

FEDERATED MALAY STATES.

ANNUAL REPORT OF THE ELECTRICAL BOARD FOR THE YEAR 1924.

BOARD MEETINGS.

1. During the year the following gentlemen served on the Board:
Messrs. J. P. Swettenham (Chairman), P. A. Anthony, C.M.G., G. E. Greig,
F. W. Mager, P. H. Henshaw, A. R. Mynott, W. A. Wilkinson,
F. G. Finch, G. Sturrock and F. D. Evans, with Mr. A. W. Every
as Secretary.
Mr. J. C. M. Matthews, Chief Electrical Engineer, attended all meetings
in an advisory capacity.
2. Fifteen meetings were held and in addition to routine management of
Government electricity supplies and inspection work under the Electricity Enactment
the following matters received consideration:
 - (a) Perak River Hydro-Electric Scheme.
 - (b) Permits to supply current in bulk or for extension to area of supply from
private installations.
 - (c) Reorganisation of technical staff.
 - (d) Transfer of Railway electrical work to the Board.
 - (e) Negotiations with Pengkalen Ltd. re Ipoh bulk supply.
 - (f) Contracts for new installations at Taiping and Batu Gajah Hospitals.
 - (g) Revision of rates for supply of current.
 - (h) Revision of methods of collecting dues for current supplied, commission to
Sanitary Board for collecting, etc.
 - (i) Valuation of Seremban installation.
 - (j) Interference on communication lines, Ipoh.
 - (k) Safeguarding of power and communication line crossings.
 - (l) Standard form of concession for supply to small towns.

3. It will be observed from appendices E, F, G that the three main installations
operated by the Board produced a total gross profit of \$314,541 or, after deducting
interest on capital, sinking fund and maintenance reserves, a total net profit of
\$104,602. The latter figure includes a net revenue loss on Seremban operation of
\$9,748 but it should be noted that whereas in 1923, under the old contract, expenditure
by Government exceeded revenue by \$9,968, in 1924 the gross revenue exceeded
expenditure by \$27,494.

BOARD OFFICE.

4. On the technical side, the main work was preparation of indents and detailed
information, calculations and preliminary work generally in connection with the new
Kuala Lumpur power station. The position at the close of the year was that indents
had been despatched for all sections except for transmission line material, details
being still under correspondence, and for the reconditioning of the hydro-electric section
which is held over till cost of the steam section is ascertained. Specifications were
drafted or preliminary schemes got out for new installations at Taiping and Batu Gajah
Hospitals, Central Mental Hospital, Kampar, Bentong, Gopeng, Klang, Port Dickson,
Kuala Lipis, Fraser's Hill and Kuala Kangsar Mosque, while reports were drafted on
safeguarding communication lines both from mechanical injury and from electrical
interference, on street lighting in Kuala Lumpur, on taking over of Railway electrical
work by the Board, on standardisation of pressures and on the operation of the
Electricity Supply Acts in Great Britain, South Africa and Australia.

The Electricity Enactment and Rules thereunder were completely revised and a
standard form of concession for supply to small towns was prepared and a considerable
amount of general advisory work was carried out by the Chief Electrical Engineer in
addition to sitting on the Examining Board, supervising operation of all Government
installations, scrutiny of indents and management work generally.

ACCOUNTS.

In this department, in addition to the administration of the one-twelfth advance required by the Treasury, detailed accounts were kept for all costs in connection with the Kuala Lumpur, Ipoh and Seremban undertakings.

Monthly statements of expenditure and revenue were submitted to the Board and any variation from normal costs fully enquired into.

The collection of the revenue in Kuala Lumpur and the rate of commission to be paid to the Sanitary Board occasioned considerable correspondence.

Reference to the appendices will show that both Kuala Lumpur and Ipoh installations proved to be thoroughly sound financial concerns. In the case of Seremban, although a net loss on the year's working is shown, satisfactory results are assured for 1925.

The steady reduction in the cost of production, as shown by the accounts, is very satisfactory.

STAFF.

5. The personnel was as follows :

Chief Electrical Engineer	...	...	Mr. J. C. M. Matthews
Chief Electrical Inspector	...	...	Mr. D. M. W. Hutchison
Executive Electrical Engineers	...	...	Mr. L. V. Fox Mr. E. A. Corbin
Assistant Electrical Engineers	...	...	Mr. J. E. Catt Mr. H. R. Sparrow Mr. E. F. Stephenson Mr. C. Harry Mr. L. Arnold
Station Foremen	...	...	Mr. B. F. Lewin Mr. J. R. Hannaford
Shift Engineers	...	...	Mr. H. H. Ewens Mr. P. A. Bray Mr. G. Harris
Secretary and Accountant	...	...	Mr. A. W. Every

Messrs. Corbin, Catt and Sparrow were on long leave during the year for periods totalling fourteen months.

Three new Assistant Engineers reported for duty; Mr. Stephenson on 14th February, Mr. Harry on 10th May and Mr. Arnold on 9th August.

The three new Shift Engineers assumed duty on 22nd May and, after they had settled in, two of the Eurasian Station Engineers were transferred elsewhere, while the third, Mr. F. D' Rozario, took over the duties of Station Foreman, vice Mr. J. R. Hannaford whose services were dispensed with on 10th November.

Shortage of staff owing to an insufficiency of officers to meet incidence of leave again caused much extra work and it was fortunate that the general health was good but even then there was but scanty supervision in some matters, notably in the Consumers' Department at Kuala Lumpur, while the Chief Electrical Engineer had to spend much time on minor details which could have been done by an Assistant Engineer. This has delayed work and rendered mistakes possible owing to absence of anyone to check calculations.

6. Reports to the Board from the Chief Electrical Engineer and the Chief Electrical Inspector together with financial statements from the Secretary are appended.

24th April, 1925.

C. V. A. ESPEUT,
Chairman, Electrical Board, F.M.S.

S U P P L Y B R A N C H.

I.—KUALA LUMPUR.

A.—GENERATING PLANT.

(i) *New Works*.—The fitting of chain-grate stokers to boilers Nos. 3 and 4 was completed; automatic stokers are now in use on all six boilers.

The 6,000 volt overhead connection between the old and Diesel engine rooms was replaced by underground cables and a new summation panel on the 6,000 volt switch-board was assembled and erected both of these works being carried out departmentally.

(ii) *Maintenance*.—No station failures affected the continuity of supply for more than a few minutes.

The Belliss steam set and the two steam turbines were in regular commission; only usual running repairs were needed with the exception of a new shaft and impeller to a circulating water pump and replacement of coils on the Belliss set due to a burnout.

Of the four Diesel engine driven sets, No. 2 A.C. set was stripped departmentally for complete overhaul; on the other sets nothing was needed beyond ordinary maintenance repairs.

Metallic packing for fuel valves and fibre pinions for circulating pumps were manufactured by the staff at a cost lower than that for replacements from England.

There were three breakdowns on the motor-generators, all repaired departmentally. The generators have been converted from compound to shunt wound machines to enable them to run in parallel with the Diesel driven sets.

In the Boiler House, each boiler has been opened up, cleaned and painted. All have been passed as safe by the Inspector of Machinery.

The hydro-electric plant at Gombak has also operated satisfactorily. Only one case is reported of burnt out generator coils from which it would appear that the new oxide film lightning arresters are effective. The only other breakdown was failure of No. 2 set governor gear in October. The Headworks Reservoir was cleaned out during October and the flume, pipe line, etc., are in a satisfactory condition.

These works were visited in September by the Engineering Association of Malaya when a short descriptive paper was presented by the Chief Electrical Engineer.

B.—TRANSMISSION LINE.

(i) *New Work*.—Nil.

(ii) *Maintenance*.—Insulator cleaning and pole painting were carried out as opportunities offered. There were four failures, three due to insulators being shattered by lightning and the other to a breakage of the earthed wire which thus came in contact with a phase wire.

C.—TRANSFORMER SUB-STATIONS.

(i) *New Work*.—A new sub-station was built at Kia Peng Road, but equipment was not complete at the close of the year.

(ii) *Maintenance*.—In the eight sub-stations now in commission there were 21 failures of supply, mostly due to blown fuses caused by branches falling on the overhead distributors. Clearing these and replacement of fuses averaged about an hour, the longest shut down being about two hours.

D.—MAINS.

(a) *Overhead*.

(i) *New Work*.—Fourteen thousand one hundred and thirty-five yards of wire constituting 3,655 yards of main were erected while 75 services were put in. Extensions were at the District Hospital, Kia Peng Road, Circular Road, Yap Ah Shak Street and Kamunting Street. Alterations to existing mains were made at Venning Road and at the Government Factory. The main along Yap Kwan Seng Road was dismantled and the materials used elsewhere.

(ii) *Maintenance*.—All steel poles in the town were repainted and the tree cutting campaign continued but broken wires from falling branches still constitute the bulk of the faults and are a potential danger.

(b) *Underground.*

(i) *New Work.*—The following cables were laid :

One thousand three hundred and twenty yards E.H.T. 3 core .0225 to Kia Peng Road sub-station, 109 yards run 3 singles .06 in Weld Road replacing overhead mains, 220 yards run .03 single in Batu Road for extension, 211 yards run 2 singles .012 for services, etc. 3,737 yards .012 single were also laid for conversion of the street lighting from arc to half-watt lamps.

(ii) *Maintenance.*—Ten faults occurred on the underground network during the year against 16 in 1923. Two were on house services, five on street lamp cables, one on a distributor and one each in a terminal box at the Central Station and in a feeder pillar.

E.—STREET LIGHTING.

New Work.—Twelve new street lamps were installed, nine being at Bungsar Road and three at Kamunting Street, while an extra red lamp for a fire alarm was installed in Brickfields Road.

The most noticeable feature in this section was the completion of altering the lighting in main streets from arc lamps to modern half-watt lamps. Not only is a steadier and better distributed light obtained but the daily trimming of carbons is done away with.

Details of lamps as at 31st December, 1924, will be found in appendix A.

F.—METERS.

Three hundred and twenty-nine new meters were installed and 491 brought in for overhaul. Of the latter 11 were found beyond repair, the balance were cleaned, adjusted and passed to stock for re-issue.

All consumers are now metered.

This branch carried out the usual repair work on medical and similar apparatus and charged 39 small accumulators.

G.—CONSUMERS.

After allowing for one Government and 13 private disconnections, the total number of consumers at 31st December, 1924, was 2,049, an increase of 81 for the year.

The total is composed of 388 Government and 1,661 private consumers, an increase of 5 and 76 respectively.

It is regrettable that it was necessary to refuse many applicants owing to the overloaded state of plant, mains and transformer sub-stations.

In addition to 125 motors aggregating 1,315 B.H.P. at Central Workshops which take a partial supply from the Kuala Lumpur plant there are 82 motors aggregating 478 B.H.P. taking a full supply from the Board's mains. Of these, 51 motors aggregating 357 B.H.P. are the property of Government and 31 motors aggregating 121 B.H.P. are privately owned.

H.—GOVERNMENT QUARTERS AND BUILDINGS.

(i) *New Work.*—Three quarters and three other buildings were wired and one building disconnected, while considerable alteration to existing installations was effected and three motors were connected up for the Printing Department.

(ii) *Maintenance.*—A considerable amount of maintenance work was carried out but there was a shortage of European staff for proper supervision.

There are now 16 exhaust, 676 ceiling and 159 table fans, altogether 851 fans, maintained by the Board in Government quarters and buildings at Kuala Lumpur.

I.—STATISTICS.

The total number of Board of Trade units generated by all prime movers was 3,257,973, an increase of 395,044 units. Units used on works were 148,503 and units sold were 2,495,820, an increase of 255,787. The output would have been greater but for the strike at Railway Central Workshops which deprived us of the bulk of our day load for some days.

All unaccounted for losses totalled 613,650 units, making losses on transmission from the hydro-electric plant, on transformation, conversion and distribution 18.84 per cent. as against 17.66 per cent. in 1923. The increase is due to copper losses in overloaded distributing mains.

The Belliss steam set ran for 1,162 hours generating 250,795 units and the two steam turbines 2,109 hours for 504,819 units, the station operating costs on the steam side amounting to cents 6.34 per unit generated against cents 6.58 in 1923.

Two thousand six hundred and ninety-seven tons of local coal were burned, giving the high figure of 8 lbs. per unit, but it must be remembered that as these sets are only used at night much coal is used in raising steam each afternoon. Coal cost \$7.90 per ton ex truck at Brickfields Goods Yard.

The four Diesel sets ran altogether 6,021 hours and generated 692,309 units at a works cost of cents 4.64 against cents 4.10 in 1923. The increase is due to the fact that owing to increased efficiency in the hydro-electric section these sets ran on a lower load factor thereby increasing the standing charges per unit.

Two hundred and thirty-three tons of fuel oil were used or lbs. 0.71 per unit generated. The price was \$57.38 per ton ex railway.

The hydro-electric station ran for 8,720 hours, generating 1,810,050 units at a works cost of cents 0.77 against cents 0.93 for 1,466,046 units in 1923.

The all round works costs for all prime movers was cents 2.88 against cents 3.08 in 1923, equivalent to a gain of over \$6,000 on the output for the year.

The old motor-generators ran for 5,040 hours and produced 345,505 units of direct current from the 6,000 volt alternating current supply.

Stoppages of plant due to engine trouble were as follows :

Belliss set	...	...	...	Nil
Steam turbines	...	...	...	One air pump failure
Diesel sets	...	...	...	One hot bearing
Hydro-electric plant	...	...	...	Two failures of governor gear

The last-mentioned sets were shut down altogether for 91 hours accounted for as follows : Maintenance work on transmission line 54 hours, faults on transmission line 30 hours, repairs in station 7 hours.

Total connections to the mains at 31st December, 1924, amounted to 2,165 kilowatts and the maximum demand recorded was 1,257 kilowatts or 58 per cent.

Further details are given in the appendices.

J.—COSTS AND FINANCIAL RESULTS.

These are detailed in the appendices but, summarised, after allowing for all overhead charges they shew a clear net surplus of \$71,679 against \$45,572 in 1923. This increase in surplus of \$26,107 is tangible proof of the value of the undertaking and no better argument could be adduced in favour of a thoroughly progressive policy of expansion.

K.—STAFF.

Mr. L. V. Fox was in charge throughout the year but was much handicapped by having no Consumers' Engineer owing to incidence of leave and there being no spare officer to take up the work. He carried out in addition to his normal duties those of Electrical Inspector for Selangor, Negri Sembilan and Pahang, which necessitated considerable absence from his head-quarters. This arrangement, while saving a certain amount in salaries, does not tend to efficiency when the Kuala Lumpur staff is already shorthanded. He also had to contend with several changes in his staff which do not assist good working.

Mr. E. A. Corbin, after return from long leave, was Mains Engineer for only three months before transfer to Ipoh in charge. He was succeeded by Mr. C. Harry for three months and then that officer had to take over duty as Plant Engineer, vice Mr. E. F. Stephenson transferred to Seremban, Mr. L. Arnold, who had newly arrived from England, taking over the mains.

Similarly the appointment of Plant Engineer has been held in succession by Messrs. Stephenson and Harry.

The arrival of three European Shift Engineers, necessitated by the growing importance of the station, permitted the transfer of two Eurasian Station Engineers for duty elsewhere. The third was retained, *pro tem.* to carry out the duties of Station Foreman, vice a European whose services were dispensed with.

There were no other changes among the permanent staff of subordinate officers.

L.—SMALL PLANTS SUPERVISED FROM KUALA LUMPUR.

(i).—KLANG ASTANA.

(a) This has given considerable trouble during the year. Eventually the engine was thoroughly overhauled and parts replaced, while a new storage battery was installed.

(b) Cost of maintenance, including renewals, was \$3,666 against \$2,022 in 1923.

(ii).—TANJONG MALIM COLLEGE.

(a) Operation was satisfactory, supply being limited to night time only.

(b) Nine thousand and forty-six units were generated and the works costs were \$2,438 against \$2,755, giving a cost per unit of 27 cents, a reduction of seven cents per unit.

(iii).—KUALA LIPIS RESIDENCY.

This small plant was inspected at the request of the Resident but it is not actually operated by the Board.

II.—IPOH.

A.—BULK SUPPLY.

(i) The purchase of current in bulk from Pengkalen Limited was continued throughout the year but notice has been given by the Company that they wish to terminate the contract on 31st December, 1925.

Supply was maintained satisfactorily without any failures at the generating station and the Board now takes the maximum supply allowable.

(ii) The Board's apparatus at Pengkalen was regularly inspected and maintained efficiently.

B.—TRANSMISSION LINE.

(i) *New Work*.—One hundred and sixty yards of overhead E.H.T. main was erected at the Pengkalen end of the line as duplicate to the underground cable between switchboard and line which had given trouble.

(ii) *Maintenance*.—There were three breakdowns during the year, one being in a junction box and two being due to failure of shackle insulators. The latter have proved to be faulty in design and have been replaced by a better type.

(iii) *Harmonics*.—This question which, apart from the troubles it gives on the switchboard, causes considerable interference on the communication lines should they not be in perfect order, has been the subject of considerable correspondence with the Consulting Engineers and with the makers of the transformers. Five transpositions of the phase wires were completed out of six proposed but the main cause of trouble appears to be the provision of shell type star-star connected transformers in place of delta-star, or even star-star, connected core type transformers.

C.—TRANSFORMER SUB-STATIONS.

(i) *New Work*.—The only new work carried out was the installation of a couple of extra instruments at Hugh Low Street for checking the output.

(ii) *Maintenance*.—Both Hugh Low Street and Cowan Street sub-stations operated satisfactorily, there being no failures of supply from breakdowns.

D.—MAINS.

(i) *New Work*.—No actual extensions were erected but, owing to the heavy demand and consequent drop in pressure along certain routes, 2,170 yards run of boosting mains were run in Silibin, Gopeng and Tambun Roads. Sixty-five new services were put in, 210 were looped from existing services and 17 houses temporarily supplied. Thirty-one Westinghouse lightning arresters were fixed at various points on the network.

(ii) *Maintenance*.—As is usual in other towns, the chief cause of cessation of supply was falling tree branches and considerable lopping was carried out with a view to improving matters in this direction but it is largely a battle between providing an effective supply and retaining shade and beauty in the roads.

E.—STREET LIGHTING.

New Work.—Two lamps, each of 150 watts, were erected, one in Lahat Lane and one at the junction of Lahat and Connolly Roads, while a traffic island at Brewster Road was equipped with two 60-watt lamps.

Full details of lamps as at 31st December, 1924, are given in appendix A.

F.—METERS.

Three hundred and twenty-eight new meters were installed while 76 were brought in for overhaul. All were repairable and passed to store for re-issue.

There are 38 consumers charged on a non-metered fixed rate per lamp as owing to the smallness of their installations the cost of a meter is not warranted by the cash return.

G.—CONSUMERS.

There were no disconnections and the total number of consumers at 31st December, 1924, was 1,191, an increase of 275 for the year.

The total is composed of 90 Government and 1,101 private consumers, an increase of 10 and 265 respectively.

Six motors aggregating 119½ B.H.P. were connected during the year, bringing the total to seven motors aggregating 125½ B.H.P.

H.—GOVERNMENT QUARTERS AND BUILDINGS.

Ten Government quarters and buildings were wired during the year by contractors under supervision by the Board's officers. None were disconnected. There are 487 fans maintained by the Board in Ipoh, viz., 430 ceiling and 57 table fans.

I.—STATISTICS.

Units bought totalled 840,870 and units sold 671,235. Units used on works plus losses in transmission and distribution amounted to 169,635 or 20.17 per cent. This is mainly due to the loss in transmission, to iron losses in transformers at low loads and to copper losses in heavily loaded distributing mains. Boosting mains are being installed to deal with the last mentioned but the only cure for the transformer losses is "off peak" load which is difficult to obtain.

Connections to the mains totalled 900 kilowatts and the maximum demand was 400 kilowatts or 44 per cent.

The price per unit paid to Pengkalen was cents 6.4 making the average cost per unit bought, after allowing for line losses, cents 7.84 against cents 10.94 in 1923, the reduction being due to the improving plant load factor and to the operation of the coal clause in the agreement.

J.—COSTS AND FINANCIAL RESULTS.

These are detailed in the appendices but it is of interest to note, as shewing the need of a full supply and the sound investment provided by one, that after allowing for overhead charges there was a surplus of \$42,671 as against a loss on the eight months working in 1923 of \$5,487.

K.—STAFF.

Mr. D. M. W. Hutchison carried out the duties of Electrical Engineer, Ipoh, in addition to the work of his substantive appointment as Chief Electrical Inspector until 4th June, when Mr. E. A. Corbin was posted to Ipoh. This appointment entails supervision of the installations at Government House Kuala Kangsar, Residency Taiping, Street Lighting Kampar, and Hospitals Taiping and Batu Gajah including the erection of new power stations at the two latter places. This is a very full charge for one man without assistance as a considerable amount of travelling is necessary and as no relief is available no casual leave can be granted. The subject is being brought to the notice of the Board.

L.—SMALL INSTALLATIONS IN PERAK.

(i).—TAIPING HOSPITALS.

(a) Two 30-kilowatt E.C.C. sets driven by Tangye cold starting crude oil engines were installed to take the place of the old Delco sets which were absolutely worn out. The larger sets have enabled lighting to be extended to the District Hospital while the Railway Station, Yards, etc., have also been connected to this supply, permitting removal of the Delco set at the station. The total cost including building was \$24,546 and supply commenced on 25th November.

(b) The total cost of supply for the year from old and new plants was \$4,361.

(ii).—TAIPING RESIDENCY.

(a) The Delco set here is also practically past repair and a partial supply is taken from the New Club pending more definite arrangements.

(b) Cost of maintenance was \$907.

(iii).—KUALA KANGSAR GOVERNMENT HOUSE.

(a) Engine and battery again needed considerable repair and the latter is quite worn out for as fast as one lot of damaged plates are replaced another lot becomes unserviceable.

(b) Total cost of maintenance for the year amounted to \$3,304.

(iv).—BATU GAJAH HOSPITALS.

The existing suction gas set has been heavily overworked in the past and, in view of the importance of having standby plant ready to take up load at once in the event of a failure, it was decided to install two cold starting crude oil engines each of 12 kilowatts capacity.

The total cost was \$12,585, including the building, and supply commenced on 17th December.

The total cost of supply for the year from both sources was \$3,194.72.

(v).—KAMPAR.

Government owns the mains for street lighting and for supply to a few quarters, etc., the Société des Etains de Kinta supplying current free as a term in their water licence and being paid for upkeep of street lamps, etc.

The mains are in a deplorable state and provision was made in the estimates for rebuilding them but this has been delayed by negotiations with the Société for a bulk supply to the town in place of the Société supplying private consumers by means of the Government mains, the condition which obtains at present.

III.—SEREMBAN.

A.—PRELIMINARY.

The installation as a going concern was taken over at midnight on December 31st, 1923, from the United Engineers Ltd., who had operated it for some 7½ years.

The generating plant consists of five Ruston-Hornsby horizontal crude oil engines driving Crompton direct current generators. Two sets have each an output of 200 kilowatts and three of 60 kilowatts each, 580 kilowatts in all.

The usual switchgear and auxiliary plant is installed but presents no features of special interest beyond the cooling towers which are of local design and are very efficient considering their low cost and local conditions of humidity.

Distribution is entirely overhead on the three wire system at 460/230 volts with split neutral run below the current carrying mains and cross bonded.

There are approximately 16 miles of mains, all important ones being carried on Mannesman steel poles. Hardwood poles are used for house services.

B.—GENERATING PLANT.

(i) *New Works*.—No new works were carried out in the station.

(ii) *Maintenance*.—On taking over, each generating set was stripped in rotation and it was found that a considerable amount of overhaul was necessary, chiefly in main shaft and connecting rod bearings. This has been carried out departmentally.

The only breakdown was on the armature of one of the balancer sets; pending the arrival of a new one from England repairs were effected locally.

There were no failures of supply of any magnitude due to the generating station and it is interesting to note that the maximum demand increased steadily throughout the year from 144 kilowatts in January to 197 kilowatts in December, an increase of nearly 37 per cent.

C.—MAINS.

(i) *Construction*.—Fourteen thousand seven hundred yards of wire constituting 4,100 yards run of new main were erected in Carew, Wilkinson, Cameron and Lemon Streets, Temiang, Egerton, Rahang and Dunman Roads, Jalan Tuan Sheik and Jalan Tungku Hassan, while 164 services were put in. Details were got out for further considerable extensions in the railway yards, etc.

(ii) *Maintenance*.—This was satisfactory, trees again being the chief contributors to local stoppages of supply.

D.—STREET LIGHTING.

No additions were made during the year.

Details of lamps installed appear in appendix A.

E.—METERS.

One hundred and twenty-nine new meters were installed during the year, while 119 were brought in for repair and re-issued.

New consumers came on faster than was estimated with the result that at 31st December, 1924, there were 71 consumers charged at a fixed rate on their estimated consumption.

F.—CONSUMERS.

After allowing for eight disconnections the total number of consumers at 31st December, 1924, was 561, a net increase of 156 on the year's working.

The total is composed of 223 Government and 338 private consumers, an increase of 28 and 128 respectively.

There are no motors connected to the supply as yet.

G.—GOVERNMENT QUARTERS AND BUILDINGS.

Twenty-eight of these were wired during the year by contractors under supervision by the Board's Engineer. There were no disconnections.

There are now 133 fans maintained by the Board in Seremban, viz., 101 ceiling and 32 table fans.

H.—STATISTICS.

The large sets ran for 2,673 hours generating 266,846 units and the small sets 6,043 hours for 185,589 units, making a total of 452,435 units generated. Units sold amounted to 352,400 and units used on works to 16,057, giving a loss in distribution of 83,978 units or 18.55 per cent.

This is mainly due to copper losses owing to insufficient area of copper in districts where demand has developed rapidly. It has also been found that there is a variable error in the master meter on the switchboard which has falsified the calculations. Steps are being taken to deal with both the foregoing cases.

One hundred and eighty-four tons of fuel oil were consumed, giving an all round consumption of 0.91 lbs. per unit generated. The consumption of the large and small sets averages 0.77 and 1.11 lbs. per unit respectively. The average cost of fuel oil was \$59.69 per ton.

Connections to the mains at 31st December, 1924, approximated 374 kilowatts with a maximum demand of 197 kilowatts or 52.67 per cent.

I.—FINANCIAL RESULTS.

These appear in the appendices but it may be noted here that there was a gross profit on the year of \$26,153. After allowing for overhead charges the accounts shew a loss of \$9,748 but whereas in 1923 Government expenditure actually exceeded revenue by \$9,968, in 1924 revenue exceeded expenditure by \$27,493.

J.—STAFF.

Mr. H. R. Sparrow took over charge from the United Engineers Ltd. on 1st January, 1924. He proceeded on long leave on 11th September, being succeeded by Mr. E. F. Stephenson who continued in charge till the close of the year.

Each of these officers was single-handed whereas the United Engineer's representative had the local branch of his Company to draw on for assistance or for leave relief. No relief was available for these officers, even for casual leave, and it was fortunate that neither of them had any serious illness. The question of relief staff is being brought to the notice of the Board.

22nd April, 1925.

J. C. M. MATTHEWS, M.I.E.E.,
Chief Electrical Engineer, P.W.D.,
Kuala Lumpur, F.M.S.

INSPECTION BRANCH.

A.—INSPECTIONS.

One hundred and seventy inspections were made.

B.—LICENCES.

One new public licence and three new private licences were issued while several expired licences were renewed.

C.—EXAMINATIONS.

An examination was held in Kuala Lumpur in July and examinations in Ipoh in May and October with results as follows :

Grade.	Passes.	Restricted certificates.	Failed.
1st Grade Engineers	—	—	1
2nd Grade Engineers	1	—	1
1st Grade Chargemen	4	5	7
2nd Grade Chargemen	10	51	18
Wiremen	36	6	5

In addition three Engineers were registered as first grade and one as second grade without examination; the restrictions on existing certificates were removed or amended in seven cases.

D.—DISTRIBUTION OF PLANT SUBJECT TO THE ELECTRICITY ENACTMENT.

State.	No. of installations.	Kilowatts.
Perak	90	9,347
Selangor	26	3,335
Negri Sembilan	3	40
Pahang	3	2,805
Total for 1924	122	15,527
Total for 1923	119	15,905
Total for 1922	106	11,876

The above figures are for generating plant operated by prime movers only and do not include low voltage automatic and semi-automatic lighting plants.

E.—EMPLOYMENT OF PLANT SUBJECT TO THE ELECTRICITY ENACTMENT IN KILOWATTS.

State.	Mining.	Agricultural.	General.	Government.	Total.
Perak	8,461	168	190	528	9,347
Selangor	3,176	68	91	—	3,335
Negri Sembilan... ..	—	38	2	—	40
Pahang	2,805	—	—	—	2,805
Total for 1924	14,442	274	283	528	15,527
Total for 1923	14,788	270	388	459	15,905
Total for 1922	11,273	282	256	65	11,876

F.—OUTPUT OF INSTALLATIONS OF 100 KW. CAPACITY AND OVER SUBJECT TO THE ELECTRICITY ENACTMENT IN KW. HOURS (UNITS) FOR 1924.

Employment.	Perak.	Selangor.	N. Sembilan.	Pahang.	Total.
Tin Mining... ..	32,977,939	9,197,700	...	2,651,910	44,827,549
Gold Mining ... ..	...	...	...	1,990,000	1,990,000
Coal Mining ... ..	...	2,720,000	...	...	2,720,000

Giving a total output of 49,537,549 kw. hours produced by prime movers as follows :

Prime Mover.	Perak.	Selangor.	N. Sembilan.	Pahang.	Total.
Water wheels ...	15,708,950	...	...	3,118,960	18,827,910
Steam engines and turbines ...	8,574,500	9,777,800	...	1,061,512	19,413,812
Diesel engines ...	8,694,489	2,139,900	...	461,438	11,295,827
Total ...	32,977,939	11,917,700	...	4,641,910	49,537,549

G.—ACCIDENTS.

One fatal accident occurred, a cooly while bathing coming in contact with the discharge pipe of a pump which had become electrified due to leakage from a motor, the voltage of the shock was probably about 380 volts alternating current.

This accident would have been avoided had the motor frame been earthed in an effective manner.

H.—REVENUE.

The revenue from all sources totalled \$2,892 classified as follows:

Inspection fees ...	\$1,347
Examination fees ...	768
Licence fees ...	130
Sale of danger plates and shock cards ...	647
Total ...	<u>\$2,892</u>

I.—REMARKS.

Tables under F appear for the first time this year, their inclusion is possible owing to the courtesy of Mine Managers in furnishing particulars.

The tables which have appeared before classifying all installations under the headings of "Power" and "Light" have been omitted as in many cases the same plant is used at different times for different purposes and consequently classification under such headings can serve no useful purpose.

Only installations subject to the Electricity Enactment are dealt with in this report.

D. M. W. HUTCHISON, A.M.I.C.E., M.I.E.E.,
Chief Electrical Inspector, F.M.S.

20th April, 1925.

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- B. Details of Votes and Expenditure.
- C. Statistics.
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- E. Revenue Account, Kuala Lumpur.
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APPENDIX A.

DETAILS OF PUBLIC LIGHTING.

1.—KUALA LUMPUR.				
Roads and Streets	87 × 1,000	watts
"	"	...	990 × 40	"
Clock Tower, Government Offices	...	...	24 × 30	"
Fire Alarm Posts (Red)	...	...	8 × 30	"
2.—IPOH.				
Roads and Streets	...	...	4 × 150	watts
"	"	...	27 × 100	"
"	"	...	2 × 60	"
Clock Tower, Birch Memorial	...	...	8 × 30	"
"	Anglo-Chinese School	...	2 × 100	"
3.—SEREMBAN.				
Roads and Streets	...	...	65 × 100	watts
"	"	...	227 × 60	"
"	"	...	14 × 30	"
4.—KAMPAR.				
Roads and Streets	...	...	32 × 60	watts
"	"	...	173 × 50	"

APPENDIX B.

DETAILS OF VOTES AND EXPENDITURE, 1924.

Votes.	Provision.	Expenditure.	Balance.	Remarks.
	₹	₹	₹	
1. Personal Emoluments ...	133,676	116,428	17,248	Provision for additional staff for whole year but appointments not made till May
2. Temporary Allowances ...	...	18,875		
3. Other Charges, Annually Recurrent ...	350,486	308,182	42,304	Saving due to economical working and reduced costs
4. " Special Expenditure ...	2,091,460	74,865	2,016,595	
5. Loan Expenditure, Kuala Lumpur ...	15,000	9,904	5,096	Works not completed Balances revoted
6. " Ipoh ...	119,000	50,508	68,492	
Total ...	2,709,622	578,762	2,149,735	

SUMMARY OF EXPENDITURE.

(a) Engineering and Administration	...	...	₹ 145,659
(b) Annually Recurrent	...	...	297,826
(c) Special Services	...	...	74,865
(d) Loan Expenditure	...	...	60,412
Total	...	...	₹ 578,762

APPENDIX C.
STATISTICS.

(I)—KUALA LUMPUR.

Type of plant.	Hours run.	Units generated.	Works costs exclusive of salaries.	Cost per unit generated.
Steam Belliss	1,162	250,795	\$ 47,956	6.34
Steam Turbos	2,109	504,819		
Diesels	6,021	692,309	32,084	4.64
Hydro-Electric	8,720	1,810,050	14,035	.77
Totals	18,012	3,257,973	94,075	2.88

UNITS SOLD.

Consumers.	Units.	Revenue.
		\$
Central Workshops... ..	346,866	52,097
Other Railway Supplies	173,072	25,961
Government Buildings	246,913	44,962
Government Quarters	138,905	20,836
Private Consumers	1,235,171	242,606
Public Lighting	354,893	69,986
Totals	2,495,820	456,448

Total Units Generated	3,257,973
" " Sold	2,495,820
Used in Works	148,503
Losses in Transmission, &c.	613,650
All in Cost per Unit Sold	14.82 cents
	18.84 per cent.

(II)—IPOH.

Total Units Purchased	840,870
" " Sold	671,235
Used in Works and Losses	169,635
All in Cost per Unit Sold	16.76 cents
	20.17 per cent.

(III)—SEREMBAN.

Type of Plant.	Hours run.	Units generated.	Works costs exclusive of salaries.	Cost per unit generated.
200 kw. Sets	2,673	266,846	\$ 31,046	6.86
60 kw. Sets	6,043	185,589		
Totals	8,716	452,435	31,046	6.86

UNITS SOLD.

Consumers.	Units.	Revenue.
		\$
Government	71,924	10,416
Private	184,584	43,564
Public Lighting	95,892	19,230
Totals	352,400	73,210

Total Units Generated... ..	452,435.
" " Sold	352,400
Used in Works	16,057
Losses in Distribution, &c.	83,978
All in Cost per Unit Sold	23.51 cents
	18.54 per cent.

APPENDIX D.

ELECTRICAL BOARD, F.M.S.

CAPITAL ACCOUNT AS AT 31st DECEMBER, 1924.

	Value on 31st Dec., 1923.	Expenditure during 1924.	Value on 31st Dec., 1924.		Value on 31st Dec., 1923.	Expenditure during 1924.	Value on 31st Dec., 1924.
KUALA LUMPUR INSTALLATION.				BY F.M.S. GOVERNMENT.			
HYDRO-ELECTRIC SECTION.				Kuala Lumpur ... 1,172,158			
1. Land	7,700	...	7,700	Ipoh	282,467	14,100	296,568
2. Buildings... ..	9,200	...	9,200	Seremban	399,139	7,984	407,122
3. Dams and Flumes	201,300	...	201,300	(1st January, 1924.)			
4. Power Pipe and Syphon... ..	32,100	...	32,100				
5. Generating Plant at Ulu Gombak	5,000	...	5,000				
6. Transmission Line	38,500	...	38,500				
OIL AND STEAM SECTION.							
7. Land	12,800	...	12,800				
8. Buildings... ..	60,670	...	60,670				
9. Generating Plant and Apparatus	161,366	4,580	165,946				
10. Turbo Plant and Equip- ment	325,427	611	326,038				
11. Mains, Feeders, Sub- stations, etc.	300,814	24,686	325,501				
12. Meters	8,480	3,936	12,416				
13. Motor Lorry	8,800	...	8,800				
14. Kuala Lumpur New Power Station ... ..	...	4,893	4,893				
Total ...	1,172,157	38,706	1,210,864				
IPOH INSTALLATION.							
1. Land	1,600	...	1,600				
2. Transmission Line	24,104	25	24,129				
3. Mains and Distributors	131,213	4,651	135,864				
4. Sub-stations and Trans- formers	55,885	...	55,885				
5. High Tension Cables	24,162	...	24,162				
6. House Services	20,882	5,242	26,124				
7. Tools	5,272	272	5,544				
8. Electrical Instruments	12,694	...	12,694				
9. Meters	6,197	3,744	9,941				
10. Furniture and Fittings	186	150	336				
11. Street Lighting	273	16	289				
Total ...	282,468	14,100	296,568				
SEREMBAN INSTALLATION.							
1. Buildings... ..	62,589	...	62,589				
2. Plant and Machinery	222,005	...	222,005				
3. Crane and Gantry	5,904	...	5,904				
4. Switchgear	11,381	...	11,381				
5. Electrical and other Instru- ments ... ..	...	93	93				
6. Loose Tools	2,581	492	3,073				
7. Oil Storage Tanks	7,769	...	7,769				
8. Cooling Towers and Fencing	10,297	...	10,297				
9. Mains, Feeders and Street Lighting	70,793	4,016	74,809				
10. Meters ... ..	...	3,279	3,279				
11. Furniture and Fittings ... ..	...	103	103				
12. Shift Engineer's Quarters and Cooly line	5,820	...	5,820				
Total ...	399,139	7,983	407,122				
GRAND TOTAL ...	1,853,764	60,790	1,914,554	Total ...	1,853,764	60,790	1,914,554

APPENDIX E.

KUALA LUMPUR ELECTRICITY SUPPLY.

REVENUE ACCOUNT FOR THE YEAR ENDING 31ST DECEMBER, 1924.

Dr.	\$	\$		Total units sold.	\$	\$	Cr.
A.—GENERATION OF ELECTRICITY.							
1. Coal and Fuel	37,103		1. By Sale of Current to :				
2. Oil, Waste and Engine-room Stores	6,244		Central Workshops ...	346,866	52,097		
3. Salaries	23,981		Other Railway Supplies...	173,072	25,961		
4. Wages	46,232		Government Buildings ...	246,913	44,962		
5. Repairs and Maintenance of Buildings and Machinery (other than wages) ...	5,511		“ Quarters ...	138,905	20,836		
			Private Consumers ...	1,235,171	242,606		
		119,071	Public Lighting ...	354,893	69,986		456,448
				2,495,820			
B.—DISTRIBUTION OF ELECTRICITY.			2. Charging Accumulators ...		38		
1. Salaries	16,378		3. Sale of Bulbs		924		
2. Wages	27,429		4. Miscellaneous Revenue ...		2,749		3,711
3. Repairs and Maintenance of Mains, Meters and Sub-stations (other than wages)	8,526						
		52,333					
C.—PUBLIC LIGHTING.							
1. Wages	12,193						
2. Maintenance and Renewals ...	6,354						
		18,547					
D.—MANAGEMENT.							
1. Salaries	26,865						
2. General Charges	1,961						
3. Printing and Stationery ...	1,096						
4. Postage and Telegrams ...	480						
		30,402					
E.—SPECIAL CHARGES.							
1. Commission to Sanitary Board	14,086						
2. Steamer Fares	3,600						
3. Pensions Reserve	3,500						
		21,186					
Balance transferred to Net Profit Account		241,539					
		218,620					
		460,159					460,159

APPENDIX F.
IPOH ELECTRICITY SUPPLY.

Dr.	Revenue Account for the year ending 31st December, 1924.			Cr.
	\$	\$		\$
1. Purchase of Current a/c ... ..	...	52,645	By Revenue earned	155,168
DISTRIBUTION.				
1. Wages	8,130			
2. Repairs and Maintenance... ..	3,773			
		11,903		
MANAGEMENT.				
1. Salaries	10,356			
2. General Charges	2,518			
3. Printing and Stationery	864			
4. Steamer Fares	548			
5. Postage and Telegrams	360			
		14,646		
SPECIAL CHARGES.				
Commission to Sanitary Board for collecting Revenue ... ..	...	5,207		
Reserve for Pensions ... ..	...	1,000		
		85,401		
Balance transferred to Net Revenue Account ... ..	...	69,767		
		155,168		155,168

APPENDIX G.

SEREMBAN ELECTRICITY SUPPLY.
Revenue Account for the year ending 31st December, 1924.

A.—GENERATION OF ELECTRICITY.	\$	\$	BY SALE OF CURRENT TO:	Total units sold.	\$
1. Liquid Fuel	11,080		Public Lighting	95,892	19,230
2. Oil, Waste, Water and Engine Room Stores	4,086		Private Consumers	184,584	43,564
3. Wages	13,179		Government Consumers	71,924	10,416
4. Repairs and Maintenance... ..	2,701		Other Revenue ... ..	...	116
		31,046		352,400	
B.—DISTRIBUTION.					
1. Repairs and Maintenance... ..	...	251			
C.—PUBLIC LIGHTING.					
1. Renewals and Maintenance ... ..	...	617			
D.—MANAGEMENT.					
1. Salaries	11,223				
2. General Charges	1,255				
3. Printing and Stationery	589				
4. Steamer Fares	701				
5. Postage and Telegrams	240				
		14,008			
E.—SPECIAL CHARGES.					
Commission to Sanitary Board for collecting Revenue ... ..	...	351			
Reserve for Pensions... ..	...	900			
		47,173			
Balance Transferred to Net Revenue Account ... ..	...	26,153			
		73,326			73,326

APPENDIX H.

KUALA LUMPUR ELECTRICITY SUPPLY.

Net Revenue Account, 31st December, 1924.

<i>Dr.</i>	\$	<i>Cr.</i>	\$
1. To Maintenance Reserve	20,000	By Balance brought forward from 1923	
2. " Sinking Fund Reserve	66,398	Account	75,757
3. " Interest on Capital	60,543	By Revenue Account	218,620
4. " Balance carried forward	147,436		
	294,377		294,377
Net Revenue, 1922		\$30,185	
" 1923		45,572	
" 1924		71,678	

APPENDIX J.

IPOH ELECTRICITY SUPPLY.

Net Revenue Account, 31st December, 1924.

<i>Dr.</i>	\$	<i>Cr.</i>	\$
1. To Balance brought forward from 1923		By Revenue Account	69,767
2. Account	5,487		
3. " Sinking Fund Reserve	12,268		
4. " Interest on Capital	14,828		
" Balance carried forward	37,184		
	69,767		69,767

APPENDIX K.

SEREMBAN ELECTRICITY SUPPLY.

Net Revenue Account, 31st December, 1924.

<i>Dr.</i>	\$	<i>Cr.</i>	\$
1. To Sinking Fund Reserve	15,545	By Revenue Account	26,153
2. " Interest on Capital	20,356	" Balance Loss on one year's working	9,748
	35,901		35,901

APPENDIX L.

GENERAL BALANCE SHEET AS AT 31st DECEMBER, 1924.

LIABILITIES.	\$	ASSETS.	\$
1. To Capital Account as per Sheet No. 1:		1. By Capital Account as per Sheet No. 1:	
Kuala Lumpur... .. \$1,210,864		Kuala Lumpur ... \$1,210,864	
Ipoh 296,568		Ipoh 296,568	
Seremban 407,122		Seremban 407,122	
	1,914,554		1,914,554
2. „ Sundry Creditors:		2. „ Stores in hand, Kuala Lumpur:	
Kuala Lumpur... .. \$ 5,800		Coal \$ 174	
Ipoh 5,438		Liquid Fuel Oil ... 2,186	
Seremban 2,483		Maintenance—Spares	
	13,721	and Constrn. Stores \$ 131,622	
3. „ Maintenance Reserve, Kuala Lumpur	58,979		133,982
4. „ Sinking Fund Reserve:		3. „ Ipoh:	
Kuala Lumpur... .. \$ 185,688		Maintenance—Spares	
Ipoh 23,243		and Constrn. Stores	2,806
Seremban 15,546		4. „ Seremban:	
	224,477	Liquid Fuel Oil ... \$ 768	
5. „ Reserve for Pensions:		Maintenance—Spares	
Kuala Lumpur... .. \$ 3,500		and Constrn. Stores 11,115	
Ipoh 1,000			11,883
Seremban 900		5. „ Sundry Debtors for Current supplied:	
	5,400	Balance outstanding 31st December,	
6. „ Net Revenue Account:		1924:	
Kuala Lumpur \$ 147,436		Kuala Lumpur... .. \$ 34,239	
Ipoh 37,184		„ Ipoh 15,051	
	184,620	„ Seremban 7,511	
Less loss Seremban ... 9,748			56,801
	174,872	6. „ F.M.S. Government... ..	267,968
	2,392,003	7. „ Steamer Fares:	
		Proportion Chargeable	
		to 1925 Accounts... ..	4,009
			2,392,003

20th April, 1925.

A. W. EVERY,

Secretary and Accountant, Electrical Board, F.M.S.