than any other municipality in South Africa, and it is due to the municipal enterprise that that has been brought about. I am not a technical man, but I realise that some steps will have to be taken to advise the Government as to the right way to go about things. There is a danger to municipalities like Johannesburg, Cape Town and Durban, who have been the pioneers of electricity in South Africa, that their work is going to be scrapped; there is a real danger of that. Small townships in a few years' time will have grown, and they will also be affected. Private companies do not like to give much away for nothing. With them it is profit and not sentiment. I certainly agree with Mr. Roberts that representations should be made to the Government in the matter.

Mr. Councillor A. LINTON: I would like to endorse Mr. Roberts' proposition *re* circulating a memorandum to the various municipalities in South Africa. Seeing that this is the first meeting of the Association since the Electricity Act was promulgated, it is up to us to take some action. When our attention was first drawn to this Bill, Mr. Bickell was away from Port Elizabeth, and it was my duty to go through the Bill and to see what action should be taken. The first thing that struck me was that it seemed to be that the Commission proposed to be appointed was so much eye-wash and

a sort of cloak for the Board of Control, and indications seemed to point that the Board was to consist of Railway nominees. I am never of favour of Government control if it can be avoided, and above all I have a great suspicion of the Railway Department in connection with electrical matters, because our experience has been that they have no conscience in dealing with municipalities. What you get out of them you have to force out of them. It strikes me that the Bill has been much improved upon, and, after all, if there is good administration we will be in practically no worse position than in the past. In regard to Mr. Roberts' fear that private control will create a monopoly for South Africa, the provisions of the Bill will be adverse to that. I do not think that private capital is going to enter into any enterprise where there is a considerable chance of making a loss and where the profits are limited. There is not so much capital in the world to-day to take that risk. Another point is that the underlying intention of the Act—I think every fair-minded man will agree to this who has the development of South Africa at heart—is the co-ordination of the power supply of this country in public hands. We may think it better that municipalities should have independent and supreme control, but, after all, it affects the national life of the country. Big schemes can produce power much cheaper. I hope Mr. Roberts will amend his motion in that way and to approach the Government.

Mr. Councillor T. ERICSEN: I personally feel that municipal electrical engineers have a distinct grievance in connection with this Electricity Act. At the same time, I do not believe in any unfair criticism. I feel that the ten or twelve eminent engineers who drew up this Bill had a very important duty to perform and they were very eminent South African engineers. Sir Robert Kotze was one of them. We must remember that this Act was drawn up to standardize the electrical supply of this country—that is, to get a uniform supply under which municipalities having various standards of voltage and so on would be standardised. The larger aspect of the Bill, of course, is the supplying of power for industrial purposes. Although municipalities have a distinct grievance in not being consulted, that is a small matter compared with the larger one of industrial development, and I feel that what the Bill is meant for is to safeguard and give cheaper power for industrial development and railway development. I feel that Mr. Roberts is quite right and is on right lines. I feel

that the Government is not aware of the fact that municipalities are such great sufferers as they are in this matter, but I also feel that if you go to the Government with amendments, proving that you are actually suffering under the Act, I am positive the Act will be suitably amended to meet the municipalities. I am sure, if representations were submitted to the Government, they would be duly considered. In regard to what has been said in connection with the rushing of the Bill, I do not agree that it was rushed, because I watched it from the time it was compiled. We also know that a Select Committee was appointed in the House of Assembly and evidence taken from all parts of the country. Amendments were submitted to the Select Committee, and if you compare the Bill as originally introduced and the Act that was passed, you will see that the improvements introduced are considerable. I was down here in Cape Town at the time and I was able to place a few points before the Select Committee, but as I have said, the Bill is meant more for the larger aspect of the country—that is, industrial development. As far as municipalities are concerned, I say again that they have grievances, and which I certainly think ought to be remedied.

The PRESIDENT: I would like to correct the position as stated by Mr. Ericson. Some of us happened to have the pleasure of going to Johannesburg and sitting with the drafters of the first Bill. We sat for two days. Here is a typewritten statement of the proceedings. The late Mayor of Cape Town (Mr. Councillor Gardener)—and I think he was correct—stated at this meeting that we believed the Electricity Bill was simply a Railway measure in order to get control of the undertaking in view of the electrification of the railways. The prime mover in connection with this matter was undoubtedly the General Manager of Railways. The Administration wanted electricity for the Railways, but did not want to take their supplies from the municipalities. The frequent strikes and interruptions in the Johannesburg municipal undertaking frightened them, although Durban, Cape Town, Port Elizabeth, East London, and other municipalities had given them satisfaction for years past. They are not wanted in the future, except to take a supply from a commission station in order to reduce the cost of energy supplied to the Railway Administration.

This Act is not at all like the old Bill. It is based on the Canadian Act. When we were about to hold our Convention

I got into touch with our members and suggested holding it at the same time as the discussion on the Electricity Bill would take place in the House. I was put off from time to time by the Department of Mines and Industries, and I am convinced it was deliberate, seeing Mr. Jagger two months before had mentioned at a dinner that the new Bill had been drafted on the lines of the Canadian Electricity Act. I went several times to the Mines Department representative, but could not get a draft copy of the Bill. I think the views expressed by the Association on the first Bill did not suit the powers; that being so, they did not want our advice on the new Bill. Although they had a year to re-draft the Bill, we could not get a copy of it until it was actually introduced into Parliament. The same thing has occurred in connection with other Bills; municipalities did not receive a copy until it was too late to work up any opposition. Measures are sprung on the public and are rushed through the House before they knew what is happening. I agree with Mr. Roberts to a certain extent, because I have always been against the Bill being rushed. My view is that, providing you keep politics out of municipal councils, you can run municipal electrical undertakings more efficiently than those controlled by a commission. I must admit that I believe a company can run an undertaking more economically than a municipality. I do not believe the Electricity Commission will be able to run a power station any more economically than we can in Cape Town, and I am sure the Railway cannot. I may say we are fortunate here in that we have no politics in our Council.

In reading the evidence given on the Bill before the Select Committee by Mr. Bernard Price, Mr. Elsdon Dew, and Sir William Hoy, you will see that the latter brushed aside the points made by Mr. Price and everybody else. It is clear they do not want to take their supply even from the Victoria Falls Power Company, who have maintained their service when the Railway have not been able to do so. I would like to say that in Cape Town we have never had a strike. The nearest approach to a shut down was when the Railway Administration could not supply coal due to their own troubles. All that is required is to protect the people who are working the stations, and this the Government failed to do during the recent troubles on the Rand. With few exceptions, municipal electrical undertakings have been a success, especially where politics are not allowed to enter into Council matters. With its own scheme Durban can sell electricity for ½d., and can do

just as they like to encourage industries, but if they have to buy at a flat or any other rate, they will find it is not so easy to arrange their municipal policy. With your own station you can make your electrical undertaking work in with whatever policy the Council wish to adopt. The whole thing, of course, depends upon local conditions. Cape Town's labour conditions are entirely different to the Rand or Durban. I do not fear at any time being unable to run the power station here; the Council have treated the men fairly and there are no just grievances. Personally, I would much rather see a private company running the power undertakings of the country than a commission. You can get some satisfaction from a private company, but not from a semi-Government department. The Government got the advice from the municipalities and from this Association and other kindred associations, but in spite of that they passed an Act to suit the Railway Administration. We ought to have squealed more when the matter was going forward. The Durban Town Council had the same opportunity of squealing as others, but it looked as if Durban welcomed the Bill. It was unfortunate we could not create sufficient interest in the various Councils. I think the best thing to do as municipal engineers is to advise our respective Councils as to what action should be taken to make our stations so efficient that when the Commission comes along they will be unable to recommend that new stations be erected. We should not wait to see what the Railways are going to do. Big towns in England and Scotland have put up large stations; they did not wait to see whether super stations were going to be put up by the Commission. I have always advised my Council, notwithstanding the criticism which appeared in Messrs. Merz and McLellan's Railway report, to spend money on improving their station. I think they are well pleased with the results to-day. If we had waited for the electrification of the Railways, we would have been in a fix to-day.

Mr. JNO. ROBERTS: It would appear to me that the sense of the Convention is that a recommendation or representations should be made, but that perhaps my particular suggestions—which were intended to crystallise the matter—were a little too violent. Consequently, I would like to modify my original proposal that the Council, after having taken the sense of this meeting, should make such representations as the Council gathers from this Convention should be made. Therefore, the resolution should be that some representation

should be made from this Convention to the various Town Councils. I will draft a resolution for submission to the Convention.

Mr. MILLAR: I beg to second Mr. Roberts' motion.

Mr. FLETCHER: There is one question which has not been touched upon, and that is the one of compensation to officials. In the English Act there is a compensation clause, and I believe that in the original recommendations made by this Association, that was provided for. I certainly think that representations should be made in that respect.

The PRESIDENT: That matter was submitted to the Drafting Committee on two occasions, and it was also placed before the Select Committee by the Mayor of Cape Town.

Mr. FLETCHER: If it happens that a town is taken over, this Association should make very strong recommendations to the Council and the Government with a view to compensation being paid.

Dr. HAMLIN: I go a fair distance with Mr. Roberts because I think it would be a bad thing if we, as members of this Association, when we are electing our Council, should not see that it would look after the interests of the whole of municipal engineers. I think the Government are out to "do us down." When the original draft came out and was sent to the municipalities, we had a meeting, and Mr. Roberts was one of a deputation which interviewed the Minister about various recommendations, and I believe one of the members for Durban said that they were thinking of erecting a big power station, and that, if the Government could supply current cheaper than they could produce, they would not mind. Can the Government supply us with cheaper current than we can generate? As a matter of fact, Mr. Christie, of Johannesburg, said something similar at the same time. The original draft was here and municipalities came and discussed it, and I believe a number of recommendations were submitted to the Select Committee on the Bill. I know nothing about the bigger places, but it will be difficult for the small people to be worse off than they are now. I agree with Mr. Dod that we are beginning to squeal before it is time to squeal. I think it is very difficult for the Administrator of this Province to send engineering matters up to Johannesburg and Pretoria for the investigation of one man who sits in his office chair.

It was said yesterday that Mr. Paul Cluver's paper at Stellenbosch took a gloomy view of small undertakings. Reports can be read over in Pretoria and people advised to go on with schemes, and I can mention several in this Colony where they are losing something like £100 a month. I have been interested in the design of these small schemes in the Colony, and I have one now before the Administrator, and, for the first time, they have sent a man down to investigate matters on the spot. As far as small municipalities are concerned, the Board will be infinitely better than what we have to put up with at the present time. I think, Mr. President, you were wrong in regard to the Weights and Measures Bill, because a month before the Bill was introduced a copy of it was sent out for criticism. I went through it with our Weights and Measures official at Stellenbosch. As far as Simonstown is concerned, I had great difficulty in getting them not to put down a scheme of their own, because I considered it was quite wrong, and told them they should get their current from the Admiralty.

After the Act has had a trial, then will be the time for the Council of this Association to take up a strong stand and circularize all its members through the Secretary and let us engineers in small places know what the difficulties are. It is rather interesting sitting here and listening to the two opposite views. One person complains that the Government did not follow the advice of Merz and McLellan and another says that foreign engineers were called in to draft this Bill. As Mr. Clark has said, we have here in South Africa men who can carry on this work, and it does not say in the Bill that they will not be asked to carry on this work. Power is given to the Commission to employ technical people, and we know there is a policy in South Africa, either rightly or wrongly, that the South African, or a man who has been years in the country, gets preference over the imported man, but I think we are on fairly sound ground. When the Commission is appointed, I have no doubt in my mind they will take eminent engineers who have made South African undertakings what they are to-day. In fact, I do not think the Commission will be able to get on without their advice.

Mr. WOLLEY-DOD: From the discussion that has taken place in regard to this Act, I think your Council will gather generally your views in the matter. There seems to be a great deal of misunderstanding as to the exact terms of the

Act and as to what has been done. I may say that, as your President of last year, your Council, directly the original Bill was published, assembled in Johannesburg and they sat there for about a week and went into the Bill very carefully. They drafted a memorandum containing their suggestions, which was forwarded to every municipality and also to the Minister of Mines and Industries, and I think those objections formed the basis of municipal delegations to Cape Town to interview the Minister, with the result that the Minister agreed to withdraw the Bill and to allow the leading municipalities to send their representatives up to the Drafting Committee and sit with them to hear all the evidence and then re-draft the Bill, and that was done. I do not say that all the points were accepted in the draft, but the general principles were accepted. Then came the time when secrecy was observed. Whether it was the Government, the Minister or the Department in charge of the Bill I could not say, but they did not want to be worried any more, and we could not get copies of the new Bill until it was laid upon the table of the House and our members of Parliament sent us up copies. We immediately wired to the Minister to delay the Bill, and the only reply we could get was that the Bill would be referred to a Select Committee, and that was eventually done. After further representations before the Select Committee, many important alterations were made, and now the Bill has become law. Many points raised to-day were pressed upon the Drafting Committee and also the Select Committee, but the point in regard to compensation was thrown out; the Government would not accept it. The criticism we have heard this morning only contains a suggestion from Mr. Fletcher that the question of compensation should be pressed, but otherwise we have simply heard general complaints that the Act is objectionable. The only objection I can see that has been raised is in regard to the composition of the Commission. As to the composition of the Board, I think, as I have already explained, the Board only appears to function as a sort of a factory inspector. It is very important that the Commission should be properly constituted, but I do not think that this Association can sit here and say, "We would like Mr. So-and-So appointed." The Association in its original recommendations succeeded in getting into the Act the provision that no one can sit on the Commission if he is employed in the Railway Administration or in any other Government Department. We got a long way there and we barred the Railways and the Public Works Department from

having any of their officials as members of the Commission. Another point which struck me was Mr. Roberts' remarks in regard to Clause 38, which refers to a municipality which wants to construct or enlarge a power station. In the first place, you have to send the report of the Consulting Engineer on the whole general and technical proposals to the Administrator, his Department being the one which looks after municipalities. The Clause provides that before giving his approval the Administrator shall call upon the Commission for a report upon the proposals and the local authority shall supply the Commission with such information as the Commission may require for the purpose of drawing up a report. It is also laid down that they shall particularly give their opinion as to whether the Commission can itself supply power on terms advantageous to the ratepayers and consumers as compared with the municipality. Then if they say so they have to submit their scheme to the Administrator, and on this information the Administrator decides as to whether the municipal scheme may go forward or not. The Administrator practically sits as a judge. There is only one point omitted from this clause which might be an additional precaution, and that is that a public hearing should be allowed in the matter; that is a great protection, and it would have been better under the circumstances that there should be a public hearing. I do not think that there is any such clause in England that a municipality has to apply to a commission. In some clauses of this Act it provides that there shall be a public hearing; a public hearing is provided in Clause 40, which deals with the exclusion of undertakings from local authority jurisdiction and where provision is made for a public hearing in case of dispute. If anyone wants to come into your area and take up your customers, a public hearing must be held to hear objections. This Act has entirely been drafted and put through in South Africa after advice from certain municipalities. That that advice was not taken completely is to be regretted. In regard to the view of certain speakers in connection with Government running stations, I think the Bill has been very careful to take it out of the hands of the Government as far as possible. The procedure of this Commission constituted by Parliament is laid down, and further there is no Government interference—it is particularly removed from the Government and that is a great safeguard. The Commission is free from Government control just as the Rand Water Board; they function as a private company.

Councillor Major KING: In addition to Mr. Roberts' proposition, I think we should endeavour to influence the Government to appoint such a Commission that the public in general would repose the utmost confidence—people who are outside municipal employment, such as electrical engineers and general managers of large undertakings. The Government should be made aware of our views on the subject.

The PRESIDENT called upon the Secretary to read Mr Roberts' motion, which was as follows:—

That this Convention instructs its Council to circulate a memorandum on the Electricity Act, 1922, among the various Town Councils of the Union, pointing out the general objection to the Act, protesting against the haste with which the Act was introduced without giving opportunities for discussion, but sympathising with the need for co-ordination and standardisation of the electricity supply of the Union of South Africa.

The motion was put and unanimously agreed to.

The memorandum, as drafted by the Council at a meeting held later in the day, and which was duly forwarded to all Municipalities in the Union in which a Municipal Electricity undertaking is established, reads as follows:—

ELECTRICITY ACT.

MEMORANDUM IN REGARD TO THE INTRODUCTION OF THE ELECTRICITY ACT, 1922.

(Drafted by the Council of the Association of Municipal
Electrical Engineers.)

1.—Introduction of the Act.

It is probably in the memory of some Town Councillors in the larger South African towns that, prior to the 1921 session of Parliament, copies of a draft Electricity Bill were circulated resulting in a Conference in Johannesburg between representatives from some of their towns and the Committee which drafted the Bill. As a result the draft was modified in certain important respects to convert it into a measure which removed some objections from the municipal point of view without interfering with the principal object of the Bill, which was to co-ordinate Electricity Supply throughout the Union, the lines of the British Act being as closely followed as the special conditions of this country permitted.

The original draft Bill was not introduced into Parliament.

Prior to, and during the course of, the next session, efforts were made to obtain copies of the re-drafted Electricity Bill which had been announced to be introduced, but no information as to the details of the measure was procurable till it had actually been read a first time, and it was then found that the new measure was drawn on new lines and practically no opportunity was given of conference between municipal interests on the new Bill and for preparation before giving evidence before the Select Committee appointed to consider it.

2.—The Past Record of the Municipalities in Electricity Production.

The Municipalities have, up to the present time, taken upon themselves the whole of the development of electricity generation and distribution in this country with the exception of that needed in the mining industry, and it is felt that the guidance, or at least the opinion of these electricity undertakers should have been sought on the newly re-drafted measure designed to continue such development on entirely new lines. It cannot be said that the municipal electricity undertakings have been unsuccessful in the past. Current is extensively distributed at prices which compare most favourably with those ruling in other countries, and with one solitary exception there has been remarkably little interruption in the supply, either from industrial disturbances or other causes. The Railway Administration depend almost entirely on the municipalities for the supplies of electricity required by them in the various centres and have made practically no complaints of the service received, either in regard to price or continuity. Considering the difficulties which every undertaking experienced during the War, this must be testimony to the reliability of the municipal systems.

3.—General Objections to the Act.

1. Power has been given to the Commission to take further development of electricity out of the hands of the Municipalities.
2. At the present stage of electricity production, when new improvements are still constantly being introduced, a single undertaker such as the Commission will be apt to become stereotyped in its methods and cannot so readily adopt the flexibility of policy and new improvements as is possible with a reasonable number of separate undertakers who employ different advisers.
3. The possibility of the whole production of electricity falling into the hands of one organisation which may be a private company cannot be viewed without some concern as being a complete reversal of the present state of things, under which there is complete public ownership, with the exception of mining supply before referred to.

4.—The Bill as it Affects the Municipal Undertakings.

The original draft Bill seemed to us to be excellent in the manner in which it provided that an inefficient undertaking could be closed and the owners compelled to obtain current from another source if such a course was considered to be in the interests of the consumers, and, further, the right was to be preserved by a successful undertaking to continue to develop its business.

The new Act does neither of these things. No steps are provided to protect the interests of the consumers of a public undertaking who may be suffering under an expensive and unsatisfactory electric supply. Further, no municipal undertaking, as in the original Bill, has the right to extend its plant without the consent of the Administrator on the advice of the Commission, but though the Act is not by any means precise on the point, it would seem that it remains now entirely at the discretion of the Board whether the Commission may assume charge of all further production of energy to municipalities. It would also appear possible that if the Commission obtain tenders considered satisfactory, production may be handed over to another undertaker from whom a municipality would be obliged to take all its further supplies of electricity without being consulted as to terms and conditions. It is specially laid down in the Act

that before any tender to operate an undertaking is accepted, the Railway Administration is to be given the opportunity of scrutinising and making a report on such tender if the Railway Administration is a customer of such undertaking, but no such opportunity is given to a municipality in like circumstances. We cannot but consider such discrimination in favour of the Railway against a large urban Corporation whose interest in obtaining a proper service of electricity is just as important, is not a little extraordinary.

5.—Discrimination in Favour of the Railway Administration.

The example given in the last paragraph is not the only illustration of such discrimination in the new Act. In Section 40, no consumer within a municipality *except the Administration* for power purposes may be supplied by any other undertaker than the municipality without the latter's consent. The Administration is here placed in a more favourable position than any other private consumer, however large, and, further, a municipality owning large, suitable and efficient generating plant may be refused the right to further improve its revenue and reduce its overall costs by the acquisition of supply of current to the Railway Administration.

It can only be assumed that the Railway Authorities have succeeded in persuading the Government that the municipalities are not to be trusted with the responsibility of supplying current to the Railway Administration any further, in spite of the excellent record which stands to their credit in connection with contracts for electricity supply, as is referred to elsewhere in this memorandum. It must also be assumed that the fear of industrial disturbances and strikes in municipal undertakings has been brought to bear in devising these particular provisions of the Act, and we think that all municipalities, whether likely to be affected in the immediate future or not, should take up this matter as being an undeserved slight upon local government generally in South Africa by the Central Government, and spare no efforts till this Act is amended to remove it.

In the first place, if one municipality is excepted, the record of municipal administration compares quite favourably with that of Railway operation by the Railway Administration since Union and by the Governments of the various provinces and States previously in regard to freedom from breakdowns of service due to strikes, etc. Neither in Cape Town nor Durban has the regular service of electric supply been seriously threatened.

In the second place, any future industrial upheaval which would be of sufficient magnitude to threaten railway operation would not be influenced by the mere question of the particular ownership of the Power Station. A Government Power Station would be as susceptible to industrial troubles as a Municipally-owned establishment.

In the third place, it has been assumed by the promoters of the legislation objected to, that the interruption of current to a railway would be so disastrous as to justify these exceptional provisions. It is maintained by us, however, that the stoppage of the Railway service temporarily to any of the large towns of the Union would be of less importance than the stoppage of the electricity supply, for in some towns such essential services as the water and sewerage systems depend on electric power.

In the fourth place, the recent strike at the Johannesburg Municipal Power Station demonstrated that, given proper protection against

violence, there is no difficulty in carrying on the service by volunteers if a strike occurred. The more modern and better planned is the Power Station, the easier it becomes to operate temporarily with a strange staff, and this fact alone is in itself bound to be a great deterrent from striking by the regular operating force.

6.—Cumbersome Machinery.

It is to be feared that the cumbersome procedure laid down in the Act which has to be gone through when a Municipality desires to extend its plant, will cause great delays. In those cases where the possibility will not arise of supply being obtained from the Commission, the delay need not be serious. But in other cases, as for instance in Natal, where the contingency has arisen of all new supplies being obtained from the Government Power Station built for Railway supply purposes at Colenso and probably elsewhere, a good many months or even years may elapse before a final decision may be given after a municipality has come to the decision to increase its generating capacity. The steps which have to be taken need not be enumerated here, as they are familiar to those acquainted with the Act, and it is hoped that the controlling authorities will cause as few delays and simplify the procedure as much as the requirements of the Act permit.

Though this Act is now on the Statute Book and must be complied with by all electricity authorities, it has been thought well by the Association of Municipal Electrical Engineers that their respective Town Councils should have the foregoing views placed before them, especially in view of the manner in which the Bill was hastened through Parliament, and in order that the greatest vigilance may be used in future to scrutinise any further legislation which may be proposed in regard to electricity control, etc.

Place of Meeting of Next Convention.

The PRESIDENT intimated that the Convention would now proceed to consider the question as to where the next Convention of the Association should be held.

Major KING: I have received a wire from the Mayor of Johannesburg and he sends you a most cordial invitation to hold your next Convention in Johannesburg, and I do hope that the Convention will see its way to accept the invitation. If you can hold your meeting about the 26th March, 1924, that would be a little before our Agricultural Show, and as this is one of the advents of the year, and as the Easter holidays will also be on and the holding of the big race meetings, it would be a most suitable date. I know it is the wish of the Mayor and Councillors that we should accept the invitation, and I promise you we will do our best to entertain you.

The PRESIDENT: We are very much indebted to the Mayor of Johannesburg and yourself for your kind invitation, and I do not think there is any doubt that it will be accepted. We very much appreciate your kind invitation to Johannesburg. It will be necessary to receive a motion that the Association hold its next Convention at Johannesburg.

Mr. MILLAR: I have much pleasure in moving that the next Convention be held in Johannesburg.

Mr. BLATCHFORD: I beg to second the motion.

The motion was then put and unanimously agreed to.

Election of Council.

The Convention then proceeded to the election of the Council, and the President invited nominations. The following officers were then duly elected:—

VICE-PRESIDENT.

Mr. SANKLEY, on the motion of Mr. Fletcher and seconded by Mr. Bickell.

COUNCIL.

CAPE: Mr. BICKELL, on the motion of Mr. Sutcliffe, seconded by Mr. Coulthard.

NATAL: Mr. ROBERTS, on the motion of Mr. Jagger, seconded by Mr. Finlayson.

O.F.S.: Mr. MILLAR, on the motion of Mr. Macaulay, seconded by Mr. Sutcliffe.

TRANSVAAL: Mr. FLETCHER, on the motion of Mr. Sutcliffe, seconded by Mr. Millar.

Representative of the Association on the Development of Resources Committee re Standard Insulators, etc.

On the motion of Mr. WOLLEY-DOD, seconded by Mr. MILLAR, Mr. Sankey was elected the Association's representative on the above Committee.

Purchase of Supplies.

The Secretary read a letter from the Borough Electrical Engineer, Durban, regarding the purchase of supplies generally with a view to reducing prices.

On the motion of Dr. HAMLIN, it was resolved that the letter be duly noted.

Affiliation with the Incorporated Municipal Electrical Engineers' Association, Great Britain.

The PRESIDENT intimated that the Council had considered a communication in regard to the above matter and had decided to recommend to the Convention that this Association become affiliated to the Association in Great Britain.

On the motion of Mr. BICKELL, seconded by Mr. BLATCHFORD, it was resolved that the Association become affiliated with the one in Great Britain.

Standard Electricity Accounts.

The SECRETARY read the appendix to the report of the sub-committee, appointed at Pretoria, by Mr. E. Poole, Durban, on the above subject.

COMMITTEE REPORT ON STATISTICS AND ACCOUNTS FOR MUNICIPAL ELECTRICAL SUPPLY UNDERTAKINGS,

With Amendments Suggested by Town Treasurers and
Provincial Auditors.

STANDARD ELECTRICITY ACCOUNTS.

APPENDIX TO REPORT OF SUB-COMMITTEE APPOINTED AT PRETORIA.

By E. POOLE, DURBAN (Chairman of Sub-Committee).

The question of a standard form of Electricity Accounts has long been before this Association, and it is hoped this year will see their completion and adoption.

As the Electricity Bill which is being introduced to Parliament includes powers in regard to accounts, it is felt that it would be as well to put forward, without further delay, a form of accounts, acceptable in the main to the Municipal Electrical Engineer, as well as the various Town Treasurers and also the Provincial Auditors, rather than later on have to adopt some form not so generally acceptable as those now before us.

Sufficient copies are not available of the proposed form of accounts as now tentatively modified, to distribute in advance among all our members, but it is hoped there will be a sufficient number of copies for each member attending the Cape Town Convention.

These modified forms are only slightly different to those circulated as the result of the Sub-Committee appointed to consider them at the last Convention at Pretoria, and the items shown in italics embody the principal points raised by the various Town Treasurers, while those shown in heavy type embody the principal points raised by the various Provincial Auditors, all of which should be included in the forms to make them quite complete. Commenting on the points raised by the various Town Treasurers who generally approved of the form in the main, it is disappointing that criticisms were only received from 19 Town Treasurers (mostly of the smaller towns), though it is understood all the Town Treasurers were supplied with a copy, so one is only reluctantly compelled to assume that silence gives consent.

In regard to the Provincial Auditors' criticisms, which will be laid on the table at the Cape Town Convention, there is little to remark, as their principal suggestions are embodied in the modified forms. Two of the Auditors, however, consider the forms too complicated for the smaller municipalities, though this did not occur to the Pretoria Sub-Committee, and the difficulty with two sets of forms would be where to draw the line.

One way, however, to simplify the accounts for the smaller municipalities might be to follow the suggestions of the Natal Auditor in regard to the Balance Sheet, of which he has sent a draft copy in which the Balance Sheet and Capital Account is amalgamated. Another way of simplifying the accounts for the smaller municipalities might be to follow the Transvaal Auditor's suggestion of omitting the Revenue and the Sinking Funds Accounts as a part of the Electricity Accounts and have them included in a **General** Municipal Reserve and Sinking Fund, as

in the case of Johannesburg's Accounts, which town is peculiarly alone in this respect.

It is, however, doubtful if all the various Provincial Auditors would approve of any such simplification, and, seeing each Province has its own Ordinance in these matters, it would be a difficult matter (as the Pretoria Auditor remarks) to have a form of accounts acceptable in every way, though the form as now modified appears to meet the case.

In regard to the classification of Working Expenses Account shown at the end of the proposed form of accounts, there may still be a few points for debate, and as at the Pretoria Sub-Committee the larger towns were not so well represented, it is hoped that at the next Convention any debatable points will be thoroughly discussed, particularly such points as the sub-division of the Borough Electrical Engineer's salary under No. 3 A/c (Generation) and No. 1 A/c (Management), also in the case of a combined Electricity and Tramway Manager, and also proportion of *Town* Engineer's salary when he also acts as Borough Electrical Engineer.

Durban, 27/2/22.

ASSOCIATION OF MUNICIPAL ELECTRICAL ENGINEERS (S.A.)

Draft Standard Form of Electricity Supply Accounts.

The Municipality of _____

Municipal year ended _____

No. 1.

LOAN ACCOUNT.

109

Date	Sanctioned			Date	Borrowed.				Date	Repaid.			Date of Maturity	Outstanding					
	£	s.	d.		£	s.	d.	at %		£	s.	d.		£	s.	d.	at %		

1

Dr.

£ s. d. £ s. d.

*Expenditure:—**Price
per
unit
sold.***A. Generation.**

1. To Coal or other Fuel delivered in Bunkers
2. To Oil, Waste, Water, & Engine Room Stores
3. To Salaries & Wages at Generating Station
4. To Repairs & Mtce.:
 - (a) Buildings
 - (b) Plant & Machinery
5. To other items:—
(detailed).

B. Distribution.

1. Overhead Mains:—
 - (a) Salaries & Wages
 - (b) Material for R. & M.
2. Underground Mains:—
 - (a) Salaries & Wages
 - (b) Material for R. & M.
3. Sub-Stations:—
 - (a) Salaries & Wages
 - (b) Material for R. & M.
4. House Services:—
 - (a) Salaries & Wages
 - (b) Material for R. & M.

C. Street Lighting.

- (a) Salaries & Wages
- (b) Material for R. & M.

D. Rents, Rates, etc.

1. To Rents, Wayleaves, etc.
2. To Rates & Taxes

		Cr.					
		£	s.	d.	£	s.	d.
<i>Income</i> :—	<i>Units</i>	<i>Price</i>					
		<i>per</i>					
		<i>unit</i>					
		<i>sold.</i>					
Sale of Current.							
1. Private Supply :—							
(a) Lighting & Domestic							
(b) Motors & Industries							
2. Municipal Supply :—							
(a) Lighting buildings ..							
(b) Street Lighting ..							
(c) Motive Power							
(d) Tramways							
3. Special Supplies :—							
(detailed)							
(a)							
(b)							
(c)							
NOTE :—							
* The above sub-division of							
Income from the various							
classes of supply is in accord-							
ance with the sub-division of							
the return of Units Sold , as							
now required by the Govern-							
ment Census Office.							
*Deletion suggested by Town							
Treasurer.							

Dr.

£ s. d. £ s. d.

<i>Expenditure</i> :—	<i>Price per unit sold.</i>						
E. Management & General.							
1. Salaries :—							
(a) Staff Salaries & Wages ..							
(b) Meter Readers							
2. To Departmental charges :— (detailed)							
3. To Stationery & Printing							
4. To Locomotion & Travelling exps.							
5. To General Establishments charges							
6. To Legal expenses							
7. To Insurances							
8. To Pensions :—							
(a) Superannuation Fund ..							
(b) Provident Fund							
9. To Miscellaneous							
Total Working Costs.							
F. Sundries.							
(a) Repairs & Mtce. of Apparatus for hire							
(b) Labour & Material on works executed for customers							
Balance to Net Revenue							

£ s. d. £ s. d.

	<i>Price per unit sold.</i>						
1. To Interest on Loans and over- draft							
2. Sinking Fund contribution and repayments of loans							
3. Depreciation or Renewals							
4. Loan expenses							
5. Other charges (detailed)							
Balance to Appropriation Account							

No. 4. APPROPRIATION ACCOUNT.

Dr.

	£	s.	d.	£	s.	d.
1. To amount transferred to Boro. Fund in relief of Rates						
2. Contributions to Capital						
3. Reserve Fund						
4. Special contributions: (detailed) ..						

No. 5. RENEWALS ACCOUNT.

Dr.

	£	s.	d.	£	s.	d.
1. To Buildings						
2. Generating Plant						
3. Underground Mains						
4. Overhead Mains						
5. House Services						
6. Sub-Station & Equipment						
7. Street Lighting						
8. Other items (detailed)						
Balance to Balance Sheet						

No. 6. RESERVE FUND ACCOUNT.

Dr.

	£	s.	d.	£	s.	d.
1. To amounts appropriated (detailed) ..						
2. Balance to Balance Sheet						

No. 7. SINKING FUND ACCOUNT.

Dr.

	£	s.	d.	£	s.	d.
1. To Balance						

No. 4.

APPROPRIATION ACCOUNT.

				Cr.		
	£	s.	d.	£	s.	d.
1. Balance from Net Revenue A/c ..						

No. 5.

RENEWALS ACCOUNT.

				Cr.		
	£	s.	d.	£	s.	d.
1. By Balance forward						
2. By Net Revenue A/c						
3. Special contributions (detailed)						
4. Interest on Investments						
5. Sales of plant or Scrap						

No. 6.

RESERVE FUND ACCOUNT.

				Cr.		
	£	s.	d.	£	s.	d.
1. By Balance forward						
2. Interest on Investments						
3. Contributions from Appropriation A/c						

No. 7.

SINKING FUND ACCOUNT.

				Cr.		
	£	s.	d.	£	s.	d.
1. By Net Revenue A/c						
2. Interest						
3. Special Contributions (detailed)						

No. 8.

CAPITAL ACCOUNT.

Dr.	Total								
	Year 1921 (?)			Year 1922 (?)			Year 1922 (?)		
	£	s.	d.	£	s.	d.	£	s.	d.
1. To Land									
2. Buildings									
3. Generating Plant ..									
4. Underground Mains									
5. Overhead Mains ..									
6. House Services ..									
7. Sub - Stations and Equipment									
8. Street Lighting ..									
9. Instruments & Tools									
10. Furniture									
11. Stores, Vehicles									
12. Sundry Expenses									
13. Apparatus for Hire.. ..									
14. Balance in Bank									

No. 8.

CAPITAL ACCOUNT.

	Total								
	Year 1921 (?)			Year 1922 (?)			Year 1922 (?)		
	£	s.	d.	£	s.	d.	£	s.	d.
1. By Loans raised									
2. Appropriation A/c ..									
3. Bank Overdraft									
4. Special contributions (detailed)									

GENERAL BALANCE SHEET.

£ s. d. £ s. d.

<i>Liabilities.</i>					
1.	To Loans	..	..	..	..
2.	Sundry Creditors	..	..	..	..
3.	Renewals	..	..	..	..
4.	Reserve	..	..	..	..
5.	Net Revenue A/c	..	..	..	..
6.	Sinking Fund	..	..	..	..

£ s. d. £ s. d.

*CAPITAL ACCOUNT.					
1.	Loans	...	...	...	...
2.	Bank Overdraft	...	...	...	...
3.	Sundry Creditors	...	...	...	...
4.	Surplus;				
	(a) Sinking Fund	...	...	...	...
	(b)	...	...	...	...
REVENUE ACCOUNT.					
1.	Bank Overdraft	...	...	...	...
2.	Sundry Creditors	...	...	...	...
3.	Surplus:				
	(a) Renewals	...	...	...	...
	(b) Reserve	...	...	...	...
	(c)	...	...	...	...

*Suggested substitution for General Balance Sheet by Town Treasurers.

GENERAL BALANCE SHEET.

	£	s.	d.	£	s.	d.
<i>Assets and Capital Outlay.</i>						
1. By Capital A/c						
2. Investments						
3. Stores						
4. Sundry Debtors						
5. Bank & Cash in hand						
6. Other items (detailed)						

	£	s.	d.	£	s.	d.
*CAPITAL ACCOUNT.						
1. <i>Capital Outlay:</i>						
Land... .. .						
Buildings						
Generating Plant						
Underground Mains						
Overhead Mains						
House Services						
Sub-Stations & Equipment						
Street Lighting						
Instruments & Tools						
Furniture						
Vehicles						
Sundries						
Apparatus for Hire						
2. Investments						
3. Sundry Debtors						
4. Bank & Cash in Hand						
REVENUE ACCOUNT.						
1. Bank & Cash in Hand						
2. Stores						
3. Sundry Debtors						
4. Other Items (detailed)						

*Suggested substitution for General Balance Sheet by Town Treasurers.

ELECTRICITY SUPPLY.

REVENUE ACCOUNTS.

Classification of Working Expense Account.

A. (Generation).

Account No. 1. To Coals, etc.—All expenditure for coal, fuel oil or other fuels used at the power station, including dues, carriage, unloading, storing and all expenses of placing same in the bunkers, also removal of ashes.

Account No. 2. To oil, waste, etc.—All expenditure for lubrication of power plant, including oil, grease, waste, rags, etc. Cost of water for boilers, condensers or cooling apparatus, engine-room stores such as metal polish, emery and glass paper, brushes, mops, oil cans, soap, soda, tallow, turpentine, paraffin, blacklead, greases, pumicestone, bathbricks, chalk, squeegees, toilet rolls, disinfectants, dynamo and motor brushes; electrical energy for driving auxiliaries and for power station light, heating and ventilating.

Account No. 3. To Wages at Generating Station.—Wages and other remuneration of men engaged in power station, including one-third of Borough Electrical Engineer's salary if he takes a shift.

Also Station superintendent, shift engineers, apprentices, drivers, firemen, greasers, coal and ash attendants, cleaners, cranesmen, switch-board attendants, fitters, carpenters, labourers, battery attendants, branch storeman, timekeeper, watchmen.

Account No. 4. (a) Repairs, etc., Buildings.—All expenditure, including wages, for repair of buildings and fixtures used in connection with the generation of electricity, including the battery room, chimney stack, workshop, storeroom, coal bunkers. Also water-pipes, drains, heating apparatus and lighting fittings, wages, materials, tools, freight, cartage of materials, and all other expenses connected with this work.

(b) Engine and Boilers.—All expenditure for wages and material, tools, freight, cartage of material and all other expenses in connection with maintenance and repair of steam plant, including engines, engine parts, and appliances, fixtures, bolts, lubricating devices, boilers, furnaces, economisers, forced draught apparatus, CO₂ recorders, pumps, feed water heaters, water purifiers and filters, tanks, condensers, cooling towers, oil separators, steam separators, coal and ash conveyors, mechanical stokers, and other boiler room appliances, piping and steam fittings, including valves, water connections and water meters.

Dynamos, Exciters, etc.—All expenditure for wages and material, tools, freight, cartage and other expenses in connection with repair and maintenance of electric plant, including generators, exciters, rotaries, boosters, transformers, balancers, motor, switchboard, rheostats, circuit breakers, and instruments.

Other Machinery.—All expenditure for wages and materials for repair and maintenance of workshop tools, also machinery and appliances such as engines, boilers, shafting, motors, lathes, grindstones, drills, forges, also cranes and other lifting tackle vacuum or pressure cleaners, ventilating fans, testing instruments and rubber gloves.

Accumulators and Accessories.—Wages and material for repairs and maintenance of accumulator batteries and connections, including renewals, cleaning acid, and acid tanks, acid pumps, distilling apparatus,

milking booster, hydrometers, rubber gloves and boots.

Other items in connection with the generation of electricity, but not specially applicable to any previous headings.

B. (Distribution).

Account No. 1.

- (a) Salaries and Wages and other remuneration to outside Foreman, Linesman, Electricians, Labourers, and others engaged on Overhead Mains Maintenance.
- (b) Material for repairs and Maintenance of Overhead Mains and any other expenditure than Wages, including Line material such as Insulators, Wire, Crossarms, Stays, also painting of Poles, etc., use of tools, ladders, carts, etc.

Account No. 2.

- (a) Salaries and Wages and other remuneration to outside Foreman Jointers, Electricians, Labourers and others engaged on underground Mains Maintenance.
- (b) Material for Repairs and Maintenance of Underground Mains, ducts, pipes, manholes, troughing and any other expenditure than wages, including jointing materials, cable, also reinstating roads, use of tools, carts, etc.

Account No. 3.

- (a) Salaries and Wages and other remuneration to Attendants, Electricians, Labourers and others engaged on Maintenance or running of sub-station plant and machinery, also for repairs to Boxes, Kiosks, Pillars and Sub-Stations, Buildings, etc.
- (b) Material for Repairs and Maintenance to Sub-Station plant and machinery, including transformers, Boxes, Kiosks, Pillars, also Boosters, Rotaries, Motors, Switchgear, and any other expenditure than wages, also carting and use of tools, etc.

Account No. 4.

- (a) Salaries and Wages and other remuneration to Electricians, Jointers, Linesmen, Labourers, Meter Fixers, Inspectors and others engaged on Repairs and Maintenance of House Service Connections.
- (b) Material for Repairs and Maintenance of all apparatus on consumers' premises such as Meters, Switches, Fuses, Time Clocks, also repairs to Cables or Wires leading thereto and any other expenditure than wages, including carting, use of tools, etc.

C. (Street Lighting).

Account (a)

Wages of Lamp Attendants, Electricians, Labourers, and others engaged on Street Lighting Maintenance.

Materials for Repairs and Maintenance of Street Lighting, including replacing Lamps, Brackets, Globes, upkeep of Time Switches, repairs to Cables or Wires, painting Poles and any other expenditure than wages, including use of tools, ladders, etc.

D. (Rents, Rates).

Account No. 1.

Rent of Power Station, Offices, show rooms, sub-stations, poles and wayleaves.

Account No. 2.

Local Rates and Taxes, including Municipal, Provincial Council or District Board.

E. (Management and General).

Account No. 1.

- (a) Salaries of Chief Electrical Engineer; (or balance of his salary if partly allocated elsewhere and in the case of a combined Electrical Engineer and Tramway Manager the sub-division of the salary shall be in similar ratio to the ratio between the units sold for the respective class of supply). Proportion of Town Engineer's salary (based on a similar ratio to the ratio between the Expenditure out of Revenue of the Electrical Department; and the expenditure out of revenue of all other departments of which he has control). Salaries of Assistant Electrical Engineers, Draughtsman, Wiring Inspectors and others of the Administrative Staff, also Clerks, messengers and other office staff.
- (b) Salaries and Wages of Meter Readers.

Account No. 2.

Proportion of Town Clerk, Treasurer, Stores, etc., and any other Municipal Department charge, not charged elsewhere.

Account 3.

Stationery, Printing, Maps and advertising.

Account No. 4.

Travelling expenses, locomotive allowance, upkeep of Motor Cars or other Vehicles, Tram fares, etc.

Account No. 5.

General Establishment charges such as repairs to Office furniture, fuel, light, water, telephone, licences.

Account No. 6.

Legal expenses, Government fees and charges in connection therewith.

Account No. 7.

Insurance for Fire, Accident, Workmen's Compensation, Employees' Liability, Boiler Insurance.

Account No. 8.

Superannuation or Provident Fund contribution or any other similar fund.

Account No. 9.

Miscellaneous charges, such as Commissions, Canvassing, Uniforms, Postage, Petty Cash, etc.

Mr. WOLLEY-DOD: Under the Electricity Act, the Board may call upon any undertaker, which includes municipalities, to furnish periodical returns in such form as the Board may think fit. I would suggest that you should refer this matter to your Council, and that they should send the form of accounts to the Board, at the same time pointing out the difficulties which will arise if the Board demands accounts in a different form to which the Provincial law demands them. That would be a hint to them that they should get one standard form. We want to avoid having to make out two sets of accounts, and I think the Council may point out that to the Board.

The PRESIDENT: I notice from the Act that the Board may call for returns from time to time on such forms as shall be supplied by them, and it would appear to me that the suggestion of Mr. Wolley-Dod meets the case. I understand the Provincial Council of the Cape Province are thinking of re-drafting the Ordinance with a view to avoiding some of the overlapping which might take place. It would be a waste if you had to send a different form of account to the Provincial Administrations than to the Board. They should all be in one form.

Mr. JNO. ROBERTS moved, seconded by Mr. SUTCLIFFE, that the Sub-Committee's report be adopted, and that it be submitted to the Board of Control.

The motion was put and agreed to.

The SECRETARY read the following report of the Association's representative on the British Engineering Standards Committee (South African Branch):—

REPORT OF REPRESENTATIVE ON BRITISH ENGINEERING STANDARDS COMMITTEE

(S.A. Branch).

To the President and Members of the Association of
Municipal Electrical Engineers.

Mr. President and Gentlemen,

At the last Convention, held in Pretoria in September, 1920, I was appointed the Representative of the Association on the British Engineering Standards Association (South African Branch), Electrical Sectional Committee, and the Main Committee, and have attended numerous meetings.

The first and most important recommendation of the Electrical Sectional Committee, as approved by the Main Committee, was to recommend the adoption of the following standards of Electrical Supply for South Africa:—

Direct Current.—3-wire 240/480 delivered voltages.

Alternating Current.—3-phase, 50 cycles, 4-wire.
240 volts between Neutral and Phases and
415 volts between phases.

Distributing or Transmitting Pressures.
3,300—6,600 and 11,000 volts.

Subsequently the work of this Committee has dealt almost entirely with draft specifications received from the British Engineering Standards Committee, London.

There was no meeting between August, 1921, and May, 1922.

These draft specifications deal with a variety of subjects, and in nearly all cases have been generally approved by the S.A. Branch, with suggestions for improvements to suit local conditions.

A list of completed specifications is being drawn up and will be circularised in the near future.

Arrangements have been made with Messrs. Hortors, Ltd., Leader Buildings, Johannesburg, to carry a stock of all current specifications.

I desire to emphasise to members the value of these specifications as most valuable works of information and reference, and a necessary equipment of every central station engineer's office.

I would call particular attention to Specification No. 72 of 1917, entitled "Standardisation Rules for Electrical Machinery," which is a necessary adjunct to every specification or enquiry for electrical machinery.

I would also emphasise the importance of Specification No. 7 of 1919, "Copper Conductors Insulated, Annealed for Electrical Power and Light," and direct the attention of members to the necessity of adhering to the new standard sizes in all enquiries for cables and overhead line conductors.

My term as representative of this Association now expires, and it will be necessary for our Association to again appoint a representative.

(Signed) B. SANKEY.

Mr. JNO. ROBERTS: I beg to propose a hearty vote of thanks to His Worship the Mayor and the Cape Town Municipality for the accommodation placed at the disposal of the Convention and for their kind hospitality afforded to members during the Conference. I would also like to congratulate our new President on the manner in which he had conducted the business of the Convention, and, in doing so, would like to couple the name of Mr. Eastman, our Secretary, for the efficient way in which he has carried out the preliminary work of the Convention and for the thorough manner in which he has presented the various memoranda and papers to the members of the Convention.

Mr. ERICSEN seconded the motion, which was unanimously agreed to.

Members and Delegates met at the Corporation's Graaff Electric Light Station in the afternoon and were conducted over the works by the City Electrical Engineer and members of his staff.

In the evening the Delegates to the Convention attended the Orchestral Concert in the City Hall, by kind invitation of His Worship the Mayor.

FRIDAY, 24th NOVEMBER, 1922.

Members and Delegates motored to Simonstown, where, by the courtesy of the Commander-in-Chief, Rear-Admiral Sir Rudolph Bentinck, K.C.M.G., C.B., they were allowed to be shown over the Royal Naval Dockyard. Later they visited Cape Point, where an "al fresco" lunch was served, and returned to Cape Town via Chapman's Peak and Camp's Bay.

In the evening the members and delegates were the guests of His Worship the Mayor and the Councillors of the City of Cape Town at a dinner held in the Banqueting Hall of the City Hall.

After the usual loyal toasts had been honoured, Sir Carruthers Beattie, Principal of the University of Cape Town, in proposing "The Association of Municipal Electrical Engineers," drew attention to the fact that the electrical development of South Africa still required the services of engineers, who of necessity were obtained from Europe or America, and appealed to Municipalities to come to some arrangements with the Universities whereby students who had completed their theoretical training would be allowed to spend one or two years in practical work in the generation and distribution of electric energy and generally to obtain some real knowledge of the requirements of the industry before proceeding to Europe or elsewhere to complete their full training in practical work.

Mr. SWINGLER, in responding on behalf of the Association, pointed out that, excepting on the manufacturing side of the industry, we in this country are not much behind the European practice. The generating stations run by the Victoria Falls and Transvaal Power Company, and those by the larger municipalities, were run at thermal efficiencies comparing very favourably with the most economically run stations in Great Britain, while the electrically operated winding plant on the Rand Mines was acknowledged to be the best example of this application of electrical energy in the world.

