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THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA

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PARLIAMENTARY STANDING COMMITTEE
ON PUBLIC WORKS.

J. W. Ryan
Actg. Clerk of the Senate,
11th June, 1925.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED ESTABLISHMENT OF AN

AUTOMATIC TELEPHONE EXCHANGE AT TOOWONG, QUEENSLAND.

Presented pursuant to Statute; ordered to be printed;

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MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

(Fourth Committee.)

The Honorable HENRY GREGORY, M.P., Chairman.

Senate.

Senator John Barnes †
 Senator Hattil Spencer Foll †
 Senator Patrick Joseph Lynch †
 Senator John Nowland †
 Senator William Flinn *
 Senator Matthew Reid †

* Deceased to be a Member of the Senate, 30th June, 1925.

House of Representatives.

Arthur Blakeley, Esq., M.P.
 Robert Cook, Esq., M.P.
 David Sydney Jackson, Esq., M.P.
 George Hugh Mackay, Esq., M.P.
 James Matthews, Esq., M.P.

† Appointed 6th July, 1925.

‡ Resigned 26th June, 1925.

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EXTRACT FROM THE VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES.

No. 116, DATED 18TH SEPTEMBER, 1924.

3. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—AUTOMATIC TELEPHONE EXCHANGE, TOOWONG.—Mr. Atkinson (for Minister for Works and Railways) moved, pursuant to notice, That in accordance with the provisions of the Commonwealth Public Works Committee Act 1913-1921, the following work be referred to the Parliamentary Standing Committee on Public Works for its investigation and report thereon, viz.—Establishment of an Automatic Telephone Exchange at Toowong, Queensland.

Mr. Atkinson having laid on the Table plans, &c., in connexion with the proposed work—
 Question—put and passed.

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AUTOMATIC TELEPHONE EXCHANGE, TOOWONG, QUEENSLAND.

REPORT.

The Parliamentary Standing Committee on Public Works, to which the House of Representatives referred, for investigation and report, the question of the provision of an Automatic Telephone Exchange at Toowong, Queensland, has the honour to report as follows:—

PROPOSAL.

1. The proposal is to erect a telephone exchange building on a site already acquired for the purpose at the corner of Church-street and Kensington-terrace, Toowong, and to install therein an automatic telephone switching system having an initial capacity of 2,000 subscribers' lines, and an ultimate capacity of approximately 4,000 subscribers' lines. It is proposed that the initial equipment shall be capable of extension to the ultimate capacity named, thereby affording sufficient accommodation for the anticipated development in the proposed Toowong automatic telephone exchange area.

REASONS FOR THE PROPOSAL.

2. The subscribers in the Toowong telephone exchange area are served by a manual (non-multiple magneto) switchboard in the Toowong exchange, and owing to building limitations it cannot be extended to give service beyond about July, 1927. It is therefore represented to be necessary to install a modern exchange plant in a new building in order that a more efficient service may be rendered to existing and prospective subscribers in the area.

ESTIMATED COST.

3. The estimated immediate cost of the work as submitted to the Committee is set down as:—

Site	£ 920
Building	9,150
Air-conditioning, ventilating, vacuum cleaning and air-compression plant ..	3,500
Exchange equipment, including that necessary at other exchanges ..	38,500
Sub-station equipment	5,010
Line plant (conduits, cables and air lines)	609
Cut-over	50
	£57,739

COMMITTEE'S INVESTIGATIONS.

4. The Committee visited the site and inspected portion of the area which the new exchange is designed to serve; took evidence from the Chief Electrical Engineer and the Superintendent of Telephones, Central Administration, Postmaster-General's Department, the State Engineer, Sectional Engineer, and Manager of Telephones for Queensland, the Chief Mechanical Engineer, Department of Works and Railways, Melbourne, and the Commonwealth Works Director for Queensland.

SITE.

5. The site is situated in a residential district at the corner of Church-street and Kensington Terrace. It has a frontage to Church-street of 66 ft. and a depth of 148 ft. 6 in. It was acquired on the 1st November, 1923, at a cost of £920. It was stated in evidence that the site selected, being at the junction of a number of roads, will facilitate the laying of cables, and is therefore most economical in respect of outside plant, while the Works officers report that it offers no objection from a building point of view. The Committee is satisfied, therefore, that the land is suitable for the purpose for which it is intended, and the price paid is not unreasonable.

BUILDING.

6. The Committee examined the plans of the building and had them explained by the Works Director for Queensland. The proposed structure is of a substantial fire-resisting character, with hollow brick walls, concrete floors and ceilings, and steel window sashes, and consists of switch-room, 70 ft. 6 in. by 36 ft.; battery-room, 32 ft. by 15 ft.; air-conditioning-room, 29 ft. by 15 ft.; luncheon-room, 20 ft. by 15 ft.; and sanitary block. A detached building at the rear consists of bin store, 25 ft. by 13 ft.; inspector's room, 16 ft. 6 in. by 11 ft.; and lineman's room, 13 ft. 6 in. by 10 ft. 6 in. While the plans show that the building is to be of a substantial and fire-resisting character and designed with due regard to appearance, the Committee is not satisfied in regard to the estimate of cost submitted.

In the case of the establishment of automatic telephone exchanges at Elsternwick and Northcote, reported upon by the Committee some months ago, it was shown that buildings designed to cater for a greater number of subscribers were being provided at a lower cost.

A comparison of the figures set out below will show an unfavorable position in respect of the Queensland exchange.

Exchange.	Initial and Ultimate No. of Subscribers.	Switch-room.		Battery-room.		Air-conditioning room.		Estimated Cost.
		ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	
Toowong	2,000-5,000	70	6 x 36	0	32	0 x 15	0	9,150
Northcote	3,800-9,300	115	10½ x 43	0½	34	6 x 21	3½	9,000
Elsternwick	5,700-9,600	112	1½ x 42	0	61	8½ x 17	10½	7,900

Although it is claimed that the cost of building in Queensland is higher than in Victoria, the Committee recommends that a careful scrutiny be made of the figures given, and an effort made to reduce the cost of construction of the building at Toowong.

FINANCIAL ASPECT.

7. It was ascertained in evidence that the total annual charge for the proposed automatic system at 1st July, 1932, or five years after proposed date of cut-over, have been estimated at £16,911, and that the revenue on the same date is expected to be £22,417, so that by that date the revenue will exceed the annual charges by £5,506.

The assets recovered or thrown spare if the automatic exchange be installed are said to have a recoverable value of £7,846.

COMMITTEE'S RECOMMENDATION.

8. In the circumstances disclosed by the evidence, the Committee recommends that, with the reservation mentioned in paragraph 6, the proposal submitted be adopted, and that the work be put in hand as early as possible.

H. Gregory
H. GREGORY,
Chairman.

Office of the Parliamentary Standing Committee on Public Works,
Federal Parliament House, Melbourne.
18th March, 1925.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

TUESDAY, 23rd SEPTEMBER, 1924.

Present:

Mr. GAZCOOB, Chairman;

Senator Barnes | Mr. Jackson
Senator Reid | Mr. Mackay
Mr. Cook | Mr. Mathews.

John Murray Crawford, Chief Electrical Engineer,
Postmaster-General's Department, sworn and
examined.

1. *To the Chairman.*—It will be remembered that I dealt with the central exchange last week, and this proposal relates to an exchange at Toowong, which is in the south of the Brisbane network system. The proposal is to erect a telephone exchange building on a site already acquired for the purpose at the corner of Church-street and Kensington-terrace, Toowong, and install therein an automatic telephone switching system having an initial capacity of 2,000 subscribers' lines and an ultimate capacity of approximately 4,000 lines. It is proposed that the initial equipment shall be capable of extension to the ultimate capacity named, thereby affording sufficient accommodation for the anticipated development in the proposed Toowong automatic telephone exchange area. The subscribers in the

Toowong (telephone exchange) area are served by a manual (non-multiple magneto) switchboard in the Toowong exchange, and owing to building limitations it cannot be extended to give service beyond about July, 1927. It is, therefore, necessary to install modern exchange plant in a new building in order that a more efficient service can be rendered to the existing and prospective subscribers in the area. The estimated immediate cost of the work is:—

Site, 66' x 148' 6"	£	920
Building	9,150	
Air conditioning, heating, ventilating, vacuum-cleaning and air-compression plant	3,500	
Exchange equipment (including that necessary at other exchanges)	38,500	
Substation equipment	5,010	
Line plant (conduits, cables, and aerial lines)	609	
Cutover	50	
	£57,739	

The actual revenue received from the subscribers in the existing manual exchange area for the year ended 30th June, 1924, and the annual revenue it is estimated will be obtained from the subscribers in the proposed 'Toowong automatic exchange area on the date of opening and with five years' development is shown hereunder:—

Average Number of Lines to existing Exchange Areas during Year ended 30th June, 1924.	Revenue Received from Subscribers in existing Exchange Area for Year ended 30th June, 1924.	Estimated Number of Subscribers' Lines, 1st July, 1927.	Estimated Annual Revenue, 1st July, 1927.	Estimated Number of Subscribers' Lines, 1st July, 1932.	Estimated Annual Revenue, 1st July, 1932.
1,205	£ 14,508	1,370	£ 16,043	1,985	£ 22,417

I submit the certificate of the accountant confirming these estimates. It is proposed that the building shall be of simple design and built on the latest fire-resisting principles. The immediate installation in the exchange is for an equipment of 2,000 subscribers' lines, but it is intended that the building shall be sufficiently large to accommodate equipment having a capacity of approximately 4,000 lines. The financial aspect of the proposal is as follows:—

Item.	As at 1st July, 1927.	As at 1st July, 1932.
1. Capital cost (new)	£ 57,739	£ 85,208
2. Capital cost (now and in situ)	114,182	141,711
3. Annual working expenses of proposed automatic system	4,670	6,073
4. Total annual charges of proposed automatic system	13,478	16,011
5. Annual revenue	16,043	22,417
6. Assets recoverable or thrown spare if an automatic exchange is established on 1st July, 1927—		
(i) Book value	17,222	..
(ii) Recoverable value	7,846	..
(iii) Cost of recovery	347	..
7. Estimated annual working expenses of existing manual exchange as at 30th June, 1927	9,672	..
8. Estimated total annual charges of existing manual exchange as at 30th June, 1927	18,353	..
9. Amount by which the revenue exceeds the annual charges for the proposed automatic system	1,605	5,506

The difference between sub-items (i) and (ii) in Item 6, i.e., £9,676, is an amount which will have to be written off in the departmental accounts. It represents the proportion of the capital outlay on the original assets which is irrecoverable, and includes depreciation due to wear and tear and labour in installation. The site of the proposed building at Toowong is not quite so good as that at Elsternwick, Victoria, as there is a fall in the land. The cost of the proposed building is somewhat higher than that at Elsternwick, which is accounted for to some extent by the fact that building is more costly in Brisbane than in Melbourne. The switch room is to be 76 feet by 36 feet, which is rather smaller than that in the Elsternwick exchange. The estimate for the building was prepared by the Department of Works and Railways, and is one which we have to accept. It will be seen from the plan that the site at Toowong is not quite so favorable for easy construction as that at Elsternwick. There is nothing unusual in the construction of the building. The land has about the same fall as that at Northcote. The revenue we receive from any network of subscribers of 4,000 or more in a metropolitan area is £5 per annum ground rental, and 1d. for each call. In the country areas the amounts vary, according to the number of subscribers, from £3 to £4 10s. for ground rental, and in such cases the cost for calls is 1d. or in certain of the larger country areas 1d.

2. *To Mr. Jackson.*—I would not regard the Launceston network as the network of a country exchange. When an exchange contains more than a certain number of lines, the charge per call increases from 1d.

to 14d. Country subscribers get a concession in this respect.

3. *To the Chairman.*—Officials of the Works and Railways Department could give more information than I about the cost of the building. I think it will be found that costs of building in Brisbane are higher than they are in Melbourne. The estimate of revenue is based upon the revenue now being received. The estimate is conservative, because the larger the network the higher the calling rate becomes. The calling rate in suburban areas is generally from 2.8 to 3 per line. The calling rate in a city exchange may go as high as 14 or 15 per line. If any correction has to be made, it will be in the direction of increasing the revenue. We have a fairly large exchange at Toowong at present, with nearly 1,000 subscribers. The estimated number of subscribers' lines in 1927 will be 1370. The sum of £57,739, which is stated as the capital cost of the new exchange, will be for providing line switches for that number of subscribers, plus banks, &c., for the five years. Between the two-year and five-year period, additional switches will have to be purchased. The cost of those are taken into account in the estimate of £55,268. That estimate is based on present prices. In each instance, the latest prices available are taken.

4. *To Mr. Mackay.*—We have much smaller automatic exchanges than this in Sydney. There is the Dee Why exchange, which has only 200 lines. That is situated about 4 or 5 miles north of Manly. It is a satellite exchange, and is so small that there was no need to submit the proposal to build it to the Public Works Committee. From an economic point of view, small automatic exchanges work satisfactorily. It is a comparatively small margin between the estimated annual revenue and the estimated annual charges at Toowong is partly due to the annual charges being higher in Toowong than in other places considered by the Committee. In the Toowong area, a plan has been made for a line plant to meet a fifteen years development. Underground work there is many in advance of that in many other areas. That is true of Brisbane generally, and of Toowong particularly. From the first they have laid underground cables rather than erected overhead wires. To that extent, Brisbane has always been more up to date than the other capital cities. There is more underground plant per 100 subscribers in that city than in any other capital city.

5. *To the Chairman.*—It may be necessary to run from the proposed exchange many miles in a certain direction, because it might not pay to build another exchange in that area until sufficient development has taken place. Normally, such exchanges have a radius of from 1½ to 2 miles. Toowong is from 3½ to 4 miles from Brisbane. Its population, on the 4th April, 1921, was 10,000. We have an exchange at Indooroopilly. Provision for 4,000 lines will be ample. If unexpected development should take place, the proposed exchange could be increased, or another one built. Another floor could be added to it. We are now following the practice of putting flat roofs on our exchanges, so that if our survey figures are wrong, another floor can be added at a comparatively small cost. Most of the buildings will stand two floors. It can hardly be imagined that a building costing £9,000 would not stand one extra floor. We are not, however, calculating upon that possibility; we are not assuming that our estimated figures are wrong. Invariably, the Public Works Department now provide us with buildings that will allow of a second floor. The exchange will be equipped with an up-to-date air-conditioning plant, similar to that provided in other exchanges. If anything, the increase in revenue per subscriber will be greater than is estimated. A severe industrial depression would not affect the calculation to any appreciable extent. We experienced bad times during the war, but the calling rate did not decrease very much.

6. *To Senator Reid.*—A radius of 1½ miles from the exchange gives the most economical result in a normally

saturated suburban district. In a very thickly populated district like a city, the radius of an exchange would not be so great. In a city it pays to put less copper underground and more money into the buildings and equipment. Toowong district is a good class residential district. The existing manual exchange cannot be extended to meet needs beyond July, 1927, upon which date it is proposed to open the automatic exchange. I was not responsible for choosing the site, but I have seen it, and think it is suitable. It is about a quarter of a mile from the present exchange. As soon as we have decided upon the site of a new exchange, all subsequent cable work radiates from it. This reduces, as far as possible, the cost of transfer.

7. *To Senator Barnes.*—The estimated annual working expenses in 1932 include everything except interest and the like. The exchange should show over 10 per cent. interest on the capital outlay. It is calculated that in 1932 the revenue will exceed the annual charges by £5,506. The exchange will be a good investment. That sum will be clear profit. We take the interest at 5 per cent., and depreciation at varying rates. For an automatic exchange we take it at 5 per cent. over a period of twenty years, and regard the residual value at the end of twenty years as being 20 per cent. That brings the actual rate of depreciation down to 4 per cent. I think it is recognized that building costs in Brisbane are much higher than they are in Melbourne. I know, for a fact, that we cannot get work done as speedily there as here. A striking example of that is the Brisbane South exchange, which should have been completed over three months ago. The equipment has been stored in the office at considerable inconvenience. I do not know what the cause is, but I am stating the actual fact.

8. *To Mr. Mackay.*—The new site is still near the theoretical centre of the local telephone system. The present site is not the theoretical centre; it is the site of the old post-office. It "just happens." It was placed there, because the post-office was there, to serve the area that was growing up round the post-office. We now estimate on a quite different basis. A telephone surveyor goes carefully over the area, and after obtaining all possible information from town clerks, surveyors, estate agents, employers of labour, and trade unions, he forecasts the telephone development and plots it on a large-scale map, from which he finds the telephone centre. At Toowong we do not consider the area as now developed, but as it will be developed in twenty years' time. If something happened to upset the surveyor's prognostications, the telephone centre would be at the wrong place. Underground cables are all laid to the old site until the new one is decided upon, after which all cables, as far as possible, radiate from the new site. The lines of the existing 850 subscribers go into the Toowong exchange, probably on twelve cables. Those cables will be extended to the new exchange, but all cables for new subscribers will radiate from the new exchange. There is thus a great advantage in knowing the site of a new exchange as early as possible. The recoverable value of plant is affected by its life. If plant depreciates rapidly, i.e., if its life is short, it has practically no value at the end of its period of usefulness. If it is recovered with half its life unexpired, it has practically half its original value. The life of a manual telephone plant is fifteen years. The present manual exchange was opened in 1898, but many alterations have been made in it since. The apparatus placed in it in 1898 is not there now, for it is almost certain that many sections have been renewed. I cannot definitely say when the present apparatus was put there, but it would be probably at various dates between 1905 and 1915. The difference between the book value of £17,522 and the recoverable value of £7,846 of assets is practically represented by scrap. The parts that can be still used are included in the recoverable value.

9. *To the Chairman.*—The cost of transferring the connexions from the present exchange to the proposed

new building is included in the amount of £609 for line plant. The cost of the cut-over is set down at £50, but that is to meet the cost of transferring the lines from one cable to another. It will be a comparatively small job to transfer the connexions from the existing building to the proposed new exchange. The capital cost shown is the value of the apparatus and includes the cost of connecting it up with the new exchange. The work of bringing the lines into a new office usually takes from six to nine months. The cut-over has to be done as quickly as possible, and is usually undertaken on a Saturday afternoon, when the traffic is light, but when overtime has to be paid.

10. *To Mr. Mackay.*—When the present exchange room is vacated, it will be utilized for post-office purposes, and will provide necessary increased accommodation.

11. *To Senator Reid.*—It is intended subsequently to provide Sherwood and Yeronga with automatic equipment, but as the exchanges will be only small the proposed work will not have to be inquired into by this Committee.

(Taken at Melbourne.)

WEDNESDAY, 24th SEPTEMBER, 1924.

Present:

Mr. Græwon, Chairman;	
Senator Barnes	Mr. Jackson
Senator Reid	Mr. Mackay
Mr. Cook	Mr. Mathews.

Lawrence Bede Fanning, Superintendent of Telephones, Postmaster-General's Department, sworn and examined.

12. *To the Chairman.*—I am aware of the question which has been referred to the Committee, and last year visited Brisbane in connexion with the proposal for an extension of the telephone exchange at Toowong. The present exchange is situated in the post-office building, on the first floor. The building is unsuitable, and does not permit of extension. The requirements of the exchange are increasing rapidly, and in order to carry on for two or three years it has been found necessary to remove one of the walls and extend the floor for about 6 or 8 feet. The type of equipment which is installed is not suitable for an exchange of the size of Toowong. At present, 1,371 lines are connected. The switchboard equipment is of the manual, non-multiple magneto type. The development of the exchange has reached the stage when it is necessary to install an improved type of equipment. Each operation is required to make the connexion, and when one subscriber calls for another, there is uneconomical. That type of equipment is suitable, where the exchange does not exceed 300 or 400 lines. The development at Toowong for the last two years has been somewhat restricted on account of the difficulty in supplying services through lack of cable, but it has, nevertheless, been at the rate of over 13 per cent. A new building is essential. The existing building is not sufficient room there to build a new exchange. As it is proposed to establish automatic telephone exchanges in the Brisbane network, it is necessary that the new Toowong exchange should provide for a modern automatic switching plant. The existing exchange is close to the Toowong railway station. The proposed new exchange is about half a mile away, at the corner of Church-street and Kensington-terrace. That site has been chosen from a number submitted for consideration. The Department lost the opportunity to obtain an even

more suitable site, as while the matter was being considered the site was sold, and a building erected thereon. The proposed site is the only available suitable site near the telephone centre. The development of Toowong is tending towards the south-west. In addition, we contemplate opening an exchange at Paddington, which will take a certain number of subscribers from the Toowong exchange. Because of that, the proposed site will be satisfactory, and I think it will not be far from the telephonic centre after a further ten years have expired. I do not think that much cost will be involved in connecting the lines from the present exchange to the new one. The cable plant has been laid out with the object of establishing the exchange at the proposed site. The Department has had the site for some time. We recommended the erection of a building to serve 4,000 subscribers, because it is estimated that, notwithstanding the erection of exchanges at Paddington and Sherwood, that number will still require to be served by the Toowong exchange. The development figures are on the conservative side. At the present rate of development, the number of subscribers would probably exceed 4,000 in twenty years. I have gone through the estimates of cost, but am unable to say why the Toowong building, which is to serve 4,000 subscribers, is estimated to cost £2,150 as against a much less sum for the building at Elsternwick, which is to serve 9,000 subscribers. No doubt, the Works and Railways Department could explain the difference in cost. The actual size of the building and its cost are matters for the Chief Electrical Engineer to deal with. He furnishes the Works and Railways Department with particulars of the amount of space required for the equipment, and a building is then designed to give that floor space. Conditions vary so much that I would not think it necessary to question the difference in cost between the buildings for two exchanges located in different States unless it was very marked. I know that the buildings and plants for automatic exchanges are designed according to certain prescribed standards, and would not question the difference in cost in the present case. I would leave it to the Chief Electrical Engineer to see that a building larger than was necessary was not erected. I should, however, be pleased to look into this question and let the Committee know the reason for the difference in cost. So far as the estimated development of the district is concerned, I think that the figures supplied are on the conservative side. The telephone service in Queensland is developing very rapidly. During the last ten years the number of lines in use has increased by 112 per cent., and the revenue by 240 per cent. I think that the estimate of 1,370 in three years' time will be greatly exceeded. Those figures were prepared some time ago. The development figures in connexion with all metropolitan networks are revised from time to time. On 30th June last the average number of subscribers actually connected was 1,371. The average number of subscribers for the whole of the year was 1,295. That figure was ascertained in order to arrive at the average revenue for the year. On the 30th July, 1923, the number of subscribers connected was probably about 1,200. Since those figures were prepared a re-survey of the district has been made, and we now estimate that by 1929 the number of subscribers will have increased to 1,620, notwithstanding that within that period some subscribers will probably have been disconnected from the Toowong exchange and connected with either Paddington or Sherwood. It is very difficult to make a close estimate of the prospective development in an exchange area, as conditions vary so much. The development figures furnished respecting Toowong take into consideration the opening of new exchanges at Sherwood and Paddington. If these exchanges were opened subsequently it is probable that the number of Toowong subscribers in

1927 will be in the region of 1,700. At the end of June, 1923, 1,224 subscribers' lines were connected with the Toowong exchange. At the 30th June, 1924, that number had grown to 1,371, an increase of 12 per cent. The increase during the previous year was 14.6 per cent. The Committee would be justified in assuming that the revenue will be greater than is shown in the estimate before it, but it depends a great deal upon whether Paddington and Sherwood exchanges are opened concurrently with that of Toowong, or later. The estimate of 1,370 was given on the understanding that the three exchanges would be opened at the same time. If that is not done, it is probable that we will open the Toowong exchange in 1927 with 400 or 500 more lines than would otherwise have been the case. I am satisfied that the provision for 2,000 subscribers which we are making will be ample for the time being. Provided that the other exchanges are opened the plant will meet requirements. Ultimately, the provision of 4,000 lines will be quite sufficient. Should Brisbane develop in the same way that Melbourne has done, and the provision made be found insufficient, we shall have to meet the difficulty by opening other exchanges. Toowong, however, is a purely residential area, and I do not think it will develop to the same extent as a Melbourne suburb. I do not know whether the building which we contemplate erecting would be strong enough to permit of another story being added to it, but I do not think that such provision will be necessary. Even if the figures in our estimates are doubled, the building would meet requirements for the next ten years. During the next five years it is proposed to open seven new telephone exchanges in Brisbane. That will mean that the area now served by each of the existing exchanges will be reduced. In some cases, it is more economical to have two exchanges, each providing for 4,000 subscribers, than one exchange to supply 8,000 subscribers. That was the reason for the establishment of an exchange at Elsternwick. Had we provided larger switchboards at Brighton, Malvern, and Windsor, the cost of that plant would have been the same as the cost of similar plant for a new exchange, and, in addition, there would have been a much greater length of line. In establishing telephone exchanges we endeavour to reach subscribers with the lowest possible average wire mileage, because the outside plant costs are heavier than the internal costs. If the development in the area to be served by the Toowong exchange increases far beyond expectations, and all that development takes place within, say, half a mile of the exchange, it will probably be more economical to double the plant there than to erect a new exchange. From my knowledge of Toowong, that is not likely to happen. In Brisbane there are only four exchanges at present, but we consider it is more economical to establish seven additional exchanges than to increase the plant in the existing exchanges. The exchanges at Central, Toowong, Wynnum and Sandgate are manual exchanges. By opening the Paddington exchange we shall relieve the pressure on Central. We then propose to erect new automatic exchanges at Albion and Newmarket. After that will come Toowong, Paddington, and Sherwood, followed by Yeonga, Bulimba, Coorparoo, and Nundah. I, personally, have nothing to do with the purchasing of the plant and am unable to say definitely whether the cost has increased during recent years. When tenders for the South Brisbane exchange were invited, a lower price was submitted than for previous telephone exchanges, but since that time I believe there has been a further increase in prices.

13. *To Mr. Mathews.*—The difference between the capital cost of £57,739 in 1927 and £35,268 in 1923 is due to the fact that the plant at Toowong will meet requirements for five years. At the end of five years it is anticipated that the limit of the existing equipment will have been reached. The estimate covers the additional expense of the plant required to meet

development during the following five years, so that no more money will need to be spent until 1937.

14. *To Mr. Mackay.*—The reason for the apparently slow rate of progress which is revealed by the figures is that the present Toowong exchange is serving the whole of the area which will be served by the Sherwood exchange, and also a large portion of that which will be served by the Paddington exchange. A considerable number of subscribers' lines will be transferred from the Toowong exchange to the other exchanges mentioned when they are opened. Instead of the increase in eight years being about 600 lines, it would, if transfers were not made, possibly total 1,200 or 1,300. The development depends largely on whether an area to be served is a residential or a business area. Toowong is purely a residential area. The present number of subscribers in the whole of the metropolitan area of Brisbane is 12,564. Our estimates are based on that number being increased to 80,000 in twenty years. That the exchanges, when examined individually, do not appear to be making much progress, is due to the fact that the area they serve is being made smaller. I am satisfied that the financial results of this work will be satisfactory. We cannot do anything with the existing building to make it suitable for development. Even to provide for temporary extensions, considerable alterations have been found necessary.

15. *To Mr. Cook.*—Before the site for a new exchange is decided upon, maps are prepared of the whole of the area. An estimate is then made of the development in each block. We then find where the development is likely to be the greatest, and determine on a point in that area as being the theoretical centre. We then approach the Home and Territories Department to obtain a site as near as possible to that centre. Officers of that Department investigate the possibilities, and usually submit several sites, from which we make a selection. While we do not disregard price, we aim at getting a position as near the telephone centre as possible. Frequently, sites are purchased three or four years or more ahead of requirements. The policy of the Department is to look ahead as far as possible and purchase sites to meet that advance. I do not know the reason for the difference between the estimated costs of the building for this exchange and the Elsternwick exchange. It may be due partly to the ground levels. I believe, also, that the price of brick buildings in Brisbane is greater than in Melbourne. I am satisfied with the estimate of the possible extension during the next five years.

16. *To Senator Reid.*—The Brighton, Ivanhoe, and Heidelberg exchanges would serve similar districts to that which will be served by the Toowong exchange. I am unable, off-hand, to give the cost of the Brighton exchange. The number of calls made each day, and not the class of service, is, however, the determining factor. The quantity of automatic equipment placed in a telephone exchange is estimated entirely from the rate at which the subscribers use their telephones. First, we ascertain the rate at which the subscribers call each day. Then we ascertain the rate during the busiest hour of the day. Sufficient equipment must be provided to meet the demands of the busiest hour. There is always a good number of subscribers who call at the same moment, and it is essential that there shall be sufficient equipment to deal with them all. On that depends the cost of an automatic exchange. If the rate of calls is eight a day, more equipment must be provided than if four calls only a day are registered. The actual cost of the plant based on the number of subscribers would not vary, but more plant would be same moment. Business centres make the heaviest demands on the system. In Melbourne the subscribers to Central average eleven calls per line per day. At Windsor the number is about five, and at Ivanhoe and Heidelberg about three each. There is also a close relation between the calling rate and the number of subscribers connected. The greater the number of subscribers, the greater the calling rate. The Toowong exchange will

reach out towards Paddington, and ultimately will end at the river. It will go as far as the Indooroopilly Bridge. There will be a new exchange at Sherwood, which will serve an area now served by the Toowong exchange. We hope to open the Sherwood and Paddington exchanges at about the same time as the Toowong exchange is opened. On the other side the area served will reach to the cemetery. The Paddington scheme is now under consideration. These proposals are being proceeded with in their order of urgency. Paddington is now served by the Central and Toowong exchanges. Practically everything to the west of Milton Reach and Rosalie goes to the Toowong exchange, which reaches out towards St. Lutcin. The area on the other side is served by Central. I have not inspected the actual site chosen for the new exchange, but I know where it is situated. I know the district well. The slope of the hill may account for the higher cost of this exchange. I am unable, off-hand, to supply figures showing the number of persons who are waiting for service at Toowong.

17. *To the Chairman.*—The principal items making up the total capital cost of £57,000 are shown on the first sheet of the statement submitted by Mr. Crawford. The building itself is estimated to cost £9,100. The amount required for equipment at other exchanges would be trifling. Each new exchange which is opened necessitates certain equipment being provided at other exchanges, the cost of which is a proper charge against the new exchange. The main equipment will cost about £28,000, which is equal to about £18 or £19 a line. That is about the average price we have been paying, of late.

18. *To Mr. Mathews.*—Any losses are shown on page 2 of the statement under item 6—"Recoverable assets." The difficulty is that we must have a new exchange at Toowong, as we cannot carry on with the existing building or plant.

(Taken at Melbourne.)

FRIDAY, 26th SEPTEMBER, 1924.

Present:

Mr. GRZOOBY, Chairman;

Senator Barnes

Senator Reid

Mr. Cook

Mr. Jackson

Mr. Mackay

Mr. Mathews.

Andrew Lewis, Chief Mechanical Engineer, Department of Works and Railways, sworn and examined.

19. *To the Chairman.*—I have not seen the site of the proposed automatic telephone exchange at Toowong, but a copy of the plan is produced. The air conditioning plant is slightly smaller than those at Collingwood and South Melbourne. The building includes the main switch room, and is approximately 76 feet x 36 feet x 16 ft. 6 in. The proposed air conditioning equipment is capable of changing air in the switch room six times per hour, requiring 4,600 cubic feet of treated air per minute, as compared with 8,000 cubic feet at Collingwood. A continuous register will be provided along the main north wall of the switch room approximately 11 feet above the floor level for the ingoing air, and return registers are provided along the south wall capable of handling up to 50 per cent. of the ingoing air. The circulation is intended to be across the room. The velocity of the air across the main centre plane of the room approximates 5 feet per minute. The air requires the following treatment:—

Dust content eliminated.

Warmed as required to maintain the temperature inside the exchange at 60° to 65°F. with an external temperature at or above 32°F.

Cooled as required to maintain the temperature inside exchange at or less than 75° with an external temperature up to 100°F.

Moisture content regulated to maintain humidity at 65 to 70 per cent.

Constant motion of air in switch room with freedom from draughts.

The plant consists of a volume fan, washing and cooling chamber, water elimination battery, and heating battery. The air is washed to eliminate dust, &c., by passing through two banks of water spray spaced at 5 inches and 4½-inch centres. When in operation these sprays form two fairly thick walls of finely divided water particles in motion, one set being opposed to the air flow, and one set assisting the air flow. The dust removed from the air is carried down with the water to the cooling tank from which provision is made for sludging as required. The air will be passed between "Vento" heater units. Hot water is to be circulated through the inside of the heaters by means of a centrifugal pump, and the surface temperature can be maintained between 80°F and 200°F. as required. The heating battery has a maximum capacity of 200,000 British thermal units per hour, and is capable of raising the air temperature through 30°F. The air is cooled by direct contact with the spray water which is re-circulated in the system, being forced through spray jets by means of a centrifugal pump, having a capacity of approximately 1,400 gallons an hour. On leaving the sprays the water falls to a cooling tank under the washer casing, and passes over the refrigerating coils to the pump section pipe for re-circulation to the sprays. The cooling coils will have a capacity of approximately 80,000 British thermal units per hour, capable of reducing the spray temperature 6°F, which in turn is capable of reducing the air temperature through 13°F. In addition to the normal evaporation cooling effect, the air is passed through oil-filters consisting of deflectors having the surface maintained wet by means of scrubbing sprays. Surplus water in the form of spray or suspended water carried through with the air is deposited on these wet deflectors. To maintain the relative humidity or percentage of saturation of the air at 65 to 70 per cent. at comfortable temperatures, it is necessary at times to remove a portion of the water vapor content of the air. This surplus vapor is removed by condensation in direct contact with the spray water, which is cooled to a practical limit below the required dew point or saturation temperature. The vapor condensed is combined with the cooling water, and falls back to the tank. The estimated costs are as follows:—

Ductwork, registers, hangers, &c., erected	£370
Fan motor, foundations, &c.	180
Water heating boiler, pump, heater, piping and accessories, &c.	300
Washing sprays, eliminator plates, air conditioning battery, spray pump, and motor	500
Ammonia compressor and condenser, and refrigerating plant	1,550
Compressed air and vacuum cleaning plant	600
Total	£3,600

I do not anticipate any higher cost in the installation of air conditioning plants in Queensland than in Sydney or Melbourne.

20. *To Mr. Jackson.*—The geographical difference between the respective centres makes very little difference in the installation cost. In all cases not less than three, and in many cases six, tenders are obtained for each portion of the equipment, so that we could expect to make very little saving unless the equipment was ordered in large quantities. There may be a sufficient number of the 900 cubic feet plants to warrant us in standardizing that equipment.

21. *To Mr. Mathews.*—The refrigerating plant proposed is not the cheapest obtainable, but there is no more economical system. I know of no simple electrical device for cooling air.

22. *To Mr. Cook.*—The cost of washing air in Brisbane will be very little greater than in Sydney or Melbourne. Long periods of high humidity are experienced in Brisbane, and, therefore, the running costs will be slightly higher than in Melbourne owing to the plant having to operate for longer periods. As the plant will probably be used, anything up to 33 per cent. more in Brisbane than in Melbourne, its life will be correspondingly less. It would be unwise to install a cheaper plant than that recommended.

23. *To Senator Reid.*—So far we have not had two plants of exactly the same size in operation to enable a direct comparison to be made of the working costs in the different states, but a record is kept of details of the costs of different plants. The costs in Sydney are about 5 to 10 per cent. higher than in Melbourne, and in Brisbane they should be about 20 per cent. more than in Sydney. That, of course, is merely an estimate, because there is no plant running in Brisbane at the present time. All we have to guide us is the temperature and humidity records at Brisbane.

24. *To Mr. Mackay.*—The parts required for a plant of similar size to that recommended are being supplied by nine firms. All the equipment is locally made. One firm could be got to supply the whole of the vacuum cleaning plant. We have ordered vacuum producers and air compressor fans in batches of six, and spray pumps in batches of three. Where it is possible to get a number of parts at one time we obtain prices for such supplies as are approved. The slight saving in cost warrants ordering half a dozen parts at one time.

25. *To Senator Reid.*—There are four of these plants in actual service operation, and some five are now going through the testing stage. All work is of departmental design with the exception of the refrigerator. We have had as many as six firms competing on one tender, and for the supply of refrigerating plant as many as nine.

(Taken at Brisbane.)

MONDAY, 20TH OCTOBER, 1924.

Present:

Mr. Gazeony, Chairman:

Senator Barnes	Mr. Jackson
Senator Reid	Mr. Mackay
Mr. Blakeley	Mr. Mathews.
Mr. Cook	

Joseph William Sutton, State Engineer, Postmaster-General's Department, Brisbane, sworn and examined.

26. *To the Chairman.*—An examination of the site for the proposed automatic telephone exchange at Toowong has been made, and the Department is quite satisfied that it is a suitable one. It is at which we call the economic centre of the area that it is designed to serve. The total establishment will be 2,000 subscribers' lines, and the ultimate capacity approximately 4,000. We propose to erect a building that will enable 4,000 lines to be installed without additions or alterations. The present magneto manual plant at Toowong caters for subscribers in the Toowong, Sherwood, and part of the Paddington automatic exchange areas as designed in the recent survey. Extra switchboard equipment will shortly be installed which, when completed, will provide accommodation for approximately 1,900 subscribers' lines. This is the maximum number of lines that it is practicable to connect to the Toowong manual exchange, as the extension proposed represents the limit of the existing equipment, and the exchange room will then be fully occupied. Moreover, it is estimated 1,840 lines will be connected to Toowong by July, 1927, and the existing exchange equipment, which comprises magneto non-multiple "A" positions and multiple "B" posi-

tions, is entirely unsuitable for a comparatively large exchange, such as Toowong. The multiple "B" equipment was manufactured from second-hand material, and was only intended to be used for a few years, meeting development until modern exchange equipment, either C.B. manual or automatic, could be installed. In addition to having all the advantages of a modern up-to-date system, the installation of automatic equipment at Toowong will effect a saving in the annual charges of approximately £2 13s. per line, which amount will increase as the exchange grows. In addition, this comparison is made between a manual exchange providing only sufficient accommodation for immediate requirements, and incapable of being further extended, against an automatic exchange providing for five years' development and installed in a building which will accommodate twenty years' growth. The 1,000 lines of equipment will meet development in the Toowong manual area until about June, 1928, but before this date it is estimated an exchange will be established at Sherwood, releasing approximately 350 lines at Toowong, which will be sufficient to meet development until the automatic exchange is established in the Toowong area.

This proposal only considers the provision of automatic exchange equipment, as by June, 1927 (proposed date of takeover), it is estimated Central, Paddington, Albion, Newmarket, South Bulimba, and Yeronga exchanges will all be cut over to automatic working. The installation of one C.B. manual exchange is a modern automatic network is contrary to sound engineering practice and should not be considered. The annual charges for the present magneto manual system as at the 30th June, 1927, just prior to takeover, have been estimated, and are included in the proposal. It is estimated that there will be 2,000 lines connected to Toowong exchange by 1932. The cost of this site is £9,150. It is within our province to suggest the lay-out of the plant and the size of the building, but not the design. Specifications in regard to the air-conditioning plant were not submitted to my branch; that matter was dealt with by a separate Department. I am satisfied that the estimates of costs which I have furnished are approximately accurate. There may be a slight difference between them and the tenders. The revenue received from subscribers for the year ended 30th June, 1924, was £14,508. The reason for the lower estimate of profit compared with that for Brisbane Central is that this is a less thickly populated area, and we have had to put down a great deal of underground plant to provide for future extension. There is also a bigger margin of spares. I consider that the amount by which the revenue is estimated to exceed the expenditure at the 1st July, 1927, is satisfactory for the commencement. The real economy will be experienced in later years, as the number of subscribers is built up and the plant which we lay down is brought into fuller use. I am quite satisfied that the establishment of an automatic exchange at Toowong is justified. If we had the manual system at Toowong, and the automatic in other centres, there would not only be higher charges for the manual, but we would also have a system there which would slow down the service. That has been the experience in Sydney, where it is more difficult to get from automatic to manual than from automatic to automatic.

27. *To Senator Reid.*—In order to carry on we have had to erect a wooden extension to our present brick building. The whole of our equipment is in the upper story. We extended the apparatus and frames. There is not very much room for further extension. At the beginning of 1910 the number of subscribers in the Toowong area was 150. At the end of 1923, to which the latest figures have been compiled, the number was 1,350. When the new exchange is established, it will serve a smaller area than the present manual exchange. The site selected is the most economical from the point of view of outside plant. Our present extensions, with the assistance that will be given when Sherwood releases 350 lines, will enable us to carry on until the automatic

exchange is established in July, 1927. It is necessary to take action immediately if we are to effect the change-over by that time.

28. *To Mr. Mathews.*—The system at Toowong at present is what is called a non-multiple board, with multiple "B" positions. The incoming calls to Toowong are answered on a multiple position. The outgoing calls—i.e., the subscribers' calls—are attended to on non-multiple positions. Really it is a make-shift system that does very well with a limited number of subscribers. It provides a means whereby the non-multiple system can be made to serve a greater number of subscribers than it otherwise would. The fact that the site decided upon is at the junction of a number of roads will facilitate our work, because our main cable routes will converge right at the exchange site. The present exchange serves a larger area than will be served by the new exchange. Sherwood and Paddington exchanges will both relieve Toowong. It is estimated that Sherwood will give relief about the middle of 1926. Without it we would not be able to carry on at Toowong until the new exchange was established.

29. *To Mr. Mackay.*—The saving of £2 13s. a line to which I have referred relates to the lower costs under the automatic than under the manual system, after giving full consideration to interest on capital outlay, working expenses, and so on. Less length of line outside the building will be required. It must be remembered, however, that the new exchange will be at a different location, and there will be a different lay-out of the cables, and that will lead to greater economy. That is the advantage derived from putting the exchange at the copper centre. At the present time it is not at the copper centre. A few hundred yards makes all the difference when it is multiplied by thousands of lines. To effect the greatest economy in outside plant, you must put the exchange in such a position that the average length of copper conductor is the minimum that can be used to serve the area. We have already undertaken a great deal of expenditure in laying cables to the new site. If a good chemical or septic system is provided, exception cannot be taken to the lavatory accommodation adjoining the exchange buildings. With the ordinary pan system, a separate building would be required. It is proposed, I believe—I do not know officially—to have some chemical system. I regard that as being essential. I do not know to what use it is intended to apply the present exchange building. The present site is not in a suitable position for the extension that is required. The site must be at the copper centre in order to effect economy, and the copper centre is the site selected, or a point closer to it than the existing exchange. A few hundred yards does not seem much to anybody not conversant with the matter, but it means a considerable additional expenditure. Seeing that we have not the room to provide for our requirements at the present exchange, we may as well build at the copper centre. The cost of the land is nothing in comparison with other costs. We have adjusted the boundaries so that Brisbane Central is at the copper centre. It may not appear to be at the centre, because there is the river close to it on one side, but it is right in the dense part of the population. We have an enormous quantity of plant laid to that centre, and the cost of shifting it, even to the drill hall in Adelaide-street, would be very great. For years we have anticipated that this would be the new centre in Toowong, and we have laid underground cables to it. We could not think of shifting it now—that would mean throwing money away.

30. *To Mr. Cook.*—The Engineers' Branch in Queensland chose the site after a systematic survey of the district had been made to see what possibilities there were of additional subscribers coming in, and the districts from which they would come. When that information was plotted out, it indicated that the site chosen was the most economical one. If a wrong site were chosen,

it would result in a waste of money. Every precaution possible was taken to select the right site. It is the duty of the engineering staffs in the different states to have surveys made before recommending any site, and to recommend the most economical site. A good deal was said with the man who is chosen to make the survey, and the man who has to supervise it, because we have to depend upon the calculations that are thus made. The Chief Electrical Engineer pays us periodical visits, and discusses all technical matters with us. Unless Central Office is satisfied that our recommendations are in order, it will not go on with the work.

31. *To the Chairman.*—It is estimated that at the 30th June, 1927, the total annual charges of the existing manual equipment will be £18,353, and the estimated annual revenue £15,000. The plan of the proposed building is perfectly satisfactory to us. The only point raised has been in regard to the sanitary accommodation. Provided that a suitable sanitary system is installed, the arrangement will be quite satisfactory. Provision should be made for the proper ventilation of the lavatory accommodation.

The witness withdrew.

Ernest Harold Bourne, State Sectional Engineer, Brisbane, sworn and examined.

32. *To the Chairman.*—I have had several opportunities of studying the actual conversion of the telephone system from manual to automatic in Sydney and Melbourne, and I spent eight months during 1922 in Canada, the United States of America, Great Britain, and the Continent. I had opportunities there of meeting leading engineers connected with both the manual and the automatic undertakings, and of ascertaining whether the automatic system had real advantages over the manual system. For limited periods in the Sydney and Melbourne networks I have had experience of the automatic system. The bi-motional system, manufactured by Siemens Brothers and by the A.T.M. Company of Great Britain, impressed me most. The panel system adopted in the United States of America was peculiar to the conditions that existed there. In Great Britain the authorities were adopting the bi-motional system manufactured by Siemens Brothers and the A.T.M. Company, and, to my mind, that is the ideal system. The bi-motional system employs switches which operate in two directions—vertically and horizontally. The systems employed in Melbourne, Sydney, and Perth are bi-motional. The type of plant to be used should be determined by experts. If one type of plant were decided upon, there would be no danger that any one company would possess advantages over another company when tendering to our specifications, which are sufficiently wide to admit every tenderer. If the plants were not interchangeable, there certainly would be a danger of one firm obtaining a monopoly, if it held the patents for any particular type. Technically, it is quite possible to have plants that are interchangeable. It is not, however, desirable to have different types of plant, for the reason that, although they are more or less interchangeable, there are details in the designs which would render it necessary to hold duplicate parts. The specifications should be so prepared that we can have interchangeability. That is being done. For the South Brisbane plant tenders were received from the W.E. Company, the B.G.B. Company, Siemens Brothers, the A.T.M. Company, and the Chicago Automatic Electric Company. Those tenders were for the first of fourteen automatic exchanges to be installed in the metropolitan area. After examining the tenders, we decided that that which most nearly met our requirements had been put in by Siemens Brothers. We recommended acceptance of that tender, and it was approved by Central Office. It was a very low tender, the reason advanced by the company subsequently being that an error had been made by its Melbourne representative. The system adopted in the United States

excellently meets the complex traffic conditions of that country. The A.T. and T. Company generally is arranging that there shall be only one operating company in any network, so that there is no need for collaboration or co-operation between independent companies. Generally speaking, the trunk line system is supervised by the parent company. I think that the charges in Australia compare favorably with those in any country that I visited. The automatic system has been established for many years in Great Britain, but until comparatively recently the rate of conversion from manual to automatic operation has been retarded. While in Great Britain I ascertained that the reason for the slower introduction of the automatic system there was the heavy financial obligation involved, and the fact that during the war the greater part of the technical staff was occupied with war work. I was not given to understand that new manual equipment was installed in preference to automatic equipment because of the higher cost of the latter. I cannot supply figures, but I think that that would not be a reason for the delay in installing the automatic system in Great Britain. I have prepared a table which gives an outline of the exchanges that in Great Britain have now been converted to the automatic system. In Seattle and Omaha the maximum number of subscribers' lines in one building was 20,000. There is not, of course, technically any maximum that must be observed; that must depend upon the density of the population of any locality and the financial aspects involved. I am of the opinion that for economic reasons from 27,000 to 30,000 subscribers under one roof is about the maximum. I have not heard of any exchange under one roof with a greater number than 30,000 subscribers. That is the number connected to the exchanges mentioned, and in both cases the telephone density is great. The buildings generally are fireproof structures of brick or concrete reinforced with steel. There is a tendency now to introduce air regulation in automatic exchange buildings, particularly where the humidity conditions are severe. Dust and extreme humidity are the two great enemies of automatic plants. The dust lodges on the contacts of the switches, giving open circuits. To prevent dust entering exchange buildings, two methods have been adopted in both Great Britain and the United States of America. One, which seems to be quite effective, is that of creating a slightly higher pressure inside the switch room so that if a door is opened at any time the tendency is for the air to pass outwards, rather than for the outside dust-laden air to enter the building. In several cases double interlocking doors are provided; there is an ante-chamber with a door on either side, one leading into the switch room, and the other connecting with the street, and so arranged that when the one is opened the other is closed. I saw a number of the air-conditioning plants that were installed. Various systems were employed. Honolulu has a very simple means for regulating air. Honolulu is pumped in from the basement without purification of any kind. It enters a receptacle which applies a pressure of about 4 lbs. to the square inch. That air is passed through electrical resistances which heat it up to about 120 or 130 degrees Fahrenheit. It is distributed by means of galvanized iron ducts. Certain processes are employed in connexion with the refrigerator system of conditioning the air in buildings, the humidity and temperature being fixed. As the temperature of the conditioned air rises, it becomes comparatively dry and absorbs moisture in the switch rooms. Mr. Hubbel, manager of the Honolulu telephone service, informed me that they had not experienced insuperable difficulties in connexion with humidity. For Brisbane I should not recommend a system different from that which is installed in the Collingwood exchange. A similar system, I understand, has now been installed at

City North (Sydney). That system, I think, is the most satisfactory form of air regulation for an automatic exchange building in Australia. I saw air-conditioning plants installed in chocolate manufacturing establishments in the United States of America. So far as I know, there are no air-conditioning plants installed in the United States which are purely for the benefit of the employees. Wherever they are installed, they are primarily used in connexion with the product that is being manufactured. In Great Britain automatic plants are being installed in most of the big cities. One hundred thousand lines are now going in in London, and it is the intention of the British Post Office to proceed with the automatizing of London as early as is practicable. In Canada and the other countries that I visited the telephone system was controlled by the Government. I must admit that the system of the United States of America, which is not under Government control, is a good one. On the other hand, I found that in Great Britain and Canada the service controlled by the Government was very good. I did not visit Sweden.

33. *To Mr. Jackson.*—The air-conditioning system in use in Honolulu is much simpler than that which is proposed to install in Brisbane. I am of the opinion that the Honolulu system would be quite unsuitable for Australian conditions. Although Honolulu is very dusty, I think that Brisbane would take a lot of beating in that regard. Of all the cities that I have visited, I think that Brisbane is about the worst. In Honolulu the pumping of dry hot air into the switches is to reduce the moisture of the air in the room. I should say that the system employed in Honolulu would not cost one-third as much as an air-conditioning plant. At the same time, I do not think that it would be one-third as satisfactory. I consider that the refrigerator system of air regulation is absolutely essential for Brisbane. Siemens Brothers were given the contract for the plant in the South Brisbane exchange. No technical difficulty would be experienced in inter-operating the two bi-motional systems. Siemens Brothers' system operates on 60 volts, which is the highest voltage used in an automatic telephone system. We would have to vary the circuits in order to operate with a 48-voltage system in Central exchange. The principal disability, however, would be the need for stocking parts that were not interchangeable in the two systems. If the tenders are close, no doubt the recommendation submitted would be in favour of Siemens Brothers supplying the plant for Brisbane Central, because, even if the price asked by that firm were slightly higher, the annual charges would be lower, as it would not be necessary to carry so much stock, and the storage accommodation required would be less. It would also be possible to reduce the mechanical staff because of the standardization of plant and circuits. If the tender submitted by Siemens Brothers was high, we would certainly consider tenders from other companies.

34. *To Mr. Mathews.*—The doors to which I referred were single doors. When the door leading to the inner chamber was opened to admit a person, the outer one was closed. The air in the ante-chamber being stationary, there is small tendency for draughts to introduce dust. There appeared to be unanimity amongst subscribers in the United States of America in favour of the automatic system. Exchanges all over America are now being converted to the automatic system. I was informed by the head of the A.T. and T. Company that that company and its dependent companies were proceeding with the conversion to the automatic system as fast as their finances would permit. No difficulty is experienced in testing the meter equipment.

35. *To Senator Reid.*—My experience is that the automatic system gives the best service, and it is being, or has been adopted in the majority of countries where telephone service has been introduced. With the manual system the operating charges are a big bur-

den. That is why the charges in Brisbane are so extremely heavy compared with automatic. The automatic system will give a better and a cheaper service to the public. There is hardly a likelihood of a monopoly securing control in Australia. In the United States of America, the A.T. and T. Company is a monopolistic concern. There are a number of independent companies, but they collaborate closely with the A.T. and T. Company. Out here I do not think there would be that danger. The manufacturers who are interested—the Western Electric Company, the B.G.E. Company, Siemens Brothers, the A.T.M. Company, Liverpool, and the American Automatic Electric Company—so far as I am aware, are independent companies, each being eager to secure business. I do not think there is a likelihood of the A.T. and T. Company obtaining control in Australia. I think that the air-conditioning plant installed in Collingwood exchange is an excellent one. There is not a great deal of difference between the humidity conditions in Brisbane and Sydney. Our periods of humidity are rather longer, and they, therefore, exercise a more severe effect on the insulation. I have not seen any plant that has been installed solely for the benefit of the employees.

36. *To the Chairman.*—If the humidity exceeds 70 to 75 per cent, it is essential to have air regulation. I think that the charts in the possession of the committee, showing the humidity conditions in Brisbane, demonstrate the extreme need there is for humidity regulation. We at present have great trouble with the manual system in the central exchange, which is operating on only 24 volts, compared with 60 volts under the automatic system. The higher the voltage, the severer the effect of humidity. The hands of the operators are moist in the summer season, and when they handle the switches or cords the tendency is to lay down the insulation of the cords. In considering the advisability of air-conditioning the fourth and fifth floors, the primary consideration is one of policy. So far as I am aware, there is no place in Brisbane, or in any city that has similar humidity conditions, in which an attempt has been made to regulate the internal conditions of the living rooms for the benefit purely of the employees.

37. *To Mr. Cook.*—Since the amount is not great, the expenditure may be warranted, in order to determine definitely whether air regulation for other than switching plant has advantages. The system that has been installed in Collingwood is a good one. The impression it leaves with me is that it is a benefit to the equipment rather than to the operators handling the equipment. I am quite convinced that air conditioning will prolong the life of a plant. I should not like to say it improves the efficiency of the employees. If the conditions outside are extreme, I can imagine the reverse being the case. If you regulate the temperature inside the building to 75 degrees Fahrenheit, with a humidity of 70 per cent, the conditions would be comfortable to work in, but upon leaving the building extreme atmospheric changes might be encountered, causing sickness. So far as I am aware, air regulation has not prejudicially affected the health of the maintenance staff. I have not heard any complaint that it has. It has been for the protection of the plant solely that air regulation has been introduced in automatic exchanges. That was my experience abroad. There is an increasing tendency to adopt measures for regulating humidity. The atmospheric conditions in the places that I visited abroad, where air regulation plants were installed, were similar to those of Brisbane, Sydney, and Melbourne, but particularly to the two former.

38. *To the Chairman.*—I think there is the possibility of pulmonary troubles being contracted by those who work in rooms that are air-conditioned, and being subjected to extreme atmospheric changes upon leaving the building. I have not, however, heard of complaints being made by maintenance officers that the change of

temperature upon leaving the building has adversely affected their health. Whilst I was in the United States of America, I spent four hours in the West street laboratories of the A.T. and T. Company, where they were treating switchboard cable required for use in tropical belts. Their idea was to find out what effect high humidity had upon the insulation that they were using in cable construction. The conditions inside were uncomfortably warm, but when I came out of the building the temperature was 50 degrees Fahrenheit, and the result was that I had to stay in bed for a week afterwards. Those conditions certainly were extreme.

39. *To Mr. Jackson.*—The temperature inside the building would not necessarily approximate to that outside. The idea is that the humidity inside should not exceed 70 per cent.

40. *To the Chairman.*—The chart certainly shows quick changes from a high temperature to a low temperature in the outside atmosphere. Those changes, however, would not be as sudden as a person would experience when leaving a room and going into a totally different atmosphere outside. If a change from 80 degrees to 60 degrees occurs in one or two hours, as in the cases cited, one has time to become accustomed to the altered conditions.

41. *To Mr. Jackson.*—If the money is available, it might be a good idea to give the air regulation of the fourth and fifth floors a trial.

42. *To Senator Reid.*—I have not noticed any substantial difference in the amount of work in winter and summer. I find that the units of work practically do not change throughout the whole year. I admit that the conditions in winter are different from those that exist in summer.

The witness retired.

Herbert Hartley Sugden, Assistant Manager Telephones, at present Acting Manager Telephones, Brisbane, sworn and examined.

42a. *To the Chairman.* On the 1st January, 1920, there were 818 lines connected to the Toowoong exchange. This has grown steadily, year by year, until on the 30th September, 1924, 1,423 lines terminated thereat. The percentage growth in 1922 was at the rate of 9.7 per cent.; 1923, 13.8 per cent.; 1924, 13.2 per cent. After certain additional switchboard equipment has been installed at Toowoong, the accommodation at that exchange will provide for 1,900 subscribers' lines. This represents the maximum equipment that can be provided in the present building. By July, 1927, it is estimated that 1,840 lines will terminate at that exchange. The present exchange is practically a make-shift arrangement, the boards being manufactured from second-hand material, and only intended for use for a few years. The exchange is growing rapidly, and to meet development, and also to meet the requirements of an exchange of its present capacity, a more modern building is being erected. The installation of an up-to-date plant is necessary. The automatic equipment at Toowoong will be an economical arrangement and a saving in the annual charges. An automatic exchange readily lends itself to quick installation of additional plant as required. This is a very important advantage of automatic equipment. Although it is the intention to increase the capacity of the Toowoong exchange to 1,600 lines, which will meet development until June, 1926, the establishment of a streetward exchange in the meantime will release 350 lines at Toowoong. This will enable development to be met until an automatic exchange is established in June, 1927. Owing to the rapid telephonic development in the metropolitan network, it is essential that early provision should be made to meet the growth. This should be done by the building of an up-to-date exchange, which should be entirely fireproof. Moreover, I am strongly of the opinion that all branch exchanges should be automatic. It has already been decided to establish automatic at the other most important exchanges. This being so, no other class of equipment

ould be considered, as it is impossible to have an efficient telephone service where there is a mixture of systems in the same network. We are asking for other automatic exchanges in the Brisbane metropolitan area in addition to this exchange. It is not within our province to estimate the cost of exchanges, but it is estimated that this will cost £27,000, and that at Brisbane Central will cost close upon £500,000. I am quite satisfied that the establishment of this exchange is an important matter. The present plant, being of a make-shift nature, is unable to cope with the business. If this proposal were not approved, the Department would have to build another manual exchange.

43. *To Senator Reid.*—There is room on the present site if it were found necessary to do that.

44. *To the Chairman.*—Even though the finances were not sufficient to establish all the exchanges that are being asked for in the Brisbane network, the Toowoong exchange should receive immediate consideration. I have been through the statement showing the estimated revenue and expenditure, and I think the estimates are reasonable. We will have no staff there, either for ordinary or trunk-line work. Subscribers making a trunk-line call will simply call Central trunk line.

45. *To Mr. Blakeley.*—We will not be concerned with the air-conditioning plant. I had nothing to do with the selection of the site.

46. *To Mr. Jackson.*—At present the Telephone Manager is not consulted when a site is being selected for a metropolitan exchange. After the automatic plant has been installed, the only question with which we will deal will be the traffic with the manual exchanges. The Telephone Manager has jurisdiction over manual but not over automatic exchanges. Trunk calls, information calls, and complaints in regard to the working of the system, will come to Central. The telephone manager will deal also with written complaints. I cannot say that I should have been consulted regarding the site. The extent of the telephone manager's jurisdiction is at present being considered by Central Office. The selection of sites is not yet, therefore, a matter for the Traffic Department. It is purely the function of the State Engineer at present.

47. *To Senator Reid.*—When our accommodation is becoming exhausted, we draw attention to the overcrowding, and the engineer takes steps to meet our requirements. We deal only with manual exchanges. We will have nothing to do with the staff at the Toowoong exchange, as it will consist only of mechanics.

I consider that a new exchange is necessary at Toowoong, and, as we have commenced to install automatic exchanges, it is wise to continue that policy at Toowoong. The network of exchanges that has been laid down for Brisbane has my approval. I cannot say whether the site chosen at Toowoong is the right one. Our capacity at Toowoong is not yet exhausted. We still have a certain amount of room for expansion, but the space available will be fully occupied by the time that the automatic system could be installed. We would then require either a new manual exchange or an automatic exchange. I prefer the latter.

48. *To Senator Bates.*—Even though Sherwood releases 500 lines, the capacity at Toowoong will be fully exhausted by June, 1927. There is provision for 1,900 lines. With the development that is expected to take place in the next three years, that provision will be exhausted at the date of the cutover.

49. *To Mr. Mackay.*—The first automatic exchange in the Brisbane area will be that at South Brisbane. It will be followed by Albion and Newmarket. I do not think that delay would be caused to those works if Toowoong also were taken in hand. It is the policy of the department to first construct the works that are already authorized. The South Brisbane exchange will be opened about April or May of next year. That is the date which has been furnished by the State Engineer. The automatic and the manual systems can be worked in conjunction, but delay is caused, and there is a

possibility of the service being somewhat inefficient. The policy of the department, therefore, is to make the whole of the Brisbane area automatic as early as possible.

50. *To Mr. Cook.*—Our expectation that we will be able to carry on until 1927 has been based upon the development that has taken place in the past. For 1924 the increased business amounted to 13.2 per cent. The percentage of growth is increasing year by year. The more subscribers you have connected to an exchange, the greater is your percentage increase each year. A rapid expansion is, of course, possible, but we have gone back sufficiently far to arrive at a workable basis for computing the probable increase in future. There is not at present a great number of people waiting to be connected to the Toowoong exchange. That applies also to the Brisbane area generally, although there are certain congested areas. I think that in that matter we are better off than the other capital cities.

51. *To the Chairman.*—If there were at Toowoong a fairly up-to-date manual exchange, with ample room for expansion, it could be worked in conjunction with automatic exchanges. That is done in Melbourne, Sydney, and Perth. No great difficulty would be experienced by those connected with an automatic exchange in obtaining a subscriber's number on the Toowoong exchange. But our view is that the system at present installed at Toowoong does not allow room for expansion, and after 1927 we would not be able to meet the requirements of the people in that district unless we had either a big manual plant or a new automatic system. There is full collaboration between the telephone manager and the electrical engineer. The latter should have the selection of sites, as he is in charge of the cables and electrical engineering work generally. Even when the whole of the Brisbane area is under the automatic system, the telephone manager will still have to administer the remainder of the state. Complaints of ineffective service will still go to the telephone manager. 52. *To Mr. Blakeley.*—The State Engineer is responsible for determining whether an area is scientifically mapped out. I am not consulted with regard to the metropolitan area, but in the case of some country centres, where it is more a rental proposition, my department has been consulted as to the site for an exchange. Our functions are defined by the Central Administration, and the selection of sites for exchanges is not one of them. We are not responsible for the efficiency of automatic exchanges, or the control of the mechanical staff. Only the operating staff is under our jurisdiction. There are mechanics in both the manual and the automatic exchanges, but with the automatic there are no operators.

The witness retired.

Harold William Barker, Acting Works Director, Department of Works and Railways, Brisbane, sworn and examined.

53. *To the Chairman.*—I prepared the designs for the building for the automatic telephone exchange at Toowoong. Information relating to the space required in the various portions of the building was supplied to me by the Postmaster-General's Department, Brisbane. That department furnished me with particulars relating to the space necessary to accommodate the automatic plant and the air-conditioning plant. I prepared the plans after an inspection of the site. The proposal is to erect a fireproof building. The site is situated on the corner of Church-street and Kensington-terrace, with a frontage to Church-street of 66 feet, and a depth of 148 ft. 6 in. The main building consists of—Switch room, 70 ft. 6 in. x 36 feet; battery room, 32 feet x 15 feet; air-conditioning room, 29 feet x 15 feet; luncheon room, 20 feet x 15 feet; and sanitary block. A detached building at the rear of the site consists of—Bin store, 25 feet x 13 feet; inspector's room, 16 ft. 6 in. x 11 feet; and linemen's room, 13 ft. 6 in. x 10 ft. 6 in. The building is of fireproof construction, with hollow brick walls, con-

crete floors and ceilings, and steel windows. The flat roof for the battery room and air-conditioning room lends itself to the design of the building, but it is not an absolute necessity. A sketch of the building has not yet been prepared. Complaints have been made regarding the type of building erected in South Brisbane, but I think that the public disregard the fact that it is not, strictly speaking, a public building. I think that Commonwealth buildings should have a reasonably good appearance, but, after all, it is to a great extent a matter of taste. The roof of the switch room will be of iron on a wooden construction. The ceiling will render that room fireproof. The eave will overhang the walls by about 4 feet, and will be lined on the under side with wood battens. The climate is principally responsible for such an overhang being provided, as it affords protection from the heat. I do not think it will increase the fire risk. The site is a corner one, and on the street side the building will be well protected. On the other side it is unlikely that buildings will be erected. It is in a residential centre. In any case, the land adjoining the cart-way is very much lower than that of the site. I do not think that the overhanging roof will constitute any danger. There is no likelihood that the reinforced concrete ceiling would be destroyed if a fire broke out in the roof. I think that the committee can confidently recommend the erection of a building with the overhang provided, in the belief that it will not increase the fire risk. The switch room is the outstanding portion of the front of the building, and it will be more in keeping with the design to have a flat roof than to have a pitched roof. With the exception of three windows in the main portion of the building, the front will be a blank. The battery room, facing the street, will also be a blank. The building will be quite a presentable one. It will be of brick, whereas the buildings in its vicinity are of timber construction. Even though it has a fairly plain exterior, the bricks that are procurable in Brisbane will give it quite a pleasing appearance. One entrance to the switch room is at the back of the building, and on the side. That is the side is designed principally for the entrance of employees. Since visiting the site with the committee on Saturday, I have come to the conclusion that the entrance at the back could be done away with, and another made in Kensington-terrace. The ramp and stairs could be taken down, thus, making available space at the back for the storage of material.

Future extensions could then be made to the building without taking down work that had already been done. I would put the entrance at the position chosen for the second or third window. It would be at a higher level than the floor of the switch room, but there would be no difficulty in getting switching gear into the room. If the door were allowed to remain open, dust would enter the building, but I understand that the practice will be to keep it closed. There will be another entrance from the cart-way, and the side. The door at the end of the switch room will be used only on rare occasions to allow material to be taken into the building. The steps and ramp at the rear of the building are provided in order to prevent the possibility of water gaining access to the switch room through the back door. It is not proposed to ventilate and air-condition the lavatory. I do not think that that is necessary. The system of sanitation provides for chemical closets of the Kaustine type. Fresh air can be obtained in the lavatories by opening doors, windows, and louvres. That would be permissible if an air-conditioning plant were installed, as it would upset the operation of the plant. I hardly think it necessary to extend the ventilation provision to the lavatory accommodation. There is another point that has to be considered. There is an outside door to the lavatory, so that the linemen can go in and make use of it. Every time that was opened it would affect the air-conditioning plant. In Brisbane we are paying £5 15s. a thousand for common bricks delivered on the site. Building is much more expensive in Brisbane than it is in Mel-

bourne. Materials are not so easily obtained, and there is not the same amount of competition. Most of the steel work erected in Brisbane comes from either Sydney or Melbourne. Bricks are dearer here than they are in the south. I understand that they are about £4 6s. a thousand in Sydney. We carry out these works by contract. We usually get plenty of tenders for our work in the city, but in country districts difficulty is often experienced. There will be no difficulty in providing a reinforced concrete ceiling 36 feet in width, without uprights. The South Brisbane exchange has a span of 35 feet. The switch room at South Brisbane is a longer room than is provided for here. From memory, I think its length is about 115 feet.

54. *To Senator Reid.*—I should say it would not be very expensive to air-condition the lavatory and the luncheon room. The three main rooms have to be air-conditioned. The site offers no difficulty from the point of view of construction. The walls of the building will be of brick, and the ceiling of concrete. I have not had any experience of air-conditioning plants. That at South Brisbane is the first automatic exchange that has been erected in Queensland. The building there is nearly completed. The level of the switch-room floor at Toowoong had to be made to suit the nature of the ground and the street frontages. It is below the ground level at the back. It is more economical to provide a ramp, because a considerable amount of brick work is thereby saved. The expense that would have to be incurred when the switch room was extended could be saved, and storage space provided for materials, if the entrance to the switch room were in Kensington-terrace. I favour doing away with the ramp and the steps at the back, and having a window there in place of the door. The staff entrance is from the cart-way, and it has outer and inner doors. The outer door will be closed before the inner is opened, thus obviating the possibility of dust entering the switch room. There is an entrance to the switch room through the luncheon room.

55. *To Mr. Mackay.*—It might be more economical, so far as building costs are concerned, to have a two-story building, but I cannot say whether the exchange could be run as economically. The shape of the site practically precluded me from designing any other type of building, and at the same time allowing for future extension. The higher price that it is estimated to cost, compared with other exchanges in the south, is due to the fact that building costs are considerably greater in Brisbane. The estimate for this building has been based upon the tender for the Albion exchange, for which a contract has been let. That was £13,163. As that tender was accepted only a few weeks ago, it gives a pretty fair idea of present building costs. The plans for the Albion exchange were drawn up in Brisbane. The department's estimate of the probable cost was £14,657. Four tenders were received, ranging from £13,163 to £15,614. The estimate for the building at Toowoong was based on the lowest tender, as it will be similar in construction. The cubical content at Toowoong will be 103,096 cubic feet. At Albion it is probably 50,000 cubic feet greater. The foundations at Albion are very much deeper. This is a very good site so far as foundations are concerned.

56. *To Senator Reid.*—I have not comparative prices for materials in Brisbane and in the southern cities, but I have the Brisbane prices. Common bricks cost £5 15s. a thousand, faced bricks £7 10s. a thousand. Steel rods for reinforcements range from £15 15s. to £17 5s. a ton. Cement is £5 17s. a ton. Metal for making concrete is 15s. a cubic yard. Sand is 12s. 6d. a cubic yard; gravel, 12s. 6d. a cubic yard; pine, 50s. per 100 feet super; hardwood, 40s.; and Oregon pine, 50s. Corrugated galvanized iron, 24 g., is £28 10s. a ton, and plain iron of the same gauge is £30 5s. a ton. Rolled steel, for ordinary building purposes, is £28 10s. per ton. Earthware drain pipe range from 11 to 12 inches. Fibro cement sheeting is 3s. a square yard; roofing tiles (Marsellos pattern) £26 a thousand, and

single tiles £10 a thousand. I do not know of any combine dealing in bricks and cement. I think there is an agreement among the brickmakers in regard to price. The timber merchants also have a standard price. There is only one manufacturer of cement in Queensland, and a lot of cement is imported here. I think the price of the imported is about the same as the local cement. Japanese cement may be a little cheaper, but it is also a little inferior. The local cement compares very favorably with the imported. Employees in the building trade are all classified under one award, and receive a weekly wage of £5 15s. 6d. for 44 hours. ~~But~~ labourers receive £4 17s. 2d. They are the only employees who are outside the general award. Casual employees receive an additional 4d. an hour if they are engaged for a period of less than 44 hours. A labourer engaged in mixing and depositing wet concrete gets an extra 1s. a day. Payment is not made for holidays. It was at one time, but recently a fresh award has come into force. All time worked in excess of the ordinary hours on any day is deemed to be overtime. Generally speaking, the tenders received for our works are fairly close, especially when there is keen

competition. In country districts, however, the variation between the tenders is sometimes considerable. There are not many tenders put in for country work. Occasionally there is only one, and at times we do not receive any at all. We are erecting the South Brisbane exchange by day labour, but it is not the practice to do our work under that system. Usually only maintenance work is done by day labour. I think it is cheaper if the work is done as efficiently and quickly as it is by contract, because the contractor's profit is saved.

57. *To the Chairman.*—The department expressed a desire to have a door at the rear of the building to allow them to take equipment in at any time. I have seen some of the equipment for the South Brisbane exchange. It came in large cases, and was very heavy, and the desire is to have as easy an access as possible. The probability is that they would be able to get in more readily from Kensington-terrace. There is a door from the cart-way on to a landing. You then go up five steps to another landing, where there are double doors. It will really be a small porch. Even if the street door is open, the others will prevent dust from entering the switch room.