

1923-24.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

PARLIAMENTARY STANDING COMMITTEE
ON PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED ESTABLISHMENT OF

AUTOMATIC TELEPHONE EXCHANGE,
NORTHCOTE, VICTORIA.

Presented pursuant to Statute ; ordered to be printed, 20th August, 1924.

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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 Newland. †
 Senator William Plain.*
 Senator Matthew Reid. †

* Ceased to be a Member of the Senate, 30th June, 1923.

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 Mathews, Esq., M.P.

† Appointed 5th July, 1923.

‡ Resigned 28th June, 1923.

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EXTRACT FROM VOTES AND PROCEEDINGS OF THE HOUSE OF REPRESENTATIVES No. 80 OF 4TH JULY, 1924.

5. PUBLIC WORKS COMMITTEE—REFERENCE OF WORK—AUTOMATIC TELEPHONE EXCHANGE, NORTHCOTE.—Mr. Stewart (Minister for Works and Railways) moved, pursuant to notice, That, in accordance with the provisions of the *Commonwealth Public Works Committee Act 1913-21*, 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 Northcote, Victoria.

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

LIST OF WITNESSES.

Crawford, John Murray, Chief Electrical Engineer, Postmaster-General's Department	1, 2
Fanning, Lawrence Bede, Superintendent of Telephones, Postmaster-General's Department	7
Hill, Thomas, Chief Engineer, Department of Works and Railways	3
Murdoch, John Smith, Chief Architect, Department of Works and Railways	4
Turner, William Howard, Mayor of Northcote	6

NORTHCOTE AUTOMATIC TELEPHONE EXCHANGE.

REPORT.

The Parliamentary Standing Committee on Public Works, to which the House of Representatives referred, for investigation and report, the question of the proposed establishment of an automatic telephone exchange at Northcote, Victoria, has the honour to report as follows :—

INTRODUCTORY.

1. The telephone subscribers in the Northcote area are at present served by a manual (magneto) switchboard in the Northcote Exchange, but the ultimate limit to which the switchboard can be extended in the existing building will only suffice to provide service for intending subscribers until about June, 1925. The Department therefore considers it necessary to establish a new exchange to meet the prospective development of the district, and for this purpose to erect a building and install a modern exchange plant. In a multi-exchange network such as that of the Melbourne Metropolitan area, it is claimed that the interests of economy and efficiency are best served by the installation of an automatic exchange.

PRESENT PROPOSAL.

2. The proposal submitted is to erect a telephone exchange building on a site which was acquired by the Commonwealth in 1915 at the corner of Bay View and High-streets, Northcote, and to install therein an automatic telephone switching system having an initial capacity of 3,800 subscribers' lines, and an ultimate capacity of approximately 9,300 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 the Northcote exchange area.

ESTIMATED COST.

3. The estimated immediate cost of the proposal as submitted to the Committee is as follows :—

	£
Site	894
Building	9,000
Air conditioning, heating, ventilating, vacuum cleaning and air compression plant	4,500
Exchange equipment, including that necessary at other exchanges (approx. £3,000)	72,700
Sub-station equipment	11,669
Line plant (conduits, cables, and open lines)	1,360
Cut-over	1,000
	101,123

COMMITTEE'S INVESTIGATIONS AND RECOMMENDATIONS.

4. The Committee visited the existing exchange at Northcote, and also the site suggested for the new exchange, and examined the plans of the building proposed to be erected there. In addition, an inspection was made of the air conditioning plant at the Collingwood Automatic Telephone Exchange, and inquiries instituted as to the necessity for these plants and the practice followed in regard to their installation in other parts of the world. Evidence was obtained from the Secretary, Postmaster-General's Department, the telephone engineers and works officers and also from Australian representatives of British and American automatic telephone companies.

5. During the Committee's inspection of the existing exchange at Northcote, it was pointed out that certain additions being made to the manual switchboard to cope with increased business will so encroach on the already limited space set apart for the staff and mechanics as to make that accommodation totally inadequate. The design for the new building provides for sufficient accommodation, but pending the erection of the new building it is considered that special steps should be taken to set apart in some convenient position more commodious and comfortable quarters for the staff.

BUILDING.

6. The plans submitted to the Committee indicated a 2-story structure with brick walls, and floor and ceiling of concrete. On account of the slope of the land, it is proposed to have the exchange room on the principal floor, and the accessory accommodation on the floor below. The inside dimensions of the exchange room will be 115 feet 10 inches by 43 feet. The accessory accommodation will comprise the battery-room, staff-room, air conditioning-room, line inspector's office, installation staff-room, and retiring-room. The principal story will be 16 feet 8 inches from floor to ceiling, and the lower story 10 feet. The building generally will be of simple design and erected on the latest fire-resisting principles.

7. A flat concrete roof covered with bituminous material was suggested, but as evidence obtained indicated that a flat roof would detrimentally affect the temperature and humidity of the building, the Committee considers that the flat roof should be covered with a timber and tile roof, and recommends accordingly.

FINANCIAL ASPECT.

8. It was stated in evidence that the total annual charges of the existing manual system as at 30th June, 1926, are estimated at £16,131
The total annual charges of the proposed system are given at £18,858
and five years after date of cut-over, at £21,919
The estimated revenue at 30th June, 1926, is set down at £25,631
and five years later at £42,347

so that five years after date of cut-over it is estimated that the annual revenue will exceed the total annual charges by £20,428. The assets thrown spare if the automatic equipment is installed are estimated to have a recoverable value of £12,688.

COMMITTEE'S RECOMMENDATION.

9. Under these circumstances the Committee has no hesitation in recommending that the proposed installation as recommended by the Department be put in hand as early as possible.

P. J. LYNCH,
Vice-Chairman.

Office of the Parliamentary Standing Committee on Public Works,
Federal Parliament House, Melbourne,
5th August, 1924.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

SATURDAY, 5TH JULY, 1924.

Present:

Mr. GREGORY, Chairman;

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

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

1. *To the Chairman.*—The proposal before the Committee is to erect a telephone exchange building on a site which was acquired by the Commonwealth in 1915, at the corner of Bay View-street and High-street, Northcote, and to install therein an automatic telephone switching system, having an initial capacity of 3,800 subscribers' lines, and an ultimate capacity of approximately 9,300 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 Northcote Exchange area. The subscribers in the Northcote area are served by a manual (magneto) switchboard in the Northcote Exchange, but the ultimate limit to which the existing switchboard can be extended in the existing building will only suffice to provide service for intending subscribers until about June, 1925. It is, therefore, necessary to establish a new exchange to meet the prospective development, and for this purpose to erect a building and install a modern exchange plant. In a multi-exchange network, such as that of the Melbourne metropolitan area, the interests of economy and efficiency are best served by the installation of an automatic exchange. The estimated immediate cost of the work is—

Site	£
Building	894
Air conditioning, heating, ventilating, vacuum cleaning, and air compression plant	9,000
Exchange equipment, including that necessary at other exchanges (approximately £3,000)	4,500
Sub-station equipment	72,700
Line plant (conduits, cables and open lines)	11,669
Cut over	1,360
	1,000
Total	£101,123

The approximate annual revenue derived, and the annual revenue it is estimated will be obtained on the date of opening, viz., 30th June, 1926, and with five years' development, is shown hereunder:—

Average Number of Lines in Area during Year 1922-23.	Revenue Received for the Year 1922-23.	Estimated Number of Subscribers' Lines, 30.6.26.	Estimated Annual Revenue, 30.6.26.	Estimated Number of Subscribers' Lines, 30.6.31.	Estimated Annual Revenue, 30.6.31.
1,320	£15,016	2,300	£25,631	3,800	£42,347

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 3,800 lines; but it is proposed that the building be designed sufficiently large to accommodate on one floor an equipment having a capacity of approximately 9,300 lines.

The financial aspect is as follows:—

	As at 30.6.26.	Five years after cut-over (30.6.31).
	£	£
1. Capital cost, new	101,123	115,468
2. Capital cost, new and <i>in situ</i>	168,589	182,934
3. Annual working expenses of existing Manual Exchange as at 30.6.26	8,573	..
4. Total annual charges of existing Manual Exchange as at 30.6.26	16,131	..
5. Annual working expenses of proposed system	5,159	7,042
6. Total annual charges for proposed system	18,858	21,919
7. Annual revenue	25,631	42,347
8. Assets recoverable or thrown spare if and when new exchange is installed—		
(i) Book value	19,603	..
(ii) Recoverable value	12,688	..
(iii) Cost of recovery	763	..
9. Amount by which revenue exceeds annual charges	6,773	20,428

The difference between sub-items (i) and (ii) in item 8, *i.e.*, £6,915, is an amount which, if the assets are recovered, will need to be written off the departmental accounts. It represents the proportion of the capital outlay which is irrecoverable, and includes depreciation due to wear and tear, and labour in installation.

I have with me the following certification of revenue from the proposed exchange:—

ANNUAL RECEIPTS.

Revenue.

The average annual revenue received from the existing Northcote Exchange for the three years ending 30th June, 1920 ... £8,496
 The average number of exchange lines connected ... 953
 Thus the revenue per line ... £8.915
 Allowing for an increase of 25 per cent. in the telephone rates as introduced in October, 1920, the revenue per subscriber's line in the Northcote area would be approximately ... £11.144

This figure is considered to be typical of the revenue received per line, as for the year 1922-23 (after the increased rates had been operating for a reasonable time) the revenue was as follows:—

Revenue from Northcote Exchange for year 1922-23	£15,016*
Average number of exchange lines connected	1,320
Revenue per line in Northcote area	£11.376†

* This figure is shown as £14,816 in the original schedule 7.
 † This figure is shown as £11,224 in the original schedule 7.

I certify that the revenue shown above is in accordance with records kept in this office.

W. JEFFERY,
Acting Accountant.

30th May, 1924.

(Taken at Melbourne.)

TUESDAY, 8TH JULY, 1924.

Present:

Mr. GREGORY, Chairman;

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

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

2. *To the Chairman.*—The proposal for the Northcote Telephone Exchange is on all fours with the proposed telephone exchange at Elsternwick. The figures with regard to estimated revenue and expenditure have been carefully prepared. For the information of the Committee, I have made a comparison of the estimated and actual revenue and expenditure with the Collingwood Exchange. The proposal for that exchange was submitted to the Public Works Committee in October, 1915, and the exchange was "cut over" in October, 1922, the intervention of the war having interfered with the purchase of the equipment, and the delay resulted in an increase in the cost of construction. The site cost £1,150. and the building £12,633, compared with an estimated cost of £6,000. The air-conditioning plant, which was not provided for in the original estimate, cost £4,136. At that time we were only considering the installation of air-conditioning plants in automatic telephone exchanges, and although we had installed plants in certain of the exchanges in Sydney, it was not then thought necessary to do so in the case of Collingwood. Later experience showed the necessity for this provision. The equipment, including exchange building, subscribers' lines, &c., was estimated to cost £152,701, and the actual cost was £171,047. I cannot say offhand, but I am confident that between 1915 and the time when the building was in progress, no substantial alterations were made to the design. Any variation would be only of a minor nature, and would add little or nothing to the actual cost of the structure. We estimated the revenue for that exchange at the date of the cut over at £11,890, on the basis of £7 per line, and the actual revenue for 1923-24 was £16 per line, or a total of £36,792 18s. 8d., the average number of subscribers during that year being 2,457, compared with an estimated average of 1,979 lines. Figures which I have just obtained show that this morning there were 2,496 lines connected with that exchange, the capacity of which is 3,000 lines. I may add that the building has been planned for a greater number, which can be arranged for by providing additional equipment. I direct attention to the remarkable increase in the actual revenue per line of £16, compared with the estimated revenue of £7. I do not suggest, of course, that we should estimate the revenue for the Northcote or the Elsternwick exchanges on the same basis, because Collingwood as a telephonic centre has somewhat changed its character in recent years. It is becoming more and more a business area, which means, of course, that there is a greater revenue from it per subscriber's line than from a residential telephonic centre. I am satisfied, however, that our estimates of revenue for both Northcote and Elsternwick are somewhat on the conservative side. The total cost per subscriber's line is probably in the neighbourhood of £80 or £100, otherwise the ground rental of £5 per year would be excessive. We have to provide for the cost of the site, lines, and equipment, both for exchange and for sub-station purposes. In Great Britain and the United States of America the estimate per line of from £20 to £22 does not include the whole outfit. In our estimate for the Northcote exchange we are not taking into account the value of the existing plant. There should not be any serious discrepancy between the estimated and actual working expenses of an automatic

exchange, because we know how many mechanics are required to maintain a given number of lines. The total annual charges in an automatic exchange are less than for a manual exchange. In the case of Northcote manual exchange, the annual charges amount to £16,131 for a total of 1,775 lines, and for an automatic exchange, with 3,800 lines, the total annual charge is estimated at £18,858. In a telephone network, such as in Melbourne or Sydney, the cost of automatic exchanges does not run out in the same proportion as in a manual exchange. In a manual exchange there is an increase in the multiple for every additional subscriber's position, so that where there are 12,000 or 15,000 subscribers the difficulties are very considerable. It is intended to bring the Melbourne exchange under the automatic system as soon as possible. I consider the site for the Northcote exchange eminently suitable, and the design of the building is quite satisfactory. The structure will be of reinforced concrete, with all the necessary provisions against fire risk.

3. *To Senator Lynch.*—The difference in the estimated cost per subscriber's line between Northcote and Elsternwick, in Victoria, and Unley and Norwood, in South Australia, is due probably to the difference in the network. In Melbourne the network is much bigger than in Adelaide, necessitating more expensive junction apparatus. I may better explain what I mean by stating that if Northcote were connected with every exchange in the network in the metropolitan area, there would be connexion with about 18 or 20 exchanges, whereas in Adelaide there would be connexion with only 7 or 8 exchanges. In a big city like Sydney there would probably be as many as four successive selectors, on the principle that as the network increases so must the number of selectors grow. The telephone is one of the exceptions to the general business principle that an increase in the volume of business leads to a reduction in the average cost. An increase in telephonic business means an increase in the initial outlay. The same principle applies to both manual and automatic exchanges. Similarly, there must be an increase in the annual charges, because more equipment means additional expenditure on the mechanical side to ensure its efficiency. We provide for an examination of the switching apparatus with a certain definite frequency. Necessarily, if lines are used with great frequency a greater number of mechanics will be employed. In an automatic exchange the human element is entirely eliminated so far as the registration of calls is concerned, but the employment of mechanics is necessary for the maintenance of the service. In every state the chief engineer is primarily responsible for the efficiency of the service, and next in order of responsibility comes the equipment engineer. An engineer is placed in charge of a group of exchanges, and is held responsible for the efficiency of all the exchanges in his group. We issue monthly a statement of faults which arise in the various metropolitan exchanges. These faults are subdivided under numerous headings, and show the order of efficiency of the various exchanges in a particular network. Whenever faults are disclosed we immediately call attention to them, and take the matter up with the officer concerned.

4. *To Mr. Mackay.*—The Northcote exchange will be somewhat smaller than the Elsternwick proposal. The figures as to probable future requirements are based upon a careful survey of the telephonic centre. The additional cost of the Northcote exchange is due to the contour of the proposed site. I would not say that the air-conditioning plant, which members of the Committee saw yesterday at Collingwood, is absolutely dust-proof, but it is the best system yet devised. I do not say that we shall not be able to make further improvements in such plants, but I am afraid we shall never get a plant that is absolutely dust-proof, because dust may be taken in on mechanics' boots or clothes. However, very few men enter an automatic exchange. The mechanic, when he enters the building, generally stays there for the rest of the day. There is no traffic in and out of an automatic exchange building.

5. *To Mr. Cook.*—The annual charges show that the approximate saving in an automatic exchange, as compared with a manual exchange, is about £2 per line per annum. At the existing manual exchange at Northcote the annual charges for an operating staff of 22 girls is £2,127, plus certain incidental expenditure, bringing the total up to £2,540. We shall be able to work that exchange under the automatic system without operators, and with only a slight increase in the number of mechanics necessary to keep the equipment efficient. As a precaution against fire we are providing chemical extinguishers, asbestos blankets, and fire buckets, with sand and water. If it were found to be impossible to check a fire with the chemical extinguishers, perhaps it could be smothered with the blankets. If, again, a fire breaks out at a point difficult to reach with the extinguishers, a bucketful of sand thrown over it should be successful. Up to the present we have had only one slight outbreak in the basement of an automatic exchange. No portion of the equipment was damaged.

6. *To Senator Reid.*—At present there are 1,775 subscribers at the Northcote exchange, and we estimate that five years hence the number will have increased to 3,800. These figures are based on a careful departmental survey of the telephonic centre. This is always a reliable guide. The Collingwood experience has shown that our estimates of the probable requirements are accurate, although in that case the revenue per subscriber's line was largely in excess of departmental estimates. This, as I have shown, is due to the fact that Collingwood is changing from a residential to an important business area. As everybody knows, the telephone is used much more largely in a business than in a residential area.

7. *To Mr. Jackson.*—An increase in the network of a metropolitan area means an increased cost per subscriber's line in automatic telephone exchanges.

8. *To the Chairman.*—The existing manual plant at Northcote will be reconditioned and issued to a country district. I have here a copy of the standard specifications which must be signed by all contractors for automatic telephone exchange equipment. It provides for several schedules of prices. Item No. 1 in Schedule "A" deals with automatic switchboard, together with associated apparatus. The tenderer is required to give a total price delivered and a total price installed. Under item No. 2 a contractor is required to give a price for secondary batteries and counter E.M.F. cells. Item No. 3 requires tenderers to quote for motor generators complete with starter, field regulator, and spare parts. The amount of a preliminary deposit is based on a sliding scale. For amounts up to £500, the deposit must be 2 per cent; for amounts above £500, 2 per cent for £500, and 1 per cent. on amounts over that sum. The minimum deposit is £2 for each tender. Under Schedule B we require a contractor to state the period which would elapse from the date of acceptance of tender to that on which delivery would be (a) commenced, and (b) completed, with a penalty in each case for non-fulfilment of the contract. Then, again, we require the contractor to state the period which would elapse from date of acceptance of tender to that on which installation of equipment would be (a) commenced, and (b) handed over to the state engineer for testing. Schedule C deals with unit prices for various types of equipment which may be used in any system. Obviously, if under this system of unit prices we can get part of one system at a cheaper rate from one tenderer than another, we will take it. Then there are the general conditions of contract, Customs duty and delivery, and what is very important, the rates of exchange. All tenderers must state the Customs duty, if any, paid on equipment and any charges in connexion with delivery and installation. We take the precaution of defining certain terms mentioned in the conditions of contract, and stipulate that the successful tenderer must be prepared to provide any portion of his equip-

ment for a period of three years from the acceptance of the tender at the tender price, provided that the contractor may secure an increase if he can show that the cost of production or transport warrants such advance on his contract price. Of course, in the event of our obtaining 75 per cent. of equipment from one contractor and 25 per cent. from another we would not expect the first named to be responsible for equipment supplied by the latter. We make the contractor from whom we obtain equipment responsible for his material. Up to the present we have installed departmentally all mechanical equipment for automatic telephone exchanges. We have always been able to do that work much cheaper than the contractor.

9. *To Senator Lynch.*—What appears to be a discrepancy in the estimated cost of Elsternwick as compared with the Northcote exchange is due to the fact that Elsternwick is an entirely new proposal, whereas Northcote contemplates a change in the system of an existing exchange. We are providing for equipment for probable requirements for five years hence, and in the case of Northcote we estimate those requirements at 3,800 lines, whereas at Elsternwick we are providing for 5,700 lines. At £17 10s. per line the increased number required at Elsternwick should account for the higher estimated cost of that proposal.

The witness withdrew.

Thomas Hill, Chief Engineer, Department of Works and Railways, sworn and examined.

10. *To the Chairman.*—I submit the following statement of the estimated cost of heating, ventilating, vacuum cleaning, air-conditioning, lighting, and power plant for the proposed exchange at Northcote:—

Electric light and power and light mains ...	£600
Ventilation, fan, ductwork, registers, &c. ...	800
Air conditioning and washing ...	625
Refrigerating plant ...	1,700
Heating ...	650
Compressed air cleaning ...	300
Vacuum cleaning ...	325
Battery-room extraction ...	100
Total ...	£5,100

We are now installing air-conditioning plants in over 30 exchanges throughout the Commonwealth. Our experience of the working of automatic exchanges shows that these conditioning plants are essential for certain localities, and I strongly urge the equipment for the proposed exchanges at Northcote and Elsternwick. Even if the manufacturer of this equipment could eliminate trouble due to moisture, a considerable proportion of the estimated expenditure would still be necessary for the purpose of ensuring absolute cleanliness in an automatic exchange. I am not sure that any of the items, with the exception, perhaps, of £1,700 for the refrigerating plant, can be dispensed with at the proposed automatic exchange at Canberra. I do not think that any of the items can be materially reduced. Mr. Lewis, our chief mechanical engineer, when giving evidence in connexion with the South Melbourne exchange, estimated the expenditure for that exchange at £4,050. Necessarily, our estimates of cost of this equipment must vary according to the character of the building. Most of the items are for standard equipment. It is very difficult to eliminate all dust from automatic exchanges. I think it advisable to provide what are known as air-locks, and to require the staff to don some style of protective clothing. They should, in fact, treat the interior of an automatic exchange like a laboratory or a powder magazine, and be required to change their boots and clothing before they enter the exchange proper. I do not think the estimate for the refrigerating plant is excessive. There is considerable competition for all plant and equipment required, and the total amount necessary for the heating, ventilating, vacuum cleaning, air-conditioning, electric light and power, is small in comparison with

the total value of the plant. As a matter of fact, the expenditure is a valuable asset to ensure the efficiency of the plant itself.

11. *To Senator Lynch.*—The plants now being installed have been evolved as the result of some years of experience. The item, £600 for electric light and power and light mains, includes internal wiring in the building. An air-lock would enable us to still further reduce the dust contents in an exchange. Several months ago we carried out interesting experiments with sheets of foolscap, which were placed in certain portions of an automatic exchange. We found there was very little deposition of dust. Owing to the operation of the air-conditioning plant, no dust can enter an automatic exchange building through any of the apertures, but it may be introduced on the boots or clothes of the mechanics. Therefore, I suggest an air-lock or a separate room in which mechanics could change their attire, and thus absolutely prevent the introduction of any dust. The cost would probably be not more than £150 or £200.

12. *To Mr. Mackay.*—To minimize the dust problem we have laid good quality cork linoleum on the concrete floors of all our exchanges.

13. *To Senator Reid.*—The item, £325 for vacuum cleaning, includes the internal fittings throughout the exchange building, enabling vacuum cleaners to be coupled up at different points, and ensuring by means of exhaust fans the thorough extraction of dust from the mechanism.

14. *To Mr. Cook.*—We treat all our contracts as Commonwealth work, and, therefore, secure keen competition for all plant and equipment required, tenders being received from Sydney, Melbourne, and Adelaide. Owing to the fact that no two competing firms have exactly the same system for the arrangement of their gear, and their general lay-out, occasionally we have to make certain modifications in connexion with the ductwork registers, fans, and ventilation. The whole of the plant with the exception of the motors is Australian made.

15. *To Mr. Mathews.*—Large electric motors are being made by individual firms in Australia, but not on a commercial scale. Commercially, very good 5 kilowatt motors are now obtainable in Australia at a reasonable price.

(Taken at Melbourne.)

WEDNESDAY, 9TH JULY, 1924.

Present:

Mr. GREGORY, Chairman;

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

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

16. *To the Chairman.*—The plans of the proposed new post office and automatic telephone exchange at Northcote have been drawn in collaboration with the postal authorities, and our proposals are in accord with what that department desires. I understand the members of the committee have visited the site of the proposed building, which is situated at the corner of High-street and Bay View-street, Northcote. The site was acquired with the idea of providing a new post-office, as the present building is now out of date, and of erecting a new automatic telephone exchange. My opinion is that it is a beautiful site, and from a post-office point of view it is admirably situated. It was first thought desirable to have two buildings. We then considered that it would be better to have the post office beneath the exchange; but after the officers of the various sections of the Post and Telegraph Department considered the matter, we came back to the original idea of having two

separate structures. The committee will see that we propose to erect the post-office at the corner of the two streets on account of the public requiring access to that particular building, and to place the exchange behind the post office, facing Bay View-street, on the eastern side of the allotment. Incidentally, that arrangement will provide for possible extension of the telephone exchange, making an "L" shaped building, to the extent of another 60 per cent. of its present size. Whether that extension will be required, I cannot say; but, even if it is not, the land will be useful for ordinary post office purposes. The proposed exchange is to be a two-story structure to the full depth of the allotment, which is 180 ft. 1 in. The inside dimensions of the exchange room will be 115 ft. 10½ in. by 43 ft. ½ in. The exchange room will be on the upper floor, and the accessories accommodation on the floor below. The floor below will occupy only two-thirds of the area of the building, because it seemed unnecessary to take out further excavation than was required. There is a considerable dip in the allotment, and we are utilizing that to provide accessory accommodation on the floor below the exchange for two-thirds the length of the building, leaving the front portion unexcavated. The accessory accommodation below consists of a battery room, store room, air-conditioning room, line inspector's office, and installation staff room, as well as a retiring room for the members of the staff connected with the exchange. There is the usual lavatory accommodation for males, which will also be used by the staff of the post office. Separate lavatory accommodation will be provided for females. The height of the building has been kept as low as possible, so that it will not dominate the post office building. We want it to appear to belong to the same institution. The buildings will be separated by a right-of-way 12 feet wide, which will pass between the two structures. The building is to be of brick, with a small amount of embellishment in cement plaster. The bottom floor is 10 ft. ½ in. high., and the exchange room itself is 16 ft. 8 in. high. On Bay View-street the extreme height of the building at the centre from the pavement level is 24 feet; at the other end the building will be 33 feet high.

17. *To Senator Lynch.*—There will be one story in the front of the building. The lower floor will extend over two-thirds of the building, so as to make the best use of the site.

18. *To the Chairman.*—It is proposed to build the walls of brick. The small amount of ornamentation will be carried out in portland cement. Brick will be cheaper than reinforced concrete. Reinforced concrete will be extensively used, notably for the floors and roof. It is probable that an alteration in the roof will be suggested. The mechanical engineers do not approve of a flat roof, because it will not provide the amount of insulation required. They desire a timber and tile roof over the flat concrete roof. The timber and tile roof is omitted in the plans, with the idea of making the appearance of the building conform to that of the post office. The engineers have told me that a considerable saving will be effected in operating the air-conditioning plant if the extra roof is provided. There will be a parapet wall and a concrete cornice on the side facing the private property. The tile roof will be in addition to the reinforced concrete roof, and not in substitution for it.

19. *To Senator Reid.*—The engineers contend that the heat of the sun on a flat roof would affect the temperature and humidity of the air inside the building. It is proposed to use 4 inches of solid, metal-reinforced concrete, and another 4½ inches of coke breeze concrete at the centre, so as to give a slope for drainage. Bituminous material will be laid on top of the concrete to make the roof watertight. In the centre of the building, therefore, there will be 8½ inches of reinforced and coke breeze concrete. There is no doubt that the engineers are right about the effect of the sun

on such a roof. That could only be overcome mechanically.

20. *To Mr. Mackay.*—In cold weather the effect of the atmosphere on the roof would be to reduce the temperature inside the building, and thus influence humidity. That would necessitate the greater use of the air-conditioning plant.

21. *To Mr. Mathews.*—If the tile roof were constructed there would be no need for a fall on the concrete roof, or for a covering of malthoid. The concrete roof would then be of a uniform thickness of 4 inches.

22. *To Mr. Cook.*—The cost of the extra roof would amount to very little.

23. *To Senator Reid.*—The roof will not project beyond the walls. The rain will run along gutters on the roof. Air passes freely inside a tile roof, so that it is always a waste of money to make openings for ventilation in such a roof.

24. *To the Chairman.*—The Collingwood exchange has not a concrete ceiling. I can provide the committee with comparative estimates of the cost of a concrete roof and a concrete and tile roof. All telephone exchanges are now being built with double roofs, and the appearance was the only reason for not proposing it in this case.

25. *To Senator Reid.*—The Chief Engineer thinks the flat roof would make a difference of from £200 to £300 a year in the cost of running the air-conditioning plant.

26. *To the Chairman.*—Concrete roofs were introduced largely as a result of the investigations of this committee. I entirely approve of them, for they secure almost complete immunity from fire risk at an expenditure of not more than £200 or £300 on an average exchange. The disorganization that would result from the telephones in a large section of a city being thrown out of order as a result of a fire can hardly be imagined. So many plans with concrete ceilings have been passed that we should regard the provision as standard.

27. *To Mr. Mackay.*—Dust and humidity are the important factors in the inside atmosphere. Immunity from fire risk is important, in my mind. I have always been nervous about the Collingwood exchange in that respect. I would like to see a concrete roof there. On a hot day sparks from an adjoining fire could blow under the tile roof, with possibly serious consequences.

28. *To Senator Reid.*—I think the blowing of sparks under a tile roof is a fertile source of fires. The statement that the double roof would save from £200 to £300 a year astonished me. The atmosphere outside the building is not satisfactory for use inside the building. It is necessary to keep humidity inside the switch room uniform. Air taken from outside has to be conditioned to a certain degree of humidity before being admitted to the building. A very hot or very cold flat roof must affect the atmosphere inside the building. The engineers claim that if an air space is provided between the outer and inner roofs the humidity of the air inside the building can be regulated at much less expense. The purpose of the tile roof is to protect the flat roof from extremes of heat and cold.

29. *To Senator Reid.*—It is true that on one side of the building there will be a lot of glass and an 11-in. wall. That, however, is unavoidable.

30. *To the Chairman.*—A double roof will undoubtedly affect the two important factors of humidity and dust. Maintaining uniform humidity becomes easier if the insulation is better. That statement is especially true of the roof, which is most subject to extremes of temperature. If the roof is protected from sun, rain, and cold, a relatively even humidity inside the building can be maintained easier and at less cost. The nature of the roof of the Queen's Hall would undoubtedly affect the humidity of the air in the hall, but in that instance humidity is of less importance. The humidity of the air inside the building would depend upon every change of temperature to which the building was subjected. A fire in a room might increase or decrease the humidity of the air in the room. Humidity, in the first place, is dependent on atmospheric conditions.

31. *To Mr. Mathews.*—The cost of three-ply malthoid is about 6s. per yard. It is cheaper than tiles, which are now about 73s. a square. The cost of the coke breeze concrete would about balance the cost of the timber in the tile roof. There would be very little difference in cost of the two proposals.

32. *To the Chairman.*—It is expected that the adjoining post office, which is not a subject of reference to this committee, will be carried out under the same contract as the telephone exchange. The exchange is 24 feet high in the middle, and the post office is 28 feet. In Bay View-street the height of the post office in the middle will be 24 feet. The two buildings are connected by a gate. The post office is 65 ft. 9 in. long by 29 feet wide in the main, and has one annexe 15 feet by 28 feet, and another 14 feet by 17 feet. The post office is to be constructed of brick and cement in keeping with the telephone exchange.

33. *To the Chairman.*—Entrance to the main chamber will be by passing through a gate between the post office and the exchange. On opening a door a landing is reached, and after ascending seven steps on to another landing and through a door, the exchange room is entered. Between the outside air and the entrance door to the exchange, one has to negotiate a vestibule and then ascend seven steps. Heavy machinery and other plant will be taken into the building through a large door in the west wall. Rolled steel joists will be projected from the concrete roof, on which a pulley will be placed, and the vehicle containing the equipment will be drawn up under this pulley. I understand that Mr. Hill has supplied the committee with the cost of the necessary engineering services. We estimate that the Northcote building will cost approximately £9,000. It will have 150,000 cubic feet, and we estimate the cost at 1s. 2d. per cubic foot. That estimate is supported by rough quantities which were taken out, and which brought the total up to £8,595. I am almost sure that our estimate will cover the cost of the tile roof if it should be decided to use a roof of that character. A tile roof can easily be supported by struts from the concrete beams, and very little light woodwork would be required. I shall supply the committee with the cost of the reinforced flat roof as at present proposed, as well as the additional cost of a tile roof, and a tile roof without a cement ceiling.

34. *To Mr. Mackay.*—The area of the proposed building is to be 118 ft. 1 in. by 46 ft. 7½ in. The proposed Elsternwick exchange is estimated to cost £7,000, while that at Northcote £9,000. The Northcote exchange will, however, be a two-story building, and will require a concrete floor. The Elsternwick exchange will be on the ground floor, and will not require a reinforced floor. At Northcote a portion of the floor will be on the ground level, and there is to be an upper reinforced concrete floor. It cannot be said that owing to the peculiarities of the site at Northcote the building will cost £2,000 more; it is because it is to be a larger structure. At Northcote we have an installation staff room, a larger store, and also a large line inspector's office, as well as lavatory accommodation for the staff of both the post office and the exchange. The Northcote building is a more elaborate structure, and as it is to be of two stories, thicker walls will be required. The floors of the Northcote building will be of concrete covered with bitumen, over which linoleum will be placed.

35. *To Mr. Cook.*—In a building such as that proposed the difference in the cost of construction in concrete as against brick would be very little. In the Northcote building the floor and roof are to be of concrete, and when allowance is made for the space occupied by windows and doors there is in reality comparatively little brick work. I could not say at the moment what the difference in cost would be, but brickwork is cheaper. Although it may be true that a number of city buildings are constructed of concrete, and not of brick, it must be remembered that the Melbourne building regulations allow contractors to put in only a 6-in. thickness of concrete for curtain walls. But if the walls

were of brick that thickness would have to be increased to 14 inches. The actual quantity of brickwork is small in this instance, and by its use the appearance of the building is improved. I am asked whether the officers of my department have ever been approached in an endeavour to get them to favour brick instead of concrete buildings. We have not had any experience in that direction, neither have I heard of the brick combine trying to prevent the erection of concrete structures. If such an effort were being made, it would not affect us in the slightest degree, because we would decide on what is considered suitable, having due regard to the economical aspect. For a good many years we have been constructing cottages on the group system, and have specified cottages of brick or of concrete; but so far we have never received a price for concrete work which would favorably compare with that for brickwork. The last illustration was in connexion with the Mildura post office, which cost somewhere in the region of £10,000. We gave the contractors the opportunity of tendering on any system, but even at Mildura, where bricks have to be brought to the place, and where one might expect to find good material for the manufacture of concrete, the price for a brick structure was lower. We are not opposed to concrete, but are naturally anxious to erect public buildings as economically as possible, having due regard, of course, to their appearance. We are shortly to call for tenders for cottages to be used by members of the Air Service. We made arrangements to specify for brick houses. I have now given instructions that alternative tenders shall be invited for concrete houses, and such a tender would be freely accepted if the price were right. It is not correct to imagine that there is any prejudice against concrete; it really enters into the construction of this building to a large extent. If we build a concrete structure, we have either to plaster it in order to make it smooth, or rough-cast it, and the cost of plastering to-day is so high that it adds considerably to the cost. During the last twelve months the price of construction has eased slightly, and there is better competition for our work than there was twelve months ago. I cannot see why there should be any occasion for prices to rise in the near future. I think it will be found that the expansion in any case in this building in twenty years will not amount to more than two or three bays, or, say, 34 feet. A considerable quantity of plant has to be installed, and if it were necessary to increase the capacity of the plant to meet the requirements for the next twenty years, I do not think the additional floor space required would amount to much. I am assured by the engineers that a tile roof is an economical proposition.

36. *To Mr. Mathews.*—Further excavation could be made if necessary to enlarge the basement, but if that were done in the direction of Bay View-street the light would not be so good. I have seen the entrance to the Collingwood exchange. We have now gone a long way towards a better understanding of the problems associated with air-conditioning since the Collingwood building was constructed. A double door at the entrance to the exchange room might be a precaution. It might just happen, although it would be improbable, that both doors would be open at the same time, and for a second or two the outside atmosphere would be brought into direct contact with the air inside the exchange. Notwithstanding the fact that a porch has been provided to prevent danger in this respect, it might be desirable to have two doors at the entrance to the switch room. I do not think that the air-conditioning plant at Northcote is to cost £400 more than that of Elsternwick, because there is a likelihood of more attention being required to the plant, owing to the flat nature of the roof. It must be remembered that it is a larger exchange. It is not a question affecting the capital cost of the plant, but of the cost of running the plant. The engineer says that to run a plant without a second roof will cost more per annum. There is no doubt that an air-conditioning plant has an effect upon the appearance of the inside of the ex-

change. When the Northcote building was first designed the windows were placed nearer to the ceiling until I discovered that the engineers had to install a pipe which was to pass along the western wall. In order that the pipe would not interfere with the daylight entering the windows, I decided to lower the windows, and in doing so I had also to widen them. The pipe has been dealt with in a way that will be less conspicuous.

37. *To Senator Lynch.*—The building has been primarily planned to meet the requirements of the postal authorities and will accommodate 9,300 lines. The first thing we do is to get in touch with the departmental authorities concerned. The building will provide for estimated requirements for 20 years, and we have land enough to still further increase its capacity by 60 per cent. The extension would be in the form of a wing towards High-street. The foundations of the building have not been designed to provide for an extension upwards. Departmental engineers consider generally that an exchange with more than 10,000 lines ceases to be economical. There is ample room on the site for the post office and the extension of the exchange. The exchange will occupy the whole of the upper floor of the building. The objection to placing the exchange on the lower floor is the difficulty of providing natural light, although it might be an advantage from the point of view of insulation. Defective insulation can be overcome by the air-conditioning plant, but it is not possible to supply natural light. The maintenance of a building costs more as it is increased in height. The cost of construction is slightly in favour of one-story buildings. The business of a post office must be conducted on one floor. A two-story post-office in the country might involve the employment of an extra man. Personally, I like to see two-story buildings in the country, but they are not economical, except where the building includes postmaster's quarters. Where the land is not sufficient to provide separate quarters for the postmaster, a two-story post office is sometimes erected, and his quarters are included in it. People like to see two-story buildings on the street, but the housewife does not approve of them. The building at Northcote is almost two story. So long as the automatic system is required that exchange will be needed on this site. Automatic telephony may, of course, be superseded by wireless or some other means of communication. The experience of the department is that brick is cheaper than reinforced concrete, although we do not exclude concrete construction. Probably nearly 30 per cent. of the cost of the building under consideration is represented by concrete. It is probable that all workmen, and not merely bricklayers, work at a reduced speed now as compared with formerly. The quantity of labour and the quantity of work available are important factors in relation to the rate of output. In the old days, when 50 bricklayers were wanting jobs and there were only ten jobs available, the man who was erecting a building had the upper hand. The reduction of output is not peculiar to Australia. It has occurred all over the world.

(Taken at Melbourne.)

MONDAY, 14TH JULY, 1924.

Present:

Mr. GREGORY, Chairman;

Senator Barnes	Mr. Mackay
Senator Lynch	Mr. Mathews.
Senator Reid	

William Howard Turner, Mayor of Northcote, sworn and examined.

38. *To the Chairman.*—The site chosen for the proposed automatic telephone exchange at Northcote will be eminently suitable. It is practically in the centre of the business part, and it will also prove suitable to the development that is taking place to the north, in Preston. The Northcote exchange is the most deplor-

able I have ever known. There are more complaints about the service it gives than there are about any other Melbourne exchange. It is quite common to have to ring three times before the exchange replies, or to have to wait five minutes to be disconnected after a conversation. The line foreman tells me that the equipment is not suitable for the number of subscribers, and that some recent additions to the plant have not brought about any improvement in that respect. There must be about 1,800 subscribers on the exchange at the present time. In a little over three years 600 additional subscribers have been connected. I do not know how the officers can have arrived at the estimate that there will not be more than 2,300 subscribers in 1926. Inquiries made by the town clerk and his staff indicate that at the present rate of increase the whole capacity of the building will be exceeded in twelve months. As Northcote becomes overcrowded, people will go further north, and Preston will begin to fill up rapidly. Both Preston and Northcote will be attached to the new exchange. Possibly later on the East Preston people will be connected with the Heidelberg exchange. Many people have not thought it of any use to apply for a telephone. I did not apply, because I was told by others who had applied that I would have no chance of getting a telephone. That belief is still general. A little while ago nobody in the Northcote district could be connected unless a subscriber died or left the district. The conveniences in the present building are disgusting. Councillors of Northcote will be very glad to see the exchange removed from the Town Hall, where the municipal staff is already overcrowded.

39. *To Senator Reid.*—The number of houses in Northcote has increased from 2,199 in 1903, and 4,801 in 1913, to 8,440 in 1923. The population has increased in the same periods from 10,186 to 33,872. The valuation of property has increased from £66,375 in 1903 to £138,029 in 1913 and £342,034 in 1923. The number of shops in High-street has increased to 242. During the last twelve months 50 or 60 shops have been added in St. George's-road, where a tram is now running. There has been an increase of 971 houses in Preston in the last twelve months. The population of Preston has increased in the same period by 2,774, and £55,011 is the increase in the value of property in the same period.

40. *To Mr. Mackay.*—The distance between Northcote and Heidelberg post office is about $4\frac{1}{2}$ miles.

41. *To Senator Lynch.*—I cannot say what took place prior to my becoming a member of the council, four or five years ago, but I know that a great deal of paper has been used up since I have been on the council in writing about the necessity for some improvement in telephonic matters in Northcote. Last year the Postmaster-General made a visit, at our request, to inspect the present building, which we are anxious to have vacated.

(Taken at Melbourne.)

TUESDAY, 15TH JULY, 1924.

Present:

Senator LYNCH, in the chair;	
Senator Barnes	Mr. Mackay
Senator Reid	Mr. Mathews.
Mr. Cook	

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

42. *To Senator Lynch.*—The existing manually-operated exchange at Northcote, which is of the magneto non-multiple type, cannot be extended to meet further development as we have reached the limit of the building accommodation available, and the present exchange will not serve the requirements of the area beyond June of next year. The building is most unsuitable, and we are able to give service only under

extreme difficulties. The accommodation for the staff is inadequate, and it is hardly fair to ask telephonists to work under such conditions. In any case, the accommodation now utilized for the exchange is required for the extension of the post office. We have selected for the new exchange a site adjacent to the existing one, and at the approximate telephone centre of the area. The district is a progressive one, and is developing telephonically at a rapid rate. During the last twelve months telephone lines connected with the Northcote exchange have increased 26 per cent. Whilst that rate of development may not be maintained, we can reasonably anticipate in the next five years development at the rate of at least 15 per cent. per annum, compound interest—that is to say, the number of subscribers will be doubled within the next five years. The establishment of a new exchange is an economical proposition. The earnings from the existing exchange exceed expenditure by about £6,000 per annum, and we estimate that in five years the revenue will exceed the annual charges by £20,000. In regard to the comparative cost of automatic and manual exchanges, a comparison of annual charges is in favour of the former. The total annual charges on the existing plant at the anticipated date of cut over, namely, June, 1926, will be approximately £16,000, whereas the total annual charges for the automatic system will be £18,000. But it must be remembered that the equipment at present installed is quite unsuitable, and we must build a new exchange to meet development. If we had at Northcote a modern manual switching system, the annual charges would probably be greater than those for an automatic system. As we have already installed a number of automatic exchanges in the Melbourne metropolitan area, and it is proposed to convert the whole of the network to automatic, it would not be advisable at this stage to install even modern manual equipment in a large exchange like that at Northcote. The interests of the department and the public alike will best be served by installing automatic equipment. If we installed a modern common battery multiple plant, the annual charges on it would be considerably higher than those on an automatic plant. The comparison of annual charges between automatic and manual exchanges respectively, which was furnished to the committee during the inquiry into the North Melbourne and South Melbourne exchanges, was favorable to the automatic system; a comparison based on present-day costs would, as a matter of fact, show the same result. Since that inquiry the hours of telephonists have been reduced, and their wages increased, so that a comparison under existing conditions would be even more favorable to the automatic system. I do not think that automatic plant is any more costly to-day than it was when the North Melbourne and South Melbourne exchanges were inquired into by this committee. The equipment to be installed at Northcote will meet anticipated development for at least five years. The plant will have an initial capacity of 2,300 subscribers' lines, and will be capable of extension to 9,300 lines. Later, we shall probably delimit the area to be served by the Northcote exchange by establishing a new exchange at Preston. It is anticipated that the 9,300 lines figure will be reached in 20 years. Our estimates have been arrived at after making an exhaustive survey of the district. The immediate expenditure upon the exchange will be £101,000, which will increase to £115,468 by June, 1931. There would be no economy in installing a plant just capable of meeting immediate requirements, and extending it frequently as the traffic developed. The initial expenditure of £101,000 will be sufficient to cater for present needs, and at the end of five years a further expenditure will be incurred to meet development. Every precaution is taken to guard against the installation of plant that would be lying idle for several years. The expenditure of £115,468 will not be sufficient to carry on the exchange until 1946, when it will reach its maximum development; there must be in the meantime addition to the capital

expenditure to meet development. There is no possibility of reducing the initial expenditure. The estimated cost of an automatic exchange is prepared by the engineering branch after a careful study of the conditions that will exist at the exchange concerned. The calling rate for every line in the existing exchange, and the maximum number of simultaneous connexions for which equipment must be provided, are ascertained. Upon this and other similar data the quantity of automatic equipment necessary to handle the traffic is determined. The specifications are not guess-work; they represent a carefully prepared estimate after an analysis of the business to be dealt with. The only idle capital is in connexion with the building, which will be large enough to meet requirements for, say, twenty years. It would not be economical to erect temporary buildings, or a small building which would have to be extended within twenty years.

43. *To Mr. Mathews.*—We are obliged to extend the existing manual board at Northcote in order to provide lines for people who are waiting for service. We are endeavouring to improve the present unsatisfactory accommodation for the staff. The building does not lend itself to extension, and we have unsuccessfully approached the municipal council for additional accommodation. We are now considering the possibility of extending the building in order to make provision for the operators. We have also arranged to renovate the rooms, and improve matters generally. There is no possibility of obtaining a cottage nearby except at very heavy cost. Of course, the proper solution is to vacate the present building as soon as possible.

44. *To Senator Lynch.*—By the conversion of the Northcote exchange from manual to automatic, we shall save the salaries of one supervisor, two monitors, and nineteen telephonists, but there will be no difficulty in absorbing them into other exchanges.