1922.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

Laid on the Table by ~~the~~ Clerk of the Senate
by Senator Newland

Pursuant to Statute
By Command

PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

Clerk of the Senate.
12-7-22

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED

ESTABLISHMENT OF AN AUTOMATIC TELEPHONE EXCHANGE

AT

COTTESLOE, WESTERN AUSTRALIA.

Printed & Published for the GOVERNMENT of the COMMONWEALTH OF AUSTRALIA by ALBERT J. MULLETT, Government Printer for the State of Victoria.

F.1681.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

Third Committee.

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

Senate.	*House of Representatives.*
Senator Hattil Spencer Foll.*	Llewelyn Atkinson, Esquire, M.P.‖
Senator George Henderson.†	The Honorable Frederick William Bamford, M.P.
Senator John Newland, Vice-Chairman.†‡	David Sydney Jackson, Esquire, M.P.¶
Senator Edward Needham.§	George Hugh Mackay, Esquire, M.P.
Senator William Plain.*	James Mathews, Esquire, M.P.
	Parker John Moloney, Esquire, M.P.

* Appointed 28th July, 1920. † Resigned 22nd July, 1920. ‡ Re-appointed 23th July, 1920. § Ceased to be a Member of the Senate. 30th June, 1920. ‖ Resigned 13th May, 1921. ¶ Appointed 19th May, 1921.

INDEX.

LIST OF WITNESSES.

EXTRACT FROM VOTES AND PROCEEDINGS OF THE HOUSE OF RERPESENTATIVES.

No 204 OF 6TH DECEMBER, 1921.

19. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—AUTOMATIC TELEPHONE EXCHANGE, COTTESLOE.—Mr. Groom moved, pursuant to notice, That, in accordance with the provisions of the *Commonwealth Public Works Committee Act* 1913-1914, the following work be referred to the Parliamentary Standing Committee on Public Works for its investigation and report thereon, viz. :—Automatic Telephone Exchange and Equipment at the following place in Western Australia :—Cottesloe.

Mr. Groom having laid on the Table plans, &c., in connexion with the proposed work.

Question—put and passed.

AUTOMATIC TELEPHONE EXCHANGE, COTTESLOE, WESTERN AUSTRALIA.

REPORT.

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

PROPOSAL.

1. The proposal submitted to the Committee is to erect a telephone exchange building at the corner of Clive-road, Congdon-street, and Claremont-avenue, Cottesloe, on a site which has been acquired by the Commonwealth, and to install therein an automatic switching system having an immediate equipment of 1,400 subscribers' lines and an ultimate capacity of approximately 2,300 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 this area for a period of at least 15 years.

REASONS FOR THE PROPOSAL.

2. The present subscribers are served by a non-multiple magneto switchboard which is said to be quite unsuitable for a multi-exchange network such as exists in the Perth metropolitan area. A recent survey of the area shows the theoretical centre to be approximately at the site which has been acquired, and by the establishment thereon of a thoroughly up-to-date exchange it is claimed that an efficient service can be rendered to present and prospective subscribers and that, further, much wasteful expenditure on line plant can be eliminated.

ESTIMATED COST.

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

	£
Site (already acquired)	120
Building	4,500
Air-conditioning, heating, ventilating, vacuum cleaning and air compression plant	3,000
Exchange equipment, including that necessary at other exchanges	29,835
Equipment for subscribers' premises	6,611
Line plant (conduit cables and aerial lines)	310
Diversion of external line plant	150
Cut-over of equipment	50
Total	£44,576

COMMITTEE'S INVESTIGATIONS.

4. To expedite consideration of this matter a sectional committee was constituted and visited the site and inspected the area, which the proposed installation is designed to serve. Evidence was taken in Perth from the Deputy Postmaster-General, the State Engineer, and the Manager of Telphones, in regard to the proposal, and from the Acting Chief Architect, State Public Works Department, Perth, and the Chief Commonwealth Architect, Melbourne, in regard to the building proposed to be erected.

5. *Site.*—It was ascertained in evidence that the position of the existing telephone exchange is nearly a mile distant from the actual telephone centre, so that, in the interests of economy, it was necessary to acquire a site nearer to the theoretical telephone centre. The land acquired is said to be approximately at the theoretical centre and, in the opinion of the Committee, it is suitable for the purpose for which it is intended, and the price paid was reasonable.

6. *Building.*—Having examined the plans of the proposed building and heard the explanation furnished by the Chief Commonwealth Architect, the Committee is satisfied that the structure has been designed with due regard to appearance and economy. It is thought, however, that as an additional safeguard to the valuable machinery to be installed, and as a means of tempering the heat of summer, the expenditure of an additional sum of approximatly £150 for the purpose of replacing the proposed galvanized iron ceiling by one of concrete, would be justified, and the Committee recommends accordingly.

7. In connexion with the building, it has been noticed that certain details of the structure have been altered during the short period that this proposal has been under consideration by the Committee. For instance, the cables will now be brought in from Congdon-street instead of Clive-road, as originally proposed, and it is now intended to provide a mechanics' store at a cost of £103. This points to a lack of co-ordination between the officers of the Postmaster-General's Department and of the Works Department intrusted with the preparation of the plans. It is realized that, when the actual installation of the machinery is taking place, some minor modifications of the building may be necessary, but other matters should have been finally settled before the reference was submitted to the Committee.

8. *Fire Risk.*—Having recommended the construction of a concrete ceiling in lieu of a galvanized iron ceiling, the Committee is of opinion that, by reason of its situation and the distance between the proposed building and adjoining structures, there is no undue risk of fire from outside sources. Information was obtained that the water main in the Perth-Fremantle road adjacent to the proposed building is of 8-in. diameter, and the Committee agrees with the recommendation of the local Fire Brigade officials that a stand-pipe be erected in the street with water service inside the building, and a hydrant in the position suggested by them.

9. *Financial Aspect.*—Evidence showed that the annual working expenses of the existing system at Cottesloe, as at 1st June, 1923, would be £5,142, while the annual working expenses of an alternative common battery manual system as at 1st June, 1923, would be £5,875. As against this, the annual working expenses under the automatic at the same period would be £4,286. The total estimated annual charges under the proposed alternative common battery manual system, as at 1st June, 1928, is given as £16,856, and under the proposed automatic system at the same date would be £14,303, while under the automatic the estimated revenue as at 1st June, 1928, is set down at £15,861. It was also ascertained that the assets recoverable or thrown spare if the automatic telephone exchange be installed would have a recoverable value of £3,000.

DECISION.

10. Under these circumstances, the Committee, in view of the generally recognised advantages of the automatic system and the lower annual cost which will result to the Commonwealth by its installation at Cottesloe, recommends that the proposal as submitted be approved.

H. GREGORY,
Chairman.

Office of the Parliamentary Standing Committee on Public Works,
Parliament House, Melbourne, 31st May, 1922.

MINUTES OF EVIDENCE

(Taken at Perth.)

THURSDAY, 26TH JANUARY, 1922.

SECTIONAL COMMITTEE.

Present:

Mr. GREGORY, *Chairman;*

Senator Newland, Senator Plain, | Mr. Mathews.

John Joseph Lloyd, Deputy Postmaster-General for Western Australia, Perth, sworn and examined.

1. *To the Chairman.*—I am aware that the question of constructing an automatic telephone exchange at Cottesloe has been referred to your Committee for investigation and report. We have an automatic exchange at Perth, and, for the information of the Committee I shall give some particulars of the conditions under which the recommendation under consideration was made. The proposal is to erect a telephone exchange building at the corner of Clive-road, Congdon-street, and Claremont-avenue, Cottesloe, on a site which has been acquired by the Commonwealth, and to install therein an automatic telephone switching system having an immediate equipment of 1,400 subscribers' lines and an ultimate capacity of approximately 2,300 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 this area over a period of at least fifteen years. The present subscribers are served by a non-multiple magneto switchboard, which is quite unsuitable for a multi-exchange network such as exists in the Perth metropolitan area. A recent survey of the area shows the theoretical centre to be approximately at the site I have already named, and by the establishment thereon of a thoroughly up-to-date exchange an efficient service can be rendered to present and prospective subscribers. Further, much wasteful expenditure on line plant can be eliminated if the project be approved. Details of the estimated cost are as follows:—Site, £120; building, £4,500; air-conditioning, heating, ventilating, vacuum-cleaning, and air-compression plant, £3,000; exchange equipment, including that necessary at other exchanges, £29,835; equipment for subscribers' premises, £6,611; line plant, including conduit, cables, and aerial lines, £310; diversion of external line plant, £150; and cut-over of equipment, £50; making a total of £44,576. The revenue derived and the revenue it is estimated that will be obtained on the date of transfer, namely, the 1st June, 1923, and with five years' development, is as follows:—Subscribers' lines connected on the 30th June, 1920, numbered 798, and the annual revenue received on that date was £7,028. The estimated number of subscribers lines on the 1st June, 1923, is 1,000, and the estimated annual revenue at that date has been set down at £11,329. The estimated number of subscribers' lines on the 1st June, 1928, is 1,400, and the estimated annual revenue at that date, £15,861. 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 1,400 lines, but the building will be designed sufficiently large to accommodate an equipment of a capacity of approximately 2,300 lines. The proposal for a new exchange at Cottesloe was submitted on the 13th October, 1920. *The matter, however, had been discussed prior to that* date, and attention drawn to the necessity for action and the desirableness of procuring a suitable block whilst land was cheap. The new exchange equipment at Cottesloe was suggested because the existing equipment is obsolete and is nearing the end of its useful economic life. Moreover, the present building in which the equipment is housed is radially about 1 mile from the actual telephone centre. In the event of the proposal being approved, and provided the building is ready, the work of installation, both at the exchange and at subscribers' premises, should not occupy over four months. The date the Department is required to work to is the 1st June, 1923, as that is the date which will best fit in with the capacity of the existing building and the equipment arrangements. Up to the time of the installation of the automatic system at the Perth Exchange the service had not been altogether satisfactory, as the equipment was insufficient for the need. During the last two years the number of subscribers has considerably increased, and, largely owing to the shortage of material which was required to extend the system, the service has not been as satisfactory as it otherwise would have been. Material that has been on order for some time is expected at an early date, and when the equipment is brought up to our requirements no fault will be found with the system. Generally speaking, the Automatic Exchange, Perth, has given every satisfaction. The proposed automatic exchange at Cottesloe will be an independent exchange, and will, to some extent, relieve the work at the Perth Automatic Exchange by taking over some of the subscribers in certain suburbs At Fremantle we have a common battery exchange which is giving satisfaction. Cottesloe has to be provided with a separate exchange, and cannot very *well be worked from Fremantle. It is our policy, of* course, to eventually convert all our exchanges to the automatic system, because, having incurred the expenditure in connexion with the Perth Exchange, and having decided in favour of the installation of the automatic system at Cottesloe, it is necessary to eventually make the whole system uniform. The Chief Engineer was responsible for selecting the locality in which the proposed exchange is to be constructed. A central spot was selected in order to make the service more economical than it would otherwise be. The building is to be of brick, and is to be constructed of fire-resisting materials. At the time of the cut-over, the revenue is estimated to be £11,329, and the expenditure £44,576. Some of the material at present in use may be used in the new building, but other material will be utilized elsewhere. The cost which I have given is, of course, only an estimate, and no doubt other charges will have to be added to it. I shall endeavour to supply the Committee with the actual capital cost of the exchange when

completed. I have been advised that the estimated saving in 1923 will be £1,800, and in 1928 £2,553. The financial aspect of the proposal is as follows:—

	£	Five years after cut-over. £
1. Capital cost now	44,676	59,938
2. Capital cost, new, and *in situ*	76,118	91,490
3. Annual working expenses of existing manual system as at 1st June, 1923	5,142	
4. Annual Revenue—		
Actual, 30th June, 1920	7,028	
Estimated, 1st June, 1923	11,329	
Estimated, 1st June, 1928	15,861	15,861
5. Annual working expenses of proposed automatic system as at 1st June, 1923 ..	4,286	5,196
6. Total annual charges proposed automatic system as at 1st June, 1923	11,901	14,303
7. Annual working expenses of alternative common battery manual system as at 1st June, 1923	5,875	7,159
8. Total annual charges proposed alternative common battery manual system as at 1st June, 1923	13,779	16,866
9. Capital which it will be necessary to expend on existing manual system if an automatic exchange is not installed	1,206	
10. Assets recoverable or thrown spare if automatic exchange is installed—		
Book value	7,453	
Recoverable value	3,183	
Cost of recovery	225	
11. Difference in annual charges in favour of establishing an automatic system	1,878	2,553

As regards assets recoverable or thrown spare, item No. 10, if an automatic exchange is installed the difference between the first and second sub-items, namely, £4,270, is an amount which will have to be written off in the departmental accounts as representing the proportion of the capital outlay on the original assets which is irrecoverable.

2. *To Mr. Mathews.*—From the figures I have quoted it will be seen that the capital which it will be necessary to expend on the existing manual system if an automatic exchange is not installed would be £1,206; but it must be remembered that the accommodation at Cottesloe at present is very limited, and a new exchange is absolutely essential, because the present building is not only approximately 1 mile from the telephone centre, but it has reached the end of its economic life. If the present system were retained, alterations and additions would have to be made to the existing equipment, and we would also be continuing operations at a point some distance from the centre of working, which necessarily increases costs. By the expenditure of the amount I have named the present manual exchange could be brought more up to date, but it is only a matter of time when conversion will have to be made. Consideration must also be given to the question of meeting the requirements of additional subscribers. Many of the Nedlands residents would be connected with the new exchange, and there is also the natural increase, to which I have referred. The present Cottesloe Exchange could take from 120 to 130 more subscribers on the old board. For the past three years the number of subscribers, as on the 1st January, have been—1919, 665; 1920, 749; 1921, 830; and 1922, 842; showing an annual increase of approximately 80.

3. *To Senator Newland.*—In connexion with the proposed exchange, provision has been made for fifteen years ahead, and by that time we expect to provide for 2,300 subscribers. Very careful consideration has been given to the extent to which subscribers will increase, and the Department considers that ample provision has been made for future development. It will be seen from the figures I have quoted that an annual increase of subscribers can reasonably be anticipated. The estimated number of lines in 1928 is 1,400, and we, therefore, expect to add 600 on to the present number within five or six years. Considering all these circumstances, the estimate is a modest one. We might be asked what justification there is for anticipating such an increase, but we are going on previous experience, and at the past rate of 80 per annum we would have 400 new subscribers in five years, although under this proposal we have allowed for 600. The improved service will also attract additional subscribers, as it has already been shown that a properly equipped automatic system is capable of rendering better service. The site selected will be the means of savings being effected in our line plant, and that factor, in conjunction with the idea of serving a large and growing district more effectively, has resulted in the present proposal. Our desire is to render a more efficient service and at the same time to economize in the matter of construction. Three or four other sites in the same locality were inspected, but the one now suggested is considered the most suitable. I could not say whether the air-conditioning plant which it is proposed to install is similar to that in the Perth Automatic Exchange; that is a point that can be explained by the engineer. I believe, however, that the plant proposed to be installed is similar to the one in the Perth Exchange, which has given satisfactory service. The only delays which have occurred at the Perth Exchange have been occasioned by the shortage of equipment, and any complaints which have been made regarding the service would be in consequence of the switchboard being overloaded. We have never found it necessary to cut out certain blocks during the busy portions of the day. I do not know of that ever having been done here, and it is a practice of which I would not approve, because all subscribers should be treated alike. If certain sections were temporarily cut off during busy periods, it would lighten the load, but I would not advocate it. I know the Fire Brigade Building at Cottesloe, but I could not say if it has been offered to the Department for use as a new exchange. I have not inspected the building, but I do not think it would be suitable. I certainly would not recommend its purchase for the purpose, because for the expenditure of £4,500 we can construct a building to meet our requirements.

4. *To Mr. Mathews.*—The district served by the Cottesloe Exchange is not an industrial area, and the subscribers consist largely of people in fairly comfortable circumstances. At the moment I cannot give the number of houses that could be served, but there are approximately 18,424 people in the district, which comprises Claremont municipality, Cottesloe municipality, Claremont Roads Board, Cottesloe Beach Roads Board, and Peppermint Grove Roads Board. During the last ten years the population has increased by 7,521. The estimate of the ultimate number of subscribers, which has been set down at 2,300, was prepared for me by my officers, and on perusing it I consider it reasonable. I could not say whether the estimate was arrived at with a view to economizing, but I do not think it necessary to make provision for a greater number of subscribers, because the request has been based on the possible requirements. In the event of the number of subscribers exceeding the estimate, I have no doubt that it will be an easy matter to make the necessary extension. In constructing we always make provision for expansions. With the manual exchange at Cottesloe we could only go on making additional connexions for about eighteen months, when we would have to cease, unless additional provision were made.

5. *To Senator Plain.*—Although we have room for an additional 120 subscribers on the present board, the construction of a new exchange has been recommended because the existing equipment is obsolete and is nearing the end of its economic life. The only complaints we have received in connexion with the Perth Exchange

have been occasioned by the lack of necessary equipment. At present, we have about 160 or 170 subscribers awaiting connexion at Perth, and, on the whole, the service is working satisfactorily, although it is heavily loaded. We have a common battery system at Fremantle which has been operating very well for some years; the board is quite equal to present requirements. The building there was constructed about sixteen years ago, when provision was made to meet expansion such as we are anticipating in connexion with the present proposal. Cottesloe, of course, is in communication with Fremantle, and there is room for extensions at the latter place. I do not think it desirable or economical to operate Cottesloe through the Fremantle Exchange. Telephone exchanges are usually established within 3 miles of each other, and the population usually determines the site of an exchange, which should be as near as possible to what we call the telephone centre. I would not be in favour of the Cottesloe Exchange operating through Fremantle, because I think it preferable to have a separate exchange, but that is a matter on which the engineer will be able to give information.

6. *To the Chairman.*—I shall submit a plan of the site, and also a statement showing the number of houses that could be served in the Cottesloe area. In the event of the Committee deciding that the installation of the automatic system at Cottesloe is not warranted, I would not favour the erection of a new exchange building on the proposed site and the installation of the manual system, because it would be merely patchwork. Eventually a conversion will have to be made, and it would be better to do it all at once. According to the official figures, the exchanges in the metropolitan area are at present paying working expenses and interest on the capital cost. Under the present system it is possible that a telephonist at Cottesloe may have to transfer a call from one board to a board at the other end of the room. A non-multiple magneto switchboard is unsuitable for a multi-exchange network.

7. *To Mr. Mathews.*—I do not think there is any district in Western Australia where the necessity for improved telephonic facilities is greater than it is at Cottesloe.

The witness withdrew.

Peter Kennedy, State Engineer for Western Australia, Perth, sworn and examined.

8. *To the Chairman.*—I am aware that the question of erecting an automatic telephone exchange at Cottesloe has been referred to the Committee for investigation, the engineering proposals for which I prepared. The selected site is as near as possible to the telephone exchange centre, and is adjacent to the fire station. There is a distinct advantage in having an exchange at the nearest point to the telephone centre, as at present with an exchange about 70 chains away from that point, it is necessary to bring subscribers' lines over that additional distance, and the preponderance of subscribers is in the direction of the proposed exchange. Covering such a distance unnecessarily involves waste in copper, cable, and conduits, and the present waste must continue so long as the exchange remains so far from the centre. In selecting the site consideration has been given to the possibility of automatic exchanges being established at Fremantle, Midland Junction, South Perth, and elsewhere, and the network has been considered as a whole. Cottesloe is to form the second step in the conversion of the whole net work to the automatic system. I produce, for the information of the Committee, a sketch plan indicating the present and ultimate schemes. Perth is in the centre of the net work, with Cottesloe shown as an automatic exchange. Hatched symbols on the plan indicate main, branch, and satellite exchanges. A main exchange is regarded as one which has junction lines with other exchanges in the network, so that subscribers connected with it can become directly connected with others in the network. A branch exchange has junction lines to the main exchange of which it is a branch, and to those with which there is sufficient community of interest to warrant a junction line. A satellite exchange has a trunk or junction only to the branch exchange with which it is connected. The question of making Cottesloe a satellite to the Fremantle Exchange, has, I believe, been mentioned to-day, but from an engineering point of view that is undesirable because everything from Cottesloe to any particular point in the network would have to go through Fremantle. That would not be economical in the matter of cable conductors, and would not lead to efficiency in operation. In designing a network from a traffic point of view, we have to carefully consider the copper cost, and the work involved in laying the cables. As a fact, many miles of cable are laid in a system, but seldom, if ever, is more than 10 per cent. of the cable actually in use at one particular time. If we had 4,000 subscribers connected with the Perth Exchange, it would be quite unusual for 400, in the same section, to move at the same time, and it is with a view to economy in the use of copper cable that central points for exchanges are provided. The basic principles recognised are the establishment of office and party line services, but party line services are not at all popular in Perth. The only effective means of meeting the present situation is to establish a conveniently located automatic exchange at Cottesloe, as the existing plant is quite obsolete, and its continuance means only useless expenditure. Perth was loaded in 1920-1921 with an annual maintenance cost of £6 9s. 1d. per line, against a charge of £9 6s. 3d. per line at Fremantle, where there is a comparatively up-to-date common battery exchange, so that with 4,000 subscribers the saving is considerable. The annual cost per line, at Midland Junction, where there is a small non-multiple exchange, runs into, approximately, £10 per line per annum. Provision has been made for 1,400 subscribers at Cottesloe, and, although this number may be considered slightly high, it is desirable to provide reasonable cable equipment in the first place, at least, five years in advance. We do not provide a greater ratio of equipment than we have cable for subscribers who may desire connexion. A shortage of equipment necessarily means a loss of revenue, and a certain amount of dissatisfaction, owing to a congested service. I also produce a plan showing the districts served by the various exchanges shown on the plan previously submitted. The proposed exchange at Cottesloe could be made to cover more than the portion coloured green, but it would not be economical. The more a service is extended from any particular station or exchange, the higher the copper costs become. Nedlands will be embraced in the Cottesloe Exchange area, although there may be some local agitation against it because many people prefer to be connected with the Central Exchange, but where the automatic system is in operation there should not be any objection. The plant at present in use at Cottesloe can be utilized in country districts, and even for extensions to such plants as we have at Midland Junction, which is comparatively a less important exchange, preceding conversion to the automatic system. Midland Junction and Guildford are only 2 miles apart, but are served by different exchanges; the intention is to make one exchange serve both districts. The value of the existing plant which will remain at Cottesloe has been considered, and realizing that conversion was impending, we have, during the last two or three years, been careful to see that

new work was such as could be utilized in an automatic exchange. You will notice that the capital cost of the new plant includes the value of the equipment lines, cables, conduits, and sub-station wiring at present in existence, which can be utilized in the proposed new scheme. The estimated immediate capital cost of the work is £44,576, the cost in 1923 is estimated as £76,118, and in five years, when additional equipment is installed, it will probably be £91,400. The difference represents new lines to accommodate additional subscribers and other expenses which must be incurred. The difference in the annual charges for working expenses in favour of the automatic system will be £1,878 per annum in 1923, and £2,553 in 1928. These figures are based for the most part on the actual costs incurred in conducting magneto manual and common battery manual exchanges, and we also have the costs in connexion with the Perth automatic which, as I have shown, are very favorable. The annual working expenses of the proposed automatic system as at 1st June, 1923, are £4,286, and at five years after the cut over £5,196. For a common battery manual system the costs would be £5,875 and £7,159, respectively. As to the interest to be charged, and the allowance for depreciation, I may mention that depreciation varies under different headings. Depreciation on buildings is 1.55 per cent., and on the air conditioning plant it is fixed, roughly, on a fifteen-year basis. Maintenance on buildings is fixed at .83 per cent. per annum. In connexion with the life of exchanges, I may say that in seven years the depreciation is not perceptible, and fourteen exchanges, comprising 27,000 lines, which have been *in use for fifteen years*, are still rendering good service. The Perth Exchange plant has been installed since 1914, and, generally speaking, is not showing any sign of wear. We are allowing a higher rate for the air conditioning plant, approximately, 6 per cent. Air and dust troubles must be carefully considered in connexion with automatic exchanges, but rather than see the work delayed, I would favour the establishment of the exchange without an air conditioning plant at the outset. I believe that a charge of 9 per cent. would be more than sufficient to cover interest and depreciation. I shall, however, go into the figures as in 1923 and 1928, and show what return we expect on the capital expenditure. Judging by experience, I do not think it wise to add to the existing exchange at Cottesloe, and I am satisfied that the proposed expenditure is justified. I am not in favour of a manual plant being installed in a new building at Cottesloe, as it has already been demonstrated that the annual costs of both automatic and manual services are in favour of the former. We have found the automatic system in Perth much more economical than the manual, and, in comparison with *Fremantle, the figures are somewhat striking.*

9. *To Mr. Mathews.*—It is our intention to ultimately provide for 2,300 subscribers on the proposed Cottesloe Exchange, and in the event of a considerable increase in the population, provision to meet increased traffic can more easily be made with the automatic than with the manual system. We are making provision for fifteen years ahead, and if we should have more than 2,300 subscribers in, say, ten years, the building would have to be extended. In regard to the machines, however, the possibility of extension depends upon the capacity of the plant. *Tenderers sometimes give a five* or ten year margin on generators or accumulators: they do not always fit their accumulators to the ultimate capacity. If they were designed for twelve plates they might equip them with six, the remainder being added when the necessity arose. I do not think there would be any cause for concern regarding the power plant. The present building could easily be extended without upsetting the system; certain final work would, of course, have to be done during the night, or on Sunday. There is 27 feet over which the building can be extended in one direction, and the locality plan shows that room could be acquired by moving the linemen's sheds back. About 50 per cent. of the block acquired is available for extension, which means that we could accommodate another 2,000 lines if necessary. Cottesloe is an exchange requiring immediate attention. Action should also be taken at Fremantle, but the Cottesloe boards would not fit the Fremantle plant. Such boards, however, could be utilized elsewhere, as, for instance, one is required at Bunbury. I have no doubt that the standard Ericsson magneto boards will be largely utilized in country districts, or within the metropolitan area, where a connexion has not been made to the automatic system. The Cottesloe district is advancing very rapidly, and an additional 70 to 80 subscribers are being connected each year. There has been a slight slump within the last twelve months, but I believe that is common throughout the Commonwealth, and has been occasioned, perhaps, by the delays caused owing to the shortage of material. I consider Cottesloe the most suitable place for extending the automatic system. The site of the new exchange has been selected after a careful survey of the locality, a house count and a valuation of the properties from a telephone point of view. The new site is on the main conduit line from Perth to Fremantle. At present cables connecting Cottesloe with other exchanges have to go off that track, and when the exchange is on the main road it will reduce the cost of inter-connexion. It has been said by some that the fire brigade building is out of all proportion to the demands of the district, but that cannot be said of this proposition. Claremont has not a separate exchange, but is served from Cottesloe. The Cottesloe Exchange is the only one between Perth and Fremantle, and serves all the intervening district. The installation of the automatic system is essential in carrying out our policy, and it is not feasible to serve the intervening district between Perth and Fremantle from the exchanges at those places. I understand that, from figures supplied by the Deputy Postmaster-General, it was shown that by the expenditure of £1,200 the present exchange could be made more effective. If that expenditure were incurred it might meet requirements for about four years, but in the circumstances it would be very wasteful, and altogether unjustified. It would be throwing good money after bad, and increasing working expenses, which would have to be maintained at the higher rate, whereas, by immediately installing the automatic system we would have a better service, and the financial proposition would be infinitely better. The rates of interest and depreciation are not fixed by me. *They are on a* fixed scale, and depreciation varies, of course, on such items as poles, cables, and conduits; on each article they are defined.

10. *To Senator Newland.*—It cannot be said that the Perth Automatic Exchange is overcrowded during hours of light loading, but at periods of peak loading there is considerable congestion. I was not the State Engineer when the conversion was made at the Perth Exchange; but I was closely associated with the work, and after it had been established it was handed over to me to bring into use. I did not design the exchange, although I designed the outside work. In equipping the Perth Exchange, provision was made for five years ahead. The equipment was installed in 1914, but we are really two years behind in our programme. The necessity for additional equipment was foreseen three and a-half years ago, but we have been unable to obtain it. We have ample room at Perth for extensions when required to meet possible developments. In

estimating our requirements for the proposed automatic exchange at Cottesloe, we have been guided largely by our experience in the Perth Exchange. We are, however, not confined to our experience there, because we have the benefit of that gained in other exchanges in the Commonwealth, and of that data we make the best use. Generally speaking, the erection of an automatic exchange at Cottesloe will not add to the work in the Central Exchange in Perth *to any appreciable extent*, but I believe it is usual to centralize maintenance as far as possible. After reducing the work here, we will also be able to reduce it at Cottesloe. The installation of an automatic exchange eliminates telephonists and the exchange at Cottesloe, when the cut over is made, will be controlled by mechanical officers only. A person in Perth, wishing to communicate with Cottesloe, would have to use the Central Exchange, but the human element would not enter into the matter at all. That arrangement will not add in any way to the load at present carried by the Perth Exchange. It is quite immaterial whether an automatic or a manual system is provided at Cottesloe, because the calls will all go to Cottesloe, the difference being that, instead of a subscriber here advising the attendant of the number required there, he will simply dial the number direct. I have been asked whether it is possible to cut out a block or a section of our telephone exchange work for a few minutes at certain periods of the day when the traffic is heavy, and thus reduce the load. That could be done, but I would only recommend it as a last resort. I do not think the congestion in Perth is sufficient to *justify it. I do not believe that* the complaints are nearly as numerous, or as acute, as they were when the Committee was last in Western Australia. We have never found it necessary to cut out certain districts, even in outlying centres, at any time. At present we have only 120 or 130 awaiting connexion with the Perth Exchange. I do not think an air conditioning plant is absolutely essential for the efficient working of an automatic exchange. Cottesloe is very favorably situated, and although the proposed exchange is on a main road, it is not a dirty thoroughfare. There is no particularly heavy traffic on that road, and for that reason I suggested that the air conditioning plant could, if necessary, wait, as no great harm would result. An air conditioning plant is required to keep the air clean, and also to keep the humidity within safe limits. If the moisture becomes too great, defects arise. The plant at the Perth Exchange has been in use for about eighteen months, and prior to its installation we had to endeavour to reduce the humidity by more expensive and less effective means. The cables at Cottesloe are practically all underground, but it has been necessary to exercise economy in certain directions, and while having the advantage of the underground cable distribution in Cottesloe has been made by open wires, which go through rights-of-way. The open wires are those which go from Perth to Fremantle. We have not used a great deal of new wire. The plant which will be discarded in the event of a conversion to the automatic system at Cottesloe will be utilized elsewhere in the State, as it is of a type that will readily fit in with existing plants.

11. *To the Chairman.*—The air conditioning plant has been installed at the Perth Exchange for about *eighteen months or two years, and its installation* was considered essential, because it was well known that the humidity should not be allowed to rise beyond a certain point. Before the plant was available we had to utilize hot-water radiators and electric fans to regulate the air. The Perth Exchange was not constructed for working under the automatic system, and if the building had been designed in the first place to house an automatic plant, provision would have been made for an air conditioning outfit. Before the plant was installed it became necessary at times to close doors and windows, to heat up the building, and cause the air to circulate, in order to get the required conditions. This resulted in the conditions becoming very trying for those who were compelled to work in the rooms. The air conditioning plant, at Perth, was placed in *position at a cost of about £460, and has met all re*quirements. We have to be very careful to prevent dust accumulating, because, if it should be allowed to enter the building, it results in mechanical irregularities an interrupted service, and time is taken in locating faults which not only impairs efficiency, but increases the cost. In addition to regulating the humidity the plant supplies clean air. We also have separate machines for vacuum cleaning, and for a hot water heating system. Up to the present I have not received plans or details of the proposed air conditioning plant. The file in connexion with this proposal arrived only on the 18th January, together with the usual plans, with the exception of those of the air conditioning plant. Speaking from memory, I believe the profit on the Perth network for 1918-19 was about £1,000, and for 1919 20 £9,000, after deducting administrative expenses, a proportion of pensions and retiring allowances and depreciation, and interest. The costs are, approximately, £21, for subscribers to the automatic exchange, and £18 to £19 for a common battery exchange. A good deal of manual equipment is used in such establishments as Foy and Gibson's, and in the Lands Department, and *Survey Department, where the operations are not suffi*ciently extensive to justify an installation of the inter automatic system. In such places they utilize a good deal of manual material, but we do all the sub-station fitting. The only exception has been in the case of the Western Australian Government Railways, where they were allowed to do their own fitting. It is the intention, of course, to eventually convert the whole system as the consensus of opinion is strongly in that direction. Sir William Noble, the Engineer-in-Chief at the London Post Office, said that the general indication is that automatic exchange work is probably the main feature in the American scheme of progress, and he found that a practically unanimous opinion that a full automatic system is the only certain method of rendering the service demanded by the public.

(Taken at Perth.)

FRIDAY, 27TH JANUARY, 1922.

SECTIONAL COMMITTEE.

Present:

Mr. GREGORY, Chairman;

Senator Newland, Senator Plain, | Mr. Mathews.

Peter Kennedy, State Engineer for Western Australia, Perth, recalled and further examined.

12. *To the Chairman.*—I now hand in a plan showing the area served by the various telephone exchanges, and also the radial distances. I have also prepared the following table in relation to the annual charges in connexion with the Cottesloe Exchange as at 1st June,

1923, and 1st June, 1928. The labour costs are based on the estimated staff and the average salaries at the Perth Exchange. Interest is calculated at 5 per cent., and includes capitalization of plant, at present *in situ*, that will be used and that to be purchased under this proposal:—

Description of Item.	Financial Aspect 1.6.23.	Financial Aspect 1.6.28.	Remarks.
	£	£	
Working expenses	4,286	5,196	Labour costs based on estimated staff and average salaries and material and incidentals on costs for Perth
Interest on capital (new and *in situ*) ..	3,806	4,574	The total capital cost new and in *situ*, 1.6.23, is £76,113, and 1.6.28, £91,480. Five per cent. interest is allowed in each case, accounting for £3,806 for 1923, and £4,574 for 1928
Depreciation—			
(a) Building	52	52	The rate of depreciation allowed for in the building is 1·155 per cent. per annum. The cost of the building is £4,500, which at 1·155 per cent. = £52
(b) Air conditioning plant, &c. ..	195	195	The estimated cost of the air conditioning plant is £3,000. The depreciation allowed is 6·5 per cent. per annum = £195
(c) Exchange equipment	1,590	1,590	The estimated cost of the equipment is £29,435 required for Cottesloe Exchange, and £400 for that in other exchanges, totalling £29,835. The depreciation allowed is 5·33 per cent. = £1,590. This allows under 19 years life, which may be regarded as satisfactory, as it is stated several automatic exchanges have been in operation 16 years or more and promise to give first-class service for many years to come
(d) Conduits	354	431	The value of conduits for 1923 is £14,170 and for 1928 £17,252. 2·5 per cent. depreciation is allowed accounting for £354 and £431 respectively
Administration Charges	1,618	2,265	The administration charges are taken at £1 3s. 9d. per line, and 6s. per station. 1,000 lines and 1,075 stations are allowed for 1923, and 1,400 lines and 1,505 stations for 1928, resulting in £1,618 and £2,265 respectively. These figures are based on the average actual charges for three years ended 30.6.21 for Perth
Total Annual Charges	11,901	14,303	
Revenue	11,329	15,861	The average revenue for 3 years under old rates is £9 1s. 3d., add 25 per cent. for increased rates = £11 6s. 7d. Take 1,000 lines for 1923 and 1,400 for 1928 = £11,329 and £15,861 respectively.

The air-conditioning plant is expected to have a life of about fifteen years, and the depreciation allowed has been fixed at 6.5 per cent. per annum, which is equivalent to £195. The exchange equipment, as at 1923, is valued at £29,435, plus £400 required for equipment in other exchanges to work in with the proposed new plant at Cottesloe. No depreciation has been allowed for sub-station equipment, as that will come under the heading of maintenance. The annual working expenses of an alternative common battery manual system five years after the cut-over would be £7,159, as against £5,196 for an automatic system. The principal saving effected in consequence of the elimination of telephonists.

13. *To Senator Newland.*—I cannot say definitely whether the air-conditioning plant in the Perth Telephone Exchange is similar to those in other exchanges in the other States, but I do not think it is. There has been considerable development in attacking humidity, and I do not think that we have yet arrived at the very best means of overcoming the trouble. I believe the plants in operation in the Eastern States are designed, as far as practicable, to perform more than one operation. One power unit would be used for not only humidifying, but for heating purposes, and also for vacuum cleaning. They combine in one plant the operations which have to be performed here by three or four. The air-conditioning plant in the Perth Automatic Exchange has rendered satisfactory service. Generally we regard the allowable percentage of humidity as 70, and we endeavour to avoid it rising above that figure. The difference between the wet and dry-bulb reading should not be greater than 6 degrees at any reading. At Perth, the percentage of humidity with the plant we have available has been reduced considerably, and the following figures for the month of February, 1921, which was exceptionally hot, will give some idea of the readings recorded. They were, roughly, 55, 59, 63, 59, 56, 51, 63, 58, 63, 58, 56, 40, 37, and so on. That will give a general idea and prove that we were able to handle the problem of humidity with the plant we have available. The Cottesloe Exchange will be somewhat nearer the sea-coast than the one at Perth but I do not think the variation will be great. The proposed site at Cottesloe is on the main road, and it is possible that at times when the traffic is heavy there may be a certain amount of dust, but, so far as I can see at present, I do not think the conditions at Cottesloe will vary considerably from those which we experience in Perth. From the satisfactory results achieved in the Perth Exchange with the plant available, it would appear that the conditions are almost ideal, and the same remarks could generally apply to the proposed new building, particularly as it has been designed for an automatic exchange. The Perth building was constructed to accommodate a manual exchange. The plans of the proposed air-conditioning plant have not yet been submitted to me. The question is one which might be submitted to the Chief Electrical Engineer, Mr. Golding, who, after his experience abroad, would be able to give valuable information as to the best means of dealing with humidity. The switches in the proposed new exchange will be of the latest type, and protected from dust, and the opinion of the Chief Electrical Engineer should be obtained before the plant is put in. The more modern plants are protected to a greater extent, and each switch, instead of being in a general enclosing case, will have individual relays and contacts protected with a metal case. Such provision should dispense with the necessity for a very expensive air-conditioning plant, and it should make such a difference as would enable us to install a comparatively inexpensive one to meet our requirements. The Perth Automatic Exchange is equipped with a hot-water system, composed of a boiler for heating the water, which is

circulated through pipes throughout the building, with radiators fixed at intervals. As a heating unit it is efficient and cheap. I cannot give the capital cost of installing such a plant, as it was put in by the Public Works Department, but the working expenses would be in the vicinity of £50 to £75 per annum. I think the cost would be much under the figure suggested for Cottesloe. Speaking from memory, I believe a vacuum plant costs approximately £150. Such a plant consists of a small motor-driven pump fitted on a carrier with rubber wheels, so that it can be taken to any portion of the building where it is required. The working expenses of such a plant are comparatively small, as it is merely utilized by the mechanics to remove dust from the switches or at any points where required. The figure might be set down at from £30 to £50 per annum. Such a vacuum plant is not used for cleansing the floors. In addition, a dehumidifier is installed, the cost of which is approximately £475. This plant has an air intake with a dehumidifying apparatus composed largely of water sprays and cool chambers. Ice is not used for cooling purposes, neither is any heating device employed. The plant takes the air in at the rear of the exchange, and, after it has passed through a washing process, it is distributed by pipes into the various parts of the switch-room, and then returned through ducts or ventilators to the outside of the building, or again through the plant. Since the installation of the air-conditioning plant the conditions in the switch-room have been very much improved. I shall supply the cost of installing a hot-water apparatus.

14. *To Mr. Mathews.*—I do not think the present system is the best for our purposes, because we should combine our requirements in the one unit. A cheaper unit than the one suggested should be sufficient; I think the amount suggested is too high, considering the work to be done. I could ascertain the temperatures taken inside and outside the building, but I do not think we have any record of the temperatures in other rooms. We have never allowed the temperature in the interior of the exchange room to become sufficiently humid to damage the apparatus.

15. *To the Chairman.*—I believe the humidity at Cottesloe will be very much the same as it is in Perth, but it may be a little more, because it is nearer to the coast.

16. *To Senator Plain.*—The property owned by the Commonwealth Government on which the exchange building in Murray-street is constructed extends to the fence at the rear, so there is ample room for expansion.

17. *To the Chairman.*—We have not noticed that the water becomes heated in any way by being brought into contact with the air, and, if it did, we could refrigerate it or cool it by using ice. That could be done, but if the conditions were sufficiently bad to justify that, it would be better to provide a proper refrigerating device. I cannot at present give figures indicating the humidity in the other States, as it is only since the installation of automatic telephones that the question has become acute.

18. *To Senator Plain.*—At times, the air has to be heated and circulated in order to reduce the humidity. When the outside atmosphere is dusty, the doors and windows must be kept closed, and, in consequence, the inside of the building becomes oppressive, but with an air-conditioning plant in operation a supply of comparatively cool clean air is always available.

The witness withdrew.

James Campbell Muir, Manager of Telephones, Postmaster-General's Department, Perth, sworn and examined.

19. *To the Chairman.*—The mechanical work of the Telephone Branch is under the control of the State Engineer, and I deal generally with the traffic and business side of the Branch. I am responsible for seeing that an efficient service is rendered to the public. It is quite true that some time ago I expressed the opinion that a first-class manual system was more efficient than an automatic system. I still hold that view; but, of course, it is merely a personal opinion. If the cost of installing a new manual system were nearly as great as an automatic system, I would favour the latter. During the last twelve months there has been a marked improvement in the working of the automatic system, judging by the decrease in the number of complaints and from my own experience, and with the additional plant that is coming in we anticipate that the cause for complaint will be almost entirely removed. The position is easier than it was some time ago, although the load on the exchange has increased. I am in charge of the business side of both manual and automatic exchanges. The figures published in this morning's paper concerning the working costs of a line on an automatic exchange and one on the manual exchange are, I believe, somewhat misleading. I do not think they are actual, and I would suggest that they be checked by the Accounts Branch. I have seen the costs as taken out by the Accounts Branch, and the disparity in the figures quoted yesterday seems to be too great. I am of the opinion that through some misunderstanding the costs of repairs and maintenance to lines have been included in both sets of figures, and if that is so they are unreliable. The comparison required is not as between manual and automatic systems, including repairs to lines on both systems, but a comparison which will give some idea of the relative merits of the two operating systems. Where we have manual and automatic exchanges the same expenditure would not necessarily be incurred on the lines of both systems, because circumstances govern the case. For instance, there may be more undergrounding in Perth than at Fremantle, and consequently the repairs at Fremantle may be heavier. Of course, the capital cost would affect the position, but I do not think repairs and maintenance should be included. I understand you desire to institute a comparison between the working of an automatic and a manual switchboard in order to ascertain which is more efficient and less costly to maintain. I believe the accountant has the figures, but he could not express any opinion concerning the efficiency. If the automatic system is to be extended, I believe Cottesloe is the next exchange which should be converted. At present, we are rendering the subscribers at Cottesloe a fairly good service, as we have very few, if any, complaints as to the working of that exchange. The plant is, however, obsolete for the requirements of an exchange such as Cottesloe. It is expensive to operate, and it is incapable of giving a first-class service. Having regard, however, to the equipment, the service is fairly satisfactory. I have been asked, if a new building had to be erected to develop the Cottesloe area, and the site was to be altered, if I would favour the installation of the same plant or recommend the installation of a new one. The question of plant would not be affected by any change in location. An automatic exchange would work effectively in a different locality to the site fixed, but the site decided upon is the result of a telephone survey based on prescribed principles which govern such matters. I am not in agreement with the published figures relative to the increased number of subscribers. I do not think for one moment that the system is going to extend so rapidly that 1,400 subscribers will be connected by 1923, and I am basing my opinion on the expansion during the past year, and on the projection made in regard to expansion. If a portion of the Nedlands district is included, the number connected with the Cottesloe Exchange will, of

course, be increased, as some of them are now connected with the Perth Exchange. For the information of the Committee I submit the following table, showing the year, the number of subscribers for that year, and the increase per cent. over the preceding year. The figures are—

Year.	Number.	Per cent.
1912	519 ..	7.8
1913	560 ..	6.4
1914	596 ..	1.5
1915	605 ..	1.5
1916	623 ..	3.0
1917	626 ..	.49
1918	665 ..	6.2
1919	749 ..	12.6
1920	830 ..	10.8
1921	842 ..	1.4

The foregoing figures are as at the 1st January, and it will be seen that the increase has not been very great. The recent drop has probably been occasioned by trade depression, and also by a less rapid increase in the population. There has not been any difficulty in supplying the necessary equipment to meet the requirements of subscribers to the Cottesloe Exchange, and we could accommodate 163 more than we have at present.

20. *To Mr. Mathews.*—The board could accommodate more subscribers. The one in the last position could take an additional 100 subscribers, and that in the second to the last position 60. It has been said that calls received at one board have to go to another board; that refers to transfer work. Such a practice is a drag *on the service, as calls have to be transferred from one* end of the switch room to the other. I do not think there has been the same expansion at such places as Fremantle and Midland Junction in recent years as there has been previously. The activities in the commercial world which followed the signing of the Armistice have not been maintained, and, in consequence of this and other factors, our extensions have not been as great as might have been expected. The gold-fields, of course, are at a standstill.

21. *To Senator Plain.*—We could carry on at Cottesloe for another twelve months with the present plant without interfering with the requirements of the subscribers, but it must be remembered that the proposed new plant will not be available for eighteen months, or perhaps two years. The present equipment will easily accommodate new subscribers for that period.

(Taken at Perth.)

SATURDAY, 28TH JANUARY, 1922.

SECTIONAL COMMITTEE.

Present:

Mr. GREGORY, Chairman;
Senator Newland, / Mr. Mathews.
Senator Plain, /

George Allan, Acting Chief Architect, Public Works Department, Perth, sworn and examined.

22. *To the Chairman.*—Our Department has been consulted in connexion with the erection of an automatic exchange at Cottesloe. The plans before you are practically the same as the drawings we have agreed upon. The drawings originally prepared by us were sent to Melbourne, but were considered somewhat elaborate, and the plans now before the Committee are those which we have to follow. A minor alteration was made the other day in connexion with the removal of a gate. The proposed building is to be of brick, with concrete floors, the flat portion of the roof is to be of reinforced concrete, and the remainder of the roof of tiles. The ceilings are to be of small fluted corrugated iron, and the window frames of metal. The walls, apart from the main switch-room, are to be 10 feet high. The roof of the battery-room is to be flat; I do not think such a roof will improve the appearance of the building, but I presume that that type has been adopted to avoid unnecessary cost. The building should be adequately lighted, as we have high lights on one side. I have not had a great deal to do with this proposal, and I, therefore, cannot say at the moment if there is any special reason why the battery-room should have a concrete roof. The work has not reached the stage of having a specification prepared, although we have preparatory drawings and preliminary estimates. Provision has been made for a bituminous surface on the portion of the roof of reinforced concrete. I have not inspected the site, but I know the approximate locality. I understand there is a right-of-way dividing the land from a dwelling on the northern side, and, although £30,000 or £40,000 worth of equipment may be installed in the building, I do not think the risk of fire is sufficiently great to necessitate the erection of a parapet wall on that side, particularly as the fire brigade station is across the road, and the water pressure good. Such a parapet would be an additional security, but I do not think it necessary. There would have to be gutters behind the parapet, and as there are trees in the vicinity possibly the gutters would become choked and the overflow of water would cause greater damage than, perhaps, a small fire. The detailed estimate of the cost is £4,222. The foundations are to be of concrete. Bricks cost 64s. per 1,000 at the kiln, and we would obtain sufficient "firsts" from consignments purchased at that price for the work. We face with the "firsts" and utilize the remainder on the inner walls. We order a certain quantity of specials, for which we pay 70s. per 1,000 at the kiln. We have not constructed buildings of rough brick and then had them limewashed, although such a method would be cheaper. Rough-cast buildings, with tiled roofs, look very well. The building is to have red brick pillars with rough-cast work between and above the plinth, which will make the structure attractive in appearance. A concrete building would not be cheaper than one of brick; and we do not do much concrete work here, one reason being that shuttering work costs more than in the eastern States. The estimate covers necessary asphalting, gravel paths, fencing, and the basement, a water supply and the necessary hydrants.

23. *To Senator Newland.*—I cannot speak with any authority on the possibility of fires occurring in the building in consequence of wires fusing, but judging by our experience in Perth there is no such danger. There would be a small boiler in the basement, but the fire there could not cause any damage unless there was gross carelessness. The building is to be constructed on fire-resisting principles, but Mr. Lapsley, Fire Brigade Superintendent, may direct us to install one or two stand pipes. I shall ascertain the proximity of water mains and the provisions made to combat fires. We have a contingency amount on which we may draw if any additional fire prevention provisions are necessary. If we built up to the plinth line with good bricks and then rough cast the remainder the difference in cost would not be great. It would mean less point work, but I do not think such a proposition worth considering.

24. *To Senator Plain.*—The roof of the battery-room is to be of concrete, and the remainder of the roof of tiles.

25. *To Mr. Mathews.*—The ceilings are to be of small fluted corrugated iron; such ceilings are cheap and practically dust proof. A brick wall, with a white dressing, would not look as well as the one proposed, which is considered to be architecturally artistic.

The witness withdrew.

Robert Henry Hall, Acting Accountant, Postmaster-General's Department, Perth, sworn and examined

26. *To the Chairman.*—I understand you wish to be supplied with figures showing the relative costs of operating the automatic and manual exchanges in the metropolitan area, and I have, therefore, prepared several tables which may give the information you desire. The first is as follows:—

WORKING EXPENDITURE.

OPERATING (INCLUDING ADMINISTRATION)—MAINTENANCE OF EXCHANGE AND SUBSCRIBERS' EQUIPMENTS (INCLUDING INTEREST AND DEPRECIATION).

Financial Year 1920-21.

—	Subscribers' Lines.	Operating.	Exchange Equipment.	Subscribers' Equipment.	Total Cost.	Average Cost.
		£	£	£	£	£ s. d.
Automatic	3,870	2,493	10,013	8,679	21,695	5 12 1
Other Exchanges*	2,333	11,310	3,651	2,775	17,736	7 12 1
Cottesloe	803	3,386	863	789	5,038	6 5 6
Fremantle	1,001	4,645	1,934	1,358	7,937	7 18 7

COST OF OPERATING.

—	Subscribers' Lines.	Operating (excluding Administration).	Average Cost.	Operating (including Administration).	Average Cost.
		£	£ s. d.	£	£ s. d.
Automatic	3,870	1,703	0 8 10	2,403	0 12 5
Other Exchanges*	2,333	7,849	3 7 3	11,310	4 16 11
Cottesloe	803	2,400	3 0 0	3,386	4 4 4
Fremantle	1,001	3,292	3 5 9	4,645	4 12 9

MAINTENANCE COST OF EXCHANGE EQUIPMENT.

—	Subscribers' Lines.	Exchange Equipment (excluding Interest and Depreciation).	Average Cost.	Exchange Equipment (including Interest and Depreciation).	Average Cost.
		£	£ s. d.	£	£ s. d.
Automatic	3,870	6,428	1 13 3	10,613	2 14 10
Other Exchanges	2,333	2,706	1 3 9	3,651	1 11 4
Cottesloe	803	752	0 18 8	863	1 1 6
Fremantle	1,001	1,279	1 5 6	1,934	1 18 7

MAINTENANCE COST OF SUBSCRIBERS' EQUIPMENT.

—	Subscribers' Lines.	Subscribers' Equipment (excluding Interest and Depreciation).	Average Cost.	Subscribers' Equipment (including Interest).	Average Cost.
		£	£ s. d.	£	£ s. d.
Automatic	5,751	7,348	1 5 6	8,679	1 10 2
Other Exchanges	2,852	2 372	0 16 8	2,775	0 19 6
Cottesloe	800	699	0 16 3	789	0 18 4
Fremantle	1,410	1,126	0 16 0	1,358	0 19 3

* Metropolitan area only, including Cottesloe and Fremantle.

The capital value of the whole of the metropolitan network from Midland Junction to Fremantle is £507,194. The automatic exchange represents £366,028, and the other exchanges from Midland Junction down £141,166. I have shown the value of the exchange equipment and subscribers' equipment for the automatic exchange, for the other exchanges in the metropolitan area, and have then shown the figures for Cottesloe and Fremantle separately. The automatic exchange figures are distinct from others in the metropolitan area. The exchange equipment is worth £94,387, which represents the inside plant alone, and is exclusive of anything outside the door. The value of the Fremantle equipment is £10,095, and that at Cottesloe £1,707. The capital value of the automatic equipment at Perth is £366,028. I understand you have been informed that the working costs per line per annum at Perth are £6 9s. 1d., and at Fremantle £9 6s. 3d., but those figures represent maintenance, including lines, and do not include interest or depreciation. I understand that you require particulars of the actual charges against the two systems to enable a reliable comparison to be instituted. In computing the working cost of an exchange I do not think the lines should be considered, because the only expense of an exchange is that incurred in operating it within. I do not consider that the cost of maintaining subscribers' stations and lines has anything to do with the maintenance of an exchange, and should not bear the interest charges on the lines. The cost of operating at the Perth automatic exchange for the financial year 1920-21 was £2,403. If we took the operating charges, exclusive of administration, it was only £1,703, therefore the overhead charges were £700. The total cost of operating the Perth Exchange during the last financial year, including maintenance of exchange equipment, maintenance of subscribers' equipment, interest, depreciation and overhead charges, was £21,695. There are 3,870 subscribers connected with the Perth Exchange, which works out at an average cost of £5 12s. 1d. per

subscriber. There are 1,001 subscribers at the Fremantle Exchange. The operating costs were £4,645, exchange equipment £1,934, and the subscribers' equipment £1,358, making a total of £7,937, or an average of £7 18s. 7d. per subscriber, as against £5 12s. 1d. at the Perth Exchange. I have shown the figures separately for the Perth Exchange, which is an automatic one, for Fremantle, which has a common battery exchange, and for Cottesloe, which has a magneto equipment Cottesloe has 803 subscribers. The cost of operating is £3,386, the exchange equipment cost £863, and the subscribers' equipment £789, or a total of £5,038. The average cost per subscriber at Cottesloe was £6 5s. 6d., which was 13s. 5d. per annum higher than at Perth. There are 198 more subscribers at Fremantle than at Cottesloe, where 1,000 subscribers could be accommodated without adding to the operating costs inside. Additional subscribers mean more maintenance expenditure outside, but not necessarily within the exchange. The present exchange at Cottesloe could accommodate 1,000 subscribers, whereas there are only 803. Interest is charged at 3½ per cent. and depreciation 3 per cent., which must be added to actual expenses incurred in ordinary circumstances.

27. *To Mr. Mathews.*—The figures submitted show that the automatic system gives the best results, and the magneto is cheaper than the common battery. The figures show various phases of costs, but one must arrive at a proper quota to make a fair and reliable comparison between the different systems, and that is impracticable. The exchange equipment at Perth is shown at £10,613, and that includes interest and depreciation.

28. *To the Chairman,*—The statement I have submitted includes everything inside the exchange, but does not include charges in connexion with cables, conduits, wires, or anything of that nature, and on that basis the average cost per subscriber, last year, was £5 12s. 1d., whilst the average cost in other exchanges was £7 12s. 1d., at Cottesloe £6 5s. 6d., and Fremantle £7 18s. 7d. These figures show the cost at Perth to be £1 13s. 3d. below the average of the other systems. I now submit the following table showing the capital value of the cables, conduits, and lines in connexion with the automatic, Cottesloe magneto, and Fremantle common battery systems, and similarly their maintenance cost:—

Capital Value.

——	Conduits.	Cables.	Lines.	Total.
Automatic	85,825	97,584	80,204	263,613
Cottesloe (Magneto) ..	8,140	5,869	12,225	26,234
Fremantle (C.B.) ..	38,786	13,609	16,599	68,994

Maintenance Cost of Conduits, Cables, and Aerial Wires.

——	Subs.	Amount (excluding Interest and Depreciation).	Average Cost.	Amount (including Interest and Depreciation).	Average Cost.
		£	£ s. d.	£	£ s. d.
Automatic	3,670	11,534	2 19 7	22,476	5 16 1
Cottesloe	803	2,136	2 13 2	3,216	4 0 1
Fremantle	1,001	3,066	3 19 2	6,711	6 14 1

This shows the total capital value of cables, conduits, and lines for the automatic system to be £263,613, and for Cottesloe magneto and Fremantle common battery to be £26,234 and £68,994, respectively. There are 3,670 subscribers to the Perth Exchange, and the annual cost of maintenance of cables, conduits, and wires is £11,534, or an average cost of £2 19s. 7d. per subscriber By including interest and depreciation the cost jumps to £22,476, or £5 16s. 1d. per subscriber. Cottesloe has 803 subscribers, the expenditure being £2,136, or an average cost of £2 13s. 2d. By including interest and depreciation the figures are increased to £3,216 and £4 0s. 1d., respectively. The Fremantle figures are also shown in the table. Of course, in charging interest one has to take into consideration the amount represented by capital value, because the higher the amount the greater the interest expenditure will be. The capital value of the conduits in connexion with the Perth Exchange is £85,825, whereas, at Fremantle, the figure is £38,786, and at Cottesloe only £8,140. If one takes 3½ per cent. on the £85,825, and also on the £8,140, and adds it to the charges already incurred, a fair comparison cannot be made, because a certain portion of the £85,825 is essential to the Cottesloe Exchange, otherwise it would not have a service at all. The automatic system has been installed for a specific purpose, and is not to be confined to Perth. The greater proportion of the calls from Cottesloe would be to Perth, and the same could be said of Fremantle. If the cost of installing the automatic and manual systems were about the same from the public and financial stand-point, I would strongly advocate the automatic system. I have worked under the two systems. With an automatic telephone one merely dials the number required which is immediately obtained nineteen times out of twenty, but under the magneto system, a person calling has first to get the exchange, and then wait for the person with whom he wishes to speak, and the delays under the magneto system as compared with the other are most marked. Telephonists can be dispensed with and only mechanics, who are required in any case, are retained. In the Perth Exchange, under the old system, from 60 to 80 telephonists and several mechanics were employed, but with the automatic equipment we have only five or six mechanics. The amount of £2 19s. 7d. per subscriber to the automatic exchange is for lines, &c., only. The actual cost would be £5 12s. 1d., which represents working expenses, as shown in the first statement, and £5 16s. 1d., representing the average maintenance cost of lines, &c., making a total of £11 8s. 2d. per subscriber, and that amount includes everything. I also submit a statement showing the total maintenance and operating expenses in the metropolitan network and the revenue derived. It reads as under—

Maintenance and Operating Expenses of Telephone Exchanges in Western Australia, 1920-1921.

——	Auto.	Other Metropolitan.	Country.
	£ s. d.	£ s. d.	£ s. d.
Operating and General Expenses.. ..	27,339 8 6	21,811 15 4	28,070 5 1
Telephone Working—Administration ..	700 0 0	3,462 19 5	3,739 0 0
Central Office—Administration ..	32 0 0	139 0 0	171 0 0
Depreciation ..	1,450 14 4	1,097 2 6	2,437 1 7
Depreciation—Reserve	1,066 18 0	1,260 15 0	2,800 7 0
Interest	13,078 5 11	5,596 17 3	6,554 16 10
Pensions	16 16 3	83 3 9	89 0 0
Total	44,684 3 0	33,468 13 3	43,861 10 6
Revenue ..	64,219 10 2	26,985 5 3	25,520 7 5
	19,535 7 2 *Profit.*	6,483 8 0 *Loss.*	18,341 3 1 *Loss.*

Automatic—Average cost per Subscriber, £11 11s. 11d—3,670 Subscribers.

Other Metropolitan—Average cost per Subscriber, £14 6s. 11d.—2,333 Subscribers.

The foregoing figures show that the revenue received by the automatic exchanges for 1920-21 as being £64,219 10s. 2d. from 2,870 subscribers, or about £16 per subscriber. Fremantle shows an average of about £14, and Cottesloe £9. The average cost per subscriber in Perth was about £11 8s.; it might be £11 5s. Some of the figures I have submitted have not been worked out with absolute accuracy, but they may be taken as substantially correct. The depreciation on cables and conduits is about 2 per cent. as against 3 per cent. on other material; cables and conduits last for about 50 years, and exchange equipment about 30 years. The profit on the automatic system last year was £19,335 7s. 2d., after charging up everything. Losses were shown on other exchanges; but they have contributed to the profit at the Central Exchange. The metropolitan exchanges showed a profit of nearly £13,000, and the country exchanges a loss of £18,341.

(Taken at Melbourne.)

TUESDAY, 7TH FEBRUARY, 1922.

Present:

Senator Newland, in the Chair;

Senator Foll, | Mr. Mathews,
Senator Plain, | Mr. Parker Moloney.

John Smith Murdoch, Chief Architect, Department of Works and Railways, Melbourne, sworn and examined.

29. *To Senator Newland.*—The buildings which are proposed to be erected as exchange buildings for the automatic telephone system to be introduced at Cottesloe will be upon a site at the corner of Congdon-street and Clive-road, Cottesloe, having a frontage of 58 ft. 3 in. to Congdon-street and 157 ft. 8 in. to Clive-road. The site has been purchased at a cost of £120, and the building scheme has been designed to meet the views of the electrical engineers in the Postmaster-General's Department. This comprises two blocks of one-story buildings, which will be of brick. The main building is to contain a switch-room, which will be 48 feet by 34 ft. 6 in., and 14 feet high. There will be auxiliary rooms connected with the switch-room, consisting of the usual room for the plant to condition the air within the switch-room; this latter will measure 25 feet by 13 feet. Then there will be the usual battery-room, 25 ft. 6 in. by 22 ft. 8 in., and a mess-room for the staff, 17 feet by 13 feet. The height of the auxiliary rooms will be 10 feet. Light will be admitted to the switch-room from all four sides, and the floor throughout is intended to be of concrete. Within the switch-room the concrete floor will be covered with linoleum set in tar, while in the other rooms the floor will be left in concrete. The second building will be detached, containing a linesman's shed for material, measuring 18 feet by 12 feet. A linesman's room will be there also for personal belongings and for meals, &c.; this will be 15 feet by 12 feet. Then there will be a mechanics' store, 12 feet by 10 feet. The Post Office engineers found that they would require this additional accommodation. Further, there will be the necessary latrine accommodation to meet requirements in both buildings. The smaller building will be constructed after the same manner as the larger, that is, with brick walls, concrete floors, and tile roof. The cables will be brought in from Congdon-street. It was originally proposed to take them in from Clive-road. The local authorities have altered their views in this matter, as they have discovered that the change proposed will better meet their purposes. The cost of the buildings, as stated before Parliament by the Minister for Works and Railways, is £4,500, with £3,000 for the heating, ventilating, vacuum cleaning, and compressed-air treatment plant. Since that estimate was prepared it has been decided to add to the plan a mechanics' store, which will cost £103; the total cost will still be in the neighbourhood of that indicated by the Minister. The arrangements of the buildings, keeping the store building at the bottom of the allotment, leave 28 feet of yard space, so that will admit of the switch-room being extended, if necessary, another 20 feet quite conveniently. The idea of the flat roof on the front portion of the building is to allow of light entering the switch-room from that side. This flat roof will be of concrete, and will be fireproof construction. The plinth of the main building, from the ground to 3 feet above the floor, will be of exposed red brickwork. From that level to the eaves of the roof the brickwork supporting the roof principals will be also of exposed red brick; otherwise the suggestion is to roughcast the walls. This idea of roughcasting in panels has been introduced by the Public Works Department of Western Australia. It is the design of the officials themselves, and I have nothing to say against it. It is quite nice, and pleases a rather extensive taste in Perth. Personally, however, if I had been designing the building I would have preferred all plain brickwork. Whether a cheaper class of brick could be used under the roughcasting, I think that the common brick available in Perth would do quite well for the whole of the job. I have not seen the site personally. I left the actual expression in the buildings themselves to the Western Australian Works Department, and I am quite satisfied with their work. Practically no extra cost is involved in such roughcast treatment as has been suggested. The inside walls will be of plaster, and the ceilings will either be of iron or asbestos. With respect to the matter of fire risk, and to the suggestion of a parapet wall on the side next to a private dwelling, that idea would not add much to the cost of the buildings; but, if it were to be put up on one side, I would go in for it all round the main building. However, the switch-room is 22 feet away from the boundary, and I understand that it would be fully 30 feet distant from the private dwelling. In addition, there is a fire brigade station opposite. Therefore, I would prefer to keep the eaves as designed. The parapet wall idea by no means removes all danger of fire, for sparks may easily lodge behind such a wall. The safest scheme would be to build concrete ceilings, considering the value of the technical equipment inside the switch-room. I do not know, indeed, whether it would not be wise to spend a little more money in all these automatic exchanges, so as to provide concrete ceilings. In this instance there would be a comparatively large amount added to the cost; that is to say, the switch-room at Cottesloe could be concrete-ceiled for about another £130 or £140. I emphasize that I would be inclined to adopt this system universally. In fact, in all the important exchanges concrete ceilings are installed. In the Cottesloe Exchange there will be an equipment worth some £40,000. The plans for this work were prepared in Melbourne. The Chief Engineer attached to the Postmaster-General's Department here has the superior knowledge and experience, and when a plan for work of this kind comes before him from the State engineers with whom it has originated, he, if necessary, modifies the proposal, and in other ways improves it where his superior experience suggests. I understand that that was the procedure in this case. I would take it for granted that if the local engineers had any ideas which they desired to include in the work, their views would be carefully consulted by the Chief Engineer in Melbourne. Indeed, he would necessarily work in with

his officers in the various States, but he should be the official to have the final and controlling say, since it is his responsibility. In preparing accommodation for the staff at Cottesloe we were not informed how many men would be employed in and about the exchange, but we were told that a room of the size indicated would be ample, and I understand that it will be. I have no knowledge of the type of air-conditioning plant in use at the Perth Telephone Exchange. My experience in this matter is not that of an engineer. We are aiming at securing perfection; but we have had nothing, or very little as yet, in Australia to guide us. I hope that we may be able to do with a much less expensive plant eventually. As for the possibility of the plants installed in Australia being more expensive than the weather conditions warrant, on the ground that they have emanated from a country where the extremes are more severe than here, I should say that the range of climate in Australia is not considerably less than that in America. The Perth automatic system was one of the first to be tried out anywhere in the world on a pretty big scale. The importance of installing air-conditioning plants has not hitherto been fully realized. I hope that, with greater experience, we shall be able to arrive at a less expensive plant than is being proposed for this small exchange. The efficiency of the Post Office engineers in Australia is very high, more particularly in connexion with automatic work. Probably nowhere is there more knowledge on this subject than here; and when the Chief Engineer of the Postmaster-General's Department has returned from his visit abroad, I expect that we shall have still more valuable information on the whole subject generally.

30. *To Mr. Mathews.*—The idea of the flat-roof front in this design is quite all right from the architectural stand-point. The cavity under the main building is not proposed to be made use of. It will be filled up solidly for the concrete floor to go over it. As to whether, in view of the return shortly of the Post Office engineers who are now abroad, it might be worth while to wait before installing further air-conditioning plants, I think that the Collingwood Exchange work had better be gone on with. I understand that that plant is all under order. With one such plant completed we would be able to derive a good deal of experience and valuable information. Generally, the subject is one which requires fuller knowledge and investigation. Concerning the point whether a parapet wall would detract from the appearance of the block, I would not like the look of the building so well. If there were a fire-proof concrete ceiling under the eaves there would be secured all the safety possible.

31. *To Mr. Parker Moloney.*—Concrete floor construction is the most fire-proof, and is altogether the best for an automatic exchange, since in a great degree *it does away with dust.* There are no seams for harboring dust, such as in the case of a wooden floor. A brick floor would not be suitable, not only because it harbors dust, but because the brickwork wears and creates dust of itself. I have pointed out that on the concrete floor of the switch-room there will be linoleum set in tar, so that the dust difficulty will be, so far as possible, eliminated. I do not think there will be much difference in the cost of the proposed buildings compared with a block of similar size in this city. Local tiles are being well made, and there is also a very good and reasonably cheap local cement which will be available. I am of opinion that the construction of concrete ceilings would be in this, and every similar instance, a warranted expenditure. In addition to other features it would render the atmosphere of the switch-room cooler.

Printed and Published for the GOVERNMENT of the COMMONWEALTH of AUSTRALIA by ALBERT J. MULLETT, Government Printer for the State of Victoria.