

PROCEEDINGS
OF THE
FOURTH CONVENTION
OF THE
Association of
Municipal Electrical Engineers
(UNION OF SOUTH AFRICA).



Held at Pretoria, South Africa,
From Monday, September 13th to September 18th,
1920.

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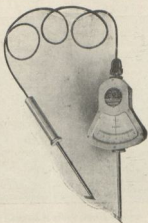
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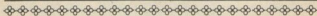
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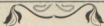
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PROCEEDINGS
OF THE
FOURTH CONVENTION
OF THE
Association of
Municipal Electrical Engineers
(UNION OF SOUTH AFRICA).

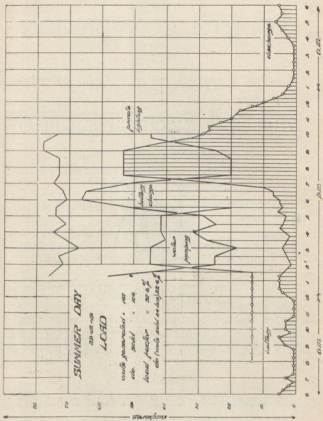


Held at Pretoria, South Africa,
From Monday, September 13th to September 18th,
1920.

[PRICE FIVE SHILLINGS].

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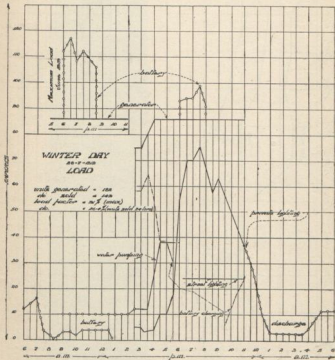
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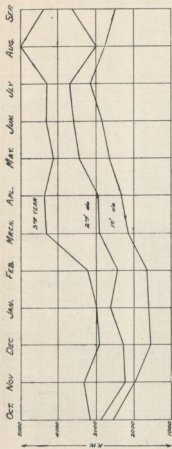


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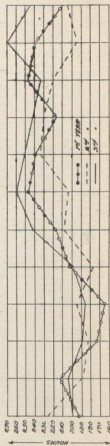
These Graphs should face page 25,
'Gas Engine Plants.'

B





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D



TOP ROW :

Prof. Dobson, D.S.O., Past President.	W. Douglas, Ermelo.	W. A. Hodge, Standerton.	T. Sutcliffe, Benoni.	L. B. Proctor, Boksburg.
Councillor Pedley, Mayor of Standerton.	Prof. Buchanan, (Visitor).	G. Mercier.	R. A. Stoker, Kroonstad.	L. L. Horrell, Pretoria, Hon. Sec. and Treas.

MIDDLE ROW :

R. F. Botting, (Visitor).	R. McCauley, Bloemfontein	L. B. Sparks, Pietersburg.	W. H. Blatchford, Greytown.	R. D. Coulthard, Oudtshoorn.	Councillor Hoy, Port Elizabeth.
T. Miller, Harrismith.	T. P. Ashley, Queenstown.	G. W. McComb, Springs.	J. Vowles, King Williamstown.	W. Bellad-Ellis.	

SITTING :

W. Fletcher, Krugersdorp.	Councillor Clark, Johannesburg.	Councillor Giovanetti, M.B.E., M.L.A., Mayor of Pretoria.	Councillor Bischoff, Pretoria.	Councillor Cunningham, Cape Town.
J. Roberts, Durban, Past President.	B. Sankey, Johannesburg, Past President.	T. C. Wolley-Dod, Pretoria, President.	G. Swinger, Cape Town, Vice President.	L. Bickell, Port Elizabeth.

Members and Delegates at the Pretoria Convention.

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PROCEEDINGS
OF THE
Association of Municipal Electrical Engineers
(UNION OF SOUTH AFRICA).

FOUNDED 1915.

EXECUTIVE COUNCIL :

President.

T. C. WOLLEY-DOD (Pretoria).

Vice-President :

G. H. SWINGLER (Capetown).

Members of the Council :

Past Presidents: B. SANKEY, (Johannesburg).

JOHN ROBERTS (Durban).

Cape Province: L. BICKELL (Port Elizabeth).

Orange Free State: T. MILLAR (Harrismith).

Transvaal: L. B. PROCTOR (Boksburg).

Natal: E. POOLE (Durban).

Hon Secretary & Treasurer :

L. L. HORRELL (Pretoria).

Box 423, Pretoria.

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 Preforia 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).
FOURTH ANNUAL CONVENTION,
PRETORIA, SEPTEMBER, 1920.

PROGRAMME OF PROCEEDINGS.

Monday, 13th.

- 10.30 a.m. Welcome by the Mayor of Pretoria and formal opening of the Convention.
 Valedictory Address of Retiring President.
 Election of Officers, etc., and other formal business.
 President's Address.
- 1 p.m. Official Luncheon at the Pretoria Country Club by kind invitation by his Worship the Mayor.
- 2.30 p.m. Election of Committees.
 Visit to Power Station and Car Sheds.

Tuesday, 14th.

- 9.30 a.m. Paper on "Gas Plants" by Mr. G. Mercier (Bethal).
 Discussion.
- 11.0 a.m. Visit to Pretoria Iron Mines.

Wednesday, 15th.

- 9.30 a.m. Sub-Committees meet at the Town Hall.
- 2.30 p.m. Visit to Union Buildings and University.
- 5 p.m. Report of Committee on "Remuneration of Electrical Engineers."

Thursday, 16th.

- 10 a.m. Visit to Premier Diamond Mine. Lunch at Premier Mine Hotel, by kind invitation of the Directors, and visit to Hatherley Glass Factory.
- 7.45 p.m. Annual Dinner at Pretoria Club.

Friday, 17th.

- 9.30 a.m. Report of Committees on "Licencing of Electricians and Registration of Contractors," "Bye Laws, Conditions of Supply and Wiring Regulations," and "Statistics and Accounts."
- 2.30 p.m. Visit to Government Railway Workshops.

Saturday, 18th.

- 9.30 a.m. Adjourned Business (if any).

PROCEEDINGS
OF THE
FOURTH ANNUAL CONVENTION
OF THE
Association of Municipal Electrical Engineers
(UNION OF SOUTH AFRICA).

PRETORIA, SEPTEMBER 13th to 18th, 1920.

Monday, 13th September, 1920.

INTRODUCTORY.

The fourth annual Convention of the Association of Municipal Electrical Engineers of the Union of South Africa opened in the Council Chamber, Town Hall, Pretoria, on Monday, September 13th, 1920. The President, Mr. B. Sankey (Johannesburg) was in the chair, and there were also present:—

MEMBERS PRESENT:—

T. C. Wolley-Dōd (Pretoria), Vice-President, John Roberts (Durban) Past President, G. W. H. Swingler (Capetown), R. W. Fletcher (Krugersdorp), L. Proctor (Boksburg), T. Sutcliffe (Benoni), W. Blatchford (Greytown), L. Bickell (Port Elizabeth), C. W. Mc Comb (Springs), W. Douglas (Er-

melo), R. D. Coulthard (Oudtshoorn), W. A. Hodge (Standerton), T. Millar (Harrismith) R. A. Stoker (Kroonstad), J. Vowles (King Williamstown), R. Macauley (Bloemfontein) and L. L. Horrell (Pretoria).

ASSOCIATE MEMBERS PRESENT:—

W. Bellard Ellis (Queenstown), G. Mercier (Bethel).

DELEGATES PRESENT:—

Councillors H. J. Pedley (Mayor of Standerton), A. Cunningham (Capetown), J. A. Clark (Johannesburg), T. Hoy (Port Elizabeth), J. Lawrence (Kroonstad), C. J. Bishoff (Pretoria).

CIVIC WELCOME.

The Mayor of Pretoria, Mr. C. W. Giovanetti, M.B.E., M.L.A., welcomed the delegates and declared the Convention open. In doing so he said he had very great pleasure, on behalf of the town, in welcoming the delegates to Pretoria. Many

conferences, conventions, and congresses were held in Pretoria, but it was a particular pleasure for him to welcome such a convention or congress as that of the Association of Municipal Electrical Engineers, which, from a Municipal point of

view, was probably more important than many of the others, since it dealt with Municipal matters. In these days of progress a conference such as that gave the opportunity of coming together and interchanging ideas, and it was very necessary, in these times, that we (Pretoria) should have the benefit of the advice of the bigger towns of the coast. Therefore, he considered that that was a very necessary conference. Pretoria, as they knew, was, they hoped, on the eve of a great industrial development. They proposed to spend about a quarter of a million of the extension of their electrical engineering works, also in connection with the Pretoria Iron Works. For those reasons he was sure that Mr. Dod would show them all he could of these works. Mr. Giovenetti expressed the hope that the Convention would be a very successful one, and that they would all benefit by their counsels together and the visits they were to pay to places of interest around Pretoria, and that they would all carry away a very pleasant memory of the town. He then invited them to luncheon with him at the Country Club that day, and concluded by formally declaring the Convention open.

Mr. Sankey, on behalf of the members of the Association, thanked the Mayor most heartily for his

very kind welcome to Pretoria. They had all been looking forward to their visit to this old-world city, he said, and they appreciated very much the programme that had been arranged for them and the hospitality that had been extended to them in many directions. That meeting marked their fourth annual Convention, and he believed that they had a larger attendance than at any of the others. That, he took it, was a sign of progress and therefore an honour to Pretoria's electrical engineer, who was one of the oldest engineers, in point of service, in the country. Mr. Sankey observed that he need not enlarge upon this subject, but formally, on behalf of the Association, he thanked Pretoria for its kind welcome and hospitality which they had already partaken of and of which more, he understood, was still to come.

Mr. Councillor Thomas Hoy, of Port Elizabeth, on behalf of the other councillor delegates, extended sincere thanks also for the manner in which they had been entertained. The fact that the Association always invited councillors to their Conventions, he said, enabled those councillors to do much better work in their Committees. He thought such conventions not only beneficial to the Association itself but to the well-being of the cities and communities which they affected.

BUSINESS MEETING.

The President welcomed the councillor delegates, and pointed out that while they were welcome to take part in the discussion they were, naturally, not entitled to vote.

Confirmation of Minutes.

The minutes of the last Convention held at Port Elizabeth in February, 1919, were taken as read

and adopted. Arising out of the minutes, the President referred to the matter of contributions from Municipalities. He reminded them that at the last Convention it was agreed that members should do what they could to interest the respective Municipalities in the Association with a view of obtaining contributions. The response had been

somewhat disappointing, and the Association was dependent practically solely on the subscriptions of members. Its expenses were chiefly in regard to the publication of their Convention minutes and stationery. They had had so far only four contributions from Municipalities, and he hoped that members would do their best to secure contributions from their Municipalities.

Welcome back from Active Service.

The President went on to welcome back, after a long absence on active service, Messrs. Stoker, Hamly, and Proctor. He was sure, he said, that they were all very pleased to see them back again. He believed the last Convention they had been able to attend was the Durban Convention.

New Members.

Messrs. Chalmers, of Alice, and Sutcliffe, of Benoni, were elected new members.

The President also announced that they had also to welcome three new members elected recently, Messrs. Bickell, of Port Elizabeth; Sparks, of Rustenburg; and Siebert, of Uitenhage, all of whom were present.

They had also to note the resignation of Professor Dobson, Mr. Stewart, Mr. Price, and Mr. Bellad Ellis, who relinquished membership owing to their retirement from Municipal service. They were eligible for associate membership, and, the President believed, they had all made application to retain their connection with the Association.

HON. SECRETARY'S AND TREASURER'S REPORT.

Mr. President and Gentlemen,

In accordance with clauses 18 and 19 of our Rules and Constitution, I have pleasure in submitting my combined Report and Balance Sheet covering the period since my last Report to June, 1920.

From a membership of 31 as per my last report we have now 34 full members and 4 Associate Members, there being thus a gain of 7. There are still a number of Municipalities not represented in our Association and it is hoped all members will endeavour to bring our aims and objects to the notice of those outstanding.

It is with regret that our Council has been depleted of so many of its members owing to their resigning from Municipal employment, i.e.: Messrs. W. Bellad-Ellis (Cape Province), G. A. Stewart (O.F.S.), and E. T. Price (Transvaal), also our past President, Mr.

J. H. Dobson, but we are pleased to be able to still retain them on our roll as Associate Members.

Their resignations open up the question of providing in our Rules that any vacancies which may occur, the remaining members of the Council shall have power to fill, and I recommend that a Rule be added on these lines.

There is one matter to which I think attention should be drawn and that is the appointment of sub-Committees at our Conventions and it is hoped that any Committees which are necessary will be appointed at our first meeting so as to enable these Committees to make their recommendations during the Convention week as it is clear that it is almost impractical for members on sub-Committees to confer after the Convention when such distances separate us as is the case and our Programme this year has

been arranged accordingly. Turning to the financial side it is highly gratifying to note that from a balance of £29 1s. 4d., as per the last Balance Sheet, we now have a balance as at June 30th last of £44 2s. 5d. Our thanks are very largely due to the liberal way in which a few of the Municipalities have given contributions to our funds and without their help we would hardly be able to carry on at the present rate of subscription. There are only four outstanding subscriptions, three being in respect of Messrs. Stoke, Hamlin and Proctor, who were away on active service and in accordance with previous procedure I recommend that their subscriptions be remitted.

While our expenses are largely confined to the publication of our

Proceedings it may be necessary to incur more expenses as the usefulness of the Association grows, especially if we are to press for legislative powers to enforce any recommendations that this Convention may make in connection with the matters to be dealt with.

With the commencement of the Pretoria Convention my term of office comes to an end and I would like to take this opportunity of thanking the President, Vice-President and members of Council for their kind co-operation in connection with the carrying out of my duties.

I am, Mr. President & Gentlemen,
Yours faithfully,

E. POOLE,

Hon. Secretary and Treasurer.

REVENUE & EXPENDITURE ACCOUNT.

Period: December 31st, 1918, to June 30th, 1920.

EXPENDITURE.		REVENUE.	
To Printing	£87 9 6	By Balance	£29 1 4
Postage & Receipt		„ Subscriptions, 31 at	
Stamps	3 16 2	„ £2 2/-	65 2 0
Stationery, Tele-		„ Advertisements ...	12 12 0
grams and Bank		„ Sale of Proceedings	5 6 3
Charges	1 13 6	„ Municipal Contribu-	
Clerical Assistance &		tions	42 17 0
Reporter	16 6 0		
Photo Home Press...	18 0		
Sundry	13 0		
Balance to Balance			
Sheet	44 2 5		
	<u>£154 18 7</u>		<u>£154 18 7</u>

BALANCE SHEET

as at 30th June, 1920.

LIABILITIES.	ASSETS.
Revenue and Expendi-	Cash in hand
ture Account	£44 2 5
£44 2 5	

E. POOLE,

Hon. Secretary and Treasurer.

I have examined the books, receipts and vouchers of the A.M.E.E. (U. of S.A.) and certify that the above Revenue and Expenditure Account and Balance Sheet are properly drawn up so as to exhibit a correct view of the affairs of the Association as shown by the books.

A. GRAHAM COOK,

Hon. Auditor,

R.P.A. Transvaal and Natal.

August, 1920.

Arising out of this report, Mr. Roberts moved an addition to Rule 9. It had been found during the year, he said, that they had been very unfortunate as far as the members of the Executive Committee were concerned. No less than three out of the four retired from the Council, Messrs. Ellis, Stewart, and Price. In consequence, towards the end of the year the Council was merely a skeleton. Mr. Roberts therefore moved that it be competent for the remaining members to fill any vacancies on the Council that occurred.

This was agreed to.

The President announced that it had been the custom of the Association to waive the subscriptions of members on active service. It was agreed to continue this practice in respect of Messrs. Hamlyn, Proctor and Stoker for last year.

Gratuity.

The President also announced that it had been usual to grant an honorarium of £5 to the typist at Durban for the work she did for the Society. This was also sanctioned.

S. A. Institute of Electrical Engineers Meeting.

The President referred to a letter received from the Secretary of the South African Institute of Electrical Engineers, to the effect that as the Association was holding its annual dinner on Thursday evening the Institute had put back its ordinary monthly meeting from that night to Tuesday, September 14th, in the hope that members of the Convention might attend. A hearty invitation to do so was extended.

It was agreed to accept the invitation, and the President expressed the hope that as many as possible of the members would accept the invitation.

RETIRING PRESIDENT'S ADDRESS.

(By B. Sankey, Johannesburg).

It has become the custom in our Association for the retiring President to present to the members assembled at their Annual Convention a few valedictory remarks chiefly dealing with the activities of the Association during his term of office.

I entered the office of President with high ambitions of work to be accomplished, and I leave it with a sense of much unaccomplished.

During my term of office, I have received from all members with whom I have come in contact, either personally or by correspondence, the most cordial assistance and co-operation, and it is a matter of regret to me that, owing to my change of sphere from Port Elizabeth to Johannesburg, I have, from stress of work and the responsibilities of my new office, found difficulty in giving the time and atten-

tion I should have liked to the affairs of the Association. To our energetic Secretary and Treasurer my thanks are especially due for his ever ready assistance and activities during my year of office, and also to my predecessor for advice in many difficult questions which have arisen.

One of the unfortunate features of this last year's history of this Association has been the loss of a large number of its most responsible and valued members who have retired from municipal life, tempted in most cases by the sweets of commercial life, and this is a phase—it is to be hoped a passing one which reflects seriously on present day municipal work.

The cause for this lies largely with present day conditions. One may say in words of one of our technical journals referring to home conditions, that the amateur philosopher will find much that is curious in the present position of both salaries and wages. On the one hand, wage earners are being paid sums which rest upon no basis of individual skill or output, but are simply the result of collective bargaining. It follows that economically they are often too high. On the other hand, the salaried official, who until recently has disdained to combine, is often being remunerated at a rate far below the figure which represents his real value. This, as events have shown in our own Association, is most evident in Government and Municipal departments, where the brain worker has less opportunity of controlling his gains than in commercial life. Economically both situations are wrong. Morally also they are all wrong; but of the two the underpayment of the brain worker is likely to do the country more harm, though while politics can intrude into these

matters in the way they do at present, it is difficult to see how the situation is to be altered without a good deal of trouble.

But whilst the engineer in the larger towns has opportunities of placing his services in the best market, such is not so often the case with engineers more isolated in the smaller towns.

A joint committee of the South African Institute of Electrical Engineers and of this Association is, however, meeting to endeavour to improve the salaries and working conditions of Municipal Electrical Engineers. Circulars have been sent out to Councils and the Provincial and Government Departments concerned, pointing out the necessity of adequate payment to secure capable men. Meantime, I have undertaken on behalf of our Association to collect and tabulate statistics of salaries and working conditions of Municipal Electrical Engineers at the present time, and am pleased to report a prompt and ready response thereto.

Some of the working conditions in the small towns read more like the days of slavery, and one can hardly realise the spirit of heartless indifference which apparently permeates some small Councils.

In this connection, I have a report to make to the members assembled at this Convention with the object of obtaining their views and expressions of opinion in order to present them at the next meeting of the Joint Committee.

If this Association can bring the attention of the Government to the necessity of the employment of competent engineers to have charge of electrical undertakings, and of engaging only consulting engineers of proved ability and long experience

in their particular branch of the profession, it will have performed good service to its members and the public alike.

Of the members who have resigned under Rule 4, special mention may be made of Col. Dobson, our first President, and Messrs. G. A. Stewart, E. T. Price and W. Bellad Ellis, whose interest in our Association I hope we shall retain under the conditions provided for in our Rules and Constitution.

Our various sub-committees have not been idle, but it has been found impractical to expect much from sub-committees who have in few cases been able to meet between Conventions; hence at our present Convention a special day has been set apart for Committee meetings.

I have also to report that I have attended one meeting of the Standards Committee on behalf of our Association. Concerning this matter and the question of Municipal Electrical Engineers and their salaries, I shall be glad to have an opportunity of speaking in greater detail before the Convention closes.

At our last Convention at Port Elizabeth, we were pleased to welcome a considerable number of Councillor Delegates, and this year we hope to see more still. We should further welcome, I am sure, some paper or contribution from one of our Councillor friends on municipal work and matters affecting electrical undertakings from the Councillor's point of view, to enable us to appreciate the difficulties and troubles which beset the Councillor's path no less than our own.

In handing over the reins of office to my successor, I feel that we are entrusting our interests to one who will take a keen and active interest in our affairs and who, from his long association with central station management, may be confident-

ly expected to maintain and add to the prestige and utility of our Association, and I wish him every success in his term of office, in which he will have the confidence and support of all our members.

Mr. Roberts proposed a very hearty vote of thanks to Mr. Sankey for the work he had done in the last year, which was carried unanimously.

Mr. Sankey briefly returned thanks for this appreciation.

Election of President.

The Convention proceeded to the election of officers. As President Mr. Roberts nominated Mr. Wolley-Dod, of Pretoria. In doing so he said that Mr. Dod was the oldest municipal electrical engineer in the country, his service exceeding even his, Mr. Roberts', of 22 or 23 years. It was very fitting, he went on, that at this time this honour should be conferred on Mr. Dod. Everyone understood that Pretoria had now taken a big leap ahead in electricity. Mr. Roberts believed that there was scarcely one of the members of the Association who was not at present considering or contemplating some new scheme or electrical enterprise, but Mr. Dod had the honour of being the first one who had the work actually in hand, to put his Municipality's schemes into being. He was sure they all wished Mr. Dod complete success, and he was certain that Mr. Dod required no commendation from him. Mr. Roberts therefore had the greatest pleasure in nominating Mr. Dod as the next president.

Mr. Bickell seconded.

There were no further nominations, and Mr. Dod, having been declared duly elected, took the chair amidst applause. He thanked them for the honour they had done him.

Election of Vice-President.

Mr. Swingler, of Capetown, was chosen as vice-president, on the nomination of Mr. Sankey.

Election of Hon. Secretary and Treasurer.

In regard to the position of honorary secretary and treasurer, it was announced that Mr. Poole, the present secretary, had sent a message per Mr. Roberts asking to be relieved. On the proposition of Mr. Roberts, seconded by Mr. Stoker, Mr. Horrell, of Pretoria, was elected to the office. It was agreed to

convey to Mr. Poole the Association's thanks for his efforts on its behalf.

The election of Council, though next on the agenda, was left in abeyance until members had an opportunity of informally exchanging ideas, in view of the fact that one member is appointed from each Province...

Venue of Next Meeting.

Convention accepted the invitation of Capetown to meet there next year, following the custom of meeting always at the town where the Vice-President is resident.

PRESIDENT'S ADDRESS.

By T. C. Wolley-Dod (Pretoria).

I first have to thank the Members of the Association for the honour they have done me in electing me as the President of the Association for the year, and to express the hope that we may all leave this, our fourth Annual Convention, wiser and more fitted for our work than when we assembled.

The objects of this Association as laid down in the Constitution are "to promote the interests of Municipal Undertakings," and in general the Municipal Electric Undertakings include the Generation, Distribution and Utilisation of Electric Energy in the Urban areas of the Union.

In these interests are bound up the interests of the producer and the consumer, of those actually engaged in the business, and of every dweller in the Municipal area whether actually a purchaser of electric energy, or only aware of the existence of the concern through the lighting of the streets or the running of the Tramways.

It is our object at all times, and particularly at our Annual Conventions, to discuss our several successes and failures, and to devise methods of emulating the successes and eliminating the failures, and by exchange of ideas and experience to simplify and standardise our business practice.

Whether the concerns that we control are large or small, there is one feature that is common to them all and that is expansion.

It is an axiom that the only practical method of transmission of power is Electrically and to-day the Electrical Industry and particularly the industry of generating and distributing Electrical Energy is the key industry of the Engineering World, and the key industry of the Commercial World.

The early history of Electric Supply in South Africa followed very much the same lines as in Great Britain. Initiated by private enterprise in the principal towns, it was soon taken up by the Local Authorities, and in Urban areas is now

practically exclusively in the hands of the Municipalities. In a sparsely populated country such as ours, where towns are few and far between, and where industries—outside of mining—naturally develop in or near the towns, it is probable that Municipal Control of Electric Supply will continue to exist for many years to come, at any rate in the smaller Municipalities, but the tendency of the future must be towards the Super Power Station under a more catholic control.

The proposed electrification of Railways in certain districts will give rise to the establishment of Power Stations either under the joint control of the Local Authorities and the Railways, or far more probably controlled by some body independent of either.

South Africa is not a country where hydro-electric stations are likely to be of any importance, and it is to coal fired steam stations that we must look for the future of electric supply.

I would commend to those of you who may not have read it, an illuminating report recently presented to Parliament in the United Kingdom by the Nitrogen Products Committee which deals very extensively with the matter of Electric Power Supply.

It would be outside the province of an introductory address to enter into details on this important question, but two extracts from the conclusions of the report give food for thought.

It states "With regard to the production of power from coal, the only proved method of obtaining cheap power in bulk is by the use of direct coal firing in conjunction with modern large sized steam turbo-electric generators."

And later: "In the present state of knowledge the application of

"by-product recovery processes offers no immediate prospect of reducing the cost of electric energy from coal below the figure obtainable from direct coal firing and the use of large steam-turbo electric units."

Whatever may happen in the future, we certainly cannot look to a return to pre-war cost of plant for many years to come. The Electric Supply concern that adopted the extravagant policy of putting in too large a plant in the pre-war days, has scored an undeserved and unforeseen advantage.

The increased cost of new plant must have a very marked effect upon the cost of Electrical Energy in the future.

An examination of the published accounts of Electric Supply concerns both in this and other countries shews that the capital charges will be a continual burden to the industry and the only means of lightening the burden is the improvement of the load factor of the Generating Station.

From the commercial point of view Electric Supply is a manufactured product dependant on labour and materials, and as the cost of these rises, so must the cost of Electric Energy increase. The only item that has not risen in cost to any extent is the cost of brain work without which no successful Electric Supply concern can exist.

The question of the status and remuneration of Electrical Engineers is one which is already having the serious attention of the Institution of Electrical Engineers in England, the Institute in South Africa and Kindred Societies, and representatives of this Association have been in consultation with the South African Institute on the question, and will doubtless report to this Convention.

It is unfortunate that owing to geographical difficulties we members seldom have the opportunity of seeing one another except at our annual Conventions, and the result has been that Sub-committees appointed to report to the Convention are unable to meet except during the Convention Week, and it is for this reason that you are asked at this Conference to devote a considerable portion of the time to Sub-Committee work to prepare the business for the whole Conference to deal with later in the week.

In recent years the several Colonies have made common cause in the Union of South Africa, but the component Provinces have not yet made common cause in Local Government.

The Powers and Restrictions under which Municipalities act with respect to Electrical Undertakings, though similar, vary in details in the different Provinces.

In the Cape Colony the "Electric Power Ordinance of 1911" repealed the old act of 1895 as well as the various Private Municipal Acts, and now governs all supply of Electricity for public purposes in Municipal Areas except Capetown.

There is nothing in the Ordinance to prevent any Local Authority from supplying outside its area, and it specifically empowers one Local Authority to contract for supply with another.

The consent of the Administrator is required for all tariffs and regulations, and the fullest details have to be submitted not only of new schemes, but of any alterations or additions estimated to cost one half per cent. of the total outlay if they exceed £100. The regulations proclaimed under this Ordinance in 1912 provide for an unnecessary amount of Government control and interference.

In Natal the law dealing with the matter is the Municipal Corporations Lighting Law of 1891 which is an enabling Law for Town Councils to supply within their boundaries, or to contract with Undertakers for such supply, and lays down on a broad basis the legal relations to be established between the Council, the Undertaker, and the Consumer, and avoids technical details.

This was supplemented by the Municipal Corporations Lighting Amendments Ordinance of 1911 which empowers Town Councils to supply from within or adjacent to their boundaries to persons or communities outside their boundaries, and also empowers the Administrator to make regulations similar to the Board of Trade regulations.

In the Free State the Electric Lighting and Power Regulations Ordinance of 1905 simply gives the Administrator power to make Regulations on the lines of the Board of Trade for safeguarding the Public and the Post Office, and such were published in 1906. One of the provisions compels the supplier to issue regulations approved by the Government for guiding consumers in installing apparatus on their premises.

In the Transvaal the Local Government Ordinance No. 9 of 1912 is an enabling Ordinance which defines all the Powers of Municipalities and includes Electric Supply.

The Administrator's consent is required before commencing supply, and also to any by-laws or regulations, but there is no provision for continual Government interference as in the Cape Province. A Municipality may establish its power station inside or outside the Municipal area, but may only supply inside.

Representations have already been made to the Commission now sitting on Local Government to have these powers extended to outside supply.

With this exception the powers of the Municipality are ample and well defined.

There is nothing in any of the Ordinances or Regulations to prevent the Municipalities of the Union from adopting a uniform code of By-Laws and Regulations, provided they are accepted by the respective Administrators, and the advantages of such a uniform code must be obvious to this Convention.

More particularly will it be advantageous to adopt a uniform code of wiring regulations, enabling wiremen and contractors to carry out the same class of work and to use the same class of material throughout the Union.

A Sub-Committee has had this matter in hand for two years and has circulated a copy of their draft to all members, and after further work with a larger Committee, will submit the final draft to this Convention for adoption.

The Transvaal Ordinance specifically empowers Municipalities to license Electricians to do wiring work, and to prevent any unlicensed persons from doing such work, and I believe that the members of this Association are agreed that it is desirable in the interests of the public that such licences should be made compulsory. Johannesburg already issues such licenses, and Pretoria is about to do so, and the decision on the particular form and method of granting such licenses will form part of the work of this Convention.

Another question of common interest to all Municipalities is the form of Statistical returns and the form of accounts. The Census Department, and the Department of

Mines and Industries have already adopted certain Statistical forms on which annual returns have to be made, and in the Cape Province the form of accounts is governed by a Provincial Regulation. A sub-committee of this Association have had this matter in hand and will report in due course to the Convention.

These matters that I have indicated will form the principal work of this Convention and we may be well satisfied if we can arrive at conclusions before we part. With this object the programme before you has been kept almost free from papers on technical matters, and it is proposed to devote the earlier days of the session to Committee work in order that definite proposals may be laid before the assembled members later in the week.

Arrangements have been made to visit the principal engineering features in the town and neighbourhood and, as you will see by the official programme, a strenuous week is before you. May it end with satisfaction to all of us.

Discussing the President's address, Mr. Roberts said he was very glad personally that Mr. Wolley-Dod had laid such great stress upon the legislative control of Municipal electrical enterprises. Speaking as an engineer of Natal, he was personally very glad that some of these restrictive provisions did not hold in that Province, but he felt very much concerned at the possibility that some such legislation might be placed upon them. He could not but believe but that some of these legislative measures were only a dead letter, because he saw—he was not aware of it before—that before even £100 was spent as a capital sum it was necessary to get the consent of the Adminis-

trator. He did not know if this held good in practice, but he did not see how it could when they considered the large amounts involved in the commercial undertakings with which they were concerned. This thing could not possibly work if it were necessary to get formal consent for every £100 worth of work undertaken. There were such things as emergencies, and he was certain that this law could never work in the conditions under which they were now carrying on their work. He thought the matter was of such importance that the President should be induced to take it up and study this legislation, and perhaps even bring forward some suggestions as to the co-ordination of the various Parliamentary legislation of the different Provinces, so that the Association might take the initiative and perhaps make some suggestions as to what would be suitable and what was not. He thought it would be a very fine work. As they knew, these things were generally left in the hands of lawyers—legal draughtsmen, they called themselves—and unless they, the Association, was very much alive to the situation they would find that some Act had been passed before they knew it and then their hands would be tied—they would not have been alive to what was of the greatest importance to them. In 1911, in Natal, the Post Office Act was passed, giving to the Postmaster-General the most autocratic powers in dealing with the control of overhead wires in town. They found now that they, the Durban Corporation, were being asked to move a long route of wires extending about two or three miles as the Postmaster required the site of the route for telephones. They were asked to go to some thousands of pounds of expense in order to meet

this regulation. He thought this matter one of the most important things they could have before them, and he moved that the President be asked to bring up a report and to co-opt any members of the Association as a Committee to go thoroughly into it.

Mr. Sankey said he thought that Mr. Roberts had raised a very important point. He, Mr. Sankey, thought he was correct in saying that all these regulations were passed into the form of Ordinances without anyone being much the wiser. It was true that they were published in the "Provincial Gazette," but nobody ever read that—very few. The result was that it was a comparatively simple matter for such a law as the Post Office Act to slip in without anybody being aware of it until, twelve months afterwards, one woke up and found that one was tied and bound. In regard to the Cape Municipal Ordinance, although he had worked under it for five or six years he could not say that he had ever studied it very carefully. Certainly it contained one very useful clause, which enabled Municipalities to supply current outside their boundaries with the consent of the Administrator. It happened that there were many of the larger towns which had smaller towns and villages just outside their boundaries which it would be able to take on, if the municipalities or authorities of the smaller places petitioned the Administrator together. It could then be fixed up in a comparatively short space of time. Apparently this was not the case in the Transvaal. As regards the expenditure of £100 on capital outlay, Mr. Sankey had to say candidly that he was not aware that this was the case—that the sanction of the Administrator had to be sought first.

The President corrected this by saying that it was necessary to have the Administrator's consent if the proposed expenditure exceeded $\frac{1}{2}$ per cent. of the capital of the undertaking.

Mr. Sankey, continuing, said he was glad it was not £100, otherwise he would have to plead guilty to having violated the regulation, for many a time he had spent considerably more not only without the consent of the Administrator but also without the knowledge of his committee. He thought some of the councillor delegates might be able to enlighten them upon the various laws in the different Provinces, and give them some interesting and useful information. There was at least one Provincial Councillor present, and he possibly might also be able to give them some useful and interesting information. Mr. Sankey concluded by seconding Mr. Roberts' motion.

A member pointed out that it seemed to him that they were asking a very great deal of one man when they asked their President to undertake this work.

Mr. Swingler said that the aspect that appealed to him was the time it took to get the Administrator's consent, more particularly in the Cape, where the Ordinance was not all that might be desired. The larger municipalities were not affected by the regulation which made the consent of the Administrator necessary when an expenditure of more than $\frac{1}{2}$ per cent. of the capital outlay was involved. After all, what did it amount to? The smaller municipalities, however, had very great trouble, and Mr. Swingler instanced the case of Muizenberg, where he had found great trouble in having to submit all tenders, details, etc., to the Administrator. And he had it on

very good authority that on one occasion, at least, the plans were approved and returned without ever having been opened. In regard to the Post Office Act, Mr. Swingler told how this was very often ignored. At one time the Post Office asked him to supply plans and sketches of all their connections. He simply went ahead with his proposals and did not bother about them.

Mr. Roberts' motion was carried on the understanding that the President be empowered to enlist the assistance of members in the work.

ELECTION OF COMMITTEES.

Statistics and Accounts:

Messrs. Poole, Stoker, Blatchford, Hodge and Macauley.

Licensing of Wireman and Registration of Contractors:

Messrs. Swingler, Roberts, Poole, Proctor, Sutcliffe and Sankey.

Bye Laws, Conditions of Supply, and Wiring Regulations:

Messrs. Wolley-Dod, Bichell, Vowles, Sankey and Horrell.

Remuneration of Electrical Engineers:

Messrs. McCoumb, Millar, Sankey, Fletcher, Coulthard and Douglas.

OFFICIAL MAGAZINE.

Mr. Sankey brought up a matter in connection with the Association's official magazine, "Engineering in South Africa." He had been trying for the last few months, he said, to make it interesting to members of the Association by writing special paragraphs, etc., dealing with Association matters.

The Association met once a year or once in eighteen months as a Convention, but for the remainder of the time they were all at different ends of the country and were apt to lose touch with each other and to look upon the Association as in a state of coma. The secretary had already told them what a difficulty it was to get members even to reply to letters, and it was even more difficult to get them to take out a subscription on behalf of the official magazine. The magazine, by the way, contained a great deal of interesting matter on electrical engineering and engineering generally. Mr. Sankey said he had therefore taken the liberty of approaching the editor with a view to getting him to compound the subscriptions of members, and he, the editor, had made what Mr. Sankey considered a very generous offer. He read the letter he had received in reply, which was to the effect that if the Association paid £2 10/- per annum the magazine would be posted to each member of the Association as

published, this offer to hold good for the next two years. Mr. Sankey was sure that by accepting this offer, and by using the magazine for the dissemination of all their official notices (except those of a very private nature) they would in reality be saving money, for at present, with the postage at 1½d., they spent more than this amount on circularising members. He proposed, therefore, that the Association pay this £2 10/- a year out of its funds.

Mr. Swingler seconded.

The President: I think the offer is a very liberal one. I think we should do very well to accept it.

The motion was adopted.

Before the Convention adjourned the President detailed the arrangements for the week. Thereafter the members were entertained to luncheon by the Mayor at the Country Club. In the afternoon they visited the Power Station and the car sheds.

Tuesday, 14th September, 1920.

Convention resumed on Tuesday morning, with the President, Mr. Wolley-Dod in the chair.

Members present:

The President (T. C. Wolley-Dod), G. Swingler, R. Macauley, T. Millar, R. W. Fletcher, T. Sutcliffe, W. Blatchford, L. Sparks, R. D. Coulthard, L. Bickell, W. Hodge, C. McComb, W. Douglas, L. Proctor, B. Sankey, and L. L. Horrell.

morning, with the President, Mr.

Associate Members present:

W. Bellard-Ellis, G. Mercier.

Delegates present:

Councillors A. Cunningham, J. A. Clark, and T. Hoy.

Visitor present:

T. P. Ashley.

GAS ENGINE PLANTS.

**With special reference to their use as prime movers in small
Electricity Generating Stations.**

By G. Mercier (Bethel).

Premise.—The author has had experience, in the management of a Gas-Engine Plant in this Country, having been connected with a Municipal Electricity Supply Undertaking.

He has, therefore, been more than an interested spectator and, *inter alia*, he has, been struck by the reliability and efficiency of such a plant which qualities are deemed so necessary, more especially, in those Undertakings that cannot afford duplicate generating plant and, likewise, by the indifference which is shown to the value of an economical prime mover as a preliminary to the success of such Schemes.

In view of the increasing competition between steam and internal combustion engines,—which is international in character—the author feels strongly that the opposition encountered in so many quarters to the spread of the internal-combustion engine is unaccountable, and that the opponents of these plants do not usually attack them on the score of economy, but, there are often heard warnings of the unreliability of their operation, initial cost, heavy maintenance charges and, the dangers of poisoning by gas.

One might easily argue that steam boilers and pipes have been known to burst, and that their attendants were worse than poisoned in consequence. However, such methods of argument are not applicable and, the deciding points must be judged on facts, and not on opinions.

In what follows, the author proposes to write more in the way of a compendium than a thesis, realising, that the Members of this Association are quite au fait with respect to the fundamental theories upon which such plants operate.

The accepted meaning of "gas-plants" obviously includes pressure-gas, and suction-gas. Since the latter—and operating on the "4-stroke" principle—are overwhelmingly greater in number, this type is treated.

Part I.—The history of progress in the design of any class of machinery broadly proceeds on well determined lines. The early stages complication in design coupled to heavy expense in experiment. The later stages disclose the relative importance of the various principles underlying the design, manufacture and, application, until finally a reliable, and efficient machine is the outcome.

Through the use of the internal-combustion engine, most notably the suction-gas engine, some of the most important advances in modern engineering practice have been achieved.

Reverting to the early stages—1860, the date of invention of the Lenoir engine—we read of the difficulty experienced in control, valve action, and timing gear.

After that, little, if indeed, any improvement is heard of until the year 1862, when Beau de Rochas proposed and patented the cycle of operations now known as "Otto Cycle."

Following this invention of cyclic operations, the production of "gas" for the engine offered further difficulties. In fact, gas producers were then inevitably pressure plants, i.e., working above atmospheric pressure.

Benier in 1894 constructed the first producer of the suction type, i.e., working under atmospheric pressure. By this method, a producer self-contained with regard to its steam supply came into existence.

The latter condition necessitated the use of a suction-pump but, at the same time, the main point lies in the fact, that the production of gas and steam, was common to a single apparatus.

The presence of this pump necessarily lowers the engine efficiency. The tests on one of these gas-engine plants developed 53% mechanical efficiency at full load with a fuel consumption of 1.87 lbs. (13,000 therms to the lb.) per B.H.P.-hr. To this epoch we owe the present day suction-plant.

Korting, subsequently improved on Benier's producer by dispensing with the suction pump and, allowing the suction stroke of the engine to create the requisite vacuum, thereby considerably increasing the efficiency.

From then onward, there has been no great alteration in the general principle of suction-gas plants, improvements have certainly been made but, more with the aim of attaining perfection of various details.

Among the most advantageous of the "improvements" with regard to their suitability for the generation of electricity are:—

ENGINE.

Governing.—Almost all engines worthy of consideration are to-day fitted with either Qualitative or Quantitative governors. In the case of the former the work done by the engine is in relation to the strength of the mixture; in the latter to the amount. For the production of electricity whereby extremely steady running is essential, recognition is due to the quantitative governor wherein, perfect control of the work done by the engine is possible, since, on lighter loads the compression pressure together with the explosion pressure are reduced.

This method of control, reduces, to a large extent the strain caused by the reversal of stresses on the working parts of the engine as, the piston receives an impulse at every working stroke which impulse is in direct proportion to the load of the engine.

Ignition.—For satisfactory running of the engine, the explosion must occur at a predetermined moment, the control of which is mechanically effected by operating a lever enabling the ignition to "lag" or "lead." In instances where such control is made possible, the firing of the explosive mixture is accomplished by an electric arc, obtained from either a low, or higher tension Magneto. The author is in favour of low-tension wherein, a draw-spark system is adopted. The electrodes coming repeatedly in contact with one another tend to keep the "break" clean. If any carbon should find its way between the points of contact, mechanical action causes the obstruction to be thrown out, whereas, with high-tension,—

the electrodes not being movable bodies—in the event of foreign substances entering the sparking gap, short-circuits and mis-fires must occur at the sparking plug.

Apart from the above, the use of low-tension magnetos, allows that the armature be oscillated instead of rotated within the field.

These conditions possess the advantage that the oscillating and incidentally current-generating movement occur through the agency of a stressed spring. The E.M.F. generated, therefore, is of a fixed value, and independent to the speed of the engine. In the case of a rotary magneto, its speed must necessarily be similar to that of the engine, the E.M.F. obviously becoming a variable quantity.

Lubrication.—This in itself, calls, for the most careful study owing, to the numerous reciprocating parts, and the temperature to which some of these are exposed. Manufacturer's have been most successful in overcoming what appeared a problem at one time, with the result, that to-day lubrication presents no striking difficulty. In passing, it might be urged, that such parts as the Cylinder, Piston-rod, and Crank-pin bearing should be lubricated from separate and positive oil pumps.

GAS PLANT.

Producer.—The production of gas in the modern producer,—especially the suction-gas type—has been so simplified, as to render same practically automatic. It is evident, that every time the piston draws in a volume of gas, this action is communicated through the various gas-cleaning and gas-cooling devices to the combustion zone of the furnace. The partial and temporary vacuum thus created is replenished,

by air being drawn in through a definite inlet passage which connects the furnace to atmosphere. Consequently, the supply of gas is in accordance with the demands made by the engine which in turn, is regulated by its governor.

The disadvantage which is common to all gas producers, is the formation of clinkers within the fuel bed. This disability, may be minimised by close attention to the supply of water to the evaporator or steam to the furnace.

The amount of steam must be limited to a determined quantity and be in accordance with the particular working conditions. If in excess, it is clear, that the damping effect so created on the fire would result in the undesirable formation of carbon dioxide. Insufficient steam on the other hand, would cause excessive rise in temperature, within the furnace and promote clinkers, as well, as, endanger the producer shell.

To minimise this inherent fault, several ingenious methods have been devised such as, movable water-jacketed metal prongs revolving in the interior of the furnace. This disturbance of the fuel precludes excessive rise in temperature at any one spot.

The open-hearth producer recently brought on the market undoubtedly deserves all it claims. The fuel resting on a massive iron hearth of conical shape, assumes a like formation, the sides of which are open to atmosphere throughout the whole circumference. The top of the producer is fitted with removable plugs, through which an iron bar is occasionally introduced to poke the fire.

Any clinkers formed may thus be forced down on to the hearth and are readily removed since, the opportunity for inspection is afforded at all points.

Evaporator.—The evaporator fitted to a producer as above described tends to correct the supply of steam to the furnace. Approximately one third of the producer height is surrounded by a boiler, from which steam is obtained for the requirements of the producer.

Now, since the evaporator is subsidiary to the producer it is clear, that when the temperature of the fire within the furnace increases this boiler is subjected to greater heat, and larger quantities of steam are produced which automatically correct the temperature. The author, had occasion, to operate an engine supplied by gas from this type of producer for 72 consecutive hours and this somewhat lengthy trial was a complete success.

Separator.—The function of the separator, is to separate the undesirable constituents from the gas. These consist of ash, dust, and particles of coal held in suspension.

Recent improvements of construction permit the separator to perform a twofold purpose. The gasses are partially cooled (by water-jacketing the exterior of the separator) as well, as, cleaned. This condition heats the water which is subsequently discharged into the evaporator. Considerable increase in the efficiency of the plant is thus obtained.

Scrubber.—The cleaning material employed in the case of fuel of a non-volatile nature, is either coke or wooden trays. When the former is made use of, it is found that the coke tends to become unevenly impregnated with dust, etc., with the result, that the gasses follow the lines of least resistance. When such an undesirable condition is reached whilst a scrubber is designed to possess ample capacity, so that the gasses may pass through it at a low velocity to ensure its

thorough cleaning and cooling, the principles of its design are partially defeated, due to the fact that the paths of the gas have become lessened. With wooden trays, such an eventuality is almost impossible since the orifices and angular defractions are equal in all directions.

Having dwelt on the improvements that characterise the modern suction-gas engine plant, it is now opportune to mention the advantages in favour of producer-gas power plants, as compared with steam-power.

The facts of not having to provide a smoke stack, condensing apparatus, boiler-feed pumps and other auxiliaries as well, as, the ready solution of the smoke problem—so much complained of in certain quarters—are all points worthy of attention and need only be mentioned.

The principal advantages, however, require to be discussed at greater length. First and foremost, it must be remembered, that in steam-power plants the lowering of the steam temperature (through radiation losses) causes a definite loss of thermal energy, whilst the cooling of the gas in a producer-gas plant will simply decrease its volume and increase the thermal efficiency.

The sensible heat of the gas is of no use in the combustion-chamber, in fact, from what has been stated earlier, it is clear that the lower the temperature at which the gas enters the cylinder the more its thermal efficiency is enhanced.

In a steam plant, heat losses are minimised by protection of the pipes. This is usually accomplished at—a fairly heavy initial cost—by lagging with asbestos or other heat insulating material.

All pipes and joints conducting steam, must be highly mechanically sound, and of heavy construction

owing, to the high pressures to which they are subjected.

The suction-gas plant (working under atmospheric pressure) cannot develop leakages of gas whilst the plant is in operation.

This condition allows cheaper material to be made use of, and as most joints on modern gas-plants are "machine ground" the troubles and cares of packing are considerably reduced.

On the question of economy a great deal may be said; one instance which is self-evident might here be mentioned. It has already been stated (vide PRODUCER) that a suction-gas producer is practically automatic with regard to its supply of gas and the demands made thereon by the engine. In other words, no more gas is generated than the amount necessary to fulfil the requirements of the engine, and that at any load. The same cannot be claimed for a steam plant.

As is well known in steam-power practice, the larger the prime mover the higher the all important efficiency. This leads one to the natural conclusion, that small steam-driven generating stations—say up to 100 K.W. capacity—cannot produce electrical energy to profitably compete with existing power users who utilise prime movers of greater efficiency—such for instance as suction-gas.

In contrast to this, the thermal efficiency of power-gas plants is practically the same whether large or small sets be considered.

From the point of working economy, it is, therefore, unnecessary to instal a single large power-gas plant since the efficiency is not appreciably lessened by successively installing several plants which ultimately result in producing the same plant capacity whilst, at the same time,

very little difference in fuel and water consumption will be the economical outcome of such procedure.

These facts, straightaway dispel the arguments brought up with regard to expensive duplication.

In stations operating under low load factors, it is then, more commendable to instal two generating sets of say 50 K.W. each, than one of 100 K.W. and thus keep up the superior efficiency.

We will now pass on, to consider the amount of losses that occur during the period that the respective plants are idle.

The figures furnished in connection therewith, are based on an average computed from various data.

Stand-by Losses.—

Steam-power: 71.5 lbs. coal per hr. on engines of 100 to 500 H.P.
Power-gas:— 4.1 lbs. coal per hr. on engines of 100 to 500 H.P.

From the above, we see, that the saving in favour of gas-plants in fuel alone, amounts to 67.4 lbs. per hour.

Water consumption—in the separator—would show similar economy. For the time being, we may assume, that this consumption would approximate $\frac{1}{4}$ pint per B.H.P.-hour, for the first two to three hours, falling off thereafter by about 50%.

Part 2.—The persevering reader, will, by now, undoubtedly expect that practical proofs be tendered to vindicate the claims made by the author in favour of power-gas plants.

It is always felt, that no better illustration can be offered than the data obtained from a plant which is in every-day use, and running under all conditions.

The information following hereafter is computed from such a plant.

A brief description of this plant is here necessary, although to some it must appear to be on a very small scale.

Engine.—Single Cylinder "4-stroke horizontal" 210 R.P.M. Mean Effective Pressure:— 80 lbs. per sq. in. Stroke:— 22 in. Cylinder diam.:— 12½ in. Extra heavy Flywheel; variable quality governor; low-tension magneto. Compressed

air Starter. Thermos syphon. Max. B.H.P. at sea level:— 40.46. Max. B.H.P. at 5582 feet altitude:— 34.6.

Gas-Plant.—Open-hearth Producer Designed to operate on either charcoal, locomotive smoke-box char, or anthracite coal.

Generator.—
"2-wire" D.C. 20 K.W. @ 210 R.P.M. (80 amps. @ 250 volts.). Assumed full load efficiency:— 85%.

TEST No. 1.

Producer fire left burning and unattended for 11 hours previous to commencement of test.

Stand-by losses during above period:—

Fuel:— 42.57 lbs. (3.87 lbs. per hour). Cost 6.75 d.
Water:— 165 gls. (15 gls. per hour). Cost 5.00 d.

Total: 11.75 d.

"Fanning" of fire started at 9.18 a.m. Gas obtained in
"Fanning" of fire completed at 9.35 a.m. 17 minutes.

NOTE:—Hand-operated Fan.

Engine started, and run idle from 9.37 to 9.39 a.m.:— 2 minutes.

Load applied to engine at:— 9.30 a.m.

Duration of test:— 5 Hours.

Nature of load:— Production of electricity.

Calorific value of fuel (Anthracite) 13660 therms per lb.
Cost of delivered bunker 26/4 per 2000 lbs.
Cost of Oil 46/2 per 8 gls.
Cost of Water 2/6 per 1000 gls.

PERFORMANCE DATA.

Total Output 100 B.O.T.U.

Load factor 94.1%.

Load Observations:— Max. 21.25 Min 18.75 Avrg. 20 K.W.

B.H.P.-hr. (avrg.):—100/746:— 134 plus 15%:— 154/5:— 30.8.

CONSUMPTIONS

per K.W.-hr.

Fuel 1.8 lbs.	Costing285 d.
Oil0025 gls.	Costing173 d.
Water (a) 1.5 gls.	Costing045 d.
Water (b) 6.0 gls.	Costing180 d.

Total:683 d.

CONSUMPTIONS

per B.H.P.-hr.

Fuel	1.17 lbs.	Costing	.185 d.
Oil	.0016 gals.	Costing	.110 d.
Water, (a)	.98 gals.	Costing	.029 d.
Water, (b)	3.9 gals.	Costing	.117 d.
Total:			<u>.441 d.</u>

(a) Water used in evaporator, and separator.

(b) Water used in scrubber.

QUANTITIES AND COSTS AS ABOVE.

Fuel	.180 lbs.	Costing	2/ 44
Oil	.25 gals.	Costing	114
Water	.750 gals.	Costing	1/104
Total:			<u>5/ 24</u>

From the values already given, and recognising that heat and work are mutually convertible, the following calculations may be accepted. Employing the figures quoted in the description of the plant we obtain:—

INDICATED HORSE POWER.

I.H.P.: $(80 \times 1.84 \times 122.72 \times 105) / 33000$	54.23
Less 17% due to altitude,	45

MECHANICAL EFFICIENCY.

E: $(30.8 / 45) \times 100$: 68.44%.

THERMAL EFFICIENCY OF ENGINE.

H.P. as above: 45×5 : 225 Total.

Fuel consumption 180 / 225: .8 lb. per I.H.P.-hr.

I. B.Th.U.: 42,416: H.P. per minute.

therefore, e: $42,416 / (.8/60) \times (13660 \times 100)$: 23.34%.

OVERALL THERMAL EFFICIENCY FROM FIRE-GRATE TO BUS-BARS.

EI.H.P.	100×1.34	134 Total.
Therms expended	13660×180	2,458,800 Total.
One H.P.-hr.	2545 therms.	
Therms recovered	2545×134	341,030 Total.
$(341030 / 2458800) \times 100$: 13.9%.		

TEST No. 2.

The following illustrative facts are offered to substantiate any claims that may be made as regards reliability.

Previous to the commencement of this second test, however, a general overhauling of the plant was undertaken including, the "grinding in" of all valves and, a new fire was started in the producer.

The following observations were then recorded:—

Total output	200 B.O.T.U.
Duration of shift	9 Hours.
Load	22.23 K.W. per hour constant.
Load factor	100%
B.H.P.-hr.	34.36 per Hour constant.
Speed variation	208-210 R.P.M.

CONSUMPTIONS

per K.W.-hr.

Fuel	1.65 lbs.
Oil	0.02 gals.
Water	8.05 gals.
Cost as above per K.W.-hr.	.494 d.
Cost as above per B.H.P.-hr.	.319 d.

THERMAL EFFICIENCY.

I.H.P.: 45 x 9: 405 total.

Coal used: 330 lbs. $330 / 405 = .714$ lbs. per H.P.-hr.

Therefore, $e = 42.416 / (.714/60) \times (13660 \times 100) = 26.09\%$.

MECHANICAL EFFICIENCY.

$(34.36/45) \times 100 = 76.35\%$.

OVERALL EFFICIENCY.

$330 \times 13660 = 4,507,800$ therms used.

2545×268 E.I.H.P.: 682060 therms recovered

therefore, $E = (682060/4507800) \times 100 = 15.13\%$ from fire-grate to bus-bars.

The author, has,—for the purpose of this paper—on several occasions endeavoured to obtain an appreciable overload test of the plant. It must here be admitted, that such attempts were unsuccessful. The best result was a load of 22.53 K.W. (34.73 B.H.P.) for a little under an hour, after which time the voltage dropped from 250 to 243.

Moreover, assuming, that the dynamo efficiency was increased say—from 85 to 86% at the time of the overload, the B.H.P. then, would only have been (22.53×1.34) plus 14%: 34.41 B.H.P.

Apart from the data already furnished, the following further observations were noted. Temperature of the cooling water. Suction pressure within gas plant. Engine speed variation.

In the absence of elaborate instruments for ascertaining these factors, rather primitive methods were resorted to nevertheless, accurate, and true figures were obtained. The average temperatures read at 18 half-hourly intervals at the following points were:—

DEGREES FAHRENHEIT.

(a) Entering separator	60	Leaving separator	135.	Increase	75
(b) Entering scrubber	60	Leaving scrubber	91.	Increase	31
(c) Entering cyl. jckt.	72	Leaving cyl. jckt.	120.	Increase	48
Water consumption in separator					400.5 gls.
Water consumption in scrubber					1210.5 gls.
Water circulated in cldr. jckt.					1250.0 gls.

A recapitulation of the results from test No. 2 enables us to trace the magnitude of losses that occur at different portions of the plant.

LOSSES ACCOUNTED FOR.

(a)	400.5 gls. raised 75 deg.	Therefore, 400.5 x 10:—
	4005 lbs. x 75	— 300375 therms or, 7.139% loss.
(b)	1213.5 gls. raised 31 deg.	Therefore, 1213 x 10:—
	12135 lbs. x 31	— 376185 therms or, 9.819% loss.
(c)	1250 gls. raised 48 deg.	Therefore, 1250 x 10:—
	12500 lbs. x 48	— 600000 therms or, 18.569% loss.

SUMMATION OF LOSSES.

(a)	- - - - -	7.139%
(b)	- - - - -	9.819%
(c)	- - - - -	18.569%
Engine friction	- - - - -	23.650%
Dynamo losses	- - - - -	15.000%
		<hr/>
		74.177%
Less thermal efficiency	- - - - -	26.090%
		<hr/>
		48.087%

The losses unaccounted for, and amounting to 48%, should be debited against:—

- (1) Radiation (Heat from gas-plant and engine given off to surrounding air).
- (2) Exhaust (Temperature thereof above atmosphere).
- (3) Producer (Heat radiation; ashes, etc.).

SUCTION PRESSURE.

For ascertaining the above, a piece of 3/8 in. copper pipe 3 in. long was screwed into one of the holes formerly made use of during the temperature test. One end of a short length of rubber tubing was expanded over the copper pipe, the other end terminating in a 5/8 in. U tube filled with pure water.

The differences in the levels of the water within the U tube (during the suction stroke) was read and found to average 0.75 in.

The negative pressure within the gas plant then equals: (0.75 in./12) x .4335 = 0.027 lbs. per sq. in. below atmosphere. NOTE: 0.4335 x Head of water in feet: lbs. per sq. in. (Molworth).

SPEED VARIATIONS.

The acknowledged methods of computing the cyclic variation of an engine flywheel are numerous, the most common being the employment of a special sensitive tachometer.

Since such an instrument was not at the author's disposal, the following alternative was adopted. Although, admittedly not orthodox yet, the values obtained cannot be very much in error.

The milli-volt meter included in a "Standard" testing set was connected across the dynamo terminals. The pulsations of the engine at various loads were thus magni-

fied on the sensitive dead-beat scale of the voltmeter. By such a manner the irregularity was found to average:—

1/4 Load, from 260 to 268 volts=	3.0%
1/2 Load, from 260 to 264 volts=	1.5%
3/4 Load, from 262 to 264 volts=	.8%
Full Load, from 270 to 273 volts=	1.1%
No Load, from 270 to 270 volts=	0.0%

During the full load test, the speed of the engine was noted to be 210 r.p.m. At this juncture, the main circuit-breaker was opened, with the following results:

R.P.M. during first 30 secs. rose from 210 to 219=4.3%.

R.P.M. during next 15 secs. dropped from 219 to 212=3.3%.

R.P.M. 5 secs. thereafter constant of 208.

Part 3.

It is common belief that the cost of a gas engine plant is considerably higher than of a corresponding steam plant.

Yet, the following figures abstracted from actual Tenders and Estimates received by the author from South African representatives of European manufacturers do not confirm this belief.

Steam Plants. (April, 1915).

(a) Tandem, Compound Steam Engine (non. con.) 650 r.p.m., direct coupled to Dynamo and Battery-Booster, capable of developing 35 K.W. max. load, Multitubular boiler fitted with feed-water heater. Price erected, £1,250.

(b) Compound Superheated "Locomotive type" (non. con.) 200 r.p.m. belt-driven Dynamo, direct coupled to Battery-Booster capable of developing 35 K.W. max. load. Price erected, £1,500.

Gas-Plant. (April, 1915).

Engine and Suction gas plant (operating with anthracite of 12,500 therms per lb.), complete with motor-driven air compressor; do.

centrifugal pump; do. fan. Direct coupled to 30-36 K.W. dynamo at 235 r.p.m. and capable of maintaining 30 K.W. continuous load (at the altitude that the plant was to have operated) and allowing for 36 k.w. for two hours. Motor driven Battery-Booster. Price erected, £1,546.

Steam Plants. (July, 1919).

High-speed vertical engine (non. con.) Direct coupled to 50 K.W. dynamo (continuous rating). Price, £3,250.

Do. as above, but allowing for 100 K.W. Price, £5,000.

Gas Plants. (July, 1919).

Suction gas operating on bituminous coal of 13,000 therms. per lb. Direct coupled to 50 K.W. dynamo (continuous rating). Price, £3,503.

Do. as above but allowing for 100 K.W. engine, "4 cylinder," vertical. Price, £4,465.

These examples clearly show that the "belief" existing in connection with capital cost is a fallacy which can only survive, providing that no investigations are made.

Apart from the fact that small gas power plants are here proved to be less costly than their rivals, steam power plants, there still exist the low running costs and maintenance charges which are encountered in gas engine practice.

The attendant occupied on a gas plant need only give his attention to the producer once every two hours, and then only for a matter of a few minutes during the time the fuel is admitted into the furnace.

In view of the above remark, it might be argued that there really is too little work for the attendant, thus affording him opportunity to perambulate around the engine room with a lump of waste in his hand. Should such be the case, would it not appear that the management is at fault and not the type of engine in use, considering that it is quite convenient to arrange that such work as meter testing and general machine shop work be carried out during the shift hours.

This shiftman need not necessarily possess any special qualifications as are called for by the Regulations from those who are entrusted with the care of high pressure steam boilers.

A review of the figures just given shows that in April, 1915, the gas plant was quoted £296 dearer than the non-condensing steam plant. (a) No doubt, this saving in favour of the steam plant is the result of the difference in dynamo speed and the direct coupling of same to the Battery-Booster.

The same gas plant cost £46 more than example (b). Again, the Battery-Booster (in B) is direct

connected to the dynamo at, however, a lower speed than (a). Further, a superheater is provided.

The extra cost of £46 for the gas plant certainly represents good value, since all the auxiliaries are separate and motor driven, also the Battery-Booster is an entirely separate machine. The direct coupling of the dynamo to the engine would also allow an appreciable reduction in foundation area, as well as in housing.

This makes it evident that, if the gas engine plant's specification be so amended as to dispense with the seeming luxury of motor driven fan, compressor, pump, and booster the price of the plant would automatically drop to a much lower cost than of either of the steam plants outlined under (a) or (b).

The examples given and dated July, 1919, are offered with a view of discussing costs from another standpoint. By the use of bituminous coal, the "running" cost of the gas plants would still further outrival the steam plants. The guarantees given with these plants were, inter alia, 1.25 lbs. coal per B.H.P. (coal of 13,000 therms per lb.) and allowing for the recovery of 3 gals. of tar per ton consumed.

The cost of anthracite—delivered bunker—was shown to be 26/4 per short ton (.158d. per lb.), that of bituminous 10/8 (.064d. per lb.).

On the assumption that a plant of 32 b.h.p. is in operation for 9 hours per day or $(3285 \times 32) = 105120$ b.h.p. hours during one year, the consumption and cost of anthracite coal would represent $(1.067 \times 105120) \times 0.158d.$ plus stand-by losses $= (3.87 \times 5475) \times 0.158d.$

Running costs, 112163	lbs., costing	£73 16 10
Stand-by costs, 21189	lbs., costing	13 19 0
Total annual cost for	anthracite	<u>87 15 10</u>

The cost for bituminous coal—based upon the same time—would be $(1.25 \times 105120) \times 0.064d.$, plus stand-by losses $(4.25 \times 5475) \times 0.064d.$

Running costs, 131400 lbs., costing	£35 0 10
Stand-by costs, 23269 lbs., costing	6 4 1
	41 4 11
Less for Tar recovered, @ 3/- per gallon, per ton	11 12 6
	29 12 5

The higher proportion of capital cost for a bituminous gas-producer suitable for the above engine would amount to about £300.

At 6% interest plus 5% depreciation per annum, the working and capital charges amount, therefore, to £62 12/5, or a saving over anthracite plants amounting to £25 3/5 per annum.

It will have been noted that in the costs given under July, 1919, the gas plants, were so equipped, as to permit of the use of Bituminous fuel. Should Anthracite plants only have been quoted for the prices for the gas-plants become much less than those asked for the steam-plants.

MISCELLANEOUS CONSIDERATIONS.

The remarks following hereafter, have been collected from various notes and observations made by the author during his period of association with the plant described, which period extends from its inception (Sept. 1916) to the present date.

Generating Plant.—The first failure occurred eleven months after the Undertaking's inauguration or, 2307 "engine running hours" resulting, in an interruption of supply lasting 3 hours. The failure was due, to the coke-filled scrubber becoming choked with coal dust. From the experience thus gained, it has since been a rule that no fuel be fed into the producer without having first been sifted by passing through a wire-mesh screen.

The second failure—12 months after the former or, 4815 running hours total—was of a more serious nature and necessitated the shutting down of the Works for three days. This was due to the break-

ing of the cast iron skew-gear pinions, operating between the crank and cam shafts.

The pinions were damaged to such an extent, as, to render it impossible to state whether any blow-holes had existed in the castings consequently, no definite conclusion could be arrived at as to the cause of the breakage.

No trouble has since taken place although, an additional 2987 running hours (to end of September, 1919) have been recorded or, a total of 7802 hours during three years. As would be expected, the "repair" bill debited to the Generating plant, is, but a small item in fact, amounting to less than £30 during the period under review.

Running Practice.—The plant is started daily at between 1 and 2 p.m. and is occupied on Battery charging and Water pumping until about 6 p.m., when the Private and Public lighting loads commence. It is here,

that the maximum demand occurs, reaching a "peak" load of from 100 to 120 amperes by about 8 p.m.

When the load exceeds the generating plant's capacity the battery is paralleled on to the generator bus-bars (as shown by the circled lines in graphs A. & B.) and whilst so employed, at times, have been known to discharge itself to within 33% of its K.W. capacity. As the Private lighting load drops, the recharging of the battery (if not accomplished earlier) is resumed and completed by about 11 p.m.

At this hour, Public Street lighting is discontinued, the generating plant shut-down, and the battery allowed to carry whatever small demand (below 40 amperes) there may be on the Private lighting Feeder.

The two Load Curves A. & B. will serve to illustrate the diversity of maximum demand existing between the Summer and Winter months.

A. Is a typical example of a Summer day shift showing, the "peak" load to be well within the generating plants capacity.

No Public lighting is shown, as the Graph was computed on a moon-light night. If this load be added (24 amperes) the maximum demand, therefore, becomes 78 plus 24: 102 amperes or, 16 amperes in excess of the plant capacity; obviously, the battery charging rate would have been proportionately decreased in order, to meet the Public lighting load had same been required.

The sum of the individual demands when considered collectively (total output) build up an aggregate load which is conducive to efficient running conditions.

On the other hand, B. represents a Winter day shift wherein, the "peak" is seen to rise, as high as 118 amperes or, 32 amperes above the generating plant's capacity.

It will be noticed from an inspection of Graphs A. & B. that the Private Lighting load on this Station is very illustrative of its inherent complaint, poor Load Factor and of no importance during the hours of daylight, in this instance, the absence of any Power consumers further magnifies the disadvantage. Such Industries as are established Locally would require—if converted to electric power—60 to 80 H.P. motors, and operating under low load factor. The Scheme, therefore, must in the present dimensions be regarded as a purely lighting one.

The progress of the Undertaking is shown on graph C. The running time occupied in producing C is delineated on D.

Comparisons between C & D clearly show the load factor to improve with the higher output, this statement, must appear clumsy at first sight. Its mention is, principally to emphasize that no outstanding loss of efficiency is noticeable despite the depreciation that has taken place during three years.

The "renewal" bill of the gas-plant and engine—during three and one half years—has been £7 made up by remounting a bearing and renewing three glass oil-containing lubricators at a cost of £5 and £2 respectively.

A complete set of "spares" for the plant is provided for but, so far, no occasion has made it necessary to utilise any of these.

SUMMARY AND CONCLUSIONS.

1. Discussions are offered with regard to systems of ignition. The advantage of low-tension is mentioned. Governing of the engine is discussed and opinion tendered with respect to alternative methods.

2. The preference for open-hearth producers is mentioned and reasons given in connection therewith.

3. Low fuel and water consumption is shown and obtained from

actual tests thus confirming the low operating costs claimed.

4. Data on thermal efficiency obtained and losses due thereto traced.

5. Initial cost of Plant discussed and compared with competitive steam-plants.

6. Reliability and low maintenance charges exemplified.

7. Personal experiences recounted and statistics of various performances shown graphically.

The President said they had to thank Mr. Mercier much for his very instructive paper, and to congratulate him upon the results of his experience with a gas plant. The President then called upon Mr. Bel-lad-Ellis to open the discussion.

Mr. Ellis said he did not know that there was anything he particularly wished to criticise, but he had one or two small notes, questions which he hoped that the author of the paper would be in a position to answer. They were not in the nature of technical queries. As the result of this high efficiency, he asked, what was the cost of the unit? was the engine direct coupled as would be assumed from the apparent speed of 210 revolutions, or was it belt driven. If so, had anything been allowed for the loss of power for belt transmission? What was the charge per unit in the town that Mr. Mercier represented? Was it known to the author that the cost of fuel was the main factor in the success of any scheme? How long had the scheme been running? How long had Mr. Mercier been in charge of it? What amounts, if any, had been periodically allocated to the redemption of rates? What amounts had been so far written off for depreciation? What was the remaining useful life of the engine?

Mr. Mercier proceed to reply to some of the queries. The machine, he said, was direct coupled, therefore there were no losses to be allowed for belt transmission. The cost of the unit was 1/3.

Mr. Ellis observed that therefore the scheme did not tend to lower the price of the unit.

Mr. Sankey asked Mr Mercier what his experience had been in regard to gas plant work as far as steadiness was concerned. Was there any difficulty in respect of fluctuations? he asked. His point was this: at one time he had to work with a small gas driven plant, but they had a very great deal of difficulty owing to the fluctuation of the load. The engine would not respond to the fluctuations, and the producer would not respond. The plant was an extremely small one, and Mr. Sankey did not know what eventually became of it. He knew of another plant with a very heavy fluctuation on day load—it was running a saw mill. Could Mr. Mercier, Mr. Sankey asked, give them any information as regarded the fluctuation of the day load?

Mr. Mercier replied that he regretted that he could not. He explained that the load was very steady on his plant, owing to the fact that the engine was used to

pump water during the day, and started off with its full load. He had had experience of other gas plants, however, he added, where such was not the case, and he thought that the secret of his success lay in the fact that his plant was used for this water scheme as well.

Mr. Vowles congratulated Mr. Mercier upon his success. As the engine directly responsible for the scheme which Mr. Mercier now had in his care, said Mr. Vowles, he was particularly pleased. He deliberately chose a gas engine because he knew that there was to be steadiness of load—that it was to be a combined water and electrical scheme. Having had a fairly long experience of gas engines he knew their disabilities. He had had a very bitter experience of them, but knowing that the hours of the water and light respectively would fit in he had come to the conclusion that suction gas plant would be best. He had great pleasure in congratulating Mr. Mercier upon the success of the scheme.

Mr. Sankey moved a vote of thanks to Mr. Mercier for his paper. The subject, he said, was a little bit out of his (Mr. Sankey's) line; nevertheless, it was a very interesting paper. It had evidently taken a very great deal of time and care in preparation and the carrying out of tests. He thought they owed a vote of thanks to Mr. Mercier for

the care and time he had bestowed on it and in presenting them with that paper.

Mr. Ellis, in seconding, endorsed these remarks, and said he had no doubt that Mr. Mercier would reply to the remainder of his questions in the usual way.

The proposition was carried unanimously.

The President announced that Mr. Mercier, having relinquished Municipal service, automatically dropped out of full membership of the Association. He hoped, however, that Mr. Mercier would register himself as an associate membership.

Mr. Mercier signified his acquiescence of this course.

Farewell to Mr. Roberts.

The chairman announced that Mr. Roberts had to leave that night and that Mr. Poole would be with them the next morning. Mr. Dod expressed the Convention's sorrow that Mr. Roberts could not remain throughout the week.

Mr. Roberts, in acknowledging these sentiments, said that no one was more sorry than he that he had to go. He wished them a most successful Convention.

Convention then adjourned. A photograph was taken, after which members were taken to the Iron Works and other places of interest. In the afternoon the various sub-committees set to work.

Wednesday, 15th September, 1920.

The sub-committees continued their work. In the earlier portion of the afternoon visits were paid to the Union Buildings, amongst other places of interest, and delegates and

members assembled in open Convention at about 5 p.m. The President, Mr. Wolley-Dod, was in the chair, and there were also present:—

Members present:

The President (T. C. Wolley-Dod), R. Macauley, T. Millar, W. H. Blatchford, J. Vowles, R. W. Fletcher, G. W. W. Swingler, E. Poole, L. Proctor, T. Sutcliffe, T. P. Ashley, L. Sparks, R. Coulthard, L. Bickell, W. Hodge, A. McComb, B. Sankey and L. L. Horrell.

Ass. Members present:

W. Bellard Ellis.

Delegate present:

Councillor H. Pedley.

The President said he had to congratulate the Committees on the great progress they had made. He knew they had been very hard at work at all sorts of odd hours. The result was that they had already had two Committees' reports before them. He hoped they would have the remainder very shortly.

The President proceeded to read a telegram which had been received from Mr. Everitt, who regretted his inability to be present owing to the fact that he was sailing from Capetown on Friday. Another telegram was read from the Association of Certified Mechanical and Electrical Engineers, Johannesburg. This was to the effect that the members of that Association recognised the importance of the remarks made by the retiring president, Mr. Sankey, in his valedictory address in regard to the inadequacy of the salaries being offered in many cases to Municipal electrical engineers. That Association, read the telegram, was the only one which was attempting to raise the general status of engineers, and would welcome any practical scheme that would secure for municipal electrical engineers the full reward for their very valuable services in the promotion of South African industries.

The President remarked that he had not yet replied to that communication but would leave it in the hands of the Council.

Election of Council.

The President called for nominations for the Council. It was pointed out that although it was not definitely laid down in the Constitution, it had been the custom in the past to appoint one member of the Council from each Province. Nominations were then called for.

Mr. Swingler's was the first name submitted, but it was pointed out that, as vice-president, he was already a member, *ex officio*.

Mr. McCauley nominated Mr. Miller, of Harrismith, as the O.F.S. representative. Mr. Vowles seconded.

Mr. Blatchford proposed Mr. Poole, Durban, as Natal's representative. Mr. Sutcliffe seconded.

Mr. Coulthard proposed Mr. Bickell, Port Elizabeth, as the Cape's representative. Mr. Sparks seconded.

Mr. Proctor's name was submitted by Mr. Sutcliffe, seconded by Mr. Miller, as the Transvaal member.

There being no further nominations, Messrs. Miller, Poole, Bickell, and Proctor were declared duly elected.

Welcome to Mr. Poole.

The President welcomed Mr. Poole, that being his first appearance in open Convention. They had all met him in Committees and elsewhere, and they had already passed a vote of thanks to him for his very valuable work as honorary secretary and treasurer.

Mr. Poole:— Thank you, Mr. President and gentlemen.

Recommendations of Renumeration Sub-Committee to be submitted (subject to the approval of this Convention) to the Joint Committee of this Association and the S.A.I.E.E.

1. Strong letter to be sent to six Municipalities subject to favourable reply from the Engineers concerned.

2. Failing above proposals having any effect it is suggested that the following steps be taken:—

(a) Letter to Provincial Administration.

(b) Letter to Department of Mines and Industries.

(c) That in the event of the above measures being unsuccessful this Committee is of the opinion that more drastic measures should be taken, and that it be left in the hands of the Joint Committee.

Grading of Salaries.

(1) Up to 50,000 units per annum: £30 per month minimum starting salary and upwards. If any other duties such as Water, Town Engineer, etc., then minimum £35 per month upwards.

(2) Up to 100,000 units per annum.

Minimum £40 upwards.

With extra duties as above £50 upwards.

(3) Up to 200,000 per annum.

Minimum £45 upwards.

With extra duties as above £55 upwards.

(4) Above 200,000 and below 1,000,000. With extra duties £60.

Minimum £50 upwards.

LARGE TOWNS: 1,000,000 upwards.

That the minimum commencing salary be £70 per month upwards.

In putting forward these proposals the Committee desire to emphasize that these are considered to be the minimum present day (1920) salaries for which suitably experienced men can be obtained and that Municipalities should offer increased remuneration by grading increases from time to time with a view to retaining such men in their service.

RECOMMEND by this Committee that the accepted members consisting of Messrs. T. C. Wolley-Dod, R. W. Fletcher and B. Sankey continue.

The chairman called upon Mr. Sankey, as the chairman of the Committee, to introduce the report.

Mr. Sankey said that before going into the details of the report he thought he ought to explain how the matter had arisen. The initiative came first of all from the South African Institution of Elec-

trical Engineers, who raised the matter and asked him, Mr. Sankey, to appoint a sub-committee of three to go into the matter. One of their members, they said, was unable to pay his subscription, and complained that his Municipality was still paying him the pre-war salary. They decided to remit his subscription.

As time was short—it was a month or so before the Convention—Mr. Sankey said he thought it was not right to waste any time, and the Committee were thus practically self-appointed. He, Mr. Sankey, communicated with Mr. Roberts and Mr. Poole, and it was suggested that Mr. Wolley-Dod, Mr. Fletcher and himself should form the Committee, being all located close together, and meet the Committee of three of the Institute, as was intended. They would notice that in their report the Committee suggested that the Convention should now authorise them to carry on with the work. Mr. Sankey said he had already given them a report of the first two meetings of the Joint Committee. They decided to write letters to all the various municipalities urging upon them the necessity and desirability of paying their engineers salaries commensurate with the increased cost of living. It was felt, however, that nothing definite could be done in the way of pressing for increased salaries until they had something to go upon. They therefore undertook to communicate with all their members and even some outside their membership to obtain a basis as to salaries and number of units sold, number of consumers, pre-war salaries, present-day salaries, and other details as to emoluments, such as motor car allowances. The response was immediate. In about three weeks replies were received from all but about half a dozen, to whom a second reminder was sent. Mr. Sankey thought there were now only two or three out of the list still outstanding. The Joint Committee then met again. The matter was discussed for some little time, and it was decided that as the Convention was so close at hand it would be a good idea if the matter were brought up at the Convention, so that the Joint Committee might

have a lead from the members of this Association, who, after all, were the people most intimately concerned. Therefore, as they knew the Committee was enlarged. There were, they would see, six municipalities which stood out very prominently as, in their opinion, being very seriously underpaid for the responsibility which they carried. Mr. Sankey said he could not guarantee that in every one of these cases the man who occupied the position was a fully qualified man in every way, but in some, at least, of the cases, there was the very strongest evidence to that effect. He might quote one case to them. The gentleman in charge of a station with an output of 20,000 units had a present-day salary of £33 a month. He was an Associate Member of the Institute of Civil Engineers, and he was also an Associate Member of the Institute of Mechanical Engineers. For these qualifications he got no extra emoluments. This, the Committee, thought, was taking unfair advantage of a fully qualified man. One other case was noted of a fully qualified man who was being very obviously underpaid. The Committee had therefore suggested to the Convention in their report that certain steps should be taken in this respect, but Mr. Sankey said he would like to make it clear that it was not only their Association that was concerned. They as a Committee, if the Convention agreed to allow them to carry on, would have to take that report to the Joint Committee, and it was for the Joint Committee to take such steps as they might consider fit. They, as a Committee of three, could not guarantee that the Joint Committee would carry out on those lines. They had got to put this to the Joint Committee and the Institute. But the Convention could at least give them a mandate from its

side, which would carry a good deal of weight with the Institute. They had also, it would be seen, made an attempt at grading—at classifying these 36 towns. The Committee thought that the best way of classifying was according to the number of units sold. Such returns were fairly reliable, he believed, and could be checked by official figures. That was the only way to form any idea of the scope and responsibility of the undertaking. In fact, as the unit was the article that electrical engineers manufactured the unit was the measure of their manufactures. The Committee had therefore, as they would see, attempted to draw up four grades, with one further grade for the large towns, the idea being that they were going to put forward what might be considered the absolute minimum. Large municipalities, and the small ones too, should start their engineers at these salaries, and thereafter they should encourage their men to stay with them as their services became more valuable as they gained experience and knowledge of that particular undertaking. That, Mr. Sankey thought, covered the ground that the Committee had been over. He would be pleased to answer any questions, he concluded.

Mr. Vowles asked for further information in regard to the matter of extra work involved for which extra remuneration should be paid. He asked if it were designed to include such items as control of wiring and installation work, all of which might be looked upon as extra.

Mr. Sankey replied that these items might be looked upon as part of an electricians duties. Extras were such things as town engineer-ships, control of fire brigades, water supplies, and so forth.

Mr. Swingler thought the better grading would be in regard to load

capacities. His point was that a plant generating say 20,000 units per annum would probably not involve more work and responsibility than one with an output of only 10,000 units. Further, in the Cape electrician artisans were demanding 3/6 an hour for a 44-hour week. The man in charge of the undertaking, said Mr. Swingler, was surely entitled to more than they, seeing that his was a constant responsibility of 24 hours a day and every day in the week. He was liable to be called upon at any moment. Although he did not know the salaries that were paid in some of the smaller municipalities it certainly looked to him as if it were better to be a fitter than to work for those wages.

Mr. Bellad-Ellis asked if he understood that Messrs. Wolley-Dod, Sankey, and Fletcher were listening to the discussion with a view to taking it forward to the other three members of the Joint Committee to try to co-ordinate what was said. He suggested therefore, as hinted by Mr. Sankey, that before the discussion went any further, the Convention should formally appoint them as members of the Committee and authorise them to carry on.

This was agreed to.

Mr. Poole agreed with Mr. Swingler in regard to the anomalies of salary. He thought that the minimum was far too low. He thought that if it went forth that engineers were willing to take £30 a month they would be imposed upon.

The President said he believed that a man on shift in his engine-room was getting £45 a month. He was not present at the Committee meeting, but it appeared to him that they had got to make some comparison between the wages of the artisan and the salary of the engineer. He thought there ought to be some

comparison between the wages of the artisan and the salary of the engineer. That was for the committee to carry forward to the Joint Committee.

Mr. Poole declared that directly they started to licence their electricians they might be sure that they would all want the standard rate of wages, no matter whether they were employed in the Western Province of the Cape, the Eastern Province, the Free State, or Natal.

The President pointed out that in Pretoria the standard rate of pay for artisans was 4/- an hour with double pay for Sundays.

Mr. Sankey said they would notice that in the first grade the Committee had made a difference of £5 only between the ordinary salary and that which included special work, whereas in the others there was a difference of £10. That was because they took into account that there were only four towns which would fall within this category—of having an output of less than 10,000 units. Of course, those were very small plants. He supposed the Grand Hotel in Pretoria used that number of units by itself. But they could hardly reckon that a mechanic in a very small town would get the same as a mechanic in Johannesburg or Capetown. He thought they had to take local conditions into account somewhat. Still, this was really £10 a month under the next grade, and that was what was really in the minds of the Committee when they were considering this.

In reply to Mr. Poole, Mr. Sankey said the basis might be that of an artisan in a particular district.

Mr Poole contended that a railway artisan for instance at Ceres, got the same rate of wages as one at Capetown. Mr. Poole emphasised that the engineer was always on

duty, whereas the artisan's responsibility terminated at the conclusion of his shift.

The President: Does a little place like a Ceres run a day load?

Mr. Poole: I am not quite sure. I will say no.

Mr. Sankey said that two out of the four places he had mentioned two were paying much under £30 now.

Mr. Poole said that the whole trouble was this: if the Convention suggested these salaries the engineers would get no more. It would do a lot of harm to the men they were trying to benefit.

Mr. Councillor Peddy (Standerton) said they were putting a minimum less than their workmen at Standerton, who got £40 a month. In fact, even to-day that was better than their Town Engineer's salary. They were setting their minimum at £30, which was what shop assistants were demanding. Therefore he thought that they should not worry about the one or two small municipalities, which, after all, only had very small plants and did not employ capable men. He thought that the Association should take a firm stand. For a thoroughly capable and trained man he thought £45 was quite low enough.

Mr. Vowles: I would like to know if these are units generated or sold.

The President: Sold.

Mr. Sankey said that he personally was prepared to put forward anything that was brought up, if they thought the minimum too low.

The President said that his personal opinion was that they should set an absolute minimum of £45, which would obviate municipalities employing cheap and incompetent persons.

Mr. Poole moved that they accept as a minimum wage up to Clause 3 £45 a month.

Mr. Swingler suggested that they simply state that their minimum salary should be a living wage. He did not see that the responsibility of an engineer increased very much if he had an output of 200,000 units as compared with 100,000. He had exactly the same plant. He thought they had also to take the load factor into consideration. He was tempted to make the stipulation that the salary of the engineer in charge should be not less than 10 per cent. more than the registered electrician's wages in that particular Province—that was to say, the engineer's salary must be 10 per cent. more than the wages paid to an electrician as laid down by the Trades Unions. If they made that the minimum it would come to about £45 a month.

It was suggested that Mr. Swingler make his proposition to this effect read 15 per cent. more, which he accepted.

Mr. Sparks seconded.

Mr. Sutcliffe pointed out that his municipality did not generate its own current. He asked what his position would be.

Mr. Proctor said that Mr. Sutcliffe nevertheless had the same responsibility for the twenty-four hours of every day. He was liable to be called upon at any moment in an emergency.

In the course of further discussion Mr. Swingler's proposition was amended to read: "That the salary of a whole-time chief municipal electrical engineer shall be at least 15 per cent. higher than the standard wages paid to skilled Engineering artisans in the same district."

Mr. Sankey pointed out that the salaries of many municipal electrical

engineers at the present time were very far below what had been laid down as a minimum. Even those figures, he thought, would be a very big pill for those municipalities to swallow, while those now proposed went to heights that they could not dream of and possibly could not afford to pay. He quite agreed that a competent man should get an adequate salary, but he feared that by adopting this rate they would get no result at all.

Mr. Pedley suggested, in view of the fact that the Municipal Congress was being held in a fortnight's time, that the matter be put forward there.

Mr. Swingler's motion now read: "That the salary of a whole-time Chief Municipal Electrical Engineer shall be at a minimum of at least 15 per cent. above the standard rate of wages of skilled electrical artisans paid in the same district."

Mr. Sankey: And not less than £45?

Mr. Poole: No, I do not say that.

Mr. Sankey: You don't make your minimum £45?

Mr. Poole: I don't know what it works out at, but it won't be far short.

Mr. Poole also pointed out, when the point was raised, that an artisan working on the Railways at a little place like Ceres would get the same wages as if he were working at Capetown.

Mr. Swingler's motion was then put and carried.

The President pointed out that this disposed of the recommendations up to Clause 3, but that there still remained the question of the men in charge of larger outputs.

Mr. Sankey said he thought they ought to fix on something higher for the large towns, for this rea-

son: the municipalities would fall back on the fifteen per cent. clause and class all municipalities in the same boat, the same as artisans. He did not think they wanted that.

Mr. Blatchford pointed out that fluctuations might occur from year to year, and that the engineer might thus find his salary reduced.

Mr. Swingler asked how men would be affected who had houses, etc., as part of their emoluments.

The President replied that he certainly thought that these emoluments should be taken into consideration. He thought that the Committee ought to embody that and also the question of extra duties in their report.

The suggestion was also thrown out that the Joint Committee should co-opt three members of the Certificated Engineers Society.

It was ultimately agreed that the Committee should draw up a revised scale for the towns with the larger outputs on the basis of the scale already suggested.

The Committee was then formally authorised to take joint action with the Committee of the Institute of Electrical Engineers.

The Licensing of Electricians. The Registration of Wiring Contractors.

The Chairman of the Committee Mr. Swingler, said the Committee had endeavoured to put before the Convention the same draft scheme which would cover both the licensing and registration of wiring contractors. He suggested that they take the clauses seriatim, which was done.

On Clause 1, Mr. Sankey asked if these regulations were identical with those of Johannesburg. He had not got his copy with him, he said.

Mr. Swingler replied that they were, with the exception of the position of the Governing Board. They had taken the Johannesburg regulations word for word, because the licences and wording of those was laid down in the Transvaal Municipal Act.

On Clause 2, Mr. Swingler pointed out that they had a slight addition to the other regulations.

Mr. Poole made it clear that they had changed electrical artisan to electrical wireman.

Mr. Sankey pointed out that the proposed regulations were slightly differently worded from the Johannesburg in respect of the question of examinations. He pointed out that in the last recommendations of the Licensing Board to the effect that up to the age of 25 the examination was to be made compulsory; over that age it was left to the Licensing Board. Mr. Sankey agreed that the expression wireman was better than artisan, as the Johannesburg regulations read. He told of a man who had no knowledge whatever of wiring, who could still be classed as an electrical artisan by reason of the fact that he had the necessary experience in underground jointing.

Some discussion took place on the question of licences—whether they would be interchangeable and whether men would have to journey to the larger towns to sit for the examinations. Mr. Sankey propounded a scheme whereby the latter hardship would be obviated, his idea being that the papers could be sent in time for the day of the examination, under seal, and opened by a magistrate, clergyman or some other such impartial person, who would remain in the room with the candidate to make sure that no dishonesty took place.

Several minor alterations were made in the remainder of the report. Which was finally accepted in the following form.

BYE-LAWS.

1. Licensing of Electricians.

(1) An electrician's licence will entitle the lawful holder actually to perform any electrical wiring work for the installation, alteration or repair of any system of wiring connected with any municipal works for the supply or distribution of electrical energy.

(2) No person shall carry out any work of the kind referred to in clause 1 unless such person is in lawful possession of a licence obtained from..... duly authorising him thereto, provided that this restriction shall not apply to the replacement of fuses or the adjustment of switches and lamp-holders. Any person contravening this bye-law shall be liable to a penalty not exceeding £5 for the first offence and to a penalty not exceeding £50 for every subsequent offence. Nothing in this clause shall be held to exclude the employment of an apprentice who does not hold the licence provided that such apprentice is working under the continuous supervision of a licensed electrician engaged upon the same work.

(3) Any person wishing to obtain a licence under these bye-laws will be required (a) to submit himself to examination by in such manner and at such times as may from time to time appoint; or (b) to submit proof that he has worked for a period of not less than five years as an electrical wireman, this period to include period of apprenticeship. The subjects upon which such examination will be made will be found in the schedules appended to these bye-laws, provided always that the Council may at any time add to,

delete or alter any of the said subjects upon giving reasonable notice of their intention to do so in a newspaper circulating in the municipality.

(4) Prior to the issue of a licence to any successful candidate, he will be required to sign a register containing a declaration that he accepts such licence subject to, and that he will conform with the conditions thereof, and with any regulations or bye-laws from time to time in force within the municipality with regard to such licence.

(5) Any licensee, if called upon at any time to do so, shall produce his licence for the inspection of any duly authorised official of...

(6) may at any time cancel any licence granted to any electrician if the Examining Board shall satisfy the Council that such person has done any electrical work in an unworkmanlike or negligent manner to the injury of any person or property or contrary to any of the Regulations or Bye-Laws; provided that, prior to such cancellation, the person whose licence it is proposed to cancel shall be given an opportunity of appearing before the Examining Board concerned and being heard in his own defence.

(7) An applicant who at date of application holds a current licence from another Municipal Council or Local Authority may upon the recommendation of the Board be granted a licence without being required to undergo an examination.

(8) These bye-laws shall come into a force six months from the promulgation thereof in the Provincial Gazette.

2. Registration of Wiring Contractors.

(1) No person or Company shall engage in or conduct the business of installation contracting for electrical work to be connected to the Municipal Supply System of the either as a master or contracting electrician unless he or they are registered by the.....

Any person contravening this bye-law shall be liable to a penalty not exceeding £5 for the first offence and to a penalty not exceeding £50 for every subsequent offence.

(2) Every applicant for registration must make application on the prescribed form and sign an undertaking to carry out all wiring and installation work in accordance with the rules and regulations of the

(3) All persons or firms engaged in the business of electrical wiring contracting at the date when these bye-laws shall come into force shall be immediately registered on application.

(4) All persons or firms wishing to commence the business of wiring contracting after the promulgation of these bye-laws shall give notice of their intention so to do in at least three copies of a newspaper circulating in..... and thereafter make application on the prescribed form.

(5) The Town Council may at any time cancel the registration of a Wiring Contractor if the Examining Board for the licensing of Electricians shall satisfy the Town Council that he has carried out his contracts in an unworkmanlike manner, or broken the rules and regulations of the or has allowed those in his employ to do so, provided that prior to such cancellation the person whose registra-

tion it is proposed to cancel shall be given an opportunity of appearing before the Examining Board and being heard in his own defence.

(7) The prescribed forms of the Wireman's Licence is as follows:-

.....
Gas, Electric Supply and Tramways
Department.

(Electric Supply Branch).

ELECTRICIANS' LICENCE.

No. 19

Mr.

is hereby licensed as a Practical Electrician under the Bye-Laws for Licensing and Regulating of Electricians within the and is entitled to perform any electrical wiring work for the installation, alteration or repair of any system of wiring connected with any Municipal works for the supply and distribution of electrical energy.

.....
Signature of
Licensee.

.....
General
Manager.

This Licence must be produced at any time when asked for by the General Manager or his duly authorised representative and the Installation Engineers of the Electric Supply Department.

8. The prescribed form of application for Contractors.

Registration is as follows:—

I/We (here state full name of person or firm and address at which business is to be carried on.)

hereby notify that I/We intend to conduct the business of electric wiring installation contracting and have advertised to this effect in the

dated

I/We hereby apply to be registered in accordance with the

by-laws and undertake that all work carried out by me/us will be strictly in accordance with the Regulations or any amendment thereof.

Signed

Address

Date

LICENSING OF ELECTRICIANS.

General syllabus embracing the subjects of examination referred to in the foregoing Bye-Laws for the Licensing and Regulating of Electricians within

(a) Pressures of supply and systems employed in Municipal area.

(b) A general knowledge of the Rules and Regulations of the Electric Supply Department in regard to the installation of cables, meters and extra meters.

(c) Definition of and calculations involving the use of the various electrical units.

Ohm's Law and calculation of pressure drop.

(d) Materials—the uses of:—

(i) Cables and flexibles: Their carrying capacity, sectional area and types of insulation.

(ii) Switches and cut-outs. Their carrying capacity, types and areas of contact and length of break required on various voltages and amperages.

(iii) Distribution boards. Carrying capacity of bus-bars of copper or other material; fusing points of fuse wire,

copper or other material, relative advantage of marble, slate or panels of other materials.

(e) A knowledge of the uses and general construction of motors, motor generators, transformers, automatic cut-outs, arc lamps, resistances, heating appliances, insulators, ceiling roses, wall plugs, lamp-holders and conduits.

(f) General methods of wiring. A knowledge of balancing of large installations, buried conductors (underground, in concrete plaster or under floors, etc.); conduit, open wiring and looping systems; size of lighting circuits, motor circuits, insulation resistances between wires and to earth; earthing, joints, bushing, protection from shock.

The examination required under these Bye-Laws shall be carried out by a Board consisting of the following persons:—

1. Representative of the Local Supply Authority.

2. Representative of the Electrical section of the Master Builders Association.

3. Representative of the Electricians' Association.

4. An electrical engineer from the staff of a technical Institution if such exists in the neighbourhood or otherwise some qualified person agreed upon by the first three mentioned.

(Note. In the case of the last 3 election shall be annually.)

The Convention adjourned at 7.15 p.m.

Thursday, September 16th, 1920.

Visit to the Premier Diamond Mine and Hatherley Glass Works.

On Thursday morning the whole party were motored out to the Pre-

mier Diamond Mine and were shewn over the mine by the General Manager, Mr. McHardy, Mr. Meyer, the Engineer and Mr. Holmes, the Electrical Engineer.

Much of interest was seen both in Electrical and Mechanical Engineering, but perhaps the most spectacular event was the "blast."—As the mine is entirely open this could be seen from the top, the noise is like a battery of big guns and must have brought back "memories" to those who had been in Flanders.

The visitors were afterwards entertained to lunch by the Directors and Mr. McHardy in a very appropriate manner welcomed the guests, to which the President replied.

On the return journey a call was made to see the Hatherley glass works, a factory for making bottles, recently re-started by Mr. Edward Marks.

Annual Dinner.

In the evening the members and delegates were the guests of the President at dinner at the Pretoria Club, which was attended by many notable gentlemen, including the Mayor of Pretoria, Mr. C. W. Giovanetti, M.B.E., M.L.A., and the Administrator, Hon. A. G. Robertson. The President, who presided, proposed the health of "The King," and, in a felicitous speech, that of "Our Guests," mentioning particu-

larly the names of the Administrator and the Mayor. Mr. Wolley-Dod carried his company back to the days when Pretoria's light was in the hands of a private company under the old Boer regime, and caused much laughter, first, by the preface to his remarks—that he had intended that it should be a speechless dinner until he reflected that it might be open to misconstruction if it were known that the Electrical Engineers were "speechless" and secondly, by telling of how the company was fined an exorbitant amount for every light that did not burn.

The Administrator, in responding, was also in humorous vein. He facetiously enumerated his qualifications to rank as an electrical engineer by reason of his having fitted electric light and bells in his farm homestead and his acquaintance with Ford cars.

The Mayor, having acknowledged the compliment to himself, proposed the toast of "The President," coupling with it the name of the Assistant Electrical Engineer, Mr. Horrell.

Mr. Wolley-Dod acknowledged the compliment in a word, and Mr. Horrell, with the observation that he could not say more than his chief, did likewise.

Friday, 15th September, 1920.

Members present:

The President, T. C. Wolley-Dod, B. Sankey, T. Millar, R. Macauley, W. H. Blatchford, R. W. Fletcher, G. W. H. Swingler, T. Proctor, T. Sutcliffe, E. Poole, L. Bickell, W.

Douglas, T. P. Ashley, C. McComb and L. L. Horrell.

Delegates present:

Councillors A. Cunningham, J. A. Clark, T. Hoy and J. C. Bischoff.

BYE-LAWS, CONDITIONS OF SUPPLY AND WIRING REGULATIONS.

Delegates and members assembled in open Convention in the Council Chamber, Town Hall, at 9.45, to dis-

cuss the proposed Bye-Laws, Conditions of Supply and Wiring Regulations and the rules of the Insti-

tute of Electrical Engineers relating thereto. The great majority of the later and the special committee's proposals in regard to the former were passed without discussion, a few verbal alterations being made and amended on the drafts as they occurred. In regard to the colours of wires, the President remarked that he was sorry that Johannesburg some years ago reversed the Customary arrangement of colours, which was rather unfortunate. One naturally expected danger from red, hence it should be the live wire. All others adopted this plan, but he regretted that Johannesburg had become the exception.

There was some discussion on the paragraph laying down that solid tubing must be used. Mr. Swingler led those who objected to this on the ground that it would unnecessarily increase the cost of wiring a building, pointing out that in a small undertaking one was often glad to get even one extra consumer on the books. This proposal, he argued, might lose such a potential consumer.

Mr. Sankey agreed with Mr. Swingler that the rule was very drastic. He thought the present method quite satisfactory if the continuity test were passed.

The rule was ultimately adopted.

Further discussion ensued on the rules in regard to flexible conductors, plugs on lighting circuits, ceiling roses, etc.

The Bye-Laws, General Conditions and Wiring Regulations were finally adopted as follows:

Bye-Laws

MUNICIPALITY OF ()

AUTHORISATION.

These Bye-Laws and Regulations are authorised under Government

Notice No. published in Government Gazette No. dated

SECTION I.

Electric Supply Bye-laws.

TITLE.

These Bye-Laws shall be cited for all purposes as the Electric Supply Bye-Laws.

1. For the purpose of these bye-laws and regulations, unless the context otherwise requires the following terms shall have the following meanings:—

“ Council ” shall mean the () Council of ()

“ Owner ” shall mean any person receiving the rents or profits of any land or premises, or who would receive such rents or profits if any land or premises, or who would receive such rents or profits if such land or premises were let, whether for himself or as agent, trustee, executor or administrator, for any person or estates entitled thereto or interested herein.

“ Premises ” shall mean any building, room, tenement, hut, shed or other erection, and the land authorised for occupation or use in connection therewith.

“ Consumer ” shall include owner or occupier of any premises to which the Council has contracted to supply or is actually supplying electric energy or any person entering into a contract with the Council for such supply of electric energy.

“ Installation ” shall include all material or apparatus situated upon the premises of any consumer and used or intended to be used for or in connection with the supply of electric energy to such premises, but shall not include the Council's service.

"Supply Mains" shall include any cable or wire other than the service which is used for the supply of electric energy to consumers.

"Service" shall mean the wires or any cables and other apparatus for the supply of electric energy by the Council between the supply mains and meter or main cut-outs on the consumer's premises.

"Contractor" shall mean the responsible person or firm doing work or placing materials in or on premises for the purpose of using electric energy.

"Manager of Electric Supply Department" shall mean the official for the time being acting as Manager of the Council's Electric Supply Department, or any other person duly authorised by the Council to perform the duty in this behalf.

"Owner," "occupier," "consumer," "contractor," or "person" shall in the case of a firm or partnership include all or any one or more of the members of such firm or partnership, and in the case of any public Company or of any body of persons, not being a firm or partnership, in the ordinary meaning of these terms, the Secretary or Manager of such Company or body of persons, or should there be no Secretary or Manager then any member of the Board of Directors, Managing Board or Committee of such public Company or body of persons.

Authentication of Notices.

2. Any notice or other document under these Bye-laws requiring authentication by the Council shall be sufficiently authenticated if signed by the Manager of the Electric Supply Department or other official or person duly authorised thereto by the Council.

Service of Notices.

3. Where any notice or other document is required by these Bye-laws to be served on or given to any person it shall either be served personally on such person or left at or sent by post to his last known place of abode or business, and if sent by post it shall be deemed to have been served at the time when the letter containing the same would be delivered in the ordinary course of the post, and in proving such service it shall be sufficient to prove that the notice or other document was properly addressed and put into the post.

Failure to comply with Notices, etc.

4. Any person who shall fail to comply within a reasonable time with any notice or order duly given or made under these Bye-laws shall be deemed to have committed a breach of such Bye-laws.

Fixing and maintaining installations.

5. Any installation connected or about to be connected with the Supply Mains shall be provided and fixed and maintained by the consumer at his own expense in accordance with the Bye-laws and Regulations which the Council may from time to time issue; copies of which will be obtainable at ().

Way leaves.

6. If the service mains are required to be on or above private property, or if the building it situated in a private thoroughfare, the Council reserve the right to refuse to supply or the right to make a special arrangement whereby the Council may be indemnified for any portion of the service lines being laid through or above such property or premises. Written permission for the laying of the service mains through or above such property must first be obtained by the Con-

sumer from the owner, or other person entitled to give such permission and be deposited with the Council.

Inspection of premises.

7. The Manager of the Electric Supply Department or any duly authorised officer of the Council may at any reasonable time or in emergency at any time enter any premises and inspect any service meter or installation and may remove any earth, bricks, stone, iron or woodwork or other covering on any portion of the premises for the purpose of discovering whether or not any breach of these Bye-laws has been or is being committed, and the Council shall not be liable for any compensation in respect thereof, but the Council shall restore such premises to their former condition.

Refusal of admittance.

8. Any person who shall refuse admittance or reasonable information to any duly authorised official of the Council in carrying out the provisions of these Bye-laws, or shall obstruct any such official in carrying out any duty connected with or relating thereto, shall be guilty of a breach of these Bye-laws.

Supply to be by contract.

9. No person shall use or continue to use a supply of electric energy from the Council's mains unless or until he shall have entered into a contract with the Council for such supply, and such contract shall in all respects govern such supply.

Resale forbidden.

10. No person shall sell or supply electric energy supplied to his premises under an agreement with the Council to any other person for use upon any other premises than those in respect of which such agreement is made, or permit or suffer such sale or supply to be made.

Fraudulent use.

1. No person shall tap or attempt to tap or allow or procure to be tapped any main or service wire in such a way that a supply of electric energy or current can or might be obtained other than or in excess of that contracted for.

Unauthorised connection.

12. No person unless specifically authorised by the Council shall directly or indirectly connect any installation with the supply mains or service.

Reconnection forbidden.

13. No person unless specifically authorised by the Council shall reconnect or attempt to reconnect with the supply mains or service any premises or installation which shall have been disconnected by the Council.

Tampering with service.

14. No person shall in any way tamper or interfere with any meter or service wire or service fuse.

Conditions for supply at low rates.

15. No person shall connect or allow to be connected any lamp or lighting apparatus to any installation supplied with energy at a rate lower than the rate ordinarily charged by the Council for supply for lighting purposes unless specifically authorised by the Council.

Penal clauses.

16. The occupier of any premises on which a breach of these Bye-laws shall be committed during his occupancy shall be deemed to be guilty of such breach just as though he had been the person actually committing such breach, unless it shall be proved that he was not cognisant of such breach.

17. Every person committing a breach of these Bye-laws shall in addition to the prescribed penalty be

liable to recompense the Council for any loss or damage suffered or sustained by it in consequence of such breach.

18. Any person contravening any of the provisions of Bye-laws Nos. 8, 9, 10, 11, 12, 13, 14 or 15 hereof shall be liable to a penalty not exceeding £50 in respect of each such contravention, and in addition thereto to a further penalty not exceeding £5 in respect of each such contravention for every day upon which such contravention shall continue.

19. Any person contravening Bye-laws Nos. 4 or 5 hereof shall be liable to a penalty not exceeding £5 sterling.



SECTION II.

MUNICIPALITY OF ()

GENERAL CONDITIONS FOR SUPPLY OF ELECTRIC ENERGY.

These conditions shall form part of any Agreement for the supply of Electric Energy for any purpose.

System of pressure.

1. (*Description of system and pressure of supply*).

Application for Supply.

2. Application for the Supply of Electric Energy for lighting, power or any other purpose must be made on the printed form which can be obtained at ().

Connection to mains.

3. No connection shall be made to the mains or service, except by the authorised employees of the Department.

Work done by Municipality

4. The Department will fix the necessary service and meter in a position selected by their authorised official, and will bring the service lines from the mains to the consumer's premises.

(Further details to be inserted as required by each Municipality).

Such portion of the service as lines beyond the boundary of the public street, shall be paid for by the consumer.

Municipal seals.

5. The meter, Municipal fuse boxes, etc., will be sealed or locked by the Department, and on no account must these seals or locks be tampered with.

Any unauthorised person tampering with the meter, service cables or fuses is liable to prosecution and a penalty of £50 under Bye-law No. 14.

Department's responsibility.

6. The Department's responsibility ceases at the consumer's main terminals. The installation must be maintained and kept in good order by the consumer. The Department does not undertake to attend to failure of lights, etc., except when due to the blowing of the main service fuses through no fault of the consumer. If the Department is called upon to attend to any other defect a charge of () shall be paid by the consumer for each attendance.

Consumer responsible for Municipal property.

7. The consumer shall be responsible for any damage, other than that due to the Electric Supply, to any meter, cutout, service cable or other Municipal apparatus on his premises.

Interruption of Supply.

8. The Department will not be responsible for accidental interruption to the supply, and may temporarily disconnect any premises for the purpose of repairs, tests, etc.

Right to disconnect.

9. The Department shall have the right to disconnect any installation or premises for which the rates or other charges due to the Department shall be in arrear, or where any of these conditions are being violated, after notice has been given to the occupier or owner of its intention to do so, or in case of grave risk, without notice.

Notice to be given before commencing work.

10. The Contractor shall notify the Department in writing before any new installation or alteration to the wiring of any installation is begun, stating the nature of the work, number of lamps, etc.

When for any building or block of buildings more than one installation or supply from a common main, or more than one distribution board or motor, shall be required, the wiring diagram of the circuits starting from the main cut-outs and a specification if available, shall be supplied to the Department in duplicate, for approval before the work is commenced.

Facility for inspection.

11. Every facility shall be given to the Department to inspect any parts of an installation in progress, or connected to, or intended to be connected to the mains.

The Department may require the Contractor to open up any joints or wires or remove any casings or fittings for purposes of inspection, and the Contractor shall re-instate at his own expense any work so opened or removed.

Number of consumers in one building.

12. (a) In the case of a block of shops, offices or rooms, there shall be provision for a room to be used solely as a switch board room, accessible at all hours to the Department's officials, not less in size than 5 feet by 6 feet and 9 feet high.

(b) The main switch distribution board feeding the sub-distribution boards controlling the various floors, or portions of the buildings, shall be erected in this room at the owners expense.

(c) The board shall be designed to carry a main switch and cut-outs large enough to safely break the highest likely maximum load of the building, and in addition a pair of cartridge type cut-outs shall be provided for each separate supply. A tank or other suitable wooden case fitted with a glass cover shall be made to close in these cut-outs.

The cover shall be fastened with a lock which will be supplied by the Department for the sum of 10/-.

This case shall be under the sole control of the Department.

(d) The Department reserves the right to meter the building in section or in bulk. Provision shall be made for the meters to be placed on the main board.

(e) The distribution boards must be labelled with numbers corresponding to the numbers of the circuits on the main board.

(e) The distribution boards must be labelled with numbers corresponding to the numbers of the circuits on the main board.

(f) Distribution board shall only feed points on the same floor of the building.

Connection to premises.

13. Unless special conditions exist the Department will only give one connection to a consumer in a building or block of buildings.

The main switch and cut-outs controlling the supply shall be erected near the point of entry.

Should the current be required for both lighting and power a pair of cut-outs shall be erected on the main board for each different supply, in addition to the main switch and cut-outs referred to in Rule 12, Clause (c).

SECTION III.
WIRING REGULATIONS.

Every installation shall be in conformity with the Wiring Rules and attached extracts of the Institution of Electrical Engineers (London), 7th edition, and with the Mines, Works and Machinery Regulations of the Union of South Africa, subject to the following special provisions:—

Note.—These regulations must be read in conjunction with the I.E.E. Rules, as points which are sufficiently dealt with there are not again referred to.

The paragraph headings follow those of the I.E.E., i.e., "General arrangement," "Conductors," etc.

GENERAL ARRANGEMENT.**Control.**

Every installation must be arranged on a system of distribution centres in the following order:—

- (1) Municipal service.
- (2) Municipal meter.
- (3) Consumer's main switch.
- (4) Consumer's main cut-outs.
- (5) Distribution boards.
- (6) Sub-distribution boards.

Three wire or multiple phase supply.

Lighting installations of more than 100 points or lamps, or requiring more than () amps maximum current, will be supplied on the three wire or multiple phase system where such are available, and must be wired as two or more separate two wire installations from the main distribution board, which installations shall be evenly balanced.

Main Switch and Cut-outs.

The main switch shall be a multiple linked switch of not less than 10 amperes capacity of a type approved by the Department, and the main cut-outs shall be single pole cutouts of a type approved by the Department.

The main switch and cut-outs shall be placed on the ground floor at a spot approved by the Department.

Meter Loops.

The consumer must provide the necessary meter loops for connecting the meter or meters which will be provided by and remain the property of the Department. A clear wall space of at least 3ft. x 3ft. in an approved accessible position must be reserved for the meter such that the meter dial shall be not less than 4 feet or more than 8 feet from the floor. (Insert details to suit local conditions.)

Coloured Conductors.

Conductors shall be coloured Red for the live or outer poles and Black for the neutral or earthed pole, and all single pole switches shall be on the red side. The lower bus-bar of all switch and distribution boards shall be on the red side.

Mounting of switches, ceiling roses, etc.

All switches, ceiling-roses, and other fittings not fixed to switch-boards or distribution boards must

be mounted on hard-wood recessed blocks or specially designed metal boxes, and when fastened to walls shall be screwed to wedge shaped blocks of ample size cemented into the wall.

Bath Rooms.

No switches will be allowed in bath rooms, and on no account may any part of an electric circuit be within reach of a person standing in the bath or on the floor of the room.

Accessibility to Roof Spaces.

Where wiring is carried out in roof spaces, a suitable trap door in the ceiling shall be provided.

CONDUCTORS.

Stranding.

All insulated copper conductors must be stranded. See "uncased wiring."

Insulation.

The insulation shall consist of one or more coatings of pure rubber next the conductor with a coating of vulcanised rubber covered with proofed tape, the whole being vulcanised together and finished with compound braiding.

Heat test.

The dielectric shall contain no organic matter except pure fine rubber, and shall shew no signs of carbonification when subjected to the action of wet steam at 320 degrees F. for 3 hours.

Stretch test.

The rubber, after the conductor and braiding and taping have been removed, shall stand an elongation test of stretching to double its original length for 24 hours, when it shall return to within 20% of its original length after 24 hours.

Joints.

Joints are not allowed in tubing or in any tube fittings except in a junction box of ample dimensions with an inspection cover and the joint shall be surrounded by a pre-spahn tube. Small circular junction boxes are not permitted.

Joints on insulated wires.

Joints must be insulated with 3 layers of pure rubber strip well stretched on, one layer of vulcanising tape, and wrapped with adhesive waterproof tape.

Joints for Electroliers, brackets, etc.

Joints between fitting wires and circuit wires must be made in the space immediately behind the base of the fitting, below the ceiling, by means of screwed connectors on a porcelain base recessed into a hard wood block, or placed in a junction box.

CASED WIRING. METAL CONDUITS.

(Vary to suit local conditions.)

Metal conduits.

All tubing not in plain sight, or exposed to weather shall be not less than $\frac{3}{4}$ in. diameter, solid drawn, brazed or welded, and shall have screwed joints, and no solid elbows or sharps bends are permitted.

All bends shall be made by a suitable bending machine, and tubes flattened or split must be rejected.

Draw-in boxes must be placed after every second normal bend.

Bushes must be of suitable metal.

The conductor shall be drawn in after the tubing is in place.

The number of conductors in any conduit shall not exceed that specified in Section 132, I.E.E. rules.

When inspection boxes, etc., are buried in plaster a cover (say 26 gauge iron) projecting half an inch outside the box all round shall be screwed to the box so as to be flush with the face of the plaster after the wall is finished.

Floor boards laid over tubing must be screwed and not nailed down.

Conduits on concrete floors and ceilings.

When tubing is run in or immediately above concrete floors all draw-in or inspection boxes must face downwards on the under side of the concrete, unless a wooden floor is laid over the concrete, when boxes may face upwards if the covers are watertight and trap doors are left immediately above each box.

Wiring in conduits.

All wiring in conduits shall be on the loop-in system and looping in shall only be done at the switches, ceiling roses, and plugs.

CASED WIRING. WOOD CASING.

Wood casing.

Where special permission has been granted, wood casing may be used, but only for surface work in plain sight.

UNCASED WIRING.

UNARMoured CONDUCTORS.

Wiring in accessible roof spaces.

Installations may be wired with uncased wiring in accessible roof spaces if the work is carried out as follows:—

The conductors must be enclosed in steel tubing from one inch above the ceiling joists to any points below such as switch plug, bracket or distribution board.

From the distribution board the circuit cables must be run to the lighting points in circuit pairs, parallel with or at right angles to the joists.

The switch pair must be similarly run from the lighting point to the controlling switch.

The conductors in the roof space must be carried separately on porcelain split bobbins, screwed to the joists or the beams. In the case of mains and sub-mains they shall be spaced 6in. apart, and the case of sub-circuits 3in. apart.

Conductors must be run on the rafters.

The supporting bobbins must not be more than 4 feet apart. Where the cables pass into a tube they must not be strained tight, and must be supported by bobbins within 12in. of the tube.

Porcelain or bushed metallic leading in tubes must be used in passing through the ceiling. These shall run up above the top of the joists and shall be securely fastened. All crossing cables shall cross at right angles and shall have a clear space of 3in. between them.

Cables must be run so as to leave a clear gangway near trap-doors, tanks, pipes, etc.

Roofs with uncased wiring must on no account be used for storage of goods, lumber, etc.

Open roof spaces.

In open roofs (without ceilings) the cables shall be carried on the roof purlins or rafters and not on the tie-beams.

In special cases where it is desirable to use uninsulated conductors, or "underwriters" wire, the conductors need not be stranded.

Outside overhead wires.

No outside uncased wires shall be run lower than 12ft. from the ground and such circuits shall be protected by independent fuses.

UNCASED WIRING. FLEXIBLE CONDUCTORS.

Flexible Conductors.

Flexible cord unless of specially approved type must not be used above ceilings, or in concealed spaces, or in conduits, or in damp places.

Flexible cord must not be used under verandahs, or in doorways or any place exposed to weather, or in butchers', confectioners' or fruit or fish shops, or in stables, public bars, public dining rooms, or kitchens, or in any places where it would be particularly exposed to the action of flies or other insects.

Flexible cord must not be used in shop windows or in any place where inflammable material is exposed near to it.

Flexible cord must not be used for switch leads.

Flexible cord extensions.

Vulcanised rubber flexible cord may be used for a one-point extension from a ceiling rose in the same room provided it is carried through insulated screw eyes not more than 3 feet apart in full sight, and not less than eight feet above the floor level, and it shall not pass through walls or partitions.

SWITCH AND DISTRIBUTION BOARDS.

Circuits to be labelled.

All circuits must be properly labelled and opposite poles connected in line to prevent confusion.

Distribution boards.

Distribution fuse boards shall be made up of clip or cartridge type fuses mounted on incombustible material, fed from copper bus bars extending the full length of the cut-outs.

The case shall be of metal or hardwood with a hinged glass fronted door. There shall be a clear space of at least 2in. between any metal at the back of the board and the wall.

FUSES.

Cut-outs.

All branch cut-outs and fuses shall be placed on distribution boards.

WALL PLUGS AND SOCKETS.

Construction.

Wall plugs and sockets shall be in accordance with the British Engineering Standards Specification No. 73 for 5 ampere plugs.

Wall plugs to carry more than 5 amps shall follow the same general specification with the parts proportionally larger.

Wiring.

Wall plugs shall be wired on circuits separate from fixed lighting points, and no wall plug circuit shall carry more than 3 plugs or be wired with cable of less than 3/.036/

CEILING ROSES.

Ceiling roses.

Ceiling roses shall be in accordance with the British Engineering Standards Specification No. 67 for 2 and 3 plate ceiling roses.

FITTINGS FOR SUPPORTING LAMPS.

Metal Pendants.

All metal pendants over 12in. long shall be hung with a loose joint.

LAMP HOLDERS.**Lampholders.**

Lampholders shall be in accordance with the British Engineering Standards Specification.

Switch lampholders must be controlled preferably in groups of not more than five, by a wall-switch in the same room. Every such group must have at least one lamp controlled solely by the wall-switch.

HEATING AND DOMESTIC APPLIANCES.**Portable appliances.**

Portable heating and cooking appliances must have plainly marked on them the pressure for which they are intended and the current consumption.

No appliance taking more than $1\frac{1}{2}$ amperes shall be attached to an adaptor fitting a lamp holder.

Wiring.

Any appliance requiring more than 5 amperes may only be used on a special heating circuit, which shall be wired separately from the lighting circuits on a similar distribution system, and such appliances shall not be attached to plugs fitting the 5-ampere sockets.

Maximum current.

The current in any heating circuit shall not exceed 20 amperes unless special permission has been given by the Department.

MOTORS.

(Vary to suit local circumstances.)

Motors over 3 H.P.

Motors rated at over 3 H.P. will only be supplied at a pressure of () volts.

They must be provided with a starting switch and resistance or other current limiting device and a no-voltage release.

All such motors must be protected by multipole circuit breakers, and motors taking over 20 amperes on full load must be protected by multipole circuit breakers with an overload coil on each pole set to break at 50% overload, fixed between consumer's fuses and the motor.

TESTING.**Insulation resistance.**

The minimum insulation resistance of circuits and appliances shall in every case be that laid down in I.E.E. rule 129.

The contractor or his representative shall be present when the final test and inspection is made by the Department's Inspectors, who shall have the right for inspection purposes to unscrew any fittings, connections, etc., to open any trap doors or joint boxes, or lift flooring boards, or to cut open joints, and the replacement of parts so disturbed must be done by the contractor at his own expense.

In cases where a second or subsequent inspection is necessary the contractor shall pay the cost of such inspection.

At the conclusion of the discussion Mr. Sankey again asked what they proposed now to do with these and the other regulations which they had passed.

The President replied that they would be sent to the various Administrations, Municipal Councils, the Electrical Engineer of the Public Works Department. Others suggested that they be also sent to the Architects Association Master

Builders' Associations, and the principal wiring contractors in the different towns of the Union. The idea, of course, was to secure uniformity throughout the country, and the opinion was expressed that the best way to get this would be by asking the Provincial Councils to incorporate them in Ordinances and force them upon the Municipalities. The President pointed out, however, that while he believed that in the other Provinces the Provincial Councils had power to do so, in the Transvaal the Council had only the power to confirm or reject legislation submitted to it by the municipalities and could not impose measures upon them.

The question of the method of circulating then cropped up. Some members thought that the regulations should be printed in the cheapest possible form and sent to the municipalities, etc., gratis. Others thought that the better way would be to get them printed by a firm such as the Argus Company with branches in all the Provinces, from whom the Councils might buy copies, altering only the name of the town, and so forth. Ultimately it was left to Mr. Wolley-Dod and Mr. Sankey, as being able easily to get in touch with each other, to find out the best and cheapest way and to act accordingly.

Statistics and Accounts.

Convention then proceeded to discuss the report of the Statistics Committee, which was introduced by the chairman of the Committee, Mr. Poole. In doing this Mr. Poole stated that the original sub-committee appointed at the last Convention in Port Elizabeth had never had the opportunity of meeting. By reason of this fact they had had to do the best they could by correspondence. He thought the Census

Form had been very materially improved—it was being approved of by more people—and he certainly thought it was going on the lines that electrical engineers wished. But, for the reason that the original sub-committee had never met and that the other committee had gone thoroughly into the matter, Mr. Poole said he felt rather diffident about introducing the subject. There were many other reasons for this—as he had said, the original sub-committee had never met, one member of the present sub-committee was absent. In the third place, he considered that the Chief Engineer of some town should have been on the committee to pilot the thing through. He considered that this would have been better, seeing that the Chief Engineer was brought more into touch with the Town Treasurer. He, Mr. Poole, was brought into touch with the Town Treasurer only once a month, and that was for the very important purpose of drawing his cheque. He supposed that most members had recently had a great deal to do with statistical returns. He felt it would be as well for the Association to be first in the field and to decide on a form of their own making, which would please them, rather than have one forced upon them by the Government. He had been told that the Department of Mines and Industries would not embody a form in the Census form. The form now before the Convention was on similar lines to one prepared by them and also to the one gazetted in the Cape Province in 1912. Apparently this form in the Cape had become a deadletter, for the Town Treasurers' returns were made out in various ways. Mr. Poole instanced Port Elizabeth as distinct from the others, and went on to specify the only alteration made by the present sub-committee—that in regard to

Loan Account. He noticed that Port Elizabeth had space for tree-planting in its return. He did not know of any others that had. As regards Pretoria, he did not quite know how they sub-divided the salary of the engineer between lighting and trams, hence his reason for suggesting some such sub-division. Maritzburg, as another instance, added bad debts to the expenditure side of its account, but he should have thought they ought to be deducted from the revenue side.

The President suggested that they should take the Town Treasurer into consultation before they proceeded with this matter.

Mr. Poole replied that the various Town Treasurers would not have the same way of putting their accounts, hence they would get no further.

Mr. Swingler said he expected that soon the Board of Trade returns would be done away with altogether, seeing that the majority of the electrical work of the Board of Trade was now being taken over by the Electricity Board which had recently been formed.

The President pointed out that in the Cape Province they had a schedule, but that there was nothing of the kind in the Transvaal. All that was required in the Transvaal was that the returns should satisfy the Government auditor.

The discussion went off into the respective methods of Government audit practised in the Transvaal and other Provinces, particularly the Cape,—the former by a Union Government auditor and the latter by the Provincial and Municipal auditors.

Mr. Poole declared his conviction that if they as an Association did not sooner or later draw up a form

for themselves they would have one imposed upon them which they would not like.

Mr. Sankey contended that the Town Treasurers would govern the matter. He told of his experience when Electrical Engineer of Port Elizabeth when he had approached the Town Treasurer there on the matter. The reply he got, he said, was that if the Town Treasurer was to be responsible for the accounts he intended to keep them in his own way.

The President suggested sending copies of the proposed form to the Town Treasurers, and then recirculating it amongst members with their remarks.

Mr. Vowles suggested that it be sent to the Government auditor direct.

The President reiterated his opinion that it would be diplomatic to take the Town Treasurers into their confidence. He suggested that each member take a copy and explain it to his Town Treasurer, and then communicate the latter's ideas to the secretary for recirculating amongst members.

This suggestion was eventually adopted.

Mr. Poole pointed out that nobody had taken up his point in regard to the sub-division of salaries.

The President: You cannot make any rule.

Mr. Poole: Would not the number of units sold meet the case?

The President: I do not think that sub-division is the correct one. Therefore I say let us have time to consider and consult the Town Treasurers. Then we can get finality in our next Convention. I think that is the best way.

ASSOCIATION OF MUNICIPAL ELECTRICAL ENGINEERS (S.A.)

Draft Standard Form of Electricity Supply Accounts.

The Municipality of.....

Municipal year ended.....

No.1.

LOAN ACCOUNT.

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

Dr.

£ s. d. £ s. d.

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

	£	s.	d.	Cr.	£	s.	d.
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 accordance with the sub-division of the return of **Units Sold**, as now required by the Government Census Office.

Dr.

	£	s.	d.	£	s.	d.
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 & Mice. of Apparatus for hire						
(b) Labour & Material on works exe- cuted for customers						
Balance to Net Revenue						

Dr.

	£	s.	d.	£	s.	d.
1. To Interest on Loans and overdraft						
2. Sinking Fund contribution and repay- ments of loans						
3. Depreciation or Renewals						
4. Loan expenses						
5. Other charges (detailed)						
Balance to Appropriation Account						

	£	s.	d.	Cr.	£	s.	d.
Total for Current Sold.							
By hire & Sale of Apparatus							
Works executed for customers							
Miscellaneous—							
(a) Meter Rents							
(b) Testing Fees, etc., etc.							
Gross Income Less Bad Debts							

	£	s.	d.	Cr.	£	s.	d.
1. Balance from Revenue Account							

No. 4. APPROPRIATION ACCOUNT.

Dr.

£ s. d. £ s. d.

- | | £ | 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.

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

Dr.

£ s. d. £ s. d.

No. 6. RESERVE FUND ACCOUNT.

- | | £ | s. | d. | £ | s. | d. |
|--|---|----|----|---|----|----|
| 1. To amounts appropriated (detailed) | | | | | | |

No. 7. SINKING FUND ACCOUNT.

Dr.

£ s. d. £ s. d.

- | | £ | 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 Net Revenue A/c						
2. Special contributions (detailed)						
3. Interest on Investments						
4. Sales of plant or Scrap						

No. 6.

RESERVE FUND ACCOUNT.

				Cr.		
	£	s.	d.	£	s.	d.
1. Interest on Investments						
2. 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.

	£	s.	d.	£	s.	d.
1. To Land						
2. Buildings						
3. Generating Plant						
4. Underground Mains						
5. Overhead Mains						
6. House Services						
7. Sub-Station & Equipment						
8. Street Lighting						
9. Instruments & Tools						
10. Furniture						
11. Stores						
Balance to Balance Sheet						

No. 9.

GENERAL BALANCE SHEET.

	£	s.	d.	£	s.	d.
Liabilities						
1. To Loans						
2. Sundry Creditors						
3. Renewals						
4. Reserve						
5. Net Revenue a/c						
6. Sinking Fund						

No. 8.

CAPITAL ACCOUNT.

	£			Gr.		
	£	s.	d.	£	s.	d.
1. By Loans raised						
2. Appropriation a/c						
3. Bank						
4. Special contributions (detailed)						

No. 9.

GENERAL BALANCE SHEET.

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

Electricity Supply.

Revenue Accounts.

Classification of Working Expense Account.

A. (Generation).

Account No. 1. To Coals, etc.—All expenditure for coal, fuel oil or others fuel 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, greese, 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 lighting heating and ventilation.

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

Also Station superintendent, shift engineers, apprentices, drivers, firemen, greases, coal and ash attendants, cleaners, cranesmen, switchboard 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 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.

Dyanamos, Exciters, etc.—All expenditure for wages and material tools, freight, cartage and other expenses in connection with repair and maintenance of electrical 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, forge, 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, man-holes, 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.

Material 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 Engineers 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 Engineers 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 No. 3.

Stationery, Printing, Maps and advertising.

Accounts 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, licenses.

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.

Papers for next Convention.

The question of papers for next Convention was raised, but the President said he thought it much more useful for them to stick strictly to business. Mr. Poole, dissenting, observed that nevertheless papers were very instructive.

Date of next Convention.

In regard to the time of next Convention at Capetown, this was provisionally fixed for next October, on the grounds that that month is a good time of the year at the Cape, when accommodation is more easily procurable, and also because electrical engineers are not over-busy at that time.

Appreciative Remarks.

Mr. Swingler proposed a vote of thanks to the President for the splendid arrangements he had made for the comfort and entertainment of the visitors. He said quite frankly that he did not know how Capetown next year was going to keep pace with Pretoria. They were very much indebted to Mr. Wolley-Dod for the very great amount of work he had put in on their behalf. He was sure they would all have Pretoria in kindly remembrance when they got back to their respective centres.

Mr. Hoy, in seconding, said he would like to be permitted to second this proposition, made by the Capetown representative. Mr. Hoy declared that he was surprised on his arrival in Pretoria at the hospitality and attention they received, especially at the hands of the Assistant Electrical Engineer, Mr. Horrell, whose object had been not only to make their visit enjoyable from the social side, but to bring them all together. The many entertainments that had been provided for them were both enlightening and englightening. He was sure they must all have been struck by their visit,

and he hoped that when the time came next year Capetown would take a leaf out of Pretoria's book, and do everything in their power to create the same happy spirit. He thanked them most heartily on behalf of the delegates.

The President, in responding, said he was very glad that they had had a pleasant stay. His object has been to combine work with a certain number of pleasing visits. He thanked them all for the amount of very hard non-showy work they had put in in committee. He thought they had accomplished something extremely useful. He wished them all farewell officially, and expressed the hope that they would all meet again next year and that they would then all learn a great deal more than Pretoria had been able to teach them.

Mr. Horrell, in acknowledging the compliment to himself, said he was sure he had only done his duty. He was very glad that they had all enjoyed their visit.

Convention then, at 12.50 p.m. rose.

Vote of Thanks.

Vote of thanks were passed to the Mayor and Town Council of Pretoria, the directors of the Premier Mine, the directors of the Iron Works, the Hatherley Glass Factory, the Engineers of the Public Works Department and the South African Railways, the chairman and Committee of the Pretoria Club, and to all who had extended hospitality and entertainment to the visitors.

Visit to Government Railway Workshops.

By kind invitation of Mr. Hendrie (Chief Mechanical Engineer, S.A.R.) a most interesting afternoon was spent in visiting the Government Railway Workshops.

The Association of Municipal Electrical Engineers (S.A.)

List of Members as at October 1st, 1920.

Messrs:

T. C. WOLLEY-DOD	Pretoria (President).
B. SANKEY	Johannesburg (Past President).
J. ROBERTS	Durban (Past President).
G. H. SWINGLER	Capetown (Vice President).
E. POOLE	Durban (Members of Council).
T. MILLAR	Harrismith (Member of Council).
L. BICKELL	Port Elizabeth (Member of Council).
L. B. PROCTOR	Boksburg (Member of Council).
L. L. HORRELL	Pretoria (Hon. Sec. & Treas.).
T. P. ASHLEY	Queenstown.
W. H. BLATCHFORD	Greytown.
H. BRITTLE	Cradock.
A. S. CHAMBERS	Alice.
R. D. COULTHARD	Oudtshoorn.
W. DOUGLAS	Ermelo.
C. J. EVERETT	Johannesburg.
P. FINLAYSON	Pietermaritzburg.
R. W. FLETCHER	Krugersdorp.
E. J. HAMLIN	Stellenbosch.
W. A. HODGE	Standerton.
T. JAGGER	Ladysmith.
S. S. MUNRO	Pietermaritzburg.
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C. W. McCOMB	Springs.
J. MORDY LAMBE	East London.
R. MACAULAY	Bloemfontein.
P. H. NEWCOMBE	Aliwal North.
W. J. PRIOR	Bloemfontein.
N. D. ROSS	Potchefstroom.
F. T. STOKES	Johannesburg.
R. A. STOKER	Kroonstad.
S. B. SPARKS	Pietersburg.
T. F. SIEBERT	Uitenhage.
T. SUTCLIFFE	Benoni.
O. K. TURNER	Kimberley.
A. E. VAL DAVIES	Capetown.
J. VOWLES	King Williamstown.
B. SARGENT	Vryheid.

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Col. DOBSON	(Past President) Box 6468, Johannesburg.
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G. A. STEWART	Box 435, Johannesburg.
F. CASTLE	Box 303, Capetown.

