

1917-18-19.

THE PARLIAMENT OF THE COMMONWEALTH OF AUSTRALIA.

PARLIAMENTARY STANDING COMMITTEE ON
PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE

RELATING TO THE PROPOSED

ORDNANCE STORE, LEICHHARDT, NEW
SOUTH WALES.

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MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

Second Committee.

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

Senate.

Senator George Henderson.

Senator Edward Needham.

Senator John Newland, Vice-Chairman.

House of Representatives.

William George Mahony, Esquire, M.P.

James Mathews, Esquire, M.P.

Sydney Sampson, Esquire, M.P.

Hugh Sinclair, Esquire, M.P.

The Honorable William Henry Laird Smith, M.P.

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

No. 121 OF 20TH AND 21ST DECEMBER, 1918.

28. PUBLIC WORKS COMMITTEE.—REFERENCE OF ORDNANCE STORES, SYDNEY.—Mr. Groom moved, pursuant to notice, That the following work be referred to the Parliamentary Standing Committee on Public Works in accordance with the provisions of the *Commonwealth Public Works Committee Act 1913-1914*, viz.:—Ordnance Stores, Sydney.

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

ORDNANCE STORE, LEICHHARDT, NEW SOUTH WALES.

REPORT.

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS, to which the House of Representatives referred for investigation and report the question of the proposed erection of an Ordnance Store at Leichhardt, near Sydney, New South Wales, has the honour to report as follows :—

INTRODUCTORY.

1. The Royal Commission on Navy and Defence Administration, in its Report to His Excellency the Governor-General, made under date 13th November, 1917, drew attention to the inadequate provision which existed in New South Wales for the storage of Ordnance stocks. The report stated that in the Second Military District (New South Wales) the stocks were housed in twenty-five stores in and around Sydney, the majority being unsuitable and inconveniently situated. Under such circumstances it was represented that it was difficult to exercise efficient or economical supervision, while the cost of labour involved in handling stores and providing against the ravages of rats, mice, moths, and other pests was considerable, and the Commission expressed the opinion that the immediate erection of a properly equipped Ordnance Store was imperative.

2. A further Report, dated 14th February, 1918, again mentioned the matter, and added that one of the contributory factors which had resulted in the occurrence of enormous discrepancies in the Ordnance stocks was the lack of adequate storage accommodation.

3. In March, 1918, Lieutenant-Colonel Sands, of the General Head-Quarters Staff, also reported against the method adopted for the storage of material, and was instructed by the Minister for Defence to inquire into the position of the various Ordnance Stores around Sydney and to recommend a site for the erection of central stores which should take their place.

Lieutenant-Colonel Sands suggested a site at Long Cove, Leichhardt, near Sydney, which was favorably reported upon by the Chairman of the Board of Business Administration of the Department of Defence, and on 11th July, 1918, the notification of the acquisition of this site for defence purposes was published in the *Commonwealth Gazette*.

SITE.

4. The land acquired is about 7 miles by rail and about 4 miles by road from the Sydney railway station, and comprises an irregularly shaped area of approximately 9 acres, bounded on its northern side by Augustus-street, on the east by Charles-street, on the south by certain land vested in the State of New South Wales, and on the western side by Canal-road. From Charles-street the land slopes rapidly to the west for a distance of approximately 200 feet, and is of a rugged and uneven character; the remainder of the depth to Canal-road, a distance of, approximately, 1,800 feet, being level reclaimed land. At its northern boundary the area is separated by Augustus-street from Long Cove, while on the westerly side Canal-road divides it from Long Cove Canal. The low-lying ground, comprising an area of about $5\frac{1}{2}$ acres, was formerly used for recreation purposes and was known as Blackmore Park; of the remaining portion of the acquired land, $3\frac{1}{2}$ acres was a subdivision on which had been erected some 27 houses.

PRESENT PROPOSAL.

5. The proposal now under consideration is that the Commonwealth should erect on the high land an Ordnance building of three storeys, the eastern wall of which will be at a distance of, approximately, 170 feet west from Charles-street. The exterior dimensions of the building are proposed at 535 feet long by 83 feet broad. Each of its three floors will be divided by a brick wall containing fire-proof doors into three store rooms or warehouses, thus making provision for six stores each 171 feet long by 80 feet broad, and three other stores each 190 feet long by 80 feet broad—the floor space of the whole building being 127,680 square feet.

On the ground floor it is suggested that there be a loading and unloading platform 18 feet wide all along the western side and the northern end of the building, while at the level of the first floor on the eastern side provision has been made for a railway platform 360 feet long and 18 feet wide, with openings in the platform to allow light to pass to the ground floor. Communication between the floors will be by means of two staircases, and provision is included for six goods lifts—two in each division. It is suggested that the walls of the building shall be of brick, but two alternatives are submitted in respect of the internal construction—one of timber floors and floor supports, the other of reinforced concrete floors and floor supports. The building is planned to carry loads of 2 cwt. to the square foot for the first and second floors, and for any load that may be desired on the ground floor.

For the prevention of fire, a 6-inch service with eight special fire hydrants outside and four hose-cocks inside the building are suggested, and provision is also included for sprinkler fire extinguishers and water towers.

ESTIMATED COST.

6. The estimated cost of the building, including provision for roadways and fencing, railway siding, and sprinkler fire extinguishers is set down at £68,015 if timber floors and timber floor supports be used, and at £69,283 if reinforced concrete floors and floor supports be adopted.

COMMITTEE'S INVESTIGATIONS AND RECOMMENDATIONS.

7. The Committee inspected the site which has been acquired at Leichhardt, visited the buildings at Circular Quay and Darling Island, where the Ordnance stores are housed, as well as Darlinghurst Gaol, the small buildings in various parts of Victoria Barracks, Sydney, and elsewhere, which have been utilized as makeshifts for storing goods because no better accommodation was available. The Committee also visited the stores of Messrs. Anthony Hordern and Sons, Sydney, and Paterson, Laing, and Bruce Limited, Melbourne, and inspected also the buildings used for storage purposes at the Victoria Barracks, Melbourne.

The Circular Quay building is an old brick structure of four stories and a basement, inconveniently constructed, and poorly lighted; the Darling Island building is a more modern well-constructed reinforced concrete building of six stories; but neither is suitable for present day Ordnance store purposes. The other places wherein many valuable stores are housed are of the poorest description and should never have been utilized, excepting, as has been the case, under circumstances of direst necessity.

During the course of its inspections the Committee was impressed by the tremendous diversity of articles included in the designation "Ordnance stores," which comprise some 75,000 items, although probably not more than 15,000 to 20,000 would at the present time be stocked in Australia.

It was apparent to the most casual observer that the stores at Circular Quay and Darling Island are in a very congested state, and as it was explained to the Committee that on the return of troops from abroad and the resumption of normal citizen force training, those subsidiary buildings, including a number of drill halls which have been pressed into service for use as stores, will be required for the purposes for which they were originally intended, the Committee has no hesitation in recommending that the erection of an up-to-date store at Leichhardt be proceeded with.

CONCENTRATION AT LEICHHARDT.

8. Evidence obtained by the Committee showed that inconvenience, lack of economy, and waste of effort resulted from the fact that the Ordnance Stores are located in various unsuitable buildings around Sydney, and that better supervision would result and considerable saving be effected if the stores were all housed in one place.

The Committee is, therefore, unanimously of opinion that it would be in the best interests of efficiency and economy if the whole of the Ordnance store business in Sydney were concentrated at Leichhardt, and that the existing store buildings at Darling Island and Circular Quay be utilized for other purposes. It was stated in evidence that the space at present occupied for storage purposes in Sydney is about 172,000 square feet. As the projected building of three storeys would provide only about 127,680 square feet of storage space, the Committee is unanimously of opinion that a four story building should be erected instead of three stories, as proposed. This will provide a total of about 170,240 square feet, and with the further provision for office accommodation and workshops to be dealt with later, will enable the whole of the stores to be concentrated as recommended.

DEVELOPMENT OF SITE.

9. The area of over 9 acres acquired at Leichhardt is capable of development to provide 700,000 square feet of storage space, and is designed to meet Ordnance store requirements for a number of years. The Committee ascertained that, in addition to the building now under consideration, it is intended that other buildings be erected on the site when required to meet

future needs. It was explained that two schemes for the development of the site as necessity arises had received consideration, namely : the erection of a building of four to six storeys on the Charles-street alignment, where the ground is of a rocky nature and provides excellent foundations, or the erection of three or more smaller buildings of one or two storeys on the lower levels, where it would probably be necessary to provide piling for foundations, as the area is reclaimed ground. The Committee unanimously decided that it would be better to fully develop the low levels for any further accommodation found necessary in the near future, leaving the high ground fronting Charles-street for the erection of a multi-storey building as the ultimate development of the site when it is possible for the Department of Defence to fully gauge its complete requirements, it being the opinion of the Committee that such high ground will not be required for many years. The Committee was further influenced in arriving at this decision by the fact that housing accommodation is very difficult to obtain in Sydney at present and that the level area is unoccupied, while the erection of the proposed building fronting Charles-street would necessitate the demolition of about seventeen houses, at present occupied and returning to the Commonwealth a rental of £461 10s. per annum.

OFFICE ACCOMMODATION.

10. The Committee is emphatically of opinion that when the stores are concentrated at Leichhardt it would be in the best interests of the Commonwealth that the administrative staff should also be located at that place. The Committee considers, however, that it would be uneconomical to use an expensive and strongly constructed store building for office purposes, and is therefore of opinion that the office staff should be accommodated, not in the store building, but in a separate building to be erected adjacent thereto.

The decision arrived at by the Committee in connexion with this matter is shown in the following extracts from its Minutes of Proceedings :—

Senator Needham moved—That provision for the office accommodation of the administrative staff be made adjacent to, but not in the Store. Seconded by Mr. Laird Smith.

Mr. Sampson moved as an amendment—That the administrative staff be located at Leichhardt and that if office accommodation cannot be conveniently provided within the main building, a new building for their accommodation be erected adjacent thereto. Seconded by Mr. Gregory.

The Committee divided on the amendment—

Ayes (2)

Mr. Gregory
Mr. Sampson.

Noes (6).

Senator Henderson
Senator Needham
Senator Newland
Mr. Mathews
Mr. Sinclair
Mr. Laird Smith.

And so it passed in the negative.

The original motion was then put and carried unanimously.

LUNCHEON AND CHANGING ROOMS.

11. The Committee ascertained that no provision is included in connexion with the building under consideration for any conveniences in the way of luncheon or changing rooms for the employees. It was noticed at Darling Island and Circular Quay, where no provision of the kind exists, that the men are compelled to boil in the street any water required for the making of tea for the midday meal. As approximately 130 men will be employed at the stores, it is recommended that a room should be provided for the store staff and artisans, not in but adjacent to the Store, where the men could wash, change their clothing, and have lockers in which they could leave their bags containing their midday meal. A dining room should also be provided where the meal could be taken in comfort, where conveniences for boiling water, &c., could be provided, and where the men could enjoy their after-dinner smoke. By having these conveniences, it would minimize the chance of smoking taking place in the Stores with consequent danger of fire, and would prevent fragments of food being left about the Stores to attract rats and mice, and thus be the cause of damage to clothing and other textile stores.

Similar provision for the clerical staff might well be included in the building recommended above for office accommodation.

ARMOURERS' AND ARTISANS' WORKSHOPS.

12. It was stated in evidence that the work of the armourers and artisans could be most efficiently and economically carried out if they were grouped together and placed under the supervision of one officer. To enable this to be done, the Committee recommends that the armourers' and artisans' workshops be concentrated at Leichhardt, on the low-lying portion of the site and apart from the main store.

CONSTRUCTION.

13. The Committee was favorably impressed with the cantilever floor slab system of construction, more popularly known as the "mushroom" system, an example of which was seen in Sydney, and regarding which a considerable amount of evidence was taken, and unanimously recommends that the building proposed to be erected be constructed with reinforced concrete floors and floor supports, and in accordance with such mushroom system of construction.

FIRE SPRINKLERS AND ALARMS.

14. Some discussion took place as to the necessity for fire sprinklers in a fire-resisting building of the nature proposed, and it was thought by some members that the risk of fire could be met by the installation of an automatic fire alarm in lieu of the sprinklers. In view, however, of the emphatic advice tendered by the Chief Officer of the Melbourne, and the Deputy Chief Officer of the Sydney, Fire Brigades Board, the Committee recommends that sprinklers should be installed.

The decision arrived at by the Committee in connexion with this matter is shown in the following extracts from its Minutes of Proceedings :—

Mr. Sinclair moved—That automatic fire alarms be installed throughout the building instead of sprinklers as proposed. Seconded by Mr. Mathews.

Senator Needham moved as an amendment—That automatic fire alarms as well as the sprinkler system, a proposed by the Department, be installed. Seconded by Senator Henderson.

The Committee divided on the amendment—

Ayes (2).
Senator Henderson
Senator Needham.

Noes (6).
Senator Newland
Mr. Gregory
Mr. Mathews
Mr. Sampson
Mr. Sinclair
Mr. Laird Smith.

And so it passed in the negative.

The Committee divided on the motion—

Ayes (2).
Mr. Mathews
Mr. Sinclair.

Noes (6).
Senator Henderson
Senator Needham
Senator Newland
Mr. Gregory
Mr. Sampson
Mr. Laird Smith.

And so it passed in the negative.

Senator Needham moved—That the sprinkler system as proposed by the Department be approved. Seconded by Mr. Laird Smith.

The Committee divided on the motion.

Ayes (6).
Senator Henderson
Senator Needham
Senator Newland
Mr. Gregory
Mr. Sampson
Mr. Laird Smith.

Noes (2).
Mr. Mathews
Mr. Sinclair.

And so it was resolved in the affirmative.

FIRE-RESISTING WINDOWS.

15. Consideration was given to the necessity for the installation of steel-framed and wired-glass windows as an aid to the prevention of a fire spreading. In view of the fire-fighting appliances provided, however, and the fact that the main risk of fire occurring will be from the inside and not from the outside, coupled with the considerable expense which would be involved in providing such windows, the Committee refrains from recommending them.

The decision arrived at by the Committee in connexion with this matter is shown in the following extract from its Minutes of Proceedings :—

Senator Newland moved—That steel-framed and wired-glass windows be installed throughout the building to be erected. Seconded by Mr. Sinclair.

The Committee divided on the motion—

Ayes (3).
Senator Needham
Senator Newland
Mr. Sinclair.

Noes (5).
Senator Henderson
Mr. Gregory
Mr. Mathews
Mr. Sampson
Mr. Laird Smith.

And so it passed in the negative.

PLATFORMS.

16. Consideration was given to the width of the loading and unloading platforms proposed on each side of the building, as some members were of opinion that a platform 18 feet wide was unnecessarily spacious and wasteful of a valuable area, especially on the lower or western side of the building, where no portion of the platform will be cut away for the purpose of allowing light to go through to the lower floor as is proposed on the eastern side. After discussion, however, it was agreed to recommend that the width of 18 feet be retained as proposed.

The decision arrived at by the Committee in connexion with this matter is shown in the following extract from its Minutes of Proceedings:—

Senator Newland moved—That the width of the platform proposed for the western side of the building be reduced from 18 feet to 12 feet. Seconded by Mr. Mathews.

The Committee divided on the motion—

Ayes (3).
Senator Newland
Mr. Gregory
Mr. Mathews.

Noes (5).
Senator Henderson
Senator Needham
Mr. Sampson
Mr. Sinclair
Mr. Laird Smith.

And so it passed in the negative.

17. Careful note was made by the Committee of the fact that the height of the ground floor of the proposed building from floor to ceiling is 10 ft. 5 in., and considerable discussion took place in regard thereto, as it was noticed that in some of the private stores inspected the ground floor was much higher, and it was thought that in the event of any heavy articles being stored on the ground floor or the necessity arising for the installation of overhead carriers, a ceiling height of 14 feet or 18 feet, or higher, would be preferable. The Committee is, however, aware that the present building has been designed with due regard to the contours of the land, the future development of the site, and the relation which this building will bear to any future buildings erected, and is loath to do anything which might disturb the harmony of the conception of the completed scheme as a whole.

RAILWAY CONNEXION.

18. Consideration was given by the Committee to the important question of the best means of connecting this site with the New South Wales railway system. Under the Departmental proposal, it was designed that the first siding to be constructed should enter the Commonwealth area at its south-eastern corner and run in a northerly direction alongside the eastern side of the store now proposed at its first floor level, and designed to serve the ground floor of any future building which would be erected on the higher ground fronting Charles-street.

While fully concurring with the wisdom and foresight displayed in designing the buildings to occupy the high ground, and in locating a siding in such a position as to serve both these buildings, the Committee, in view of its decision that the lower levels should be developed prior to utilizing the higher ground, recommends an alteration in the location of this siding. Believing, as it does, that the area to the west of the store now under consideration will be fully developed before any building operations take place on the higher ground, it is unanimously of opinion that the best needs of the site will be served by constructing the first siding along the western side of the store, leaving the high level railway for future consideration when the Charles-street frontage is being developed. Any building to be erected to the north of the main store should be so located as to permit of the railway recommended being continued to Long Cove when considered necessary.

LIFTS.

19. Careful attention was given by the Committee to the question of the lifts to be installed in the building, and inquiries made as to the relative advantages of the electric and hydraulic lifts as compared with the hydraulic-electric system suggested for this building. After hearing evidence from several witnesses in the matter, and inspecting other types, the Committee is satisfied that the hydraulic-electric type proposed would meet all the needs of this building, and recommends its installation accordingly. A perusal of all the evidence obtained, and the inspection of many lifts in Defence and Postal buildings in addition to private stores, failed to convince the Committee that any necessity exists for such large and powerful lifts as asked for. In view, therefore, of the space required for six lifts of a size of 14 feet by 8 feet, and the installation and running costs of lifts designed to carry 3 tons when the maximum load would rarely exceed 1 ton, the Committee is unanimously of opinion that in the interests of economy, and without in any way impairing the efficiency of the store, it would be better to have the lifts of a carrying capacity of 30 cwt. each, and of a size approximately 9 feet by 7 feet.

20. Considerable difference of opinion existed even amongst officers actually working stores as to the position in which the lifts could best be placed, having regard to efficient and economical working, the saving of space and the reduction of fire risk. In view of the fact that this store will be served by a railway on one side and a roadway on the other, the Committee, after due consideration, recommends that the lifts be placed on each side of the building.

The decision arrived at by the Committee in connexion with this matter is shown in the following extract from its Minutes of Proceedings :—

Senator Needham moved—That the lifts be placed on each side of the building instead of in the centre as proposed. Seconded by Senator Newland.

The Committee divided on the motion—

Ayes (5).
Senator Needham
Senator Newland
Mr. Gregory
Mr. Mathews
Mr. Sinclair.

Noes (3).
Senator Henderson
Mr. Sampson
Mr. Laird Smith.

And so it was resolved in the affirmative.

21. The question then arose as to the necessity for the six lifts stipulated in the designs, and whether the amount of tonnage which the Committee ascertained is handled in a year could not be dealt with by a less number. Weight was, however, given to the facts that an extra story has been recommended for this building, and also that the lifts should be able to deal not only with the work done under ordinary conditions, but also be capable of meeting the stress during abnormal periods. It was therefore decided to recommend that six lifts be installed in the building—three on each side.

The decision arrived at by the Committee in connexion with this matter is shown in the following extract from its Minutes of Proceedings :—

Senator Needham moved—That provision be made in the building for six lift wells—three on each side of the building; that four of the lifts be installed at once, and the remaining two lift wells be utilized for the installation of chutes until such time as further lifts may be found to be necessary. Seconded by Senator Newland.

Mr. Gregory moved as an amendment—That provision be made in the building for six lifts—three on each side. Seconded by Mr. Sampson.

The Committee divided on the amendment.

Ayes (4).
Senator Henderson
Mr. Gregory
Mr. Sampson
Mr. Sinclair.

Noes (4).
Senator Needham
Senator Newland
Mr. Mathews
Mr. Laird Smith.

and, the Chairman having given his casting vote in favour of the amendment, it was resolved in the affirmative.

STAIRCASES.

22. Inquiry was made as to whether, with a view to providing adequate means of escape for employees in the event of fire, further staircases should not be installed; but the opinion of the Fire Brigade officers examined in Sydney and Melbourne convinced members that the existing provisions were sufficient.

The decision arrived at by the Committee in connexion with this matter is shown in the following extract from its Minutes of Proceedings :—

Senator Newland moved—That a fireproof staircase be built in with each lift well, but separated from it by a wall. Seconded by Senator Needham.

The Committee divided on the motion—

Ayes (2).
Senator Needham
Senator Newland.

Noes (6).
Senator Henderson
Mr. Gregory
Mr. Mathews
Mr. Sampson
Mr. Sinclair
Mr. Laird Smith.

And so it passed in the negative.

ADDITIONAL AREA.

23. During the course of its investigations the Committee ascertained that a small piece of land, containing an area of approximately $\frac{1}{4}$ acre, lying between the Commonwealth area and the storm water channel on the south and south-west, and said to be the property of the New South Wales Government, would greatly enhance the value of the site by enabling additional road access to the Stores to be provided on the south. As it was represented that this area is probably not required for State purposes, and could be obtained by the Commonwealth for a nominal sum, it is recommended that steps be taken to acquire such area.

SITE.

24. The Committee is satisfied that a thorough investigation as to the possible sites available and the potentialities of the Leichhardt site was made before the latter area was decided upon. It was stated in evidence that the Chairman of the Sydney Harbor Trust expressed the opinion that there was no other available site around the harbor possessing both a water frontage and railway connexion. Setting aside the advantages of water frontage, it was stated that the Engineer-in-Chief for Existing Lines, who has a knowledge of the vacant areas in proximity to the railway line, intimated that he knew of no other site within reasonable distance of Sydney which would give the same area and facilities. Estate agents and others were also interviewed by those responsible for the selection of the site, but the general opinion was that there was no other available piece of land equally suitable. It is a considerable attraction from an Ordnance Store point of view that this site possesses the threefold advantages of access by road, rail, and water.

Road Access.—It is of importance that the site should be within reasonable distance of the Sydney factories, which will supply the Stores with boots, clothing, &c., so that the cost of delivery will not be excessive.

The Leichhardt area possesses this advantage, and it was stated in evidence that the Chamber of Manufactures had intimated that the site is sufficiently close to permit of the delivery of goods from the Sydney factories without the addition of any freight charge.

The State Public Works Department have had motor lorries of 1 and 4 tons capacity running on the road which leads to the Leichhardt site, so that the road presents no difficulty to motor transport.

Rail Access.—The railway also affords very considerable facilities, for whilst the Stores have not the immediate advantage of the through railway to Darling Harbor, which has been authorized by the State Government but not yet finished, it is stated that within two years the railway will be connected right through to Darling Harbor with the line that at present passes the Leichhardt site. In addition, there is to be a receiving station within 300 yards of the site, and there is also to be a big marshalling yard about a mile distant from the proposed Stores; so that ultimately the site will be in a much better position so far as railway facilities are concerned than it is to-day.

Water Access.—In regard to transport by water, it is stated that in normal times, the Long Cove Canal would not be of great value, excepting occasionally; but in time of emergency, if ships had to carry stores to the Pacific Islands or elsewhere overseas, it would be of considerable advantage to be able to send barge-loads of cargo quickly to the ship's side instead of having to send the goods by road or rail. At high tide the canal is said to have a depth of about 9 feet, which is quite ample for barges; and it is known that the State Public Works Department uses it regularly for the transport of heavy goods. It was stated in evidence that upon even 3 feet of water, by means of specially constructed barges, it is possible to carry from 30 to 40 tons of goods, while with the present depth of water in the canal at high tide, it would be possible to bring up barges loaded with as much as 100 tons.

EXISTING BUILDINGS ON SITE.

25. During the course of the inquiry, evidence was furnished to the Committee that there are 27 buildings, mainly small cottages, on the upper portion of the site acquired. Of these it will be necessary to demolish ten to permit of the erection of the store now contemplated, while the remaining seventeen will have to be removed prior to the erection of the building on the high ground fronting Charles-street. In view of the fact that the high ground is not likely to be required for many years, and the scarcity of dwelling houses in and around Sydney, the Committee recommends that as many as practicable of the habitations on the site be retained, and that employees at the Stores be given first preference to occupy them. Further, the Committee urges that, if at all possible, such of the buildings which occupy land required for store purposes be removed bodily to any suitable portion of the site not likely to be required for some time and let to the employees.

HOUSING OF EMPLOYEES.

26. With the establishment of the Stores at Leichhardt, and the employment there of a large number of men, it is the opinion of the Committee that it will become more and more difficult as time goes on for the employees of the Stores to obtain suitable dwellings within reasonable distance of their work.

To enable the Commonwealth to select those best suited for its purpose and to retain a healthy, contented staff, it is the opinion of the Committee that it would be a good business proposition for the Commonwealth to provide dwelling houses at a reasonable rental, and the Committee recommends that the Government take into consideration a scheme for the housing of employees of the Stores on suitable unoccupied land within reasonable distance of the Leichhardt site.

FINANCIAL ASPECT.

27. If the foregoing recommendations of the Committee be followed it is pointed out that, in addition to other advantages, the proposition from a financial point of view is satisfactory to the Commonwealth.

The concentration of the whole of the Ordnance Store business at Leichhardt, which the Committee considers of paramount importance, besides making for greater convenience, increased facilities for administration, more efficient supervision, economy of distribution, less handling of goods, and greater security against losses from fire and other causes, will permit of the release of the drill halls, &c., required for other defence purposes, and will enable a reduction to be made of about 25 per cent. in the staff now necessary to carry out the work.

The saving which will be effected in this direction is estimated at £5,400 per annum, which, capitalized at 5 per cent., amounts to a sum in excess of that necessary to provide the four story building, together with the separate office accommodation, armourers' and artisans' workshops, and dining facilities, &c., recommended by the Committee.

A reduction in the overhead charge on the Ordnance Store business will also result from the fact that the Darling Island and Circular Quay stores, which cost the Commonwealth over £100,000, will be utilized for other purposes.

SAVING EFFECTED.

28. The location of the railway siding in the position recommended by the Committee will result in a saving to the Commonwealth of, approximately, £6,300.

SUMMARY OF COMMITTEE'S RECOMMENDATIONS.

29. Briefly summarized, the recommendations of the Committee in connexion with this matter are :—

- (i) That the erection of an up-to-date Ordnance Store at Leichhardt be proceeded with ;
- (ii) That the whole of the Ordnance Store business in Sydney be concentrated at Leichhardt ;
- (iii) That the existing store buildings at Circular Quay and Darling Island be utilized for other purposes ;
- (iv) That the proposed building be of four stories ;
- (v) That the area be laid out with the intention of erecting the next section of storage accommodation required on the lower levels of the site ;
- (vi) That provision for housing the administrative staff be made adjacent to, but not in, the Store ;
- (vii) That luncheon and changing rooms be provided for the convenience of employees adjacent to, but not in, the Store ;
- (viii) That provision for armourers' and artisans' workshops be made on the low-lying portion of the site apart from the main Store ;
- (ix) That the Ordnance Store proposed to be erected be constructed of reinforced concrete floors and floor supports as proposed and in accordance with the mushroom system of construction ;
- (x) That fire sprinklers be installed as proposed by the Department ;
- (xi) That the width of the loading and unloading platforms on each side of the building be 18 feet as proposed ;
- (xii) That the first line of railway to be constructed be at a level of 54 feet and run between the proposed Stores A and B ;
- (xiii) That the lifts to be installed be on the hydraulic-electric system, of a carrying capacity of 30 cwt. each, and of a size approximately 9 feet by 7 feet ;
- (xiv) That provision be made for six lifts—three on each side of the building ;
- (xv) That the area of, approximately, $\frac{1}{4}$ acre of land adjoining the Commonwealth site on the south, and bounded by Charles-street on the east and the storm-water channel on the south and south-west, be acquired by the Commonwealth for the purpose of providing better access to the site on the south ;
- (xvi) That as many as practicable of the habitations on the site be retained, and that employees at the Stores be given first preference to occupy them ;

- (xvii) That if at all possible, such of the buildings which occupy land required for store purposes be removed bodily to any suitable portion of the site not likely to be required for some time and let to employees of the Stores ;
- (xviii) That the Government take into consideration a scheme for the housing of employees of the Stores on suitable unoccupied land within easy distance of the Leichhardt site.

H. GREGORY,
Chairman.

Office of the Parliamentary Standing Committee on Public Works,
31 Queen-street, Melbourne,
26th June, 1919.

ORDNANCE STORE, LEICHHARDT.

MINUTES OF EVIDENCE.

(Taken at Melbourne.)

TUESDAY, 6TH MAY, 1919.

PRESENT:

Mr. GREGORY, Chairman;

Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.
Mr. Mathews,	

Percy Thomas Owen, Director-General of Works, Department of Works and Railways, sworn and examined.

1. *To the Chairman.*—I am aware that Parliament has referred to this Committee the question of the proposed erection of an Ordnance Store near Sydney. The site selected is known as Leichhardt, or Long Cove. It adjoins a branch of the New South Wales railway which leads to Glebe Island, and connects with Wardell-road, on the Bankstown line. Its distance by rail from the Central Railway Station is about 7 miles. The branch line from Wardell-road to Long Cove does not connect with the main line of railway to Strathfield, but passes under it, and hence the connexion must be made *via* Wardell-road and siding. The site adjoins an area which has been set apart by the New South Wales Railways Commissioners as a railway sleeper depôt, and in its immediate vicinity is the State Public Works Department Stores depôt. In regard to the outlet to the sea, I may mention that Long Cove is a shallow bay. The New South Wales Railways Commissioners, I understand, intend to deepen the approach to their sleeper depôt, so as to permit of navigation by barges. The waters of Long Cove Bay, with a frontage to the Ordnance Store site, would not take heavy draught vessels, and at the present time difficulty would be experienced even in their navigation by barges. But I have always understood that ships seldom go to an Ordnance Store unless the bulk of their cargoes are intended for it. At the present time even barges could not be taken up Long Cove to the proposed site unless some deepening work were first carried out. Possibly this has been done since my visit to the canal. I did not consider the suitability of any other site for the purposes of an Ordnance Store. I did tell Mr. Watt, however, that from my knowledge of Sydney Harbor it would be extremely difficult to secure a suitable site save in the vicinity of Glebe Island. I now submit to the Committee a revised estimate of the cost of an Ordnance Store building—(a) with timber internal construction, and (b) with concrete internal construction. I also present further plans showing the development to date of the Sydney metropolitan railway system and the position of the proposed Ordnance Store. I further submit a plan disclosing what cottages will require to be removed to make room for the first building in connexion with this project, together with a description of those cottages, a plan showing the location of railway sidings to develop the complete Ordnance Store depôt, cross sections through the site featuring the building proposed to be first erected, and also the sections of future buildings. I have also prepared a drawing of the proposed railway bridge on the railway siding to

the first building, and a scheme plan of the possible future development of the Ordnance Store buildings and railway sidings. The amount of the revised estimate does not differ greatly from the estimate originally presented, but when forwarding the original plans and estimates, I represented to the Minister that the time allowed for their preparation was so brief that I ought to be afforded an opportunity later to present any revised estimate which might seem to be necessary after I had gone into the matter in detail. The cost of the Store, with timber floors and floor supports, would, according to my revised estimate, amount to £61,000, plus £6,850 for sprinklers; and, with concrete internally, its cost would be £63,532 18s. 9d., plus £5,750 for sprinklers. The cost of the concrete is included in the main estimate. In other words, the expenditure upon the structure in concrete is estimated at £69,000, inclusive of sprinklers, and, if erected internally of wood, at £67,850. These amounts do not include the cost of the land, but do include the cost of the railway siding in each case, and of the formation of an embankment for the first building. That is to say, it covers the outlay upon the railway siding where it will take off from the existing New South Wales Government railways, right into the site, and also the cost of the bridge. The proposal to provide Ordnance Stores for the Sydney metropolitan area—that is to say, accommodation for the storage, maintenance, receipt and issue of stores for the different military units, originated with the Defence Department. The present site was acquired by that Department as an Ordnance Store depôt or compound. The building now before the Committee is proposed as the initial Ordnance Store building, which would be supplemented by further buildings in the future, according to Defence requirements. The data upon which the Defence Department arrived at the conclusion that this Store is necessary is not in the possession of the Works and Railways Department. But we were informed by the Defence Department that, in view of its requirements in the matter of Ordnance Stores, taking into consideration the accommodation which, although it has been provided for other purposes, is now being used for this purpose, and bearing in mind the equipment with which the members of the Australian Imperial Force are returning, these buildings were a necessity. Doubtless the Defence Department will be able to inform the Committee what it proposes to do with existing buildings—for instance, with the Ordnance Store at Circular Quay and with that at Darling Harbor. I have here the drawings of the Darling Harbor Store, because I hope to be in a position to give the Committee useful information regarding the existing buildings. I understand from the Chairman of the Business Board that the Defence Department contemplates a continuance of the use of the Darling Harbor Store, although I cannot make that statement authoritatively. The position taken up by the Chairman of that Board is that, at all events, this first building is required. Yesterday I had a consultation with the Quartermaster-General on the matter, and he has now before him the whole facts in regard to existing space, and is considering the question of future requirements. The Department of Works and Railways was informed, on the 18th March, 1918, that a site for Ordnance Stores

had been acquired. I was then asked by the Minister for Works and Railways to go into the matter, with a view to putting forward a scheme for consideration by the Defence Department as to what buildings should be developed upon that site. Accompanied by Colonel Sands, who at the time was acting in a capacity relating to Ordnance Stores for the Defence Department, I visited the site, and I also got into touch with the Railway authorities of New South Wales in a preliminary way. As a result, I am in a position to say that we shall be able to develop, under the scheme which I will submit to the Committee, 500,000 superficial feet of floor space, although the present proposal is limited to 126,000 superficial feet. When I visited the site, I presumed that the Defence authorities, in selecting it, had looked for two things, namely, access by railway and access by water. Viewing the project from that stand-point, I informed Mr. Watt, who was then Minister for Works and Railways, that to get a site on Sydney Harbor where land would be a reasonable price—a site which would have a water frontage and a railway siding leading into it—was a difficult matter. That is one of the reasons why I have submitted diagrams showing the places around Sydney at which the water front is tapped by railways. However, my business was not to comment on the site, but to determine what could be done with it. The scheme which has been laid before the Committee has in view the development of railway access to the utmost over the whole area secured, and provision also either for bringing in or sending out stores by water. But the railway aspect of this matter is the more difficult one, because there is a road round the northern, eastern, and western boundaries of the site. The site, indeed, is a peculiar one. It consists of a sandstone declivity on its eastern side, that portion being covered by cottages, whilst the western side is a low-lying reclaimed area. The land to the east lends itself readily to the construction of multi-storied buildings at a comparatively reasonable cost, whereas the land lying to the west will involve piling in connexion with the foundations, and this work will, of course, entail a considerable outlay. I, therefore, came to the conclusion that we ought to endeavour to develop the project on the eastern side of the site, at least for a start. I think we shall also be wise if we attempt to provide as much floor space as we can having direct access on the horizontal to the railway platforms, with a view to decreasing the lift loads. Hence I had to consider how, by eventually building on the whole area, the easternmost structure could be connected with the railway platform, as well as the buildings immediately to the west of it. It is apparent that if we sank the eastern portion to the level of the remainder of the site a very heavy expenditure would be involved. Consequently, the railway platform developed in connexion with the first building needs to be at a higher level than are the platforms erected to connect with the lower levels. The result will be that the railway which is now proposed will eventually serve the ground floor of the eastern building "C," as well as the first floor of the structure "A," which it is now proposed to erect. Further, if buildings of two stories are erected on the lower portion of the site, the railway which it is now proposed to construct will serve the first floors of those buildings as well. Thus there will be direct connexion with the railway platforms from the first floor of all the buildings on the west portion B of the site and from the ground floor of the building A and the buildings B on the lower levels. As will be seen by reference to the drawings which I have submitted, A represents the centre group of buildings, B the lower group on the west, and C the future buildings on the higher level to the east. In arriving at this lay-out many proposals were tried. For example, I endeavoured to work the whole scheme from one rail-level—that is to say, from the lower level to the

west. I also attempted to work it by means of a siding on the lower level to the eastern buildings. The drawback to the first proposal was that we would be attempting to develop a scheme over an area, every foot of which would have to be piled, and that we could never, even then, tap the best part of the site by rail access. Hence the adjustment which has been made. The general scheme has been submitted to the Defence Department, and the Board of Business Administration are satisfied that it should be adopted. Its members decided that the building shown as A on the diagram submitted should be proceeded with in the general lay-out, thus providing a floor area of about 126,000 superficial feet. In the selection of the site I do not know, but I do not think, it was assumed that it will be necessary to despatch goods by water. Under some conditions I think a big saving might be effected if goods could be sent directly by means of barges from the Ordnance Stores to ships. But I have no responsibility in connexion with the choice of the site. In locating the railway sidings I asked to be placed in direct touch with the New South Wales Engineer-in-Chief for Existing Lines. I disclosed to him the nature of the project, the approximate location of the buildings, and the future development of the scheme, and he was good enough to prepare the railway siding plans presented to the Committee. These railway sidings will be run with New South Wales rolling-stock, and, consequently, it was wise to conform to its requirements in regard to curves and connexions. It may, therefore, be taken for granted that the planning of the sidings has really been agreed to by the New South Wales Railways Commissioners. The site is at present partly occupied. A portion of it was park lands, or a reserve, and another portion was a subdivision. In connexion with the latter, I have laid before the Committee a plan showing the class of houses erected thereon, together with a description of them. I have, in the correspondence on this question, obtained a series of photographs of these houses—photographs obtained by the Works Director of New South Wales, whom I asked to say whether any of the dwellings were worth removing, say, to Lithgow. In reply, he stated: "It cannot be recommended that any of these cottages should be removed to Lithgow." From what I saw of them, I do not think they conform to the type of cottage the erection of which, at Lithgow, is favoured by this Committee. When it came to the question of designing the proposed buildings on the site, I thought there were two courses open to the Department—one to design buildings for timber construction on the slow burning principle, and the other to design concrete buildings; but in either case to provide brick exterior walls. What would be the class of construction has not been determined, but it is feasible to erect future buildings B with timber frame structures, two stories high, and on the slow burning principle, the alternative being light curtain walls with brick piers with internal story posts of wooden construction. I have had borings made, as will be seen by reference to one of the plans, and these show that, in order to obtain good foundations for buildings on the lower level, it would be necessary to sink to a depth of 23 feet between the ground level and the rock. Piles would have to be driven to the rock, and bearers laid across with either concrete or timber construction on the top. The maximum boring was 30 feet and the minimum 13 feet. As I have previously remarked, there were two courses open to us—to design for an internal timber construction and for construction by means of reinforced concrete. When designing for framed timber we are able to eliminate the fire risk to a great extent by using heavy members, thick floors and iron-bark girders. But one difficulty which confronted us in that connexion was the fact that to sustain the loads which will come upon the floors we would have to put

the story posts, if timber is used, much closer together than we would have to put them if the building were constructed of concrete. The plans show that the bays in the concrete have 20-ft. centres, whereas in the case of timber the centres are 14 ft. x 11 ft. 5 in. There are other advantages which well-constructed reinforced concrete would confer. As a fire risk concrete is preferable to timber, although under some conditions not to a great extent, for I am a strong believer in the use of ironbark. But, instead of having floor joists with 16, 18, or 20 inch centres, the floor joists, when slow-burning construction is adopted, can be widened out to 3-ft. centres and made heavier, the object being to reduce the number of arrises where fires take hold. Concurrently with the preparation of drawings for timber internal construction I had prepared drawings for construction with reinforced concrete. In determining the type of reinforced concrete construction I called in the Chief Architect, who recommended what is known as, under its registered name, Turner's mushroom system. The Committee will, doubtless, be interested to learn the reasons which actuated the Department in adopting that system. Briefly, they are that, by the elimination of the main and subsidiary beams, the storage capacity is increased. In other words, you can reduce your story height for equal storage. Where stores are stacked high, the beams interfere with the passage of light above the stacks of the goods. It is also contended that this method is an economical one both for permanent and temporary material, and by temporary material I mean the timber forms in which the concrete is laid. From a fire risk point of view, it is contended that fire attacks, first, the lower edges, or arrises, of beams. The use of the flat plate, it is urged, is preferable. However, I concluded that for this particular purpose the mushroom, or reinforced cantilever plate, is the better. We then got into touch with Mr. A. R. Crawford, the Australian representative of the Turner system. That system is a patented one. Its use will entail the payment of a royalty, but provision for this has been made in the estimate of the cost of the building. The royalty would also cover professional service for the final drawing of the reinforcements. There is some place in Melbourne which has been constructed upon the mushroom system, and there is also a building in Sydney. After we had decided to recommend the adoption of 20-ft. bays in this mushroom system, I was interested to learn, on looking into the drawings relating to the Rock Island Arsenal in the United States, that a similar distance between the centres had been adopted there, as well as a similar height of floors and a similar type of floors to that which we have recommended. The Rock Island Store buildings are very extensive. There, I repeat, a similar class of structure has been erected to that which it is proposed to construct in Australia—a multi-storied building which is called their warehouse, and single-storied buildings which are used for vehicle sheds. The plans of the Rock Island establishment were sent out by Colonel Wilson, who recently returned to Australia, and who went to America and England especially to study Ordnance Store questions. In the preparation of the drawings presented to the Committee I came into direct touch with the Ordnance Store Officer, Mr. Wakeman. Our original sketches showed lifts on the outside walls, whereas the present drawings disclose lifts within the floor areas. Mr. Wakeman, who is a very experienced Ordnance Store officer, prefers the latter system. Yesterday Colonel Wilson told me that he was looking into the matter, but was not yet quite sure whether it would be advisable to make some alteration in this connexion. I also discussed with Mr. Wakeman the loads to be carried upon the various floors, with the result that we are now planning for loads of 2 cwt. to the square foot for the first and second floors, and for any load that may be

desired on the ground floor. To carry a load of 2 cwt. to the square foot in a timber-framed building we require either to have our supports closer together or to have them very massive, thus adding to the expenditure, whereas by the employment of reinforced concrete it is a very simple matter to go up to the 2 cwt. load. I have also discussed with the Ordnance Store Officer the number of lifts to be used and the positions which they should occupy. The lifts proposed, as shown on the plans, are big ones, being 14 feet long by 8 feet wide. This will be necessary, because there may be some articles of equipment which will require large cage areas. Also, that size of lift is quite suitable for running loaded trolleys, which may be discharged on an upper or a lower floor, as the case may be. These lifts will be worked by hydraulic power. The lighting is to be practically continuous all round. Colonel Wilson told me that for some classes of goods, such as waterproof sheets, light is not required. But in such cases it will be a simple matter to put in concrete slabs to partition off such area as may be required to store such articles. The system of lifts provided for in the scheme is a self-contained hydraulic development. They are self-contained, electrically driven, high pressure, direct acting plunger lifts. There are to be six lifts. To run them there will be two electrically-driven hydraulic pumps working in conjunction with two high-pressure accumulators. The speed proposed is 60 feet per minute to lift 3 tons. We took out the cost of installing electric elevators as compared with the self-contained hydraulic lifts, and found that, whereas the former would have cost £11,280, the latter will cost only £9,000. The estimated annual cost of maintaining the six lifts under the former system is £305, and under the latter £215. I understand that some very big firms are now adopting the self-contained hydraulic system of lifts, as, for example, Messrs. Anthony Hordern and Sons of Sydney. Colonel Wilson asked me yesterday whether, if we installed these hydraulic lifts, we could use them for clothes-pressing purposes. I replied "Yes," but added that it might mean a small increase in the size of our accumulators. We could not apply the electric current direct for clothes-pressing purposes; we should have to press per medium of the hydraulic. The estimate of cost includes the provision of water mains and fire stand-pipes, a 6-in. service, eight special fire hydrants outside, and four special hose cocks inside, the building. We consulted Mr. H. B. Lee regarding fire protection, and his view is that eight fire hydrants will be sufficient. The estimate submitted also includes the cost of providing hose and hose brackets. We have obtained a separate estimate for the sprinklers. But even with sprinklers it is necessary to provide stand-pipes and cocks. My estimate also includes interior and exterior lighting. The supply for the lighting will be obtained from the Balmain Light and Fire Supply Company, which has an alternating current plant, three phase. The estimate also includes £1,045 for roads and channels, and £200 for fencing. It further covers the cost of sewerage. In this connexion I may mention that the first plan submitted to the Committee shows a line of sewers which is incorrect. The proper location of these sewers is shown by a dotted line on one of the plans presented to-day. In considering this project, the question arose as to why the building should be fitted with sprinklers. Mr. Lee is emphatic as to the advantage of installing them. He says that his experience of fires which are arrested by means of sprinklers leaves no doubt as to their efficacy. But the question of providing sprinklers for an Ordnance Store is quite a different matter from that of providing them for a large mercantile house. The owner of the latter wishes to feel that if his place is burned out he has some capital to go on with. But, in the case of an

Ordnance Store, it must be recollected that the building will contain material which, when wanted, will be wanted very much, and which, at any time, it will be difficult to replace. On these grounds I would strongly recommend that the building should be provided with sprinklers. Mr. Lee emphasizes the fact that not only does the use of the sprinkler system give an alarm on the outbreak of fire, but it also gets to work immediately upon the flames. In connexion with several Commonwealth premises we have installed the watchman system. That is to say, the watchman is required at intervals to press a button attached to a clock, and if he fails to do so the fire brigade gets an alarm. Obviously, that system is very much better than the system of merely requiring a watchman to punch a machine. It is proposed to apply the sprinkler system to the whole of the Ordnance Store buildings. I asked why it should be applied to the ground floor, where heavy stuff will be stored. Mr. Wakeman pointed out that at certain periods material of an inflammable nature will be coming in and going out of the store, and in such circumstances there will always be a fire risk. I then inquired why the system should be applied to the whole of the top floor, and was informed that to do otherwise would be to sacrifice the flexibility of the building. A good deal of discussion has taken place with Messrs. Wormald Brothers in reference to the sprinklers. We desired to know whether we could purchase the heads of the sprinklers and install them ourselves. They replied "No," affirming that they would not intrust the installation of the apparatus to anybody except under their own supervision. Finally I obtained details of the cost of the scheme, in order that we might go through them and ascertain whether the estimate was a reasonable one. That has now been done. The cost, I think, is on the high side, though it is not more than 10 per cent. in excess of what we might reasonably expect, and, therefore, I have not hesitated to put it forward at this stage as an estimate of what the job will cost. When the question was under consideration during Colonel Wilson's absence from Australia, it was pointed out that he had been sent to America and England especially to look into the matter of transport, and that it would be premature for us to make an estimate of the cost of transporting appliances before his return. In discussing the question with him, he told me that he was quite sure that it would be advisable to put in spiral chutes for the quick handling of packages, and he is now considering whether, with the aid of such chutes, he would not be able to eliminate one of the lifts. I inquired of Mr. Crawford whether we could introduce spiral chutes with the system of mushroom reinforced concrete construction, and he replied in the affirmative. Colonel Wilson, I gather, considers that the transport by trucks, self-contained and electrically operated by hand, will be the principal means employed for removing material, together with automatic elevating appliances, such as we have already seen in Australia. There will be nothing in the way of overhead conveyors, either on the Telfer system or the traveller system. I have no doubt whatever that the extra amount involved in the construction of the building with reinforced concrete will be more than compensated for by its advantages over wooden construction. By the adoption of concrete we would obtain increased cubic space, better lighting, and better loads. In fact, it is an all-round better proposition than is timber. Of course, this circumstance is partly due to the exorbitant price of timber at present. In New South Wales ironbark is quoted at up to 45s. per 100 superficial feet, and in the estimate which I have submitted we have allowed only 35s. per 100 superficial feet. I doubt very much whether ironbark can be obtained at this figure. There will be no need for the use of cranes in the building, because anything in the way of heavy guns will be stored

on the ground floor. A field gun is not a heavy load. I do not anticipate that anything heavy will be stored on the upper floors, except, perhaps, loads of waterproof sheets or some articles of equipment which can be stored high, and which are fairly heavy in the aggregate. It is not a fact that Ordnance Stores are being erected at Liverpool, but Mobilization Stores are being constructed there. These are intended half for vehicles and half for equipment connected with mobilization. Information regarding these matters can best be obtained from the Quartermaster-General. The cost of the Mobilization Stores is estimated at £40,000, but I do not think that amount represents the end of the expenditure upon it. More buildings will be required, and an ammunition dump may be needed, so that the cost may be very much in excess of what I have stated. The Business Board considered the erection of the Stores at Liverpool an urgent matter. The final meeting, at which it was decided what should be done there, was attended by General Legge, General Forsyth, and the senior responsible officers. When the armistice was signed, and we learned that our troops were to return with all their equipment, the Board looked about with a view to finding accommodation for this equipment. In the absence of that accommodation they apprehended such a serious position that they have been pressing for the erection of these stores. The Liverpool project consists of single-storied iron sheds, those for the vehicles having their floors on the ground level, and those for ordinary equipment having the floors at platform level. They are 60 feet wide; I forget their length. In regard to the building materials at Canberra, where buildings were erected for aliens who were interned, I was asked the other day by the Minister what could be done with it. I told him there were over 3,000,000 feet of timber there, fittings for 600 dwellings, besides stoves, sinks, water pipes, electric fittings, and considerable quantities of rough furniture. All this is quite useful stuff, and represents a big asset. I suggested to the Minister that possibly the Housing Commissioner might make use of some of these buildings. I did suggest the erection of more floors for building "A" of the Ordnance Stores, but I was told that the Defence authorities preferred three floors. In the "C" group of buildings it is proposed that the floors should run from four to six. The disadvantage of going beyond six stories is to be found in the lift provision that becomes necessary. The Defence Department thought that three floors would be required for building "A," and probably six floors for building "C." Personally, I think that building "A" might go up to four floors. When you consider the amount that will have to be spent on foundations, and that there will be only one floor above the railway level, I think it will be recognised that we might go another floor above that level without greatly increasing our lift capacity. This might involve an increase in the cost of the reinforced stanchions, but the walls would cost the same, as well as the roofing and the other services. In explanation of what is known as the Turner mushroom system, I may say that, instead of using beams which carry flat reinforced plates, the reinforcement springs out of the column itself, which is octagonal, and the reinforcing emanates from the columns in all directions and crosses. Thus you have a reinforced concrete plate 5 inches thick with cantilever at the top of the column, which distributes the load economically. It is contended that it is cheaper in construction to pour the concrete on to a flat plate, with merely a sheeting under it, than it is to get it into beam boxes. I do not say it is a system which I would advocate in every case, but in connexion with a building such as is now proposed I think it possesses the advantages which I have mentioned.

The witness withdrew.

Brigadier-General John Keatly Forsyth, C.M.G.,
Quartermaster-General, Department of Defence,
sworn and examined.

2. *To the Chairman.*—As Quartermaster-General I control the Ordnance Stores in all the States. It is proposed to erect Ordnance Stores for the District of New South Wales at Leichhardt. It is absolutely essential for efficient and economical distribution that such stores should have access by rail. It is not so essential that the stores should be accessible from the sea, but it is highly desirable. The proposed building at Leichhardt will deal only with the stores for New South Wales, except when it may be necessary to distribute from New South Wales goods manufactured there for distribution to other Military Districts. A water approach would be very desirable in the event of it being necessary to send stores overseas. The proposal to erect stores at Leichhardt was formulated before I assumed my present office, in July, 1918. For some years the Department has been dissatisfied with the existing storage in New South Wales, and following upon the report of the Royal Commission which inquired into the administration of the Defence Department, the Minister for Defence decided to proceed with the erection of new stores. He deputed Colonel Sands, of Sydney, to look for a suitable site, and after full investigation that officer concluded that the site at Leichhardt was the best procurable. Subsequently the site was inspected by Mr. Swinburne (Chairman of the Business Board), the Inspector-General of Administration (Brigadier-General Ramaciotti), Colonel Wilson, and Mr. Watt, at that time Minister for Works. All of them expressed the opinion that the Leichhardt site was the best that could be obtained. I have never visited the spot, but, basing my opinion on what those other gentlemen have said, and a study of the map, I think it is a good site. It has railway communication; it is easy of access; it is on the south side of the harbor; and is convenient for distribution in the metropolitan area. I have not personally made inquiries as to the possibility of Long Cove being dredged to a depth sufficient to allow of barges coming alongside the stores. Probably Mr. Swinburne has a fuller knowledge of the details of the site than I have. I do not say that access by water is essential, but it is highly desirable, and would allow of the more economical handling of goods received from or sent overseas. I do not suppose that in peace time there will be much overseas traffic in ordnance stores, but war is the eventuality that we must always bear in mind. Therefore, I think it would be desirable to have a water frontage if possible. At present 172,000 square feet of storage is occupied in Sydney, and of that space 64,000 feet odd is in drill halls. We desire that latter space cleared, so that the drill halls may be used for their legitimate purposes now that training is being recommenced. Figures which have been supplied to me, and which I believe are reliable, show that there is 50,880 square feet of storage space in the Circular Quay Stores and 57,000 square feet in the Darling Island Stores. The buildings at present being erected at Liverpool will be known as Mobilization Stores, which are quite distinct from Ordnance Stores. In the former the Mobilization Stores of the different units are kept until the units draw them when mobilized for war. In peace time a unit does not have all its war stores. In all countries the extra stores required in war time are kept in Mobilization Stores, and ear-marked for each unit. As a unit is mobilized, it picks up its own extra stores and equipment. The Ordnance Stores, on the other hand, contain the bulk equipment, camp stores, and reserve stores of all sorts, including clothing, cloth, and harness. The new building at Liverpool was not originally intended to accommodate the large quantity

of goods coming to hand from overseas in connexion with the return of the Australian troops from Europe, but the return of equipment for 100,000 troops must add tremendously to the strain upon the stores, which are overcrowded already. I think that estimates of the ordnance storage required in each of the States in peace time have been worked out by my Department, but I do not know that we have actually fixed any definite requirement of floor space. In my opinion, proposal "A" for buildings at Leichhardt is absolutely essential to meet existing requirements. Not only do we need more storage, but the existing stores at Circular Quay and Darling Island are unsuitable. The idea is that the proposed stores at Leichhardt shall be substituted for those at Circular Quay and Darling Island. The latter two do not carry nearly the quantity of stores which the Department has in hand. The Leichhardt building will have about 125,000 square feet of floor space, which is about 17,000 square feet more than the combined space of the stores at Darling Island and Circular Quay, or 3,000 feet more than the combined space of the Mobilization Stores, the buildings at Circular Quay, Darling Island, and the drill sheds occupied by stores. The Mobilization Stores enter into the consideration of the Leichhardt project for the reason that hitherto all stores have been kept in Ordnance. Previously we had no Mobilization Stores, but when the Liverpool buildings are completed some of the goods that were kept in the Ordnance Stores will be transferred to the Mobilization Stores. The erection of Mobilization Stores has always been a matter of urgency, but the work has been deferred from time to time. During the war a few small Mobilization Stores were built in Melbourne, but the policy of scattering this storage accommodation has been abandoned. In future all Mobilization Stores will be kept in one central place where the troops will concentrate. The idea is that on the outbreak of war the troops shall mobilize at the one point, and there pick up the stores which belong to them. The plans prepared by the Works Department for the proposed stores at Leichhardt have been studied by the Business Board, and by myself and members of my staff. I was consulted by Colonel Owen before the plans were drawn. The Circular Quay Stores are not only in an unsuitable position, but they are structurally bad. They provide no opportunity for extension, and are without yard space. Colonel Wilson, a member of my staff, was sent to America to make special inquiries on the subject of Ordnance Stores, and in the preparation of plans we have had the benefit of his advice and experience. Reinforced concrete construction will not necessitate so much obstruction of the floor space by internal piers as would the use of timber. If, as I am informed, the use of reinforced concrete throughout will increase the cost of the building by only £2,000, I would prefer that form of construction, because of the greater convenience, as well as the longer life of the building. In my opinion, the carrying of plan "A" to four stories will not detract from the handiness of the building. The additional story may increase the difficulty of issuing the stores, but not to a material extent. I am not sufficiently conversant with the pros and cons of the question to express an opinion as to whether the elevators should be in the centre of the building or against the walls. I understand that Colonel Wilson reported that in American stores the elevators are against the walls. The placing of them in the centre of the buildings would not seriously decrease the effective floor space, and there would be this advantage, that a greater proportion of the goods on the floor would be nearer to a lift centrally situated than to one against a wall. I have studied the plans for giving railway access to the buildings, and I think they insure an adequate service for the quick and efficient handling of goods. It is

highly desirable that all stores should be under the one control and management. One of the drawbacks of the present position is the difficulty of control caused particularly by the stores being scattered. The risk of loss is greater, because there is not the same opportunity for supervision. It is necessary to have the Mobilization Stores at Liverpool, but it would not be wise to place the Ordnance Stores there also. One objection is that there is no water frontage at Liverpool. Moreover, in peace time the bulk of the distribution is to troops in or about Sydney, and Liverpool would not be so handy for daily distribution or for general intercourse with those who have to deal with the Ordnance Department. Liverpool would not be convenient for the issuing of cloth to the manufacturers or for the receipt of their goods for inspection.

3. *To Mr. Sinclair.*—When the proposed stores are occupied they will be fairly heavily loaded, but only with the equivalent of ordinary merchandise. Big guns, waggon, and other wheeled vehicles will be kept at the Mobilization Stores. Nevertheless, it will be necessary to have fairly substantial foundations. I am not in a position to express an opinion as to the suitability of the natural foundations at Leichhardt. The stores at Darling Island and Circular Quay are Government property. I believe the stores at Darling Island were erected for the use of the Defence Department and the Postal Department, but the latter has vacated them, and the Defence Department is in entire occupation of the building to-day. Our proposal is that after the completion of the Leichhardt stores we shall surrender the Darling Island building, and sell that at Circular Quay. It is thought that the price obtained for the Circular Quay site will go a long way to meet the cost of the Leichhardt stores. If we can sell an unsuitable property, and with the proceeds erect another building that meets our requirements, we shall gain greater efficiency and give a lot of employment without incurring much expense. This scheme was mapped out before I was appointed Quartermaster-General, but I discussed the lay-out of the buildings before the plans were prepared. All the local distribution in the city will be done by either horse or motor transport. There is a proposal to design the lifts so that the goods will come down in the lifts on the trollies, and then be wheeled out to the transport vehicle, without necessitating any double handling.

4. *To Mr. Mahony.*—Stores are booked into Ordnance, and thence they would be booked out to the Mobilization Stores and become the property of the units. There will be no red-tape difficulties in the way of units getting their supplies. The intention is to issue the mobilization stores as soon as possible. In the British Army the mobilization stores to which each unit is entitled are fixed. We shall follow that system, and once a unit gets its stores it will keep them for all time.

5. *To Senator Needham.*—I am of opinion that for both peace and war requirements there should be access to the Ordnance Stores from the sea as well as from land. That would have been my opinion even if the Business Board had not reported to that effect. I quite indorse the Board's recommendation. The figures which I quoted regarding the store space in the proposed building at Leichhardt were calculated from the plans. The figures giving the accommodation at Darling Harbor and Circular Quay were, I understand, obtained authoritatively by the Business Board, and given to me by Mr. Swinburne. Colonel Wilson was the only officer of the Department who was sent to America to make inquiries regarding this project. He is the man whose advice we follow in regard to the style and general features of the building. I believe in hav-

ing central Ordnance Stores in each State, in order to allow of adequate supervision and convenient and economical distribution.

6. *To Mr. Laird Smith.*—The Darling Island Stores were built for Commonwealth purposes. I believe that half of them were intended for the Postal Department, but when that Department became dissatisfied with them the Defence Department took possession of the whole. Since the outbreak of war no Ordnance Stores have been erected in Sydney. The overflow of stores has been placed in the drill halls. The present scattering of stores all over the city is very costly, and in war time would create difficulties. From a stocktaking point of view the system is very inconvenient. Stock of the New South Wales stores has been taken recently, and I think that the stocktaking generally is nearly up to date. Central Ordnance Stores would mean a considerable saving to the Commonwealth, and would give greater military efficiency. I do not think that the Department has any insurance policies on its buildings or stores. It carries its own risks.

7. *To Mr. Sampson.*—I recommend the erection of the Leichhardt stores in substitution of those existing at Darling Island and Circular Quay, although it would not, of course, be practicable to dispense with the existing stores forthwith. If the two existing stores were to remain, I would not recommend the carrying out of the project which is now before the Committee. But as the present accommodation is over-crowded, we should have to provide some extra storage, especially in view of the large quantity of stuff that is arriving from abroad. My view is that the projected building will not be sufficient to accommodate all our stores in the near future. There is some uncertainty upon that point, because we do not know what responsibilities the Commonwealth will have to carry in connexion with mandatories over the Pacific Islands. If we accept any such mandatories Sydney will be the most convenient place for the carrying of any extra stores and equipment that may be necessary. We are not yet in a position to know what the peace conditions will be, and it is possible that we shall have to carry a larger quantity of stores than we are at present reckoning upon. However, we are hoping that the peace terms will be known before the projected building is put in hand. We cannot gauge our actual requirements until the peace terms are known, and it would be desirable to have that knowledge before committing ourselves to any larger plan than what is projected at present. I repeat my statement that sea frontage for Ordnance Stores is desirable. We might be comfortable in stores erected a few miles inland, but I think they would be better on the sea front. Even if the Leichhardt site is not accessible to barges to-day, we should have regard to our requirements in the future. It is not necessary that the stores should be accessible to sea-going vessels, because they are not likely to be receiving shiploads of material; all the goods the stores are likely to receive overseas can be handled by barges.

8. *To Mr. Mathews.*—I do not know to what extent the members of the Business Board, other than Mr. Swinburne, investigated this project. I know that Mr. Swinburne inquired into it exhaustively, and I believe the other members of the Board gave careful consideration to it. Mr. Swinburne spent days in Sydney in dealing with this matter alone. He made inquiries from land agents in regard to other available sites; investigated the subject of electric lighting; and took evidence from departmental officers. His recommendation was that the erection of new stores was desirable, and that the Leichhardt site was the best obtainable. He dealt, not only with the question of providing new storage accommodation, but generally with the depart-

mental system of purchasing stores. To-day the Quartermaster-General and the Business Board work in conjunction in respect of all business matters, such as the letting of contracts. These matters are submitted to the Board for decision as to whether they are good business propositions.

9. *To Senator Newland.*—I have never seen the Darling Island Stores, but Mr. Wakeman, Assistant Director of Equipment, a very reliable man who had some years experience in these stores, has complained to me that they are very unsuitable. Mr. Swinburne formed the same opinion. One of the most serious disabilities is the narrowness of the buildings and the lack of yard space. There is no opportunity for expansion at either place. Circular Quay is infinitely worse than Darling Island, because the buildings are very bad and there is no rail communication. Probably, when the stores are in full operation, nearly 100 men will be employed there; certainly, if the building is carried to four stories fully 100 men will be required. There are to be six hydraulic lifts, but they will be slow and costly to work as passenger lifts. There will be only two stairways. I shall consider the matter of installing separate passenger lifts for the use of employees. The value of the water approach at Leichhardt will depend to a large extent on the cost of dredging. But I should think that the initial cost would be outweighed by the advantages in the years to come. Straight and spiral chutes for the handling of the goods have been suggested by Colonel Wilson as a result of his American observations. The suggestion is to be further considered, and, I think, will be adopted. In the existing stores we have machines which help the men in the stacking of goods, and our policy in the future will be to install the latest labour-saving devices.

10. *To Senator Needham.*—Our Ordnance Stores are usually delivered by ordinary cargo vessels.

11. *To the Chairman.*—The principal stores to be accommodated in the proposed building are clothing and clothing materials, rifles, machine guns, probably trench mortars, harness and saddlery, tents, blankets, camp equipment (including cooking utensils, horse lines, latrine buckets, waterproof sheets, and mattresses), ambulance stretchers, hospital stores, entrenching tools, wheelbarrows, picks, shovels, crowbars, accoutrements, such as bandoliers and belts, infantry web equipment, water-bottles, mess tins, signalling stores, heliographs, wireless stores, surveying instruments, drawing instruments, periscopes, telescopes, horse-rugs, horse-bags, and tools of every trade. In addition to actual storage accommodation, we must have floor space for the inspection of goods on receipt. In regard to the storage of new and second-hand material in the same building, nothing is put into store until it has been thoroughly cleaned. Sleeping equipment is fumigated or sterilized. Tents are fumigated only when there has been sickness in camp. Blankets are never re-issued until they have been sterilized, and periodically they are washed. Nothing goes into the stores in a dirty condition. I do not think it would be necessary to have a separate store for the accommodation of second-hand materials. All our stores are sectionized, and, of course, if we are provided with a better building then we have at present, we shall have greater facilities for sectionizing. The plans for safeguard against fire were submitted to the expert opinion of Superintendent Lee, who actually reduced the provision we had made, because he considered some of it was superfluous. He favours the installation of sprinklers, and I think we shall probably adopt that system. I think it wise to proceed with the erection of building "A," which will not be in excess of our requirements, but at this stage I do not think we should

do more. Certainly, the addition of another story to the building would help to meet our requirements at the present time, and if, later, further accommodation were required I should prefer plan "C" to plan "B."

12. *To Mr. Laird Smith.*—I am satisfied that the layout of the proposed building will admit of an up-to-date system of stocktaking, because it provides merely a series of open floor spaces. Some changes in the system of storekeeping now introduced in the 3rd Military District are being extended to other districts. Under the old system there was a tendency to keep things in bins, and to pack coats, &c., loose on shelves. Stocktaking then meant the counting of every individual article. Now the system is to bale the clothing and blankets, and to place in boxes such articles as saddlery, &c. Each bale or box is branded with its contents, and then the goods are stacked without the support of racks or shelves, thus saving space and making for preservation of articles. In order to take stock one has simply to count the number of bales or boxes. If it is necessary to take from a bale or a box, the alteration is marked on it at once. Thus there is, in reality, a daily stocktaking in progress. The proposed building will be quite suitable for the operation of that system. I should like to add a word regarding the suitability of the Leichhardt site from the military point of view. Some people ask why we propose to place Ordnance Stores in a big city, where they will be in danger of destruction by aeroplanes in time of war. My opinion is that the store would be safer amongst the buildings of a city than if it were isolated in the country. If it could be placed so far inland as to be beyond the reach of aeroplanes, it would not be of much use. Moreover, a store or factory that is away from close settlement is more easily identified by the enemy. It would not be practicable to keep at an isolated store enough anti-air-craft guns to scare away hostile airmen, and you could not keep protective air-craft there. In regard to the risk of damage to the Leichhardt store by shelling from a cruiser, the enemy must have an aeroplane to spot for it, and we shall have in Sydney, as they have in London, sufficient air-craft and anti-air-craft guns to drive off the enemy observer. In London they have all the appliances for either driving the enemy air-craft away altogether, or alternately driving it so high that it cannot do accurate bombing. I know that in Gallipoli the enemy shelled us at a distance of 11 miles or more, but they did not know "within a few inches" where his shells would land. An enemy off the coast near Sydney would have little chance of hitting the Ordnance Stores at Leichhardt unless he had air-craft to spot for him. My argument against the placing of a store inland would apply equally as much to any defence building situated 60 or 70 miles inland. A factory at Lithgow or Tuggeranong would be within easy reach of air-craft sent from enemy vessels, and could be more easily picked out there than in Sydney. Moreover, in the absence of protective guns the enemy could descend low enough to make sure of his aim. I have heard people in London say that the "archies" were a failure, because they had never brought down an aeroplane. I was in London during two aeroplane raids, and only saw a couple of machines brought down in France by gun fire. But even if the anti-air-craft guns did not do much damage to the raiders they kept them twisting and turning and at such a height that they were not able to discharge their missiles with any accuracy. Although the Germans tried hard to destroy Woolwich Arsenal, I do not think they ever landed a bomb inside the Arsenal grounds, although some fell in the vicinity. In having our Ordnance Stores in a big city we shall have the protection of anti-air-craft guns to put up the necessary barrages to keep air-craft away.

13. *To Mr. Sampson.*—If we take anything like adequate steps to fulfil our obligations in regard to defence against air-craft, I do not think an enemy will ever be able to destroy the Ordnance Stores. The apprehension of danger of that kind would not warrant us in scattering the stores instead of concentrating them in one locality. A building is very hard to hit from the air if the airman is being heckled by gun fire from below and protective air-craft above.

(Taken at Melbourne.)

WEDNESDAY, 7TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.
Mr. Mathews,	

Lieutenant-Colonel Archie John Landles Wilson,
Director of Equipment and Ordnance Stores,
sworn and examined.

14. *To the Chairman.*—I have been connected with the Equipment and Stores Branch for nine years, and for the last four years have occupied the position of Director. I first heard of the proposal to erect Ordnance Stores at Leichhardt from the Chairman of the Royal Commission on Navy and Defence Administration, who informed me that Colonel Sands had been instructed to make inquiries in Sydney with a view to the selection of a site, and that he had chosen that at Leichhardt. I do not know what the site cost. It was not acquired until after my departure from Australia on active service. I had inspected it, however, before leaving, and considered it quite suitable as a site for Ordnance Stores. It has its drawbacks, chief amongst which is the very considerable fall of the land, but we must put up with that slight disadvantage, in order to obtain the great advantages associated with it. I was aware that portion of the site would provide very poor foundations except at big cost, but a considerable proportion of our Ordnance Stores will eventually be housed in single-story buildings, for which the land is quite suitable. It is true that I have made special investigations in other countries. I had instructions to interview the authorities of the United States, with a view to inspecting their Ordnance Stores, and obtaining all information in regard to up-to-date Ordnance buildings. I carried out that instruction, and subsequently, in both England and France, inspected numerous Ordnance Stores. I was not in Egypt, but I studied very closely the war methods adopted in France and England. I went to America before going to England and France. It is correct to say that I have specialized in works of the character now under the consideration of the Committee. The Leichhardt buildings will provide accommodation for all classes of military equipment other than vehicles and explosives; as well as for clothing and clothing materials. The heading "Equipment" in the military vocabulary, comprises some 75,000 items, but at the present time we in Australia would probably not stock more than from 15,000 to 20,000 of them. We require a Mobilization as well as a General Ordnance Store in each State capital. The Ordnance Stores at Leichhardt will be used in peace time to supply the requirements of the State of New South Wales generally. In time of war we may have troops from other States operating in New South Wales, and these stores would serve all troops that could be readily supplied from them, having regard to the existing facilities for transport. It is not at present proposed to have one general Ordnance

and Equipment Store from which supplies could be sent to the stores in the other States. That is the system adopted in England and Canada. When stores are ordered there they are delivered either to a central depôt or to a depôt which is really controlled by, or part of, the central depôt. In Australia the distances are far too great to enable us to do that on a big scale, the cost of handling and transport under such a system would be prohibitive. In respect of some lines, however, we shall have a central Commonwealth depôt situated wherever the Government factories are eventually located. All Government factories ought rightly to deliver to a central depôt, upon which all the outlying depôts could draw for their supplies as required. That would give us a much better grip of the stocks held in the various State depôts. We shall have a Storekeeper controlling the staff of the Ordnance Store in each State, and there will be one Central Executive controlling the whole of them. The control of the distribution would operate, as you say, from the Central Staff. I have with me information as to the capacity of the existing stores buildings in Melbourne, Sydney, and Adelaide, and information regarding the stores in the other State capitals can be readily obtained. In Sydney we are utilizing a floor space of 172,000 square feet; in Melbourne a floor space of 130,000 square feet, and in Adelaide a floor space of 64,000 square feet. This floor space is quite insufficient for our requirements. The Ordnance Stores in each State are congested, and were congested even before the war. With the return of our men and their equipment there will be a much bigger demand for space. Even now we are constantly at a loss to know how we are to handle the equipment coming in until additional space is provided. We have given consideration to our requirements in each State capital in time of peace. I agree with you that it would be unwise to erect large and expensive stores merely to house material now coming in, unless that space would be required later on. Before the war, in Sydney we had the Circular Quay store, the Darling Island store, an old store in Argyll-street, and about fourteen stores at Victoria Barracks, while at different times we had, in addition, three or four rented buildings in and around the city. Those stores were always congested, and most difficult to administer. The floor space to be provided by the new buildings for which we are now asking will only be equivalent practically to the floor space we had before the war. That fact alone, I think, is ample justification for the proposal to erect the new stores at Leichhardt. When we secure these further buildings at the Leichhardt site we intend to centralize, and have the whole of our New South Wales Ordnance Stores and equipment located there. Fairly early in the war I suggested that we should consider the erection of large central Ordnance Stores in Sydney, and the disposal of the scattered store houses held by us there. It would be for the Minister to decide whether, on the erection of these stores, the buildings which will be vacated by us should be sold or handed over to other public Departments. It is difficult to say at present exactly what we shall require. All sorts of obligations might be undertaken by the Government, necessitating our holding far more equipment than we anticipate, and necessitating also an increase in the number of our troops, with a consequent increase in the volume of transactions to be carried out by us. The first essential of a central Ordnance Store, as distinguished from a Mobilization Store, is that it should be convenient to the locality where the goods to be stored are likely to be manufactured. It should also be convenient to water and railway transport, in order to minimize transport charges. It should, further, be as nearly as possible in the centre of the majority of the military units that it is to serve. The Leichhardt site is within road transport distance of that portion of the manufacturing

centre of Sydney from which we draw most of our military supplies. Contractors usually take delivery from our stores. In the case of cloth, for instance, they frequently take delivery three times a week, and if we had to supply them from a store distant 20 or 25 miles from the city, it would be an enormous task. Many contractors work on a small capital, and want to take small and frequent delivery of cloth, because they have to pay for it in advance. Then, again, most of the units which these Ordnance Stores will serve are in the metropolitan area of Sydney, because more than one-third of the population of the State is concentrated in the metropolis. That condition will continue to exist. It is certain that the requirements in connexion with Ordnance Stores in Sydney will increase rather than decrease, and on that account it is essential that these stores should be in the city. It might be necessary later on, in a large State like New South Wales, to establish sub-stores, but that contingency does not arise at present. The first essential in regard to a site for Ordnance Stores is proper facilities for railway transport, and the second is good road connexions. Although not absolutely necessary, accessibility to water transport is also a very great advantage. There must always be heavy expense in the transport of ammunition if you are not on a water frontage, where you can lighter your stores from the steamer to the railway. It is not proposed to house in these stores more than a small quantity of safety ammunition, such as will enable emergency issues to be made. Having these essentials in view, I think the Leichhardt site is the best we could get. The railway proposals in connexion with the stores have been explained to me by Colonel Owen, and I consider them quite satisfactory. They are almost on the lines of those associated with the Rock Island Arsenal in the United States. I understand that the State Government intend to deepen the canal to enable them to transport sleepers to their depôt, which is a little higher up the canal than we are. The State Government have stores alongside our site, and the Metropolitan Board of Works stores immediately adjoin them. It would be a distinct advantage to have a sufficient depth of water, and also small wharfs to enable us to barge quite a lot of our stores to be sent to other States. The design before the Committee is for a building much of the character of Ordnance Stores that are being erected in the United States. It is not on the lines of the buildings erected in England during the war. Prior to the war, in the Old Country three-storied buildings were used for this purpose, but during the war period the authorities had great difficulty in obtaining material, and all the Ordnance Stores erected during that time were practically of only one story. They were built of black iron, painted, or of coke breeze slabs, hollow bricks, or practically anything that could be used for the purpose. The great difficulty connected with an Ordnance Depôt in which the buildings are one-storied is exemplified in the large Didcot (England) Ordnance Stores. The buildings there cover 62 acres. The Chief Ordnance Officer told me that it took him over two days to go around his depôt, and that even in that time he could not make a satisfactory inspection. Single-storied buildings, spread over a wide area in this way, render supervision very difficult. In time of war, when they had in England plenty of Chinese labour and the labour of prisoners of war, the difficulty was not so great. Few Britishers were employed at Didcot at that time, and the labour used was very cheap. But the cost of running such stores in peace time—labour and administration—would be enormous. I prefer to have the General Ordnance Stores more concentrated. Mobilization Stores, which are purely war buildings, are not in the same category. You ask whether the question of the danger of enemy attack on stores concentrated in one spot, such as is proposed in this case, has been con-

sidered. It is, perhaps, an advantage in war time to have big Ordnance Stores surrounded by other buildings. With the use of searchlights and a good barrage, it is remarkably difficult for an aeroplane to single out a particular building for a bomb attack. Take, for instance, what happened in London during the war. The enemy tried again and again to drop bombs on the railway stations there. They succeeded in dropping two or three bombs on stations and bridges but with no serious results. At Boulogne there were two or three hundred air raids carried out, with a view to bombing wharfs or ships carrying troops, but very little damage was done. On the occasion of the last raid they got a lucky shot on to the Commandant's quarters, and destroyed them, but, fortunately, the staff were not there at the time. It is practically impossible to drop a bomb from an aeroplane on a particular building, except by a lucky chance. The roofs of the purely military buildings are so well camouflaged these days that it is almost impossible to pick them out from the air. As to shell fire from the sea, in this case the ships would, in my opinion, be too far out to be able to drop a shell into the buildings at Leichhardt. If the enemy had complete control of the air it might be possible to hit them; otherwise any attempt of the kind would be purely guesswork. This war has taught us that in war time practically every building suitable for the purpose is utilized as an Ordnance Store. I should imagine that the Mobilization Stores at Liverpool in time of war would also become general Ordnance Stores. I prefer the Leichhardt site rather than a site 30 miles inland, selected to guard against the dangers of war. So far as the Leichhardt site is concerned, the railway provisions seem satisfactory, and I should be pleased to have facilities for water transport. The design of these buildings now under your consideration is quite satisfactory, except that I would have preferred a building 20 feet wider. The plan is for a building 80 feet wide; I should have preferred it to be 100 feet wide. After hearing the explanation made by the Director-General of Works as to the proposal for future expansion, and having regard to the certain development of Australia, I think, however, that the suggested building is the best that could be erected on this site. The section marked "A" on the plan is to be erected at once, and I understand that the section marked "B"—I refer to the building shown on the northern end of the plan—is to be next proceeded with. Except that I should like this building to be wider, the design compares favorably with the best type that I saw abroad, and, having consulted with the Works Department, I think that the proposal submitted will fit in better with our requirements than would a wider building. The provision of lift accommodation almost in the centre of the building instead of on one side is satisfactory. Lifts in the centre of a building are more advantageous than are those placed on the side of a building. I told Colonel Owen, when I first saw the plan, that I would substitute two chutes for two of the six proposed lifts, because, if we should have occasion again to send out of Australia such enormous quantities of clothing as we sent out during the war, we should be able to go about the work in a way different from that adopted at the start. All our clothing is now baled in standard-size bales—so many garments to the bale—and these bales can be very quickly dealt with by means of a chute and a gravity runway from the bottom of the chute to the railway truck or other conveyance. A bale is put into the chute from the top floor, and it slides straightway into the truck or vehicle alongside without any further handling. Provision is made on the plan for six lifts; I think it would be sufficient to have four, with two chutes. I should like to have a conversation with the Senior Ordnance Officer in Sydney before that matter is finally determined. All the chutes would be inside

the building. I saw a number of chutes placed outside the big post-offices of London, which have a floor space of $2\frac{1}{4}$ acres. The lifts there were little used; practically everything went down the chute. The chutes would be particularly handy for dealing with clothing in bales of standard size, and the lifts could be used for mixed consignments. In the American stores the chutes are inside. In some of the four-storied buildings taken over by the War Office in England there were big chutes in the centre. These were mostly railway terminal buildings, and the trucks were brought into the buildings. With gravity runways there would be no difficulty. A gravity runway is fixed at the mouth of the chute, and the package or box runs from the chute to the runway, and goes straight into the truck without any further handling. The runways consist of steel rollers, ball-bearing, and will convey material wherever required, either straight ahead or round a corner. The cost of construction of chutes would be considerably less than that of lifts, and they would lead to more economical handling. I was told that at the Didcot Ordnance Stores, by means of the runways, they reduced their labour by 60 per cent. These chutes and gravity runways are specially effective in the handling of heavy goods. While I was at Didcot they were moving 9.2 and 18-pounder shell. At one time such shell was moved from place to place on trucks—one man to a truck—but when I was there they were employing the gravity runways. There are spring boards or brakes on the chute, which regulate the speed at which the package goes down. The proposed 3-ton lifts in the Leichhardt building will be sufficient for our purpose, and will, I think, be quite satisfactory. As to the question whether wood bearers or reinforced concrete should be used inside, I favour the reinforced concrete. All the uprights in the American buildings are of reinforced concrete, and they give a fine, clear space. With wooden uprights, on the other hand, you get almost a forest of posts, and these posts are found very inconvenient in connexion with the handling of goods. For Ordnance Store purposes the clearer the space the better. It would be absolutely foolish, in my opinion, to use wooden uprights rather than reinforced concrete merely to effect a saving of £2,000. We have not considered any proposal for wharfs on the Long Cove Canal, but in the event of our having a water-way we should do so.

15. *To Mr. Sinclair.*—There is no railway siding on the site, but the railway is about 150 yards distant. The intervening land is, I believe, owned either by the Railway or the Public Works Department. I understand from Colonel Owen that there will be no difficulty in bringing the railway into the site. It is proposed to use hydraulic lifts. I approve of their use. Our experience of electric lifts has not been a very happy one.

16. *To Mr. Mahony.*—All deliveries from the Leichhardt stores to units in the metropolitan area are likely to be by road transport, and I should say that the motor will be the means of conveyance employed in the future. Despite that fact, I still think it necessary to have railway connexion with the stores. A railway siding is particularly useful during the camping period, when we have to send away to one camp from 20 to 30 truck loads of material. I have not compared the cost of putting in a railway siding with that of transporting our goods by barges to the Darling Harbor sheds, or by motor to the Central Railway Station. I assumed that it would be accepted as absolutely necessary that a central Ordnance Store should have a railway siding. Such a siding would be used every day in distributing to country units, rifle clubs, and senior cadet corps, which are scattered all over New South Wales. The enormous cost of handling goods despatched by motor to the Central Railway

Station would eventually far outweigh the cost of putting in a siding on the site. My officers will still have control of the Mobilization Stores at Liverpool.

17. *To Senator Needham.*—I was not accompanied from Australia by any other officer on my visit of inspection to Ordnance Stores in America. I was sent away on active service with the Australian Imperial Force, and was instructed *en route* to investigate Ordnance Stores matters in the United States of America. I was in the United States for about one month. A two or three story building leads to more economy in administration, and is more convenient for the issue of stores than is a one-story Ordnance Depot. It means cheaper handling, provided you do not go higher than four stories. When I said that the Commonwealth might have greater obligations which would necessitate increased floor space for Ordnance Stores, I had in mind the proposed mandates in connexion with the islands in the north. I also think that the Government will decide that the equipment for the present strength of our Military Forces is insufficient for the defence of Australia. Such a decision would, of course, necessitate increased storage accommodation. You are correct in assuming that I also had in mind an increase in the number of reserve troops, and particularly in the equipment provided for our troops. It is almost unquestionable that Australia will go ahead by leaps and bounds, and that within the next 30 or 50 years our Citizen Forces will be very largely increased. That, quite apart from any question of mandates or increase in the Army reserves, is sufficient to justify this increased accommodation, and I have previously explained that we want this accommodation to meet the requirements of our present Citizen Forces and Cadets. Regarding the question of accessibility, sea access is a distinct advantage, but it is not such an absolute necessity as proper rail and road conveniences. I should, of course, like also to have sea access for these stores at Leichhardt.

18. *To Mr. Laird Smith.*—The design for the stores was not prepared until my report had been received from America. The Leichhardt site had not been taken over when I left Australia. Within a fortnight of my return from service abroad a copy of these plans was sent to me, so that I might make any comment I desired. I did not suggest any further alteration. It is difficult to say whether the building now proposed to be erected is large enough for our present requirements. The requirements of a Military Force constitute such a variable quantity that I should not like to commit myself to the statement that the building proposed to be erected immediately will be sufficient, but, having in view the fact that the site provides scope for expansion, I should say that it will be sufficient to meet our needs so far as we can foresee them. From a stocktaking point of view it will be very much better than the older buildings. The Ordnance Stores at the present time in Sydney are scattered over seventeen different buildings. It is difficult to estimate what saving this concentration will effect. The figures as to the number of officers employed just now would be on a semi-war basis, and could hardly be compared with those relating to the staff necessary in normal conditions. By this concentration we should be able to reduce our staff by, roughly, 20 per cent. My experience abroad teaches me that it is absolutely necessary to carry up to twelve months' stocks. Full provision has been made to prevent the deterioration of stocks in these buildings. The principal trouble is in connexion with the storage of clothing, owing to the ravages of moths and silver fish. As the design shows, these stores will be splendidly lighted, and that is a fine safeguard. It would be an advantage to have the building self-contained as regards power, lighting, and heating, but if anything happened to the lighting

system of Sydney in war time our engineers, no doubt, would be able very quickly to make the Leichhardt stores self-contained in that regard. It will not be necessary to provide for travelling cranes; I do not favour them. Nearly all the Ordnance Stores that I saw in the United Kingdom were fitted with big overhead travelling cranes, but most of them were being discarded. They are not used for anything under a 12-in. shell, and rarely in their case, since it is found better to move them on small trucks. From the point of view of its economical working, an Ordnance Store starts to become costly when it goes higher than four stories.

19. *To Mr. Sampson.*—We shall be forced, in any event, to close the great majority of the seventeen stores in Sydney since they are drill halls, and are required for drill purposes. I understand that it is intended to dispose of the buildings at Darling Island and Circular Quay, but it would be dangerous to dispose of both of them until we know what is going to happen and what equipment will be coming back during the next few months. I should recommend the immediate disposal of the Circular Quay building for which, I understand, a sufficient sum could be obtained to provide for the erection of the Leichhardt store. I consider this is a favorable time to expand the Ordnance Stores. This project will provide a lot of employment, and that is a consideration quite apart from the fact that we must have more storage accommodation if our equipment is not to be ruined. It is for the Minister to determine whether the Circular Quay store should be sold at public auction or merely transferred to another Department. You ask whether this is a favorable time to consider the expansion of our Ordnance Stores, having regard to the fact that the Peace terms and the proposal with regard to a League of Nations have not yet been determined. If it were decided, and the Commonwealth Government agreed, that an army of 1,000 would be sufficient for Australia, it would be foolish to build now; but I cannot conceive of such a situation arising. I believe that, no matter what may be the decision of the Peace Conference, Australia is in such a position that she must be fully prepared to defend herself. On broad general principles the determination of any big question should be deferred for a month or six weeks until we have further information as to the decisions of the Peace Conference, but I am strongly of opinion that this building should be erected. Before the time for the closing of tenders, I think we shall know where we stand.

20. *To Mr. Mathews.*—If any great difficulty is anticipated in regard to the erection of the second store later on, I should advise the erection of a building of four stories instead of three at the present time. The extra floor space, amounting to something like 33,000 square yards, would be a distinct advantage. When I was abroad I observed that the lifts there were more often erected against the walls than in the centre of a building. The advantage of having lifts in the centre of a building is that a good open space is thus secured around them for the assembly of stores, and, generally speaking, the distance to be covered with the trucks is less. There should always be ample room round a lift to avoid delay in loading and unloading, and thus save demurrage. There should be an entrance on both sides. In the United States they use two patterns of trucks. They have what is known as the Cowan Transveyor. In such a building as is proposed here there would be, perhaps, dozens of small platforms under which a truck could be pushed. By pressing a lever the truck is raised about 4 inches, and with its load it is then pulled on to the lift. They also use electric trolleys, which are driven by a man from the front, and draw about two trailers. There are advantages connected with the building of a lift on the side of a store, but there are

still greater advantages in having the lifts in the centre. I do not think lifts for the workmen are required; they take up a good deal of space. In some of the new warehouses in the United States they have one-man lifts, which consist really of belts with steel rods, which go up through a small man-hole. A man steps on to one of these belts, or ladders, and, on pressing a button, is carried up to the next floor. Such a fitting is handy, but scarcely worth the cost of installation. I do not think any economy would be effected in having for the workmen means of transport from floor to floor other than the ordinary lifts and staircases.

21. *To Senator Newland.*—In all the buildings that I visited the lifts were inside. To have them outside would mean working in all sorts of weather. That would be unsatisfactory. We need to get our goods under cover as quickly as possible. My experience of the Ordnance Stores in England and the United States was under war conditions. I had no experience of their requirements in time of peace. It is correct that at the time of my visit to the United States there was much confusion owing to want of space. When I passed through they had practically no Ordnance Stores. It must not be forgotten, however, that they were then almost wholly equipping their troops in France. From 75 per cent. to 90 per cent. of their stores were being sent direct overseas without going into an Ordnance Store; that was in 1918, at a time when they were being urged to send their men over at once without waiting to train or equip them. After conferring with the leading warehousemen in the United States, the authorities there decided that buildings of six stories were the most suitable for use as Ordnance Stores. I at first indorsed that recommendation, but in the light of subsequent experience I decided that a building of six stories would not be economical for our purpose. A building of four stories would be far more satisfactory. An important consideration in designing an Ordnance Store is the provision of ample facilities for getting your material into the stores and taking it out again. Our experience at Darling Harbor is that when we go up to the higher stories we are at a considerable disadvantage, and that our lifts cannot keep our trucks supplied. I should say that, including the office and administrative staff, we should require about 130 men to operate the proposed building of three stories at Leichhardt. If an additional story were provided, I do not think it would materially affect the number required. I cannot say whether the plan makes provision for dining or recreation rooms for the employees, but it should do so. The Director-General of Works has carefully explained to me the provision made for ventilating and lighting, and it seems to be quite satisfactory. We had a very unfortunate experience with our store at Darling Harbor so far as dampness is concerned, but we hope that in connexion with this building the Works Department will profit by its experience. There are means of overcoming the difficulty, and we eventually got rid of the dampness at the Darling Harbor store. The building under discussion should be immune from such trouble.

22. *To the Chairman.*—This building will be lighted by electricity. Colonel Owen informed me that he had consulted with the fire authorities regarding the fire prevention, and had put in a greater number of hydrants than they considered necessary. On their recommendation two of these had been taken out. The plan provides for the sprinkler system, which we have at the Circular Quay stores. Since we do not insure our stores, I think it wise to have such a system. We experienced no difficulty with the Works Department in having effect given to our ideas in the preparation of our plans. I have not gone into the question of the financial savings to be effected by the concentration of our work in this one building; what I have always had in mind is that we propose to dispose of two stores, the

value of which is approximately double the cost of the one which we now intend to erect, and which will meet our requirements. That unquestionably is a sound business proposition. We have 224 employees at present. In any event, there would be a certain reduction in their number on account of the lapsing of war work; but when we return to normal conditions we should be able to dispense with, say, 30 men, whose average salary would be about £180 per annum. That would represent a saving of £5,400 per annum, so that, allowing 6 per cent. for interest and sinking fund on an outlay of £70,000 upon this building, it would mean a saving of over £1,000 a year.

23. *To Mr. Mahony.*—You ask whether it is proposed to dismiss a number of these men if this store is erected. Naturally, a considerable number will be put off as the work decreases, and already the services of a number have been dispensed with. Those men were only brought in because of war conditions. We do not propose to dismiss any of the permanent ordnance men, but we always employ a number of temporary hands.

24. *To the Chairman.*—The erection of this building, and the consequent concentration of our work, would give us greater security against theft. With our stores scattered over a number of buildings it is impossible to have proper supervision, and there must be more risk of deterioration. This scheme will mean a saving in respect to the cost of inspection and administration, as well as the prevention of theft. The proper supervision of labour is a big item. If men who have been working in seventeen different buildings are brought into one big store to do the same amount of work as before, then obviously we must be able to considerably reduce our overhead charges. If I had to choose between erecting a building of four stories, instead of a building of three stories as proposed, with the erection of the buildings in section "B" to follow almost immediately, I should say it would be advisable to erect a three-storied building now, and to proceed with the second building immediately afterwards, because of the increased railway facilities that would be afforded and the fact that we should thus have rail access to a water front. Having regard to the future needs of Australia, I should recommend that this building be of four stories. Subject to that one alteration, the plan is quite satisfactory to me. There can be no question as to the necessity for a railway siding; we must have one. It will quickly pay for itself.

25. *To Mr. Mathews.*—Under the present Act every employee in the Ordnance Store is a civilian. It has been proposed for several years to make the Ordnance Department a military organization since it is an integral part of the Defence Force, and must become a military organization in time of war. I think the intention still is that the Ordnance Department should be a military organization. The pay of the men is governed by the pay in other stores, and even if they were made a military organization that would be the position.

26. *To Mr. Sinclair.*—All vehicles will be stored at Liverpool. Buildings for their accommodation are being erected there. It would not pay to store vehicles, which would occupy a great deal of space, on a valuable site like that at Leichhardt. I understand from the Director-General of Works that satisfactory provision has been made in this plan for fire escapes. Two stairways are provided, one of them being specially for the use of the men in case of fire. The concrete supports are to be erected at 20 feet centres.

27. *To Mr. Laird Smith.*—The employees in the Ordnance Stores that I visited while abroad were living in ordinary military huts, but I should say that the tendency will be to erect dwellings for them. Alongside some of the manufactories that I visited there were what might be described as small townships, which had

been created by building houses for the employees. At Woolwich there is quite a township of the kind, and at the big aeroplane stores at Hendon the employees' buildings, which are of brick, also form quite a township. In the United States the men were living in huts. In the case of a store in the city, it is not considered necessary to provide housing accommodation for the men, with the exception of the caretaker. At the Mobilization Stores, Liverpool, it would be necessary to provide cottages only for the caretakers. Where a large number of men are employed in a rural district it would be necessary to provide housing accommodation for them.

28. *To the Chairman.*—The suggestion that there should be one Stores Department controlling the whole of the stores required by the various Departments of the Commonwealth is impracticable so far as the Defence Department is concerned. It would be absolutely impossible to conduct our Ordnance Stores in a satisfactory way under such a system, but it might be applied to minor items, such as stationery, and a few other things common to all Departments. Ninety per cent. of military equipment is purely technical, and not used by any other Department, so that there can be no overlapping of purchases, and there would be no saving by concentrating supplies in one Central Department. If, during the war, we had been forced to go outside our own Department—had been compelled to go to another controlling body—to purchase our supplies, I fear we should not have been able to meet our requirements. They are so huge that they justify the maintenance of our own stores. In war time our requirements would swamp those of every other Department. One strong reason for forming the Ordnance Department into a military organization is that we might train the employees in it in peace time for the duties they would take over in war time.

(Taken at Melbourne.)

THURSDAY, 8TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Thomas William Wakeman, Assistant Director of Equipment, Department of Defence, sworn and examined.

29. *To the Chairman.*—I have held my present position since February, 1918, and I have had duties in regard to administration and handling of stores for about ten years in the Commonwealth service. I consider that I am a specialist in the handling and control of military stores. I was for nearly two years in Sydney as second in charge of Ordnance Stores. My present duties comprise the compilation of tables, preparation of scales of issues and instructions as regards storage and distribution. I have not now any control over storekeepers in other States. I have not been closely connected with the projected stores at Leichhardt. I was consulted by the Works and Railway Department in regard to the plans, and I have seen the site since its selection. I am not enamoured with the site, but do not know of a better one. I have not looked around Sydney in search of a suitable site. I am not an engineer, but I consider that the site being partially on reclaimed land will be expensive in the matter of foundations. My view was strengthened in that direction after having read Mr. Swinburne's report. He made a special report upon the site. One great consideration for Ordnance Stores is plenty of room. For Sydney, I should say that the site should be not less than 10

acres. The position should be close to railway and with good road communications; if possible, also, it should have access to the sea. I have seen the plans submitted, which include railway sidings, and I consider they will when completed provide ample railway facilities. A very big proportion of the metropolitan troops in the State will, in the ordinary course, be concentrated near Sydney. It is necessary, therefore, that the stores should be approximately central. With respect to goods coming in, it would be a great advantage to have the stores as near as possible to Sydney, seeing that a great portion of the goods are manufactured in and around Sydney. As to goods coming overseas, they are now lightered or carted to the stores. I do not place great importance on sea communication for local requirements. We made use of water transit only very slightly when effecting deliveries from the present Sydney Stores. We would always send goods by rail wherever railways could take them; even to units along the coast of New South Wales nearly all our stores go by rail. In time of war, railway service would still be preferable. For one thing, sea communication might not be safe, or might be cut off. It is very convenient to have direct sea facilities, but is not absolutely essential. Of course, it would be much cheaper to lighter goods in bulk than to cart. Darling Island stores are directly on the water, and Circular Quay is also very close to the sea-board. I prefer a one-floor building to a structure of several stories, but I am not prepared to say what height would be the most economical generally. I think it is wise that, under normal conditions and with Sydney's present population, the whole of the stores should be concentrated upon the one site; but as the population of the State increases decentralization would be necessary. It would be necessary, probably, to establish stores at Newcastle and elsewhere; but to serve Sydney it would be preferable to have the whole concentrated on the one site. Assuming that the whole of it can be used, the Leichhardt area should be sufficient. I understand that the Darling Island stores are to be sold. I do not think we would need them when we are established at Leichhardt. As for floor space, that is linked up with the policy of the Government in regard to the number of troops to be equipped. As matters stand, I would not care to venture an opinion concerning necessary floor space. The universal training scheme reaches its zenith this year, and will comprise about 120,000 troops. Of the Australian Imperial Force, there were, in organized fighting units, approximately 100,000 men abroad. Their equipment will come back and be stored in the Mobilization Stores. We have not at present sufficient equipment for the Citizen Forces, independent of that returning from abroad. It depends, therefore, upon the policy of the Government whether that equipment will be held in reserve and the Citizen Forces equipped independent of it. Floorage space at Leichhardt, as proposed, ought to be sufficient for present purposes, but in the next five years or so we may require 25 per cent. in addition to allow for normal expansion of the Forces as population increases. The present proposition is for a three-story building. If all the stores were on the one floor one great advantage would be in direct handling. There are many stores which are very heavy, and can only be raised to the upper floors with difficulty. Such stores are apt to monopolize the ground floor, which should be free. For example—we receive guns and carriages from England for coast defence purposes, these heavy weapons, with their gear, weigh many tons, and are very bulky. All such stores must come in on the ground floor and stay there until the Department concerned is prepared to receive them; thus they might occupy for extended periods all the ground floor space available. We need that space, however, for assembling stores generally for quick issue to units. Buildings of three or four stories

are all right in the case of ordinary merchandise, but Ordnance Stores are quite a different proposition. My experience at Sydney was that the ground floor at Darling Island was occupied throughout the war by such bulky and heavy items as Gardiner oil engines and their gear. These were stores that we could not move in the lifts, so the ground floor was not of much use to us. We had to assemble our stores, so far as possible, in the various stories. Not a great deal of space would be required altogether for heavy stores, but it does not take many items of such stores to monopolize a ground floor. In the future we may import numbers of aeroplanes and their parts. These will not necessarily be heavy, but will be bulky, and would require to remain on the ground floor, since they would probably not be movable in lifts. From my study of reports on Ordnance Stores in other countries, particularly with regard to Ordnance Store buildings erected in England and America during the war period, such buildings have been rushed up temporarily. Prior to the war there had been in these countries no fixed policy of construction, apparently; it generally depended on the site. Having gone into the lay of the ground at Leichhardt, and the nature of it for foundations, I should say it would be wise to make the most of that portion of the site having the soundest foundation. I would, therefore, concur in the construction of the type of building marked "A" on the plan. That is, that there should be several stories. If ample room were made for heavy goods on a ground floor of a separate building, I would not object to the construction of additional stories. I prefer the steel and concrete stanchion buildings, owing to the lesser risk of fire. I would prefer the floors to be of timber, however. It is very unhealthy for men working on concrete floors around the Sydney Harbor. Such floors always seem to be damp. At the Darling Island stores those conditions are marked, and the men complain a great deal. With regard to construction of wood, we have had experience of borers getting into the shelves, &c. They are liable to destroy a certain amount of the stores, but ordinary precautions, such as washing down the floors with phenyle, should preserve a wooden structure. We have lost very little stock owing to the depredations of boring insects. All the uprights and floors are of timber at Circular Quay, and very little damage has occurred. An important factor with regard to Ordnance Stores is that fully 80 per cent. of general stores issued come back, and in various stages of depreciation. In the working of such stores the more space available around the lifts the better. You cannot have too much clear space there. We cannot immediately place goods into stock. It often takes days to classify stores before they can be put away, and the space around the lifts is the most valuable in the store. I understand the lifts at Leichhardt are to be worked by hydraulic power. Electric lifts are not sufficiently reliable, in my opinion, for Ordnance Store buildings. At Darling Island I have often seen only one, and sometimes two, out of the four working; the others have been out of order. I prefer the hydraulic lift because of its greater reliability. A 3-ton capacity should be quite sufficient. I have not had personal experience of handling stores by means of chutes. I prefer the lifts to chutes, which, of course, work only one way. We frequently have to take stuff in more speedily than to put it out; in order to prevent accumulation. We would probably always have ample time to get our stores away. We could always get goods on to a concentration area more quickly than the troops would be ready to receive them. It might be well worth while, however to experiment with chutes, but I would suggest that provision be made for the necessary additional lifts if eventually working with chutes is not found satisfactory. I do not think that a building of more than four stories can be economically worked. With more

floors than that the working becomes proportionately more expensive, and supervision is more difficult. The more you go, also, the more you restrict the amount of goods which can be carried by the lifts within a given period. If economy can be effected in construction, I would not object to the building of four-storied stores at Leichhardt in lieu of three storeys, as shown on the plan. That is, so far as handling is concerned, there should be no extra expense. I would object, on the score of administration, to such a building being more than four stories in height. My experience has been that you will never get adequate supervision on the top floors. It takes about twice as many men to do work there as upon a ground floor. In Sydney the practice in regard to distribution of stores was for the various units to call for their own goods, providing their own means of transport to and from the stores. They would hire a delivery cart or lorry. That system also gave an effective check upon the outgoing of goods. It may be taken for granted that from Leichhardt the greater proportion of stores will be sent out by road. The buildings at Leichhardt, as they are planned, will give requisite facilities for delivery into lorries and for distribution by way of road. With respect to office accommodation, I think that, besides the offices planned upon each floor, which are only for use by foremen, there should be central office accommodation. That should be as near as possible to the centre of the buildings. I understand that we are to retain the Circular Quay offices for a time. Under normal conditions we would require a staff of approximately 130 men. We will need office accommodation quite as much as that which we have at Circular Quay when the whole of the Ordnance Department is centralized at Leichhardt. I strongly urge that there should be luncheon and changing rooms erected, quite apart from the store buildings. Attached to the luncheon rooms there should be some lavatory accommodation in addition to that upon each floor, and it would be well to make some small kitchen provision for the boiling of water and the warming of food, &c. It is not desirable to have the men partaking of their luncheon on the floors where they work. For one thing the waste scraps attract rats. There is also the matter of smoking; and, further, the men do not care to have to bring in their hand-bags for the reason that in case of loss of goods suspicion might fall upon them. The men themselves would much prefer to have their lunch-room accommodation quite apart from, but reasonably close to, their work. At present there are temporary stores buildings scattered all over Sydney. In 1917 there were 22; now there are about 17 or 18. Centralization of store houses would mean economy. We have frequently had to keep men at various of the smaller stores in the capacity of caretakers and watchmen. These outlying buildings were frequently a source of loss. They were more or less open to burglary; we have lost a lot of stores in that way. There is also the danger of loss by fire, and, in quite a number of directions, economy in administration could be effected by the construction of the new stores. Fewer men would be required. We could dispense with 20 or 25 employees in Sydney by having the whole of the business centralized. The wages thus saved would average about £180 per man per annum.

30. *To Mr. Mahony.*—The great proportion of our goods under ordinary conditions would be distributed around the metropolitan area, seeing that nearly 50 per cent. of the troops are concentrated about Sydney. Most of the remainder of our stores would be distributed by rail; only a little would go by sea. Information could be supplied, I think, concerning the quantities distributed by rail over a given period, but such information to be reasonably accurate could only be obtained with great difficulty and expense. We find that the system of having the various metropolitan units call with a delivery cart or lorry for the stores they require

is by far the cheaper. Before the war a permanent staff of about 90 persons was engaged, and we employed some 20 temporary hands. When I was in Sydney, however, during the maximum pressure of war work, we had about 200 temporary employees on our pay-sheets. We shall always require a certain number of temporary workers, since work in Ordnance Stores comes in rushes, and it would not be economical to maintain a full permanent staff to meet rush jobs. The stores in the Mobilization Branch were to be under the Senior Ordnance Officer for the district. Those goods will be on Ordnance stock charge, but in a separate ledger account. They will not be written off the Ordnance books, however, unless issued to units. They will be regarded as reserve war stores. If we are going to maintain those stores as the war equipment of units, we shall have to be very careful, and not treat them as general stock. The Mobilization Stores being erected at Liverpool are for the purpose of accommodating the equipment returning from abroad. It was intended that that equipment should be held in reserve for war purposes. If the Government does not sanction the equipment of the Citizen Forces, independent of those mobilization stocks, we shall have to draw upon them and issue from there. The Ordnance Stores at Leichhardt are to be drawn upon for every-day transactions.

31. *To Senator Needham.*—If I were selecting a site for Ordnance Stores I would choose one which would accommodate the whole of the stores upon one floor. At Leichhardt, however, I would not recommend the construction of one-floor stores. If all the stores were housed in a one-story building there would be more economy in supervision and a better chance of segregating various lines of stock. It is difficult to segregate stores in a building of several stories. A one-story self-contained building is also much more satisfactory to the employees themselves. It tightens up the matter of responsibility for loss, for one thing. As to the possibility of trouble with boring insects in a wooden building, our losses in the past five years would hardly amount to more than £100. I think it would be very difficult for the Department to secure an accurate record of the stores sent out during recent years by railway. Of course, a check is kept of all goods distributed, but there have never been statistical records kept showing railway deliveries.

32. *To Mr. Laird Smith.*—Concerning the construction of administrative offices, if they are to be independent of the store buildings they should not be more than 100 feet away from them. If the offices could be separately constructed, and with due regard to economy, it would be preferable. It would not be conducive to efficiency, of course, to have the offices unreasonably far away from the stores. In fact, they should be as close to them as possible. Much of our office work is connected with the assessment of articles returned in a damaged or unserviceable condition, and it is a great convenience to have the offices right on the spot. It is not intended to issue stores from Leichhardt into the Mobilization Stores at Liverpool, and from thence to units during peace. We shall probably have the mobilization stores at Liverpool filled before the Leichhardt buildings are erected. From what I have seen of the plans, the lighting and power provisions are satisfactory; but I am not acquainted with or expert in the ventilation proposals. Good ventilation is essential. The greatest disadvantage experienced in the old stores in Sydney has been the lack of yard space. There is no accommodation for vehicles, and we have not been able to lay out tentage, &c., for drying or overhaul, either at Darling Island or Circular Quay. As to the advisability of carrying big stocks of materials in peace time, I would say that if they are perishable and procurable locally, it would not be wise to carry big stocks; but if they were not procurable locally sufficiently large stocks

should be maintained. In the lay-out of the new stores provision has not been made for coping with war reserve equipment. The Leichhardt stores will provide purely for peace administration under normal conditions. I do not think the cost of installation of travelling cranes would be warranted. There was one at Darling Island, but I do not remember seeing it used. I have not had actual working experience in private warehouses and stores. The question of facilities for stocktaking at Leichhardt will depend on the quantities of stores being carried. We have a continuous system of stocktaking. As for the construction of homes for employees in the neighbourhood, I should like to see one or two dwellings at Leichhardt for the accommodation of watchmen or caretakers. I would suggest that one or more of the present buildings, if they are at all suitable, be retained for that purpose.

33. *To Mr. Sampson.*—If a suitable site were procurable within about the same distance of Sydney as Leichhardt, but away from the sea, and upon which single-storied stores could be erected, I would prefer such a site. Of course, it would require equally as good railway facilities and conveniences by road. I regard the erection of a one-story building as of more importance than contiguity to a sea frontage. There are 145 temporary employees engaged in Sydney at present. It should be possible to do with about 25 less if the buildings were centralized. If the policy of construction was for single-story buildings, I would prefer a series of separate buildings each subdivided where necessary. The great advantage of single stories is the avoidance of double handling. I would not have one-story buildings more than 200 feet in length, and if I were to be provided with the same floor-space as is proposed at Leichhardt, I would have six separate one-story buildings. The supervision of those would be more economical than in the case of supervising a number of floors in the one building. In single-story buildings stocks can be more easily segregated, and can be locked up if they are not being drawn upon, without any inconvenience to other branches of the stores. There are a number of sections which have only two or three transactions a week. These could be effectually locked up during slack times, and the men employed there could be utilized in whatever branch might be having a rush of work at the time. In comparing one big building of several stories with a number of separate single-story constructions, there is the factor of greater risk of fire, and also of the possibility of the greater damage to the one big building by aeroplane attack. In fact, there is greater general safety with the half-dozen single-floor structures. On the original plan for Leichhardt, provision was made for three lifts only, and it was on my suggestion that the number was increased to six. I was not informed at that time that it was intended to install hydraulic lifts. Assuming that they are to be hydraulic, I do not think six too many. I am not sufficiently acquainted with the uses of chutes to be able to express an expert opinion upon them, but there should be no harm in making accommodation for one or two by way of experiment.

34. *To Senator Newland.*—Store accommodation for the Ordnance Department has been very unsatisfactory since the adoption of universal training. That was introduced a long way ahead of us as regards store houses. We were not prepared for it, and have not kept pace with it. When the war broke out the situation became very much worse. Adelaide is in a fairly good position with respect to Ordnance Stores; Brisbane is about the worst. It is not intended that any clothing—and probably no blankets—shall be returned from overseas to our stores. The blankets used by the troops returning on shipboard do not belong to our Department, but are under control of the Navy. My reference to equipment coming back

from overseas concerns such lines as arms, accoutrements, harness, saddlery, guns, waggons, and the like. It is our practice to re-issue such items of clothing as greatcoats until they have become worn out. The same with items like leggings, but we do not re-issue such lines as are included in what we call "next to the skin" items. Tents, as they are returned, are disinfected, if used for accommodating persons suffering from infectious or contagious diseases. We have probably thousands of tents now out on issue to the Health authorities in the various States. They will have to be disinfected before their return to store. But I do not think it would be an economical project to erect a fumigating chamber at Leichhardt, since there would not be the continuous volume of work to justify it. It would not be the practice of the Department to store such bulky lines as coast defence armament in the Mobilization Store. Such stores are for fixed coast defences, and the Ordnance Branch has to receive them into store and hold them until required for mounting. We keep them, for example, until gun emplacements are ready to receive the ordnance; and a considerable period frequently elapses before those emplacements are available. The Ordnance Stores are often looked upon as a general convenience—the dumping ground for all obsolete military stores which units do not wish to be bothered with. With regard to unhealthy conditions due to concrete floors and damp conditions generally, many representations have been made at Darling Harbor, and a lot of work has been done there to better things, but the unsatisfactory condition has not been overcome. Concerning the Leichhardt stores, I do not think it is proposed to artificially heat the new buildings. Nothing is more effective for keeping insects out of stores, such as clothing, than continuously turning them over and exposing them to the light.

35. *To Mr. Sinclair.*—With regard to the Leichhardt site, even if a one-story building were to be erected on the lower ground, it would have to be either piled or floated on concrete. I would not recommend that in the construction of a four-story building the office accommodation should be on the top floor with the idea of saving hoisting of goods to that elevation. It would not appeal to me as a workable proposition. We have to deal very largely with the representatives of a large number of military units, also a large section of the public, and would require office accommodation on the ground floor.

(Taken at Melbourne.)

MONDAY, 12TH MAY, 1919.

Present:

Mr. SAMPSON, in the Chair;	
Senator Needham,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.
Mr. Mathews,	

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

36. *To Mr. Sampson.*—The plans now before the Committee illustrate the proposals of the Department of Works and Railways for meeting the requirements of the Department of Defence by the erection of Ordnance Stores on a site on the banks of Long Cove Canal, at Leichhardt, Sydney. The site was selected by the Department of Defence, and its possibilities for the purposes of an ordnance store were carefully considered by the Works Department before the lay-out of the building was designed. The Works Department prepared various designs for the criticism of the Defence Department, and the design finally selected was that now before the Committee. The building that it is

proposed to erect first is shown in red, possible future buildings being coloured grey. It is intended that the building to be first constructed shall be of three stories. Of the buildings which may be constructed in the future, the largest, which will lie parallel with that now under consideration, will be from four to six stories high, and four others at right angles to these two, two stories high; but as no man can say what the ultimate requirements of the Defence Department may be, it is impossible to make any definite statement as to the size of the possible extensions of the group of stores that may be erected on the site. One of the matters which has chiefly to be considered in determining how the site might be turned to the best advantage was that of railway communication. It will be seen that access by railway can be given to the site on two sides. Having regard to the amount of accommodation immediately required, it is proposed to lay down in the first instance only one line of railway, with two tracks, which will run parallel with one of the long sides of the building, at the level of its first floor, its ground floor being accessible to horse-drawn and motor vehicles. A second railway can be built subsequently to communicate with the possible extensions and to give access to the store immediately under consideration. This second line would pass the end wall of the building under consideration, and would also give communication with its middle portion at the ground floor level. One of the good features of the plan is the extraordinary accessibility of the building by railway and vehicles generally. The Business Board of the Defence Department thought that a building three stories high would best meet the Department's immediate requirements. The exterior dimensions of this building will be, length, 535 feet, and breadth, 83 feet. Each of its three floors will be divided by a brick wall, containing fire-proof doors, into three store-rooms or warehouses, and provision will thus be made for six stores, each 171 feet long by 80 feet broad, and containing 13,680 superficial feet, or, in the aggregate, 82,080 superficial feet; and three other stores, each 190 feet long by 80 feet broad, with a superficial area of 15,200 square feet, aggregating 45,600 square feet, making the floor space of the whole building 127,680 square feet. In each store will be placed a small glazed office, from which the man in charge will be able to view what is taking place in the store. These offices and the latrines, which will be on each floor, will be adjacent to the stairs. On the ground floor there will be a loading and unloading platform all along one of the sides of the building and one of its ends. This platform will be 18 feet wide. At the level of the first floor there will be a railway platform 360 feet long and 18 feet wide, with openings to allow light to pass through the platform to the ground floor. The building itself internally, will be 80 feet wide, which is a convenient working width, and the most economical in regard to lighting. With that width, the light from the windows from each side will have only 40 feet to penetrate to the centre of the building. Communication between the floors will be by means of two goods lifts in each warehouse or store, going between the ground and the second floor. There will be six of these lifts in all, and two stairways, so designed that two stores will be served by each, they being built next to the dividing walls. Having regard to the present cost of materials, my Department came to the conclusion that for a building of the description proposed, brick would cost little, if anything more, than a framed and lined construction of timber and iron. We propose, therefore, to use brick for the walls. Some time ago in considering a proposal for the construction of a store for the Postmaster-General's Department, the Committee obtained a good deal of information on the subject of floor construction, and came to the conclusion that for the particular building then under investigation, hardwood floors would serve, with sufficient provision against the outbreak of fire. Remembering that determination of the Commit-

tee, we have designed wooden floors for this Ordnance Store, but we also put forward as an alternative the use of concrete floors. We think that the cost of concrete floors would not be much more than that of wood floors if the cantilever floor-slab system of construction, popularly known as the mushroom system of construction, were adopted. I know several buildings in Melbourne in which the floors are of that construction, and it has been employed in the building of a large warehouse recently erected in Sydney. Some time ago I met the architect of the Sydney building, and he expressed himself as thoroughly satisfied with the effectiveness and the economy of the system. We have consulted the engineer who is the agent in Australia for the patentees—the system is covered by American patents—and on the understanding that he would be paid the usual royalty if the system were adopted, he supplied us with the information necessary to enable us to have plans prepared illustrating its adaption to this building and to enter upon calculations of the cost of using it. Our calculations show that if proposal "A," that is the design with wooden floors, were adopted, the cost would be £61,165, and if proposal "B," the design with the concrete floors were adopted, the cost would be £63,532, a difference of £2,367.

37. *To Mr. Mahony.*—The payment of royalty is included in that estimate of cost.

38. *To Mr. Sampson.*—If it were decided to install the best system for preventing fires the sprinkler system would have to be adopted, and if the sprinkler system were installed the difference between the cost of wooden and concrete floors would be only about £1,367, it being estimated that for wooden floors a sprinkler installation would cost £6,855, and for concrete floors £5,755. The royalty that would be charged for the special concrete system of flooring would be 1½d. a superficial foot, but the patentee would give us information and experience that would be of great value to us in making the design.

39. *To Mr. Mathews.*—The royalty would amount to about £230 for the first floor, and it would be the same for the second floor; the ground floor would be a solid construction of brick work embedded in cement. In my opinion, the so-called mushroom system of making concrete floors for warehouses is most scientific, and its cost is less than that of the only other system of concrete construction of which I am aware, namely, a construction supported by cross beams on uprights. Among the advantages of the mushroom system which occur to me off-hand is the saving of the beams which are otherwise required for concrete floors, and what is called the false work, that is the wooden framing in which these beams are formed. There is some difficulty in adjusting the steel rods to the exact position which they should occupy in the troughs within which the concrete beams are constructed. This adjustment takes time, and further time is expended in getting the concrete properly into position. From the mushroom system beams are eliminated. There is a slab of concrete over the whole floor supported on columns which directly engage with it without the intervention of beams. These columns at a certain distance from the base spread out, and the steel in them runs into the floor. The stress passing from a beam to a vertical column must pass through a right angle, but with the type of construction I speak of, only a very little part of the floor acts on the supports as a beam would act on them. The spreading out of the columns gives a cantilever support. I have no doubt but that we should save a great deal by adopting this system for concrete floors.

40. *To Senator Needham.*—In other countries the mushroom system of construction has been used a great deal, and it has been employed in seven or eight buildings in Australia. I may be asked why the Department has not already used it. The reason is that an occasion for using it has not presented itself to us. The system

is not adopted in ordinary building construction, because the swelling out of the supporting columns would spoil the proportions of its rooms, but in a large open store it is different.

41. *To Mr. Mathews.*—The system is most scientific. No doubt if a man applied it without having available the experience of others who have used it, he might waste material, but with the advantage of this experience, it is capable of economical application. Applying the results of the construction in the Sydney factory which I have mentioned, the Department arrived at the estimate of cost that I have already given.

42. *To Mr. Sampson.*—The diaphragm walls, that is, those dividing the building, are all carried out through the roof as a provision against the spread of fire, and the brick pediments on the side elevation have been designed, not for their architectural appearance, but as a further provision against the spreading of fires, and it is unlikely that a fire breaking out in any store-room would spread to another. That is a matter which the Committee should keep in mind when considering the advisability of installing the sprinkler fire prevention system. An advantage gained by the use of concrete flooring in preference to wooden flooring, which I have not mentioned, is the saving of space. Wooden floors in this building would require to be supported with wooden columns, whose distance apart would be 14 feet in one way and 11 ft. 8 in. in another, whereas the supports of concrete flooring would be 20 feet apart in one way, and 19 feet apart in another. Consequently, the supports of concrete floors would create less obstruction than the supports of wooden floors. It was Mr. Swinburne who approved of the accommodation provided for in the design, he acting for the Defence Department. Personally, I cannot say what accommodation should be provided, but if within a fairly short period the Defence Department will require more floor space than is given by the design, it would be best to add another story, or portion of another story, to the building. To do that the proposed foundations would have to be strengthened. If concrete floors were arranged for, the cost of adding another story, and of thus providing 42,560 more feet of floor space, would be £13,440, including the cost of increasing the foundations, which would be about £220. I take it that the administrative offices from which the business of this proposed Ordnance Store will be directed, will be at the Victoria Barracks, in Sydney; the only offices for which provision is made in the plan are the small glazed offices in each of the nine store rooms of which I have spoken. No luncheon room has been provided for the men who will work at the store. If I had to make provision for them, I would probably set apart a portion of the top floor. That would mean, of course, diminishing the storage capacity of the building by the area of the floor space set apart for the recreation of the employees. As to the suitability of the site for the special purposes of an Ordnance Store, I have not been asked to consider it, but I know nothing against it. The foundations of the proposed building will go down to the rock, but the foundations of so much of the possible extensions as may be built on the alluvial ground may have to be carried on piles. There were many consultations between Colonel Owen and the Defence Department, and occasional consultations between me and the Defence Department before the design before the Committee was adopted. In my opinion, concrete floors are not damp and unhealthy; they are, I think, the best floors that can be got. In a climate like that of England they would be cold in winter, but I do not think that they are objectionable out here. A man who is working constantly in one part of a building could put down a piece of cocoanut matting to stand upon. The only provision for fire escape is the two stairways; and that, I think, is ample. Artificial heating is not provided for, and, in my opinion, is not needed. The proposed building,

having three floors with direct railway access to the middle floor, and direct road-vehicle access to the ground floor, and with vertically communicating lifts, is as workable as a building could be. The price per foot of floor area for the building as designed, including the cost of the railway communications and platforms is 9s. 11d., or approximately 10s. per square foot, and to add another story would cost about 6s. 4d. a square foot. These figures, in my opinion, are very low. The cost per cubic foot of the building as designed is about 8d., and the cost of another story would be about 6.3d. per cubic foot, the cost of a four storied building being 7.66d. per cubic foot.

(Taken at Melbourne.)

TUESDAY, 13TH MAY, 1919.

Present:

Senator NEWLAND, in the Chair;

Senator Henderson,	Mr. Sampson
Senator Needham,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.
Mr. Mathews,	

Percy Thomas Owen, Director-General of Works, Department of Works and Railways, recalled and further examined.

43. *To Mr. Mathews.*—Neither I nor my Branch was consulted about the suitability of the site before it was purchased. I could not say from whom the Defence Department purchased it. I believe part was a public reserve, and understand also that there are a number of small cottages on the eastern side. The site was gazetted on the 18th March, 1918. On that day the Minister for Defence wrote, through the Secretary of Defence, to the Department of Works and Railways a letter which I cannot at present find on my file. I believe the Business Board of the Defence Department considered the suitability and price of the land before it was purchased, although I was not present at the inspection or the negotiations. I did not hear of the proposal for the Mobilization Stores at Liverpool until the following December. In that month the Defence Department submitted to our Department certain requirements in connexion with the buildings at Liverpool. I understand that the Business Board considered that matter. The necessity for the store at Liverpool arose when the armistice was declared. Soon after that the Defence Department heard that the Australian Imperial Force would be returning with a large amount of equipment. When the Ordnance Store at Leichhardt was proposed, it was known that many of the artillery gun parks and buildings in Sydney were filled with equipment for the Australian Imperial Force. Space had to be provided for that, but in addition there were the equipment and vehicles which would be returned with the Australian Imperial Force, and I think it was at that stage that the Liverpool proposition became urgent. I did not give evidence before the Business Board when they were considering the suitability of the Leichhardt site. I believe Colonel Sands, who was acting in the capacity of Ordnance Officer in the Department of Defence, was in touch with the Business Board when the site was selected. I submitted plans of the Leichhardt store in various stages to the Business Board. The first preliminary plan was on the general principle of what I have submitted to the Committee, but the sidings on the lower level were not at right angles to the siding on the upper level. That means that the buildings "B" were set at an angle. I set to work to avoid that, reconsidered the plan, and produced the one which is before the Committee. That

plan was taken by me to the Business Board, discussed, and concurred in. I think the full Board was present, but I am not sure. My interviews with the Business Board were more in the way of consultation than evidence. I explained to the Board our proposals, and they accepted the scheme to have the two levels. The Board suggested no alteration. When we were first preparing the plans, I received a letter from Mr. Swinburne, saying that he thought that buildings "A" and "C" might be several stories high. He wrote to me, because in my first discussions with him I said we might have a timber-framed structure of the slow burning type with one or two stories, but in that I was referring only to the lower building, which will be on the alluvial. I wrote in reply that it was always the intention of the Department to erect the building on the eastern side, that is, on the hard foundation, multi-story. The plans were submitted to the Business Board in the stage of sketches showing the dimensions of buildings, positions of sidings, and so forth, but the working drawings were not sent to the Board until much later on, in fact, not until Colonel Wilson arrived, the reason being that the time left for the Department to prepare working drawings and estimates in time to submit to Parliament for this Committee was so short that we sent in the plans practically the day they were finished. But during the preparation of these plans the Defence Department put Mr. Wakeman, an Ordnance Store officer, in touch with the Department of Works and Railways, in regard to all details of construction and dimensions. I could not say that the Business Board had at all times power to suggest alterations or to accept or refuse the plans. A question of departmental responsibility arises. The Minister for Works and Railways contends that when a Department has stated its requirements, the Department of Works and Railways, or he himself, is responsible to produce a building suitable for the purpose, and that he does not divide that responsibility with any other Department. If the Business Board desires to alter these plans, it has no power over our Department. If, for instance, the Board said it wanted the building constructed with steel columns and joists, I would advise the Minister "No," and the Minister's decision would prevail. The Business Board is a part of the Department of Defence. It states what it wants, and has a general responsibility in saying "Yes" or "No" to any scheme prepared by the Department of Works and Railways. It is usual for the Department of Works and Railways to submit to any Department for which it is preparing drawings a copy of those drawings for approval before the work is done. We regard the Business Board as part of the Department of Defence. I have direct touch with the Business Board, but all official communications go to the Secretary for Defence. If the Business Board wanted any alteration of our plans, it would have to be done through our Minister. If plans from the constructional or works point of view did not meet the views of the Department of Defence or the Business Board, it would be quite within their province to advise their Minister that they did not agree. Then if I continued to advise my Minister to the contrary, and he accepted my advice, it would be a matter for Cabinet decision. I would not say that the Business Board carries out duties similar to those of this Committee. This Committee is responsible to Parliament, and not to a Minister. The Business Board has not to enter deeply into questions of construction or alternatives. It must take the advice of the Works Department. This Committee need not do so if there is anything in the proposals of the Works Department with which they do not agree. The Board would not have power to carry into effect alterations which I thought were not suitable. If there was a difference of opinion it would become a Ministerial matter. Of course, I am not a member of the Business Board, and what I have stated are merely my impressions of its functions.

44. *To Mr. Sinclair.*—To satisfy ourselves as to the natural foundations, we had borings made by the Railway Commissioners, New South Wales. This was the simplest method. They had their plant available and were kind enough to undertake the work. We bored until we got to sandstone. If the Committee recommended the addition of another story to the building, our provisions as to foundation and superstructure would carry it, subject to possible modification of footings with the increased load. The foundation rock is good enough to carry another story. The length of the siding for the first building is 2,370 feet. It takes off from an existing siding which connects with the Public Works Department's Depôt. This 2,370 feet is a siding on the railway which connects Glebe Island and Waddell Road on the Marrickville to Bankstown line. A plan of the siding was prepared by the Engineer-in-Chief for Existing Lines, New South Wales railways. The object in getting him to prepare it, which I did after discussion with the Commissioner of Commonwealth Railways, was to attain straight away a proposal which would be agreeable to the New South Wales Railway Commissioners. The 2,370 feet of line is to be constructed by the New South Wales Railways Commissioners. The Engineer-in-Chief has given an estimate which is before the Committee. All we have to construct is the formation for a distance of 1,050 feet within the boundary of the Commonwealth property and the bridge. The track-laying is to be carried out by the New South Wales Railway Commissioners. The estimate shows that the cost of the work we have to do, including the formation of the embankment, and the bridge, is £8,313. That is included in the total cost. The system of concrete flooring adopted is known as the mushroom. Ordinary concrete material reinforced, with steel bars, is used. It would be just as subject to dampness as any other concrete floor, but I anticipate no trouble from that cause, as all the outside walls of the building will be cavity walls constructed of brick. There are other materials such as ironite or petrite, which are used for covering floors. We have used ironite, which is a good material, but it was not proposed to use it for this building as the expense would be fairly heavy for a start. There is brick on flat on the ground floor, but there is no wearing surface on the first or second floors. I do not think there is anything serious to apprehend from dampness in a building of this sort where all the men employed will be moving about all the time. In the office portion of the building it is possible that the Chief Architect (Mr. Murdoch) has made provision for wooden floors. It is quite true, as Mr. Murdoch said yesterday, that the floors are to be divided off into three compartments, and each compartment made fireproof against the other. The lift well will be also concrete-cased, and the doors will be fire-resisting and self-closing. The drawings show wooden stairs of ironbark, but since they were prepared I have talked to the Chief Architect about it and it is very probable that we shall put in concrete stairs at the same cost. They would be walled off in the same way. The floor space given to the Committee is gross and includes lifts and everything else. We shall use hydraulic power for the lifts, and the power will be produced on the premises. We shall use electric power for the motors to run the pumps. The cantilevers give more head room under the flat of the floor, but where they spring from the head of the column there is a slight interference with the headroom. Still that is not very material. I should say that the workable height of stores is 7, 8, or up to 9 feet, but I think 9 feet is getting high. After that it becomes expensive to work. It will be necessary to timber underneath the mushroom formation, but in carrying out work of this sort the timbering would be moved from one bay to another. Two bays of timbering would be prepared, alternating them. It is anticipated that the timbering will tend to cheap-

ness. Timbering for flat ceilings as compared with timbering for beams is much simpler and cheaper.

45. *To Mr. Mahony.*—The ordnance store officers approved of the dividing walls for each floor, as segregating the different parts of the building to a certain extent in case of fire. The principal object of these dividing walls is the prevention of fire. It is not thought necessary to provide outside fire escapes as well. There are two stairs, and the lifts, and it is not anticipated that a large number of men will be employed.

(Taken at Sydney.)

FRIDAY, 16TH MAY, 1919.

Present:

Senator NEWLAND, in the Chair;

Senator Henderson,	Mr. Sampson,
Senator Needham,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.
Mr. Mathews,	

George John Oakeshott, Works Director for New South Wales, Department of Works and Railways, sworn and examined.

46. *To Senator Newland.*—I am acquainted with the business that is now occupying the attention of this Committee. I had nothing whatever to do with the selection of the site of the proposed Ordnance Store at Leichhardt, but I inspected it when Colonel Owen visited it some time ago. I am acquainted with the plans which have been prepared in connexion with the erection of this store. I went over to Melbourne when they were being considered, but the plans themselves were actually prepared in that city under the eye of the Director-General of Works. I had nothing whatever to do with their preparation. I, however, had an opportunity of studying them, and as a practical man I am satisfied with them. I know that there are two constructional schemes before the Committee, and I certainly favour the concrete scheme. It is a little more expensive than ironbark, but the additional expense is so small that I advocate its adoption. Under that scheme it would be possible to place the piers of the building so much wider apart than would be the case if ironbark were employed, and, consequently, there would be more free space for the storage of goods. In the second place concrete would be more fire resisting than would be a building of wooden construction, although I admit that ironbark is wonderfully fire-resisting. One great advantage to be found in the mushroom system which Colonel Owen has recommended is that it does away with all the heavy beams in the ceiling. As a result, there is more space for the storage of goods, and more chance of getting the air and light over the tops of the stacks. I have no knowledge of any ill effects having been experienced by men working in concrete stores by reason of dampness. I do not know of any cases in which they have contracted rheumatism. But if they actually had a bench in the proposed store, we could have wood laid on top of the concrete. My own opinion, however, is that in moving about from floor to floor, as they would be, no harm could be occasioned them. I do not think that the goods stored in such a building would suffer from dampness on account of the concrete. Indeed, there would not be any dampness in the building except that which was introduced by goods that were wet. I notice that no artificial heating is provided for in the plans, and I do not think that it is necessary. If such appliances were provided, they would never be used. Even a long spell of wet weather would not, in my

opinion, dampen the goods, and thus encourage vermin. A good storeman would keep all the windows closed whenever the humidity of the air was excessive. But in average weather no danger need be apprehended in this climate from mildew or anything of that sort. The mushroom system of construction is an excellent one, because it dispenses with the heavy beams and cross beams in the ceiling. I have not had any personal experience of the system, but I know that Wrigley's Chewing Gum Factory is constructed upon that principle. It is the only building of the kind, as far as I know, in Sydney. I have seen similar structures in America, and many illustrations of them. The great principle of this method of construction is that it permits of a series of bars being bent along from each pier, and these make a complete umbrella or mushroom on the cantilever system. The result is that any weight put upon any portion of it is transmitted in a scientific way to the downward thrust of the pier. Under ordinary methods of construction, if you have a weight in the middle of a girder it becomes necessary to strengthen that girder very much in order to bring the thrust down to the pier, whereas under the mushroom system the thrust is brought from some distance directly down to the centre of the axis of the stanchion. Of course, there are some panels between, but these are fortified with reinforcements which make them perfectly safe. Under this system there are no obstructions on the ceiling. It is far the most convenient system, both from the standpoint of the absence of obstructions, and that of providing light and air. I do not see very much necessity for providing fire escapes in such a building as that which is featured on the plans before me. I know that a report was presented by Mr. Harry Lee upon the Darling Island stores some time ago, and that in it he recommended the provision of fire-escapes outside the building, and we installed them. It must be remembered that a fire escape is intended for the saving of lives, and not of material. The number of men who will be actually engaged in the stores which it is proposed to erect at Leichhardt, will be very few at any one time, and it seems to me that they would be able to escape either by means of the lift or by the fireproof staircases. I do not regard the risk of fire as being very great. If escapes were provided outside the building it would be necessary to provide so many. I do not think that one central fire escape would be sufficient, because if there were burning material between an employee and the central position, he would naturally go down by the staircase which was nearest to him. I am acquainted with the existing Ordnance Stores at Darling Island and elsewhere. I do not see the necessity for fire escapes at the Darling Island stores, because the buildings there are divided by a fire-resisting solid staircase, with the brick walls all round it, so that a man could easily escape to the staircase. The floor is fireproof, which means that any fire which broke out there would be localized, and there would be no danger of its spreading so quickly as to prevent a man from escaping. It is only where buildings are constructed of very inflammable material that men are unable to escape before the flames spread. That is not likely to occur in a building such as that which is now proposed. The only danger would be from an outbreak of fire amongst the stores themselves. In such a contingency the sprinkler system would probably extinguish it, but if it did not, the fire brigade would be summoned, and would be on the spot in a few minutes, so that the risk of a man losing his life would be infinitesimal. I think that the railway facilities provided for the transport of stores in and out of the proposed building are satisfactory. We shall have direct access to what, in my opinion, will be the main goods traffic line in Sydney, that is, the line which runs under Waddell Road into the Illawarra

line. That could connect direct with Darling Harbor, and thence with any other line in the State. I should like to see the proposed building erected with at least another story added to it. In other words, I should like it to be four stories instead of three. On one side it will be seen that the ground floor is accessible from the road, while the first floor is accessible direct from the railway siding, so that really there is only one floor above for the lifts to work to. With a system of lifts such as has been recommended by the Director-General of Works, it would be a good thing to add another, and, perhaps, two stories, to the proposed building. In that case the drawings would have to be revised accordingly. In the event of another story being added to the building, the foundations would have to be reconsidered. It would cost a little more to run the lifts to these additional stories, but not much. On the flat or reclaimed ground I would not advocate the erection of more than two stories, because we should have to put down piles there to a depth of 20 or 30 feet, and we ought not to put a five-storied building upon such foundations if it can be avoided. But the foundations of a considerable part of the proposed building would be in rock, and, consequently, they would easily stand the addition of another story. Such an addition would not add to the cost of working the building. When once a trolley has been taken to the cage of a lift it would matter very little whether it went up one story or two stories. I have seen chutes working. I saw a good many of them in America, and learned that they were always getting out of order. In addition, they are very liable to damage the goods. Doubtless their employment affords a quick method of transferring a package from one floor to another. But it must be remembered that the goods have to be carried to the opening of the chute, just as they have to the cage of a lift. In addition, a chute takes up a good deal of room, whereas a lift occupies no more space than the size of the cage itself. I think that lifts travelling 60 feet a minute would be ample for handling the goods at the proposed store. In regard to the water approach to this site, I may mention that I have seen a barge up against the wharf of the Public Works Store—a flat-bottomed barge. I know that there is not very much draught there. A big sea-going vessel could not get in. I have not heard the question discussed of the advisableness or otherwise of having the administrative offices built under a separate roof away from the main structure. That is more a matter for the consideration of the Defence Department. But there must be a place in the main building where the foreman can keep his books. He must have a room that he can lock, because he will be in charge of certain valuable articles, and his dockets must be kept where men cannot get at them. We have provided only very small office accommodation for each block in the proposed building. If changing rooms for the employees have to be provided, I should place them on the roof of the building. But the number of men who will be working in this store will be very small. Of course, if 100 men were employed there, changing rooms and other accommodation for them could not be provided on the roof.

47. *To Mr. Laird Smith.*—It would be much more costly to provide the required space for storage purposes in a building of one story. Where very heavy weights have to be handled, the less lifting of the goods there is, the better. I do not advocate a single story building at all. Too colossal a site would be required to cope with the work. The ultimate requirements of this store are set down at 500,000 superficial feet. What an area that would occupy if it had to be provided on one floor! I do not think that the proposed cement floor would get cut up with the traffic. We have a patent cement floor. It is not merely cement concrete, but I have known very

heavy traffic take place on cement, with very little damage. Under the mushroom system of construction it would be possible to do with less columns than would be necessary with ironbark. I do not know what royalty is charged in connexion with that system, but the pamphlet which I have submitted to the Committee comes from Hardie and Company, who carried out the construction of Wrigley's chewing gum factory. I rang up Mr. Charles Reed, the engineer for Hardie and Company, in regard to this question of royalty, and he told me that when he erected Wrigley's factory the royalty was paid. He said that for some reason or other Mr. Turner used to gather in the royalty from America, but that as the result of certain litigation which had ensued, he had been obliged to return the whole of this money. There is still some company in America which can collect the royalty, but Mr. Reed does not believe that it has a representative in Australia. He told me that if he were undertaking another job of a similar kind, he does not think he would have to pay any royalty. I have not gone into the question of the power lighting and heating of the proposed building, because that is a matter which comes within the scope of the Engineering Branch of our Department. I have had experience with electric lifts and that experience teaches me that they are more liable to get out of order than are hydraulic lifts, in addition to which they are more expensive to install. I do not think it would be expensive to install an hydraulic system of lifts in the proposed building. I would not like to say that the installation of electric lifts would be much more costly. I am not sufficient of an expert to give evidence on the matter. It is rather difficult to say at what height a building commences to become expensive when used for a store. But I should like to see a building of this kind contain five stories. Of course, if the ground were very valuable the structure might be made higher. Undoubtedly I think that it is necessary to install sprinklers in the building even if it be constructed of concrete. It must be remembered that goods would be stored in it over an area of 180 feet by 80 feet, and any of these goods might catch fire. To risk the destruction of the whole mass would be too colossal a risk to incur. Owing to the inflammable material which will be stored in the building I advocate the use of sprinklers. These, of course, would operate only just where the outbreak occurred. Additions might easily be made in height to the proposed buildings as planned if we knew of them beforehand, and could design the foundations to carry another story. But additions could not be made laterally without upsetting the whole site plan. Whether or not the lifts, as shown on the plans, are in a suitable position has been the cause of a good deal of discussion. At first my own opinion was that it would be better to have them very close to the platforms so that the goods could be wheeled straight into them. But evidently the Ordnance Department does not regard that consideration as being so important as having a gangway on the upper stories so that they can bring the goods from any point of the compass to the lift. I am satisfied that a suitable foundation for the building can be got over the made-up land. For that portion of the site I strongly advocate the erection of a wooden frame structure rather than a brick building.

48. *To Mr. Mathews.*—There are no royalties payable on the ordinary reinforced concrete system. As a matter of fact, where a patent exists, the charge is made on the raw material. There are several patents of that kind, but no royalty is payable upon them. So far as I can understand the question of whether the mushroom system of construction is sufficiently unique to warrant the payment of a royalty upon it, was determined in America. Doubtless, Mr. Reed will be able to give you the details in respect of that matter. If in the erection of a store you used narrow pillars in the centre

and spread then out at the top, the Patent Office could tell you whether you would be infringing any patent rights. If any such system has been patented you would be bound by it. If a property were being purchased in Sydney, either by the Postal Department or the Customs Department I would be consulted in regard to the site as to its suitability for building purposes, but not as to the suitability of its position. I was not consulted in connexion with the acquisition of this particular site, but I am under the impression that my chief was. With a view to promoting efficiency it is very desirable that comforts, such as changing rooms, dining room, &c., should be provided for the employees in the proposed store. This accommodation might easily be added. Undoubtedly such facilities conduce to efficiency.

49. *To Mr. Sinclair.*—It is not my province to consider whether the site for the proposed stores is the most suitable one which could be obtained around Sydney. I know that it is very difficult indeed to get a site which possesses a water frontage as well as railway conveniences. For that reason Darling Harbor is the most convenient water frontage. But no site is available there. The railway is very convenient to the site which has been acquired. A similar remark is applicable to the water frontage, if what I understand is true, namely, that the State authorities intend dredging the Bay near the site, with a view to making it navigable for deeper draught vessels. There is a road between the Commonwealth property and the water's edge. It is known as the Canal-road. At present that road is used only to accommodate the stores of the State Public Works Department. It would not be much below the level of the proposed Ordnance Store, and would permit of the goods being hauled over it quite easily. As a rough rule, I think that goods cannot be economically stacked to a greater height than 10 feet. Personally, I prefer that the height should not exceed 8 feet, but that is rather an extravagant method of stacking, although it is a most convenient one. I do not see the necessity in a building such as is proposed of installing a travelling crane, because anything which requires to be handled on the upper floors can be handled by means of trolleys. The goods would not be of a colossal weight such as are met with in a foundry. There would be very few loads of 3 cwt., and that is not a very big weight for a man to wheel. The heavy stuff would be kept on the ground floor. It would be an easy matter to have some travelling cranes on the ground floor, but they would not be required on the upper floors. I have not seen the mushroom system tested from the stand-point of its carrying capacity, but I have never heard of its failure. It has been designed to carry 2 cwt. per square foot. This allows a safety margin of 75 per cent. It ought, therefore, to carry a great deal more than 2½ cwt. I cannot suggest any alternative method of housing the lifts. These must be placed as convenient as possible to the spot where the material is stored. It would be a mistake to do away with one of the lifts in each bay. When I first considered this matter I was of opinion that it would be better to have the lifts outside, but now that I know the requirements of the Ordnance Store, I think that inside lifts would be better. It is not merely a question of space that has to be considered, but of convenience in handling material.

50. *To Mr. Mahony.*—I know that the Commonwealth Government have acquired some land alongside the Callan Park Mental Hospital, but that is not near the site of the proposed store. Broughton Hall and Kalouen are quite adjacent to Callan Park. I do not know that it is the intention of the State Government to remove that hospital in the near future, but I understand that they intend taking over the whole of the buildings that we are putting there, and making them a branch of the Callan Park Mental Hospital. I know that the Commonwealth Government are building some permanent

wards of brick on the understanding that the State will take them over when the soldiers are finished with them. The site of Callan Park Mental Hospital would not be a suitable one for the proposed Ordnance Store because there is no railway near it. The railway would have to be brought to it through private property. In addition, the ground from Broughton Hall slopes right down to the water, so that it would be necessary to build an expensive retaining wall, and to do a lot of dredging and reclaiming to make the site a suitable one. Further, access to the railway would be very expensive. The ground there is all natural ground, but for storage purposes more or less level ground is required. At the site mentioned we should either have to reclaim the land or haul everything from the water up a steep incline. Consequently I do not think it would be a suitable site at all.

51. *To Senator Needham.*—There is water access to the site of the proposed store as well as land access. If it could be obtained, it would certainly be better to have a site nearer the sea. I could obtain a site possessing sea access, but lacking railway access. To my mind the latter is more important than the former. I cannot say whether very much importance ought to be attached to sea access. That is a matter for the Ordnance Branch of the Defence Department to decide, and I do not know where it gets the bulk of its goods. A vast quantity of bricks will be used in the construction of this building, and I suppose the nearest place at which they can be obtained is Enmore. The cost of the bricks landed on the job would be about 65s. per thousand. That is the current price. I do not think there would be more efficient provision over the different stores if the building was restricted to one floor only. In such a case the distances which would have to be travelled by the employees would be so great that the handling of the material would be a very complicated business. It is desirable, and indeed necessary, that the stores should be concentrated to a great extent. When, therefore, the building exceeds a certain ground area, it becomes too straggling. Beyond a certain point it would be extravagant to spread the building on the one-story principle.

52. *To Mr. Sampson.*—We supervised the erection of the Darling Island Stores, but they were actually built by the State Public Works Department. They were erected by Colonel Vernon. I do not know what Colonel Wilson means when he says in his evidence that we had a very unfortunate experience with our store at Darling Island so far as dampness was concerned. The Darling Island store was built on a very elaborate system of piling right on the water's edge. I should like to know what he means when he says that "eventually they got rid of the dampness at this particular store." There has been no trouble in regard to dampness rising in that store. The space now occupied in the storage of goods by the Defence Department is considerably in excess of the space proposed to be provided in the new buildings. If it were found necessary to increase the accommodation, I would suggest the addition either of another story to the proposed store, or the starting of a building on the east of the buildings to be erected on the rock foundation. If it were found necessary to increase the floor space that is contemplated by 45,000 feet, I would recommend the addition of another story, or the erection of a second building. That is what I would do if the increased accommodation was likely to prove sufficient for many years, but if it became apparent that, say, 100,000 additional feet would be required in ten years' time, I should advocate the erection of a new building. The proposed structure would easily bear another story without any considerable addition to its cost. I saw a good deal of the mushroom system of construction in the United States, and I was impressed with its utility. Upon my first acquaintance with it what most appealed

to me was its audacity. It did not seem strong enough, but when I went into the matter, and understood how strongly it was reinforced, I changed my opinion. The great feeling one gets of a building constructed on this system is its airiness and space. There is no doubt of its stability. Under the cantilever system the bays would be 20 feet x 20 feet, as against 14 feet x 11 ft. 5 in. for ironbark construction. It will be seen, therefore, that the number of piers is considerably reduced if reinforced concrete is employed. There is always a danger of fire penetrating to the reinforcements, but there is very little danger. The danger would arise from a highly inflammable material near one of the stanchions which would generate intense heat. That, however, is very unlikely. Of course, cement will not stand intense heat. There is no danger of the collapse of a building erected on the cantilever system with the precautions that it is proposed to adopt in this Ordnance Store. As a matter of fact, the fire risk is reduced almost to a minimum. When I was in the United States I saw chutes in operation in the big stores. In many of the stores there they are used for the handling of small parcels, and they are generally of a spiral character. For the handling of big packing cases I do not approve of their use, and my inquiries resulted in my learning that they were constantly being blocked. As a result, the chutes get knocked about very badly. It must also be remembered that they take up a good deal of space. Whether I would prefer four lifts and two chutes in the proposed building would depend entirely upon what is to be stored there. Personally, I prefer the lift every time. By its use you are able to store just what material you choose, and to put it just anywhere that you may choose. I am not an expert upon property, but I should say that the store at Circular Quay is a good saleable proposition. My opinion is that it could be sold at any time. I cannot say whether it would realize a sufficient amount to defray the cost of erecting the proposed store at Leichhardt.

53. *To Mr. Laird Smith.*—I do not think it advisable for the Department to erect dwellings for the employees in the proposed store in the vicinity of that building. I do not believe that the men would live there, seeing that there is such a good system of tramways in Sydney. They would prefer to get farther from their work.

(Taken at Sydney.)

TUESDAY, 20TH MAY, 1919.

Present:

Senator NEWLAND, in the Chair.

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Mr. Gregory,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith,

Major Alfred Hudson, Senior Ordnance Officer, Second Military District, Defence Department, sworn and examined.

54. *To Senator Newland.*—I have been connected with the Ordnance Stores Department for a number of years, and I recognise the necessity for increased accommodation in that connexion in New South Wales. I saw the plans of the proposed store at Leichhardt for the first time on Saturday last. The proposed building, if erected, would very considerably relieve the existing congestion in this Department. I am not prepared offhand to make any general statement as to the requirements of the Department in Sydney. I have had experience of Ordnance Stores in South Australia as well as in New South Wales. At the present time the stores in this State are housed in about seventeen different

buildings. This makes the administration very difficult, and can scarcely be regarded as an economical method. With the exception of those at Darling Island the buildings are unsuitable for the purpose for which they are being used. The Darling Island store is a very convenient one, by reason of the fact that it has a water frontage as well as rail frontage, the railway being practically at its door. A water frontage may not be an essential in an Ordnance Store, but it is a very great convenience. I saw the site of the proposed store about six months ago when I visited it in the company of the Chairman of the Business Board. He spoke to me in general terms of the proposal to utilize it. I do not think very much of the water frontage facilities which exist there at present. If over-sea shipments of material, and large Inter-State shipments to and from the store are likely to take place—if such shipments could be even barged from the vessels—it would be a great advantage. It would obviate the necessity for landing them, and then carting them to the railway for transport to the proposed store. All stores which are indented from England could be so transhipped by barge to the store. They will be principally ammunition and technical stores. There will be little or no shipments of cloth, leather goods, or boots from overseas. These would be Inter-State shipments. Generally speaking, the plans appear to be designed to provide the maximum of facilities with the minimum of labour. But to my mind the lifts from a storage point of view, ought not to be located in the centre of the building. I would place them on the outer walls, but inside the building. The fact that the goods would have to be transported over a longer distance from the lifts if the latter were placed at the side of the building, would be a small consideration when once those goods have been placed on a trolley. I have not considered the question of locating the lifts outside the building altogether, and before approving of such a scheme I should like to know more about it. I have not had any experience of the working of chutes. I do not think they would be of very great advantage in a building of this kind. Future developments may cause me to alter my opinion, but at present I think the lifts provided in the plans would be sufficient for carrying on the necessary work. I would not recommend cutting out any of those lifts. In regard to the stacking of goods, I would like to have a foot clearance between the ceiling and the stack. With some classes of goods 10 feet is not too high to stack them, but with other stores, such as chests of rifles, no advantage would be gained from adopting this plan because of the labour that would be involved in putting them up and getting them down again. With goods of this description 8 feet would be quite high enough to stack them, but in the case of lighter material which can be handled readily, height would not matter so much. In Ordnance Stores it is essential that there should be plenty of light and ventilation. This tends to discourage vermin, particularly among fabrics. We have not experienced any trouble with dampness in any of the stores on the water front. If there has been any difficulty of that kind at one of the stores I have not heard of it; but I have only been here some seven or eight months. I have recently heard of men complaining, not so much of dampness, as of the effect of concrete floors upon their feet. They complain of soreness because the concrete has no "give" in it. We place timber under our stores when we stack them up. That is desirable for ventilation purposes where concrete floors are in use. This precaution is not so necessary in the case of wooden floors, but, nevertheless, I like ventilation under the stores. When the proposed store is erected, I understand that the buildings at the Paddington Barracks, which have been utilized for Ordnance purposes during the war, will probably be returned to the Field Artillery or to the units concerned. I understand that the buildings at Darling Island are to

be retained by the Ordnance Branch. At present some of our stores are located at Darlinghurst Gaol. I have not heard of any objection to the men working there, but personally I consider the practice undesirable. I would not care to express an opinion as to the merits of the hydraulic as against the electric lift system. At our stores we use two baleing machines. They are hand machines—not power. I have not gone into the question of whether it would be an advantage to have power dumping machines, either hydraulic or electric, for the reason that the baleing which has been done has been mainly connected with oversea shipments associated with our Expeditionary Forces. Just now there is much of that class of work being done in our stores. If the present conditions of affairs were to continue, the advisableness of installing a power dumping machine would have to be taken into consideration. I prefer that the administrative offices should be kept separate from the proposed new building. They ought to be quite apart from the main building. I have not considered how long, in the ordinary course of events, the projected stores would suffice for our requirements. But I doubt whether a three-story building will be sufficient. A high building is, in my judgment, not so good for administrative purposes as a low building. If plenty of land were available, I would say, "By all means keep the building down in the matter of height," but in the scheme now under review, I would suggest the addition of another story to the proposed building if it is desired to make a complete clearance of the stores at Circular Quay, and in other buildings at present in occupation, and to have a little margin to come and go on. If only three stories are provided, I am afraid that the building will be rather crowded. I do not think that the addition of another story would add disproportionately to the cost of working. The main project is to end the existing unsatisfactory state of affairs at once. In these circumstances, I think that a fourth story would probably meet the case. I propose to avoid, as far as possible, storing heavy packages on any of the upstairs floors, and to have all the unpacking done on the ground floor. There will be no guns stored in the building unless upon the ground floor. A similar remark will apply to heavy gun machinery of any description. The capacity of the lifts should, in my opinion, be about a ton at the most. I do not know whether packages of aeroplanes would weigh more than that. The packages would probably contain various parts which would require to be assembled here. The construction of a shed for the carrying out of this work would be another matter altogether. I have not tried any experiments in the way of disinfecting stores by means other than by putting ordinary disinfectants upon them. I have not tried smoke in this connexion, as I do not know whether it would be effective. Of course, such things as blankets are disinfected after each period of use. I cannot say how long the effect of this operation lasts. But disinfection is carried out frequently on account of articles being so often returned and overhauled. Without assigning any reason why, I should like to see sprinklers installed in the new building as an additional safeguard in case of fire. In my opinion, it would be better to use concrete than timber in the erection of a building of this description, from the stand-point of convenience, safety, and cleanliness.

55. *To Senator Henderson.*—In the event of adequate space being provided in the proposed building it is intended to remove the stores which are at present in Darlinghurst Gaol.

56. *To Senator Needham.*—I have no knowledge of what was paid for the site for the proposed new building. Excluding the Darling Island Stores the accommodation provided in the scattered Ordnance Stores around Sydney would roughly total about 116,000 square feet of floor space. At Darling Island there are ap-

proximately 56,000 square feet, inclusive of the space occupied by lifts. Consequently we have more floor space than it is proposed to provide in the new building, but the stacking accommodation is not so high. I know the water approach to the site at Leichhardt, but I have no idea of what is the depth obtainable there at low tide. If 5 or 6 feet can be obtained there it would be of great assistance in enabling barges to transfer goods from ships to the store. I would like to see the stores raised from the floor by a few inches to permit of proper ventilation and to facilitate cleansing operations. About 6 inches would be sufficient. At the present time two drill halls are being used for the storage of goods. I have already said that the buildings at Paddington Barracks, which have been utilized as Ordnance Stores during the war, belong to the Field Artillery and other units, which will doubtless require them again upon the resumption of ordinary military training. The only building which might possibly be disposed of is that at Circular Quay. But I do not know what are the intentions in this respect. I have no knowledge of the mushroom system of building construction by means of reinforced concrete.

57. *To Mr. Sampson.*—I was not consulted in connexion with the preparation of plans for the proposed store. I have no personal knowledge of the system of storing that is in operation in other countries. I understand that it is intended to store the whole of the goods which are lying in the various buildings around Sydney, except Darling Island, in the proposed new store. I have not considered the saving which would be effected by the concentration of these stores in one place. I do not think that the adoption of this course will enable us to make any reduction in the staff at present. From an extract of Colonel Wilson's evidence read to me, I note the following statements by him—

We have 224 employees at present. In any event there would be a certain reduction in their number on account of the lapsing of war work; but when we return to normal conditions we should be able to dispense with, say, 30 men, whose average salary would be about £180 per annum. That would represent a saving of £5,400 per annum, so that allowing 6 per cent. for interest and sinking fund on an outlay of £70,000 upon these buildings, it would mean a saving of over £1,000 a year.

I would work out my own ideas of the saving which might be effected, and then see whether or not I can indorse Colonel Wilson's statement. I also notice that Colonel Wilson has worked out the existing space occupied by Ordnance Stores at 172,000 square feet, and I know that the proposed new building will provide, approximately, 126,000 square feet of floor space, leaving a deficiency of 46,000 square feet. But I have already said that I expect to gain something by having higher walls. I will undertake to look into this phase of the matter, and to let you know the result of my investigation at a later stage.

58. *To Mr. Laird Smith.*—In the discharge of my duties I receive some instructions from the Board of Business Administration, and some from the Quarter-master-General through the Commandant. My opinion of the extent of our requirements in the matter of storage accommodation is based more upon peace than war conditions. If all our offices and stores were concentrated at one place I think our work could be carried on considerably cheaper than under existing conditions, though to what extent I cannot say without first going into the matter. If I were intrusted with the laying out of the stores stock-taking in the new building would be much more rapid than it is at present. Off-hand I cannot suggest any improvement in the proposed building which will

enable me to exercise a closer supervision over the stores. A reduction in the number of pillars in the building would prove a great advantage. In Sydney we have the system of continuous stock-taking. It would be a great advantage to all concerned if the employees could be housed in Commonwealth buildings near the proposed store, for the reason that at present some Ordnance Store employees reside at North Shore and away up the line. Leichhardt is forty minutes or more distant from Circular Quay. I favour the erection of a building handy to the stores in which the men could partake of meals and effect a change of clothing. I think that the consumption of meals in the store would tend to attract rats there. I have found that in the higher stories of the building at Darling Island the rats are very destructive. But in a building of more than one story I can more adequately protect stores from deterioration as the result of vermin. Whether I would favour the use of travelling cranes within the new store would depend entirely upon the class of goods that has to be handled. I consider it would be an advantage to store the lighter goods on the upper floors. We have no mechanical appliances in any of our stores. I think that it is wise, under normal conditions, to carry about twelve months' stock. I am not intimately acquainted with the working of any private stores, and I cannot say whether there would be any relation between their methods and our own. I have had about twenty-four years' experience of Ordnance work in South Australia. In our stores here the only women who are employed are typistes. I am in favour of the installation of sprinklers throughout the new building. I have not found that cement floors cut up badly as the result of wheel traffic over them. The store at Darling Island seems to wear well. I have not looked into the question of whether the lavatory accommodation, provided in the proposed building is sufficient for the staff. I think it is an important matter just as is the provision of bath accommodation in the men's dressing room.

59. *To Mr. Sinclair.*—I have not been asked to supply any figures regarding the space that is required for our stores. I would have to go a little bit deeper into the matter before I was in a position to state the floor space actually required to store all the goods at present stored in other places. I am endeavouring to clear the stores in buildings which are only in temporary occupation by us. I cannot say whether the buildings at Darling Island and Circular Quay are transferred properties. The building at Darling Island was erected before I came to New South Wales. At Darling Island there are two lifts on a 90-ft. floor, and in the new building it is proposed to install two lifts on a 180-ft. floor. That does not seem excessive. I have not gone into the question of what the lifts at Darling Island carry, and what those in the proposed new store at Leichhardt would carry. A lift may carry goods which are bulky but not heavy. I do not think there would be more than a load of 15 cwt., or 1 ton, at most, on any of the lifts. Off-hand, I cannot say what would be the carrying capacity of these lifts in a day. I recognise that the six lifts which it is proposed to provide would reduce the space that would otherwise be available on each floor by, approximately, 700 feet. When goods are received into any of our stores they may possibly stay there for some time. On the other hand, there are quite a number of stores which are issued and returned frequently during their lifetime. Clothing material would not come under this heading. I will go into the matter of whether one substantial lift could not be made to serve two floors, thus permitting of two lifts being dispensed with. The lifts at Darling Island are very much in use. During the past four months I have been re-arranging the stores there, and they have been moved up and down over the floors whilst I have been concentrating and re-arranging them. As a result there is much more work on the

lifts now than there is in normal times. I do not suggest that any explosives should be stored in the new building. A separate building will also be required for the storage of oils and paints. I am aware that there is a road between the site for the proposed store and the water front. I did suggest to the chairman of the Business Board that the erection of an inexpensive landing shed there would be of value, because the stores when landed could be examined in the shed and then passed direct into the new building.

60. *To Mr. Mathews.*—I am a civilian with a military title. The rank which I hold was given me for service in connexion with the equipping and embarkation of troops for the South African war by the Government of South Australia. There are two sub-heads at our stores who possess military titles, not including Major Brown. I am not paid as a soldier, but as a civil servant, just as is Major Brown. We use the water frontage at Darling Island whenever stores are going to the forts, or to the engineers at the Heads. If stores came by barge we would take them in from that water frontage. It is a matter of utility, so far as the wharf at Darling Island is concerned. When the whole scheme at Leichhardt is carried out similar facilities will, I presume, exist there. I was not consulted as to the suitability of the site before it was purchased. I have no idea who was. I was not in Sydney at the time. My predecessor was Major Brown, but I cannot say whether he was consulted. During my term of office in South Australia a new store was erected. The whole establishment was built upon fresh ground. I was with the engineer and the commandant when the site was inspected, and the proposed position of the various buildings was pointed out. I was consulted as to the position of the Ordnance block and I suggested that it should be located alongside the railway line, where the store was built. At Darling Island we have some gun pedestals. It is usual to store these at Ordnance depôts until they are issued to the place where they are intended to be mounted. I do not anticipate being called upon to handle anything so heavy as they are in the lifts of the proposed new building. Nothing so heavy is likely to be received into the store except, perhaps, guns which might be received and overhauled in sheds outside before being despatched to where they were to be mounted. I have not heard of electro-hydraulic lifts in connexion with the proposed new building at Leichhardt, and I know nothing of any form of hydraulic system in which the power is generated by electricity. I have not been consulted in regard to the kind of lifts to be installed in that building. At Darling Island provision is made for men employed there to wash themselves. I think that dining rooms and other conveniences ought to be provided at the proposed store. They would greatly tend towards contentment of service. When I was in Adelaide there was a small outbreak of fire in the Ordnance Store there, but the chemical extinguisher soon put it out. So far as I can recollect there has been no fire when the stores have been closed. I have not heard of any fire in Australia in military stores. The appliances for the prevention of fire at Darling Island appear to me to be adequate. They are overhauled by the fire brigade periodically. At night a watchman is employed to protect the stores there, as is also the case at Circular Quay. The smaller establishments have no watchman. I advocate the installation of sprinklers together with the other precautions against fire. I think that lifts aid in the spreading of fire, but I would not care to say off-hand that it would be feasible to work the lifts outside the building altogether. At the same time I think it would be preferable to have the lifts inside rather than outside.

61. *To Mr. Mahony.*—I approve of the floor space being divided into three compartments. I have sug-

gested the removal of the lifts from the centre of the building in order that it might be open throughout its entire length, so that the workmen could be kept under observation. I cannot give the Committee any idea of the volume of goods that is likely to be received into and despatched from the store by rail. I could not get the desired information by reference to the railway freight charges, because the Ordnance Branch does not examine the inward freight accounts of outlying units. The bulk of our stores are received and despatched by road and rail. During normal times it is very probable that the greater quantity would be by rail.

62. *To Mr. Gregory.*—I have been in charge here for about eight months. I cannot say whether that is the reason why I was not consulted in regard to the erection of the proposed new building. Inquiries may have been made concerning the site prior to my coming here. My official files would not show that. But I have already stated that the Chairman of the Business Board took me round to the proposed site, and told me roughly of the idea which he had in view. I saw the plans of the proposed building in the office of the Director of Works and Railways on Saturday morning, but I have not studied them. I cannot say whether the head of my Department was consulted as to the suitability of the site prior to my coming here. I will go into the matter, and will let the Committee know my ideas as to the staff that would be required in this new store, and as to whether a saving can be effected. Of course my opinion will be based on the assumption that all the Ordnance stores will be concentrated at this site. In South Australia all the work was done on the ground floor. If there is sufficient space available, I think that a single story building is preferable, and certainly I would not recommend more than two stories at most. I do not think that the constant handling of goods would be much more expensive in a four-story building than in a three-story one. If it is intended to make a clean sweep of the buildings in which stores are housed at present, I think that at least a four-story building is required. For efficient handling, however, the limit that I would recommend in any building of this kind is two stories. I do not know anything of the American system of delivering goods in chutes. I have not had any experience of the class of stores with which we deal outside of the Government service. It would be quite a hazard to say what our normal floor space should be, because originally the stores in South Australia were in a similar condition to the stores in New South Wales. That is to say, there were a lot of scattered buildings in which the stores were housed, with the result that the supervision was not good. In a single story building the employees can be kept under observation better than they can be in a building of several stories. Consequently, I think that more efficient work can be obtained in a single story building. It would be desirable to have the diningroom accommodation for the employees outside the main building. I cannot say whether the office accommodation contemplated in the proposed store is ample for our requirements, because I have no idea of what was in the minds of those who included that accommodation in the plans. I do not approve of the administrative offices being situated within the main building. The only office accommodation in the store itself should be that provided for the foreman, the storeman, and the supervisors of sections. To provide sufficient room for them some alteration in the plans may be required. I cannot tell from those plans whether the lavatory accommodation to be provided in the building will be all that I deem desirable, but so long as there is such accommodation for the employees on each floor that will be sufficient. I have not studied the system of chutes, and I cannot say whether or not they are effective. When I said that it was desirable to keep a year's stock on hand, I had in mind chiefly the matter of clothing. So far as clothing is concerned, contracts

are made in Melbourne for keeping up a certain supply, and that clothing is issued as required all over the State. I would not guarantee that this particular class of goods would come into the store to-day and go out again within a month.

63. *To Senator Newland.*—I have noticed that the plans provide for the placing of lifts not quite in the centre of the building, and I favour pushing them up against the wall. I would prefer to see the lifts placed on the roadside wall, and not on the wall on the railway side.

64. *To Mr. Laird Smith.*—I would not like to say off-hand that it would be wise to distribute the lifts alternately on the road-side wall and the wall on the railway side, because I wish to consider how it would be best to work the store.

65. *To Senator Newman.*—We make little or no use of the flat roof of the building at Darling Island. I cannot say whether it was intended, when that building was erected, to use the roof for spreading out tents upon it for the purpose of examining them. I would not suggest a flat roof on the proposed new building for that purpose. I do not think it would be an advantage. It will be necessary, of course, to provide stairways in the proposed store, in addition to lifts. I would also suggest the provision of fire-escapes, and I recommend that these be placed on the outside of the building. Whether fire escapes ought to be provided in view of the other precautions against fire which it is proposed to take is purely a matter of opinion. But I think that the men should have every chance of getting away in case of fire. In case of emergency, a chute may have its advantages in the rapid handling of goods, but I would not care to express an opinion upon chutes until I had seen them working.

66. *To Mr. Laird Smith.*—I do not like the idea of packing goods on the floor on which they are stored. I would rather have the packing centralized.

67. *To Mr. Gregory.*—For the purpose of securing effective control over all the stores in New South Wales it is advisable to have those stores concentrated on one site.

The witness withdrew.

Robert Kendall, Engineer in Chief for Existing Lines, New South Wales Railways, sworn and examined.

68. *To the Chairman.*—I have been asked to connect the New South Wales Railways with the proposed Ordnance Store at Leichhardt. The negotiations began with a visit from Colonel Owen, who asked me if I would undertake to provide plans for linking up the Glebe Island railway with that store. The plans were forwarded to Colonel Owen, with an estimate of the cost under certain conditions. That estimate did not include the whole cost, because I had no idea of what were the proposals in respect of the Ordnance area. I am aware that there are two schemes before the Committee indicated by letters "A" and "B." The estimated cost of the undertaking, including earthworks only, on that section of the line from the junction of the main line to letter "A" on the plans, leaving the Commonwealth engineers to carry out the earthworks for the remaining portion of the railway, is £5,610. The estimate for the lower section—that is from the junction of the main line to the letter "B," including earthworks only, is £4,100. For the information of the Committee, I may say that these estimates cover only servicable rails, not first-class rails. By "servicable" rails I mean rails from our own lines which are quite suitable for the purpose required by the Commonwealth, and which are perfectly safe for all rolling-stock that is likely to pass over them. In other words, it will be a first class line, up to siding conditions. All our marshalling yards, station yards, and reception yards, are constructed of similar material. The difference is that the Commonwealth will be supplied with rails at £7 10s. or £8 per ton, whereas new rails would

cost £10 per ton. The latter is the price that we are paying to the Broken Hill Company for them. The siding would take off from the main line on the property of the Railways Commissioners, and would pass close by the State Stores; but a small section of that area will be required to make provision for the future widening the main line, by providing two additional roads if that should ever become necessary without making any alteration to the Federal Ordnance Branch. According to the plans I have prepared, the same set of points would let the train on to both the high and low level lines. In addition to the ordinary railway charges, the New South Wales Railways Commissioners would levy a charge for every shunt into that siding. There would also be a charge for the maintenance of the railway, but whether this work would be undertaken by the Commonwealth or by the New South Wales Railways Commissioners I cannot say. I can, however, give the Committee an estimate of the annual cost of maintenance of that railway. The No. 1 section would cost about £50 a year, including renewals. The rails would probably last fifteen or twenty years, and the sleepers would be new ones. The maintenance of No. 2 section—that is from the letter "A" to the dead end, would involve a cost of about £70 per annum. That means £120 a year altogether, and this sum covers not merely the cost of fettling, but also of renewals. In the vicinity of the site we are experimenting with some concrete sleepers. We laid down about 200 of them, which were supplied by Mr. Miller, of South Australia, who is associated with Mr. Teesdale Smith. These sleepers were manufactured, and were supplied to us at 14s. each, although the actual cost of manufacture was more than 20s. each. They have now been down about two years. Personally I do not think much of them. They are already showing signs of cracking, notwithstanding that there is comparatively little traffic over them, not more than two trains daily. I would not advocate their use at all at present prices. The rails which we should lay down for the Commonwealth would weigh possibly about 77 lbs. per yard. To lay down the first section of the siding would occupy about sixteen or seventeen weeks. We can easily supply the spoil that would be required in this work. At the present time we are extending the cutting between Glebe Island and Darling Harbor which goes through Pymont. There is a very large cutting there which involves the excavation of 67,000 cubic yards. Now the Commonwealth requirements in connexion with this siding amount to only 13,700 cubic yards. We could load and unload that spoil by rail, provided that the Commonwealth would pay for its transport, and for such loading and unloading. It would not be called upon to defray the cost of excavating. The spoil would have to be hauled from the job a distance of about 8 miles. Up to the present time we have disposed of 57,000 cubic yards of this spoil, so that unless the Commonwealth takes advantage of the opportunity which is now presented to it, it will lose it. The charge which will be made for shunting is set out in the following memorandum from our Chief Traffic Manager:—

This siding should be treated as between sections in regard to which the standard shunting charges are 2s. 6d. per four-wheeled truck, subject to a maximum of 5s. for each fifteen minutes or part thereof, freight to be calculated on the actual distance to and from the siding.

A considerable stock of tramway rails has been brought round to the State Stores by means of lighters. We have not done any deepening at the landing there. As a matter of fact when the tide is out the barges rest on the bottom of the canal. The Harbor Trust is responsible for keeping the channel open and occasionally they dredge it. In order to fully utilize that area it will be necessary for the canal to be deepened. Our intention was to construct a wharf there at the extreme end of the slope. That itself would retain the land behind it, and

we would not require to deepen the canal too much. The range of tide from dead low to high tide is about 5 feet. At high tide we can send barges in comfortably. The public road does not interfere very much with our work because we deliver both by rail and road. It is an advantage to have that road.

69. *To Senator Needham.*—We would charge demurrage on the trucks left lying on the proposed siding. That charge is 10s. per vehicle for twenty-four hours. Of course, a reasonable time is allowed to unload. Any vehicle arriving on one day must be unloaded on that day.

70. *To Mr. Laird Smith.*—We would retain running control over the siding. If a siding is put in anywhere, the Railways Commissioners reserve to themselves the right to use it if they so desire, and they also insist on fixing all time-tables. In the maintenance of the proposed line, the services of the permanent way men who are ordinarily employed upon that section of the main line would be utilized. But no more work would be thrown upon them. If, for example, 5 miles was regarded as a fair length for the men to maintain, and the additional work of maintaining the proposed siding were imposed upon them, we would shorten their length to 4 miles. We would not accept the certificate of a Commonwealth representative as to the safety of the line. In this connexion I may perhaps be permitted to quote an almost parallel case. We constructed for the Commonwealth a branch line from Liverpool to Holdsworth, a distance of nearly 5 miles. The New South Wales Railways Commissioners are maintaining that line, and are charging the Commonwealth £300 per year for so doing. We have two men working on it. The war is now over, and the traffic on that line is represented by two trains a week. In these circumstances there is no warrant for the continued expenditure on it of £300 annually for maintenance. I have this matter under consideration at the present time. We will still maintain it, but with a much reduced staff, and before we allow any train to run upon it, one of our own officers must certify that it is safe for traffic.

71. *To Mr. Sinclair.*—My estimate of £5,610 covers the high level railway scheme. I have informed Colonel Owen that the cost to the Commonwealth of laying down that siding, so far as section "A" is concerned, will be £5,610. The New South Wales Railways Commissioners will not bear a penny of that cost. The Commonwealth must bear the cost of the junction with the main line. In addition, we undertake to complete the section from "A" to the dead end in respect of earthworks only. But, of course, my estimate covers the cost of sleepers and rails. The provision of earthworks would be a long way cheaper than the building of a viaduct, in addition to which the Commonwealth would be relieved of all maintenance. There is a drain down Charles-street which effectually copes with all storm waters. The object of constructing a bridge, I understand, is to provide road communication from Charles-street into the Commonwealth area, otherwise it would be necessary to go round Austenham-road. It is true that the roads between the Commonwealth property and the foreshore will prevent the Commonwealth having a jetty directly connected with the proposed Ordnance Store. It would be very much simpler, of course, if the Commonwealth could build right up to the water's edge and hoist its stores from lighters into the proposed new building just as is done at Darling Island. But I gathered from Colonel Owen that most of the stores would be brought by rail. In the event of there being much water-borne stores an overhead conveyor could be installed. The site at Leichhardt has a water connexion but not a water frontage. The maximum shunting charge by the New South Wales Railways Commissioners would be 5s. per four-wheeled vehicle. That is the smallest vehicle we run. We have special vehicles such as bogeys, which have eight wheels. An eight-wheeled vehicle would be charged twice as much as a

four-wheeled vehicle. The latter has a low capacity, its net load being 15 tons, whereas a bogey vehicle has a capacity of 40 tons, whilst the well waggons carry 70 tons. The object of imposing a maximum charge of 5s. per vehicle with a limitation of time is to prevent delay. It is an ordinary demurrage charge.

72. *To Mr. Mathews.*—It was my own proposition that the New South Wales Railways Commissioners should merely construct the line up to the point marked "A" on the plans. I submitted it because Colonel Owen had given me a certain level of the floor of the store. In the ordinary sense, the rails would be 3 feet 6 inches below that level. That provided me with the level at the beginning of the Commonwealth property. From that point which is marked "A" up to the main line, I knew what filling would be required, though I had no knowledge whatever of what was going to be done on the area. In regard to the erection of the bridge which is shown on the Commonwealth plans, I cannot say what is in the minds of the designers in regard to access to the store. The approach from Austenham-road is very steep, whereas the approach from Charles-street is practically on the level. We would undertake the construction of the bridge in question if the Commonwealth desired us to do so. We possess all the facilities required for carrying out the work. Before we could connect the proposed siding with the main line it would be necessary to remove the corner building.

73. *To Senator Needham.*—The proposed railway connexion with the main line would be what we term a private siding. In connexion with such sidings, the practice is for the Railways Commissioners to provide them at the expense of the applicant. The siding becomes the property of the applicant, and if he wishes to take it up at any time and to sell the material he is quite at liberty to do so. The Commonwealth, in regard to the proposed siding, would be treated in exactly the same way as would any private individual.

74. *To Mr. Laird Smith.*—The work would be carried out under the supervision of my own branch. In this State our railways are entirely dissociated from the Public Works Department, and have been so during the past two years.

(Taken in Sydney.)

WEDNESDAY, 21st MAY, 1919.

Present:

Mr. GREGORY, Chairman.

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Ritchie Eagle, Controller of Stores, Postmaster-General's Department, New South Wales, sworn and examined.

75. *To the Chairman.*—I have occupied my present position in Sydney for seven years. Previously I was Controller of Stores in the Postmaster-General's Department, Perth, for six months, and Chief Clerk in the Railway Stores, Western Australia, for three years. I know the site for the proposed Ordnance Store at Leichhardt in a general way, and I have just had an opportunity of inspecting the plans for that building. In view of the fact that the Defence Department at present have stores located at Circular Quay and Darling Island, indeed, at quite a number of places in and around Sydney, I am of opinion that the erection of a centralized building would result in better supervision and greater economy. I do not think it is possible to insure proper supervision if the stores are located at sixteen or seventeen places about the city. Before I could say whether the site at Leichhardt is a suitable

one for the erection of the proposed store, I should require to know what quantity of stores are to be purchased by the Department, where they are going to be bought, and what is going to be done with them. It will cost 2s. 5d. per ton more to take stores to Leichhardt than it would to convey them to a place within the city boundary. That is the amount which is set down in our contracts. It is the charge which is made for cartage by means of horses, and I think it would apply to large as well as small quantities of goods. Of course it would not apply to large quantities of material which are forwarded by rail. All freight charges by rail to the proposed store would be approximately on the 10-mile minimum basis, but I cannot say from memory what the rates are. If a great many of the stores had to be issued to the city area, I would prefer a site close to the city. I consider that good road transit facilities to the store from the city are essential. It would also be of advantage to have a railway right into the store. Sea transit, too, would also be a slight, but not a very great advantage. Our own stores send away a fair quantity of goods by sea. If we had a water frontage it would not be cheaper to send the stores out to ships by barges than to despatch them by rail, because the quantities we forward to each wharf are too small. Assuming that large quantities of material had to be sent to New Guinea by the Defence Department from here, economy would be effected by forwarding the goods to the ship by means of barges instead of by rail. In a building of this description, I would prefer concrete floors to wooden floors, provided they were not too expensive. If the concrete cost only £2,000 more I would certainly favour its use. Where many piers are used they interfere with the light in a store. The more space one has for the stores the better are the facilities for handling them. In our stores we use hydraulic lifts. These are effective, but are more expensive to work than electric lifts. Personally I prefer the latter. I have had experience in the working of electric lifts with heavy loads, and in my judgment they are better than hydraulic lifts. They rarely get out of order if you have good people to look after them. They generally carry loads ranging up to 30 cwt. or 2 tons. I have seen electric lifts working in Sydney, and I believe that Messrs. Dalton Bros., in Kent-street, have some installed with capacities of 30 cwt., 2 tons, and 4 tons respectively. I have seen big loads on an electric lift which is the property of the City Council, and which is located at the back of the Town Hall, in Clarence-street. I think electric lifts, generally speaking, are more satisfactory than are hydraulic lifts, and it is much more economical to work them. If an hydraulic lift costs over £60 per annum in maintenance, experts will tell you that it is cheaper to instal electric lifts. I observe from the plans of the proposed store that the lifts are to be placed in the middle of the building. I think it would be better to have them on the sides. The lifts give access to the floors, and it will very often happen if they are in the centre that you will have people in the middle of your store who have no right to be there. Then again, it is an advantage to load straight into carts direct on the outside of your building, particularly in fine weather. I know that there is a roadway which is intended to give admission to the ground floor of the proposed building, and a railway which is to give access to the first floor. That circumstance, however, makes no difference to the opinion which I have expressed in regard to the position of the lifts. The situation of the lifts which I favour, would mean the keeping of your carts in fine weather outside of the building altogether. That is a very important matter, because, although many carters are very honest, material sometimes goes astray. If plenty of room were available I would only have a one-story building, and travelling cranes installed in it. By that

means the working costs would be reduced. Two men would thus be able to handle a case weighing up to 2 tons. I would recommend travelling cranes on the ground floor if it is intended to handle cases weighing up to 10 and 15 cwt. The lighter stuff could be stored upstairs if more than a single story building is erected. It would be more expensive to store such material on the higher floors. The installation of overhead cranes would occupy some of the space that might otherwise be used for storing goods. It would require about 6 or 8 feet headroom, and, consequently, it would be necessary to make your first floor higher. The proposed store might be carried to, say, three floors, or it might even go up to five floors with advantage. When once the stores have been placed on the lifts that part of the labour is done with, and it does not matter whether they are then taken up three stories or five stories. There would be only a little loss represented by the additional distance that the lift had to travel. I understand that there is sufficient room on the site which has been acquired to provide all the accommodation required by the Defence Department in a building of a single story. I do favour construction of three blocks in a one story building. In the circumstances surrounding this proposal, three stories would be as high a building as I would recommend, if it were decided to go higher than one-story. At the same time, I would prefer a single story building if it were possible to give effect to my suggestion. If the foundations are very poor in the low-lying portions of the ground marked "B," that, of course, will add to the expense. An 8 or 10 feet wall is not a large wall to put down, and if by so doing you could dispense with the services of three or four men at £150 or £156 a year each, it would represent say, £500 annually. You would thus be making a saving each year whilst getting your work done more expeditiously. I think there would be the same degree of safe custody in the case of a building with only the ground floor. I have seen some chutes at work in Sydney. Their utility depends upon the class of goods which have to be handled. If the goods will permit of it, chutes are very useful. I think that they would be worth installing in the proposed building. Looking at the plan of the structure, I would say that it provides for too many lifts. Of course the number required depends on the number of tons which have to be taken in and out of the store each day. I think that four lifts should be sufficient, but that depends upon the tonnage that has to be handled, and in the absence of information as to that tonnage I should not care to express a definite opinion. If I had charge of the proposed building, I would put the administrative offices on the top floor. One of my reasons for so doing is that for accountancy work it is necessary to have good light. The placing of the administrative offices there would necessitate a number of people, both officers and outsiders, travelling up to the top story of the building. But the number of visitors would not exceed, say twenty in the morning, and an equal number in the afternoon. That circumstance, therefore, would not make any difference to my recommendation. My objection to having the administrative offices outside the main building is that in very wet weather the accountants may find it necessary to go into the store in order to check the stock. They would require to take books and papers with them, and they would have to go across an open space in order to reach the store. Looking at the matter from the standpoint of possible future developments, I think the administrative offices should be on the top floor of the main building. But if they were placed there more sanitary facilities would be needed than are provided for on the plan. I think that some provision should be made in the way of luncheon rooms for the workmen. If offices for the clerical staff were being built outside the main structure, it would be well to place these sanitary facilities outside also; but if not, special accommodation for the purpose should be set

aside in the main building. The employees will also need a place where they can hang their coats, and it would be satisfactory to them if dining-room accommodation were provided in the main store. Such accommodation would not be likely to attract rats if it was properly looked after. In the stores of the Postal Department there are concrete and asphalt floors in the basement. I find no objection to them. The men complained that the cement floors were cold to their feet, but we provide them with a board upon which to place their feet when standing. I think that the workmen would object to concrete in the proposed building, but the difficulty might be overcome in the way I have suggested. We have no mechanical heating apparatus in our stores. It is advisable to take special precautions against fire, and to install an automatic fire alarm. A fire may break out amongst inflammable goods, but by means of an automatic alarm it may be extinguished before it gets far. I do not approve of sprinklers being installed in a building in which you have concrete floors.

76. *To Mr. Sampson.*—I would have one building of a single story, so that it would be possible to have a travelling crane running the whole length of it. I would divide it into compartments, but I would not have a dividing wall—merely an open bay. Under such a system it would be possible to have the most efficient supervision. The manager would be able to overlook everything. He would be in a position to exercise proper control over the stock, and to attach the responsibility for any faults to the proper officers. If the building were split up into sections, such for example as ironmongery, saddlery, boots, &c., and stores were packed in those sections before the material got clear of your yards it would have to pass through two or three sets of men, so that while there is a little to be said in favour of safety in dealing finally with the stores in different divisions, there is not so much as appears at first glance. I could work out the information which you desire as to the cost of running a single story building, providing the same amount of floor space as compared with the three story building which is proposed.

77. *To Mr. Laird Smith.*—Most of the packing and unpacking could be done on one floor unless you had to handle some special kind of material. If, for example, stationery were stored on one floor I think the stationery packing could be done on that floor. But by having a single packing room, fewer packers would be required and the plan would lend itself to better supervision. It is a practice which is followed by all the leading merchants in Sydney. A concrete floor would not cut up as the result of trucks running over it. There are special preparations which may be put upon it for the purpose of binding it and preventing dust. An electric lift, if properly installed under adequate supervision, would not be likely to prove a failure. If the Defence Department has no electrical experts on its staff I would favour the company which installs the plant being vested with the supervision of it. It would be a good idea to place the lifts alternately, one at the back and the other at the front along the sides of the building. It is desirable to have an up-to-date telephone system within the building installed. It is not a great expense, but it is a very great convenience. It would be an advantage to house in the vicinity in Government buildings the workmen employed in the store. These houses would pay for themselves all right. I would arrange for the foreman, if married, to live on the premises, give him a house at a nominal rental, and stipulate that one of his family must always be on the premises, as it would be equivalent to having a watchman there.

78. *To Mr. Sinclair.*—We get the power for our lifts from the Sydney Hydraulic Power Company. There is always a good pressure available, but our stores are not

far away from the pumping station. Each lift proposed in the plan would be capable of handling approximately 30 tons of goods in eight hours, assuming that those goods were in 6-cwt. and 10-cwt. cases. In a one-story building with overhead cranes it would be possible to pack the stores much higher. They could be stacked to a height of 16 feet without any difficulty whatever. You can stack twice as high in a single-story building as you can on the ground floor in a double-story one. High packing would not be detrimental to the goods which have to be handled. A lift in a building certainly creates a draught and acts like a flue in the spread of fire unless properly housed in. If the lifts were located on the dividing walls of the compartments one lift would serve two of those compartments, but another doorway would be required alongside the lift.

79. *To Mr. Mathews.*—I control all stores in the Postmaster-General's Department, New South Wales. During my term of office in this State new stores have been erected, but no stores have been reconstructed. We have purchased a building which was already in use as a wool and grain store from Messrs. John Bridge and Company. It is situated near Messrs. Anthony Hordern's. It required no alterations, and it contains seven clear floors. In the purchase of that particular building I was consulted as to its suitability. I would certainly have taken it amiss had I not been consulted, because later the Department may come at me on account of my working expenses. I prefer electric lifts because of their economy. I have not heard anything of electro-hydraulic lifts. They would, I presume, involve the use of an hydraulic ram, and that is where the cost comes in. I have had experience of fires in stores. We had some goods stored on railway property in Simpson's store. We had £19,000 worth of goods in that store and our nett loss was £7,000. That store was deliberately set on fire by members of the Industrial Workers of the World. That fact was proved. Where concrete floors are used, the ordinary precautions against fire should be sufficient without the installation of sprinklers. I know of a case where sprinklers have done damage to goods, through having gone off accidentally when there was no fire. I know of one case in which there was a fire when the sprinklers did not go off. In my opinion it is not necessary to have the compartments which are shown on the plan of the proposed new building, seeing that the store will have concrete floors and be fitted with proper fire alarms. The walls shown on the plan would certainly restrict supervision in the store, and would militate against the prompt handling of goods. As a private individual I would not construct the compartments shown on the plan; I would have the structure all in one story. I think that baths should be provided for the employees, as well as luncheon rooms. I would put a shower bath in for the men. There should also be proper lockers for their clothes.

80. *To Senator Newland.*—In our stores we use what are called tiering machines for stacking goods. These machines have a platform upon which the load is placed. A handle is turned at the back of the machine, and the load is raised by electric power. When it reaches the height to which the goods are being stacked it may be revolved over the stack so as to push the load off. We call these machines revolvers. A trolley could be placed on the platform of one of these appliances and be hoisted up. The machine may be moved from any part of the building to any other part. One man can pull it about. The machines are operated by electric power, but it is necessary to connect the electric power with a switch. Formerly five or six men were required to handle packages weighing 6 or 7 cwts., but with the aid of this machine two men can handle them. We find it convenient and profitable to stack our goods to a height of 12 feet. We go right up to the ceiling. It would be profitable in the building shown on the plan to

stack goods to the height I have named if there were sufficient headroom. In the case of buildings of several stories with sufficient over-head space you could stack goods 12 or 14 feet high. Only the heavy classes of goods would be stored on the ground floor, the lighter materials being placed in the upper stories. In the case of goods which have to be turned over sometimes, about 12 feet is a fair working height to which to stack them. In our store it is an advantage to have plenty of light. We have stores that would deteriorate if they were not frequently turned over. To keep out moths, silverfish, &c., the best preventives I know of are camphor balls, linen bags, and Epsom salts. A difficulty will arise from dampness as soon as you get on the edge of the salt water, which will rust saws, chisels, and tools of that description, unless they are protected. We have experienced no trouble with dampness in any of our existing stores, but when we were located at Darling Island we had trouble with them. I cannot say whether dampness is detrimental to cloth material because we do not hold cloth longer than six months as do the military authorities. In Ordnance stores, of course, material may lie for twelve months, or two years, without being turned over. I have had no complaints from my staff in regard to rheumatism having been contracted as the result of working under damp conditions. If I were stacking goods such as those which have been referred to, on a concrete floor, I would certainly put some timber under them. The timber should be raised a little from the floor so as to let a current of air pass under it. Whether fire escapes should be provided in a building such as is proposed, depends on the number of employees there will be on each floor. If there will be such a number as would be likely to cause congestion should a fire break out, fire escapes should be provided. If there were 100, or 120, men employed in the building and these were distributed over several floors it would not be necessary to have fire escapes so long as there was a stairway at each corner of the building diagonally opposite to prevent them being cut off in case of fire. The stairway would be inside the building, and it should, of course, be fireproof.

81. *To Senator Needham.*—Under our accounting system we charge out everything that we issue at the same price as we purchase it for. We charge it up to every job. I should be able if I were given the requisite time, to tell you precisely how much material, and also the kind of material which has been issued from our stores within the last two or three years. It would take a long time to supply the information, because we stock from 8,000 to 10,000 different lines. It would cost about £20 to get that information, but we could tell you the total value of the goods we issue every day or every year straight away. The new Postal stores at Harbor-street have not yet been started. I would prefer the administrative offices of the proposed building at Leichhardt to be on the top floor. I do not think there is any danger of divided control resulting from the adoption of that course so far as safety is concerned. The foreman of the store would be held responsible for seeing that everything was all right. If the clerical staff were required to work late I would hold the senior officer of that staff responsible. He would be a man who was either next, or second, to the manager. He would, therefore, be a responsible officer. In the circumstances outlined, the foreman would have to go round at knock-off time and see that all necessary doors and windows were shut, and he would leave certain windows and doors for the senior officer of the clerical staff to shut. I would like to see dining room and lavatory accommodation for the employees provided in the main building. There would be no danger of fire occurring as a result of following this course, if there were concrete floors in the building. In regard to smoking, I think that a light concrete wall could be put up and this would be fireproof and the men could be allowed to

smoke in the enclosed space. If I were a workman in a building such as that proposed I do not think I would desire to get as far away from it as possible, whilst I was having my meals. As a matter of fact, many workmen prefer to have their meals at their benches.

82. *To Mr. Laird Smith.*—I have to deal with a variety of materials—stationery, clothing, ironmongery, mechanical and civil engineers' tools, and stores. I would like to view any goods which were about to be sent out from the store for military purposes, if those goods had been stored for two years. I favour the continuous stock-taking system, but you must have good men upon it. We do not adopt that system. We take stock only once a year.

83. *To the Chairman.*—I am still of opinion that a portion of the main building should be utilized for diningroom purposes. It would be cheaper to devote a part of the structure to that purpose than to erect a separate building for it. We do not allow smoking in our stores. The men have to go outside to smoke. In my opinion the ground floor of the proposed building should be higher than the other floors in order to permit of the working of travelling cranes. The other stories should be 12 feet high, and the ground floor might go up to 22 feet. I do not consider that 10 feet is a reasonable height for each of the floors shown on the plan. It is altogether too low. The height ought to be at least 12 feet, and I would suggest 14 feet for the first and second floors.

84. *To Mr. Sinclair.*—In a one-story building with open floors you could not so well localize the risk of fire as on floors with fireproof partitions, but such a building would really be safer than one of several stories. Of course you would need to have passage ways through it which should be kept clear so as to give the firemen proper access to it in case of emergency.

(Taken at Sydney.)

THURSDAY, 22ND MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Ernest Walter Osgood, Manager Messrs. Anthony Hordern's Bulk Stores, sworn and examined.

85. *To the Chairman.*—I have had 22 years' experience in stores, and have been in the employ of Messrs. Anthony Hordern and Sons for the past 22 years. I have been in charge there for about three years. In my opinion it is desirable to centralize as much as possible the storing of enormous quantities of material such as have to be handled by the Defence Department. The storing of bulk goods does not require a great deal of supervision, and I think it would be well to have only one site. It would lead to economy if all the stores of the Department were thus concentrated. In our own business it would not matter much if we had a sea frontage so that we could land goods from barges, because we do not do very much of an Inter-State trade. We transact a large retail business, principally in New South Wales. If our goods went direct from our stores to our customers, I do not see that a sea frontage would be an advantage. When I get an order from the shop, the goods are sent to the delivery room in Swan-lane, from which they are delivered either to the carts or to the railway. Whether I would advise the building of a single story structure for the housing of stores, or a structure of several stories, would depend entirely upon the class of goods to be stored there. If they were heavy, and required the use of a travelling

crane to handle it would be an advantage to have a building of only one story. The advantage of a structure of this character is that you can stack your goods much higher than is the case in other types of buildings. If you had only to handle packages not weighing more than 5 cwt. or 6 cwt., there would be no disadvantage in having a building three or four stories high. Three men can lift a very heavy package. From the standpoint of economy no objection can be urged against a building of four stories. After having inspected the plans of the proposed store at Leichhardt, I would suggest that the lifts should be placed alongside the cart-dock. In a building of three stories, I would advise going higher than 10 feet for each of the floors, but the exact height would depend upon the class of goods to be stored. If the packages are fairly light, the building should be taken higher. With the aid of small simplex hoists no difficulty would be experienced. Of course, if the materials are packed loosely you would not be able to go as high as you otherwise would. For instance, we get quantities of blankets from Henry Bull, of Liverpool, and these are packed very loosely. As a result we cannot stack them very high. I would recommend that the ground floor of the proposed building should be 18 feet or 20 feet high, and that travelling cranes or electric hoists should be installed there. I would have the ground floor high enough from the ground to permit of drays coming in to receive their loads. This would be just the height of a lorry, namely, about 3 ft. 6 in. I notice that the proposed building is divided into three compartments, and I would recommend that these breaks should be made. At the top of our building we have an iron door which automatically closes in case of fire. I would suggest that the new building at Leichhardt should be fitted with these automatic closing doors. The number of lifts required in such a building would depend upon the rapidity with which the goods were delivered. If goods were being rushed up from the wharfs it would be better to have two lifts running than to have only one. Where the lifts are placed does not matter so long as they are built up against the cart dock. If they are kept within the building the cart dock should come to the level of the lift. This would obviate double handling. The lifts should be operated by electric power. Hydraulic lifts are not more reliable than electric. The electric lifts are very reliable, and if they get out of order they can speedily be put right. That is my experience. Over a long term of years we have found electric power quite suitable for our lifts. We have two electric hoists in our stores, and we find them very convenient. They enable us to pack goods very much higher than they could otherwise be stacked, and only one man is required to drive them. I have had no experience of the delivery of goods by chutes. I would not like to express an opinion upon the question of whether the ground plan of the building proposed lends itself to economic working. It is a matter entirely different from anything with which I have been connected. I would prefer not to venture an opinion upon the question of whether there is any means of getting goods into the store by sea from the canal. I do not know that it matters greatly where the administrative offices are placed from the standpoint of efficient control. I have two or three offices connected with my store. The central office is not a very large one. It is built in between two stores. It does not necessarily follow that a separate building is required for administrative offices. My own opinion is that they should be placed inside the main building. I believe that it is compulsory under the State law to provide luncheon accommodation for the employees in the proposed store. I think that the lavatory accommodation should be outside the main building unless it is placed on the ground floor. Quite a number of private firms have put this accommodation on a flat roof, over which a shelter shed is usually erected. I think that arrangements could be

made to provide a smoking room for the men inside the main building. The employees in our stores have complained that it is very cold working on concrete floors. But the cold does not seem to affect them greatly. No man has suffered physically from working on concrete floors, and most of the employees are old hands.

86. *To Mr. Laird Smith.*—The less the number of columns there are in a building which is used for storage purposes the better. In a store such as is proposed at Leichhardt, it would be an advantage to have all the packing done on one floor. All our goods are unpacked in one room. Even though the floors be of concrete, I think it desirable to instal sprinklers in the building. In one of our buildings we have the sprinklers, and I know that they are fitted throughout the Palace Emporium. Insurance companies require that there should be at least 2 feet clear space between the sprinklers and the goods. This should be taken into consideration when determining the height of rooms. We have also automatic fire alarms. Upon one occasion one of these alarms saved our building. As a matter of fact, the firemen were there before the watchman could give the alarm. Our lifts are looked after by a handy man, who has been in the store for 30 years. The movable electric light along the wire which you saw in our store this morning works satisfactorily and economically. It may possibly be advisable to instal in the proposed building between one floor and another an up-to-date telephone system. It all depends upon what is required. If it is desired to communicate quickly and frequently with the storeman, a telephone system would undoubtedly be an advantage. We have men looking after the different sections of our store. I do not think it is necessary to have a foreman in the building that is now before the Committee. A leading man in the different sections would be sufficient. His wages would be 65s. 6d. per week, whereas that of an ordinary storeman is 64s. It is quite possible to secure efficient supervision in a building of three or four stories. I would prefer to have the clerical staff located on the ground floor.

87. *To Mr. Sinclair.*—Our lifts are not fireproof. They are open lifts, and it would be impossible to make them fireproof. If a fire broke out on the lower floors, the fact that the lifts are not fireproof would undoubtedly be a disadvantage, but I see no way of avoiding it. The quantity of stuff that men could shift during a day with a 3-ton lift working at its maximum capacity would depend upon the size and weight of the packages, and upon whether those packages had to be stacked immediately. It would be difficult to say what is the maximum shifting capacity of a lift in a day, because we do not get goods coming into one lift in a constant stream. I have no idea of the cost of one of the lifts. I think that the lifts in the proposed building could be worked in the partitions, either in the corner or in the centre. If that plan were adopted one lift would be able to serve two compartments, and four lifts would be ample for the entire structure. I have had no experience of the mushroom system of construction. With overhead cranes in a one-story building the goods could be packed very high indeed. We have a store in which they are packed out on a height of 20 feet. With the necessary gear we could get as much use out of a single floor building as could be got out of a building of several floors where men have to handle the goods. As an expert storeman I would prefer a single-story building, if sufficient room were available at the site of the proposed store. But if the goods can be handled satisfactorily by any other means, the single floor building would involve a lot of waste of land. There is not a great deal in the stacking of goods. A few men can handle a lot of stuff.

88. *To Senator Needham.*—I have about fifty men, including clerks, under my control. Our stores are

scattered. But even if they were concentrated in one building I would still favour the administrative staff being kept within that building. At the same time, I do not think that it matters very much where they are housed. We do not hold our storemen responsible for the safety of our stores. I do the locking up myself. Our office staff is never required to work late. We do not have any night work. Our employees have their meals within the building. It would be wise to provide the employees in the proposed building with separate dining room accommodation and other conveniences. The proprietors of Arnotts' biscuit factory do that. They have a separate building for the purpose. A shower-bath, if provided, would be nice, but a good wash basin is all that is necessary. I cannot offer any suggestion as to whether housing accommodation should be provided for the workmen, but I know that such accommodation is provided in England. I am in favour of fire escapes being installed outside the building, although we have no fire escapes on our building. Most modern buildings, however, are fitted with these escapes, and I think they should be provided where men are employed.

89. *To Mr. Sampson.*—In the handling of our stores there is no principle on which costs are debited against us. The expenses of the store just come out of the general expenses. If I had plenty of land upon which to erect a store to accommodate the whole of our stock, with a view to its economical handling, I would put up a one-story building sufficiently high to permit of the use of travelling cranes or electric hoists. But, of course, the class of stock to be handled would have to be taken into consideration. I do not know the class of material that will be handled at the Ordnance Stores. If the parcels were light, it would be better to have more than a single-story building. Most of our stock is heavy. We could not keep all of it in a building of one story, because we always require certain packages at a particular time. On the other hand, if only one class of goods were being handled, a single-story building would be sufficient. For handling a mixed class of goods, I prefer a structure such as is outlined in the plan before the Committee—a building of, say, three stories. I cannot say which would be the most effective from the point of view of efficient control, a single-story building or a three-story building. I have never experienced any trouble in the matter of supervision in our store. No difficulty of that character should be experienced in either class of building. But for the handling of one class of goods a single-story structure would be preferable. It may be an advantage to have a building of several stories divided into compartments. The floor accommodation in our various stores amounts to 140,000 square feet. If you have your stores centralized you will, of course, need to employ fewer men. I advise centralizing them as much as possible for economy of working. Altogether we have eight stores in Sydney, but one of them is a very small building. Centralizing our stores would probably dispense with 20 per cent. of storemen and clerks now employed. I do not know whether we turn over the stock in our stores once, twice, or three times a year. Some departments turn over their stuff very quickly. It is a matter of management, and each department is responsible for its own working.

90. *To the Chairman.*—In my opinion, it would be better to have the drays coming right up the lifts which are shown on the plans of the proposed building. There is no necessity for a ramp at all. It is possible, however, that the goods might be handled quicker by means of a ramp; but, of course, in wet weather it would be useless. In our most modern stores we have ramps, which enable the drays to come right into the building. There is only a few feet between the end of the cart-dock and the lifts. I think it would be

better to enable the drays to be backed right into the proposed building. The railway should also be brought close to the building. This would be very advantageous in wet weather, when the goods would otherwise be liable to get wet. Looking at the matter all round, it would be better to dispense with the ramps on both sides, and to have the levels adjusted, so that the road and the railway would come on to the same floor.

(The witness withdrew.)

Charles Albert Reed, Engineer, Trussed Concrete Steel Coy. Ltd., sworn and examined.

91. *To the Chairman.*—I claim to have special knowledge regarding the mushroom system of reinforced concrete construction. The advantages of that system are that it eliminates all main and secondary beams, and provides a flat ceiling, thus preventing any shadows from being thrown on the ceiling. As a result, where shaft-hangers are used to drive machinery you are able to put them as close up the ceiling as possible. You are also able to change the direction of your shafting wherever that course is deemed desirable. In addition, you dispense entirely with girders. These are the advantages of the system. To determine the strain which a floor will bear, formulas have been devised. Mr. Turner, who introduced the system in America, has certain formulas, most of which have been investigated by professors of engineering in the universities. These have been checked, and the system has been proved to withstand the tests which are claimed for it. The system was used by me in the erection of Wrigley's spearmint establishment at Roseberry. That is the only building in which it has been used in Sydney. In the United States, however, it is used very extensively, particularly in motor-car works, where there are long lengths of shafts employed in driving a number of small machines. All that is claimed for the mushroom system are the advantages which I have enumerated, and that it gives the employees in any building erected upon it more light, owing to the absence of beams. It is specially adaptable to machine shops. There is no possibility of the Committee seeing any buildings being erected upon that system in a half-finished state here, but I have several illustrations of Wrigley's establishment at various stages of its construction. The columns there are all composed of reinforced concrete. We had to design the building to carry 200 lbs. per foot super. That means that it will safely carry twice that load without showing any sign of failure. But if a bigger load be put upon it a certain deflection will be set up between the columns. At the present time, the system is cheaper than the employment of structural steel girders and stanchions. The mushroom system, I believe, is protected by a patent. In America, Mr. Turner, who claims the patent rights of the system, had those rights challenged, and, I believe, challenged successfully. He appears, however, to hold the patent rights for Australia, and I paid a royalty to him for the use of the system in the erection of Wrigley's spearmint factory. It is a system that I would unhesitatingly recommend for the building of a store similar to that shown on the plan. If any portion of the floors of the building had to carry specially heavy goods, the columns supporting such portion would need to be specially strengthened, and the floor slab would be specially designed to allow for such loading without any difficulty. The worst type of load which can be placed on any floor is a machinery vibrating load. I have had a good deal of experience in building concrete stores, though not in this country. The average weight-carrying capacity of a general store might run as high as 4 cwt. to the foot super., or as low as 1½ cwt. The construction of a building must be decided by a

consideration of the materials that are to be stored in it. I cannot see any objection to the design of the building proposed in the matter of spacing the columns. It provides for 20-ft. square bays, the same as are to be found in Wrigley's.

92. *To Mr. Sinclair.*—The mushroom system was patented in America, and that country will not patent any process unless it is the original recorder of the patent. That fact, however, had nothing to do with Mr. Turner's failure to uphold his rights. It appears that he patented this system some years ago and allowed people to use it on royalty. Other firms in the same line of business began to get annoyed, and, as a result, they discovered that another man had previously patented the system, although he had never developed it. Thereupon, they instituted legal proceedings against Mr. Turner, and compelled him to disgorge all his royalties. I have since discovered that Mr. Norcross has not a patent in this country, although Mr. Turner has. The latter, therefore, can claim royalty from anybody who uses the system. The amount of the royalty is 1½d. per foot super. I paid him about £200 royalty in connexion with Wrigley's establishment. I did not wish to pay royalty, and would not have done so if I could have avoided it.

93. *To Senator Newland.*—Under the mushroom system every floor carries its own weight. I would recommend a skeleton frame building—viz., with wall columns and wall beams with brick filling, thus making the mushroom floor independent of the brick walls for support, that is not what is contemplated in the plans of the proposed building. This would strengthen the structure enormously, and would give an equal weight-carrying strength all over the floor. It would not appreciably add to the cost of the building. It would merely mean replacing brickwork with concrete. The steelwork laid down under this system gives an equal weight-carrying strength all over the building. That is to say, in the centre of the floor, between the four pillars, the strength of the floor is as great as it is on the top of a column. Round the edge of the columns is the weakest point. The steel rods are carried to the bottom of the columns and spirally bound from top to bottom, and the column rods are bent out into the slab for a distance of as many feet as may be required.

94. *To Mr. Laird Smith.*—The vibration of the lifts has no ill-effect on this type of building. I preferred to pay the royalty rather than contest the rights of the patentee of the mushroom system. It was probably cheaper to do so. Unless there is an absolute necessity for placing the lifts in the centre of the building, they should be put on the outside. A lift in the centre of a building will occupy more space than a lift on the outside of it. In the case of fire, the lifts would act as a flue, but they would not do so more in one place than in another. The electric is a much cheaper and better lift than is the hydraulic. There are reliable companies in Sydney which install these lifts.

95. *To Senator Newland.*—I consulted the Patents Office in Australia before paying the royalty. From the inquiries which I made into the matter I was satisfied that it was too risky for me to infringe the rights which are possessed by Mr. Turner. The payment of the royalty entitles one to assistance from the representative of the firm holding the patent rights. I made that firm equally responsible with myself for the safety of the construction of Wrigley's building. Therefore, I sent my drawings down to them to be approved. They approved of those designs, and certified to the ability of the system to carry the load required. In other words, they took joint responsibility with me so far as the design was concerned.

(Taken at Sydney.)

FRIDAY, 23RD MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Robert Sydney Sands, late Lieutenant-Colonel, of the General Head-quarters Staff, Defence Department, Melbourne, sworn and examined.

96. *To the Chairman.*—I retired from the active Forces on the 1st January this year. My home is in Sydney, but all my work has been done at the Head Office in Melbourne. My services were availed of because of my business experience in connexion with manufacturing concerns in New South Wales. During the last year of my connexion with the military staff, I had experience of Ordnance Stores. Prior to that, I had charge of all the German prisoners of war in Australia and the East. I am familiar with the way in which Ordnance Stores are housed in Sydney. From a business point of view, the present method of storage is a scandal, and I reported that fact to the Minister of Defence in March of last year. Afterwards, he gave me a free hand to come here and inquire into the position of the various Ordnance Stores, and to select a site for the erection of central stores which are intended to take their place. The position to-day in regard to the housing of ordinary stores here is just as it was before the war. As a matter of fact, four-fifths of the buildings which contain our war material in New South Wales, were in use before the war, so that the present position cannot be regarded as abnormal. As the result of my investigation, I recommended that the buildings containing stores at Circular Quay and Darling Island should be sold. Those buildings would be most useful to commercial people as wool stores. They would realize a very good price—sufficient to enable us to purchase a suitable site, and to erect centralized stores upon it without any cost to the Commonwealth. Moreover, a centralized store would enhance the efficiency of the service tremendously. It is advisable to have the whole of these stores centralized on one site. I would have the entire staff located there. The buildings at Darling Island are not suitable for the purpose to which they are now being put. They were erected for the Postal Department with a view to accommodating Postal stores, but were gradually acquired by the Defence Department. They are of tremendous value, and are only utilized for the housing of heavy materials. I selected the site at Leichhardt. I am a director of a paper mill which has a capital of £150,000. I refer to the Cumberland Paper Board Mill at Lane Cove River. To that mill we have to take 80 tons of material daily, and to despatch from 80 to 100 tons. Though the Commonwealth has a wharf at Darling Harbor, it is never used by big ships, but only by barges. I do not believe there has ever been a large ship go to the Darling Island Stores, notwithstanding that there is deep water there. All the work is done by barges. That is the way we do our work at the paper mills. We do not require a big depth of water there. We work on a depth of 4 feet. In selecting a site for the proposed Ordnance Store, my object was to secure for the Defence Department one which possessed this particular advantage, because the districts to the south of the northern rivers of New South Wales are run from Sydney. The top districts of those rivers are run from Brisbane; but they should be run from Sydney, because about six handlings of the goods are

necessary between Brisbane and those rivers. I recognise, therefore, the necessity for obtaining a water frontage in connexion with the site, and also the advantage that would be conferred by a railway frontage. The line that I chose with which we can link up, is the main goods line of New South Wales. The present goods line runs down to Redfern, and thence to Darling Harbor, but it will be cut out in the near future. When that is done, all the goods from New South Wales must come down the line close to the site which I chose. It will, therefore, possess both water carriage and railway carriage—two matters of tremendous advantage. It is the only place in the neighbourhood of Sydney where these two advantages can be obtained. That is the reason why I selected it. Moreover, the manufacturing centre of Sydney is gradually forming out that way. I took the President of the Chamber of Manufactures to the site, and he approved of it as a most suitable one for the delivery of goods manufactured in Sydney. As the city possesses half the population of the entire State, obviously a large proportion of the outgoings of the store will be within the metropolitan area. Major McMahon is the largest carrier in Australia. I took him out to the site, and he reported that the access to it was all that could be desired, so far as the levels are concerned. Most of the goods that will be delivered at the store will be sent there by the manufacturers, and, as I have already remarked, the manufacturing centre is gradually developing in that direction. The Chamber of Manufactures says there is no objection to the delivery of orders within that site. The delivery outward will be chiefly by rail. In the city proper, there is very little in the way of delivery of goods. The metropolitan troops are all taken to Liverpool, and are given their training there. That means that the Ordnance Stores round the city are very little used, most of the equipment being at Liverpool. It is the country centres, and the river centres, to which most of the goods are sent from the stores. Whilst I was in command of the German Concentration Camp at Holdsworth, I got permission to put a branch line down 5 miles into that area. There are two sidings there which take the goods for the Infantry at Liverpool, as well as those for the Infantry and Light Artillery at Holdsworth. In the site at Leichhardt, I seemed to obtain every requisite that was essential. When I selected that site, the Department told me the estimated floor space which it would require in normal times, but my business was to choose the site, and not to go into the question of the requirements of the Ordnance Store. However, I considered that the site would provide ample space for all the departmental needs. I had the buildings at Circular Quay and Darling Island valued by Messrs. Hardie and Gorman. As I had a free hand in the matter, I went to the best people available to obtain the information which I desired. I shall be glad to supply the Committee with the valuations of those buildings. The foundation for the proposed building on one portion of the site is not too easy a matter to handle. I think you would have to pile it for 30 feet. But we have a factory 150 ft. x 300 ft., six stories high, which stands upon 35-ft. piles. Piling is an expensive job, but not unduly so. When I selected the site, I was aware that the foundations for the lower levels would require piling. But a brick building could be erected on the higher levels, where there is a good rock foundation. I got the land agent who is most interested in that particular locality—a city man—to give me, confidentially, his estimate of the amount that would be involved in the resumption of the private lands.

97. *To Mr. Mahony.*—The Commonwealth Government agreed to pay the New South Wales Government a fair value for the public park which will be taken over on the understanding that the proceeds would be handed to the Leichhardt Municipal Council for park

purposes. I shall endeavour to supply the Committee with the amount so estimated.

98. *To the Chairman.*—The plan of the proposed building has been worked out on the lines I suggested, although it may contain some details with which I do not agree. Goods will be brought into the store from the railway line marked "C" about 15 feet above another line which will be used, if the buildings marked "P" are erected. I do not agree with the proposal that the low level railway should stop at the outside of the building marked "A." I believe that it could be taken right into it, and possibly it could be taken right into the building marked "C." The higher level railway would communicate with buildings "A" and "C." I recognise the necessity of getting goods into the store from the canal. If goods had to be delivered by water, and if some were intended for "A" building, some for "B" and some for "C," they would be taken to those stores by the low-level No. 1 railway, or by low-level No. 2 railway. Goods from the canal to stores "A" and "C" would be taken by the low-level railway. They would be brought to connect with the north end of No. 1 store. Of course, if there were a large shipment of goods it would be better to do a bit of shunting. I think the low level No. 2 railway should be carried through to the lower level of the "A" store. I consider it would also be advisable that the low-level No. 2 siding should run through the centre of the "A" store. Two years ago, when I was in Japan, for the Commonwealth Government, I visited the Naval yards at Nagasaki, where I found that the whole of this class of work is done by means of overhead gantries. The network of the gantries is truly wonderful. Yet it is really very simple, but here we do not seem to have any good system in operation. All the stores at Nagasaki are brought from the water and distributed in the yards by means of overhead appliances. When the whole of the stores of the Defence Department are concentrated I think that the expenditure involved in providing gantries and overhead transport generally would be warranted. I would rather have the stores on various floors, because, in trucking the stuff a long distance, it is best to be near a lift. I have had many a fight with the Defence Department over this matter. It has an idea of having a building covering about 100 acres, and containing only one floor. Why, a horse and cart would be necessary to take the stuff from one end of it to the other, whereas, in a building of several stories, you could easily get near to a lift to enable you to send your stores up and down. At the paper mills we have big sorting sheds, and it would never do for us to have to cart the stuff on trucks right up to the spot from which we wish to send it away. I would favour the erection of a four-story building to provide the floor space required by the Department. To have a building only of one story is a worn-out idea. I would install electric lifts in preference to hydraulic. A very good supply of current can be obtained from the Balmain Electric Supply Company, whose cables pass in close proximity to the site. We use electric power in the matter of hoists, &c. I consider that 10 feet between the floors is a fair height. I think that 10 feet clear between each story would be sufficiently high for the stacking of general merchandise, except for the ground floor, which I would make 12 feet. But I would like to obtain some data bearing on the point from some of the factories in which I am interested, and in which stocks of certain goods are stored. Provision is made in a number of those factories to enable the carts to back right into the buildings. Rather than have a dockyard within the building I would prefer a ramp with a verandah overhead to protect goods from wet weather, and because of the saving which would thus be effected in space on the ground floor which is the most valuable space in the entire building. I think there are more than sufficient lifts provided in the plan of the proposed store. Seeing that the structure is to

be 570 feet long I would recommend its division into compartments as shown on the plan. It seems rather a peculiar idea, however, to have the lifts located in the centre of the building. In my judgment they should be situated so as to facilitate the handling of the goods. With a roadway on one side and a railway on the other, the lifts should be located on alternate sides of the building. I consider it wise to have breaks in the ramps where the lifts come down so that carts may be able to back direct into the lifts. The less handling there is of material, the better, especially in the Government service. Some of the storemen are the dead beats of the service who have been fired into the Ordnance Store where they go to end their days. The authorities used to make it a sort of old man's home right from top to bottom. I favour the installation of sprinklers and of the hose in addition.

99. *To Mr. Sinclair.*—I cannot give you any idea of the probable tonnage that will be stored in the proposed building. That is a matter which I left to the people who are charged with the handling of the goods. It is one which is altogether outside my province. At Darling Island you may see big bins of bolts and nuts which may lay there for years. But all the manufactured material, such as saddlery, uniform, &c., is brought in and goes out of the store fairly frequently. There is, of course, a reserve stock which is kept for war-time purposes. I know that one of our stores was valued at £50,000. It is filled with dead stock. On an average, however, the goods in an Ordnance store would not be handled anything like as frequently as is ordinary merchandise. At our factory in Druitt-street, Sydney, we have a 3-ton lift handling bales of paper and general merchandise, and I could get from the storeman in charge of it his estimate of what that lift will carry in a day if continuously employed. I shall be glad to supply the Committee with information on this point after having made proper inquiries. Of course, a great deal depends on the class of material which has to be stored. In the storage of wheat, for example, a chute may be used with very great advantage. If the lifts were placed against the walls one lift, in case of emergency, could be made to serve two compartments of the proposed building. But, of course, lift wells are very bad in case of fire. That danger, however, might, to a great extent, be eliminated by the use of automatic closing doors. I would recommend the use of chutes in the handling of materials such as bales of clothing, &c. The fact that there is a road between the site at Leichhardt and the water front does not spoil the advantage which is conferred by the possession of a water frontage, because only the State Government can use that road. There is a dead end to it at the State Government's Public Works Store. The road may be altered as much as was deemed desirable so long as the State Government have access to it. The Commonwealth would certainly have its own little shunting engine and trucks on the jetty. Before submitting any reports to Melbourne I consulted Colonel Kendall, the Chief Engineer for Existing Lines in this State, and he acquiesced in all the railway arrangements that have been suggested. He did not make any offer in regard to shunting operations, but said that the Railways Commissioners would operate the two sidings which the Commonwealth required in the ordinary way as commercial sidings. I suggest that the Commonwealth should have a small shunting engine there in the same way as the Broken Hill Proprietary have at their works. The point of whether the New South Wales Railways Commissioners would allow the Defence Department to engage in shunting operations when its trucks were off the high level system was never raised between us. I know that stone quarries do their own shunting with horses, and that at the finish they bank up a train for the railway authorities to attach their engine to, and take away. I was informed that the

cost of the line to be laid down to point "A" on the plan would be £2,500. I understood throughout that whatever the cost might be incurred in the building of the two lines intended to serve the store, the Commonwealth Government would have to pay it. I do not know whether it is the practice for the State railway authorities to put in the points of clearance at private sidings so as to protect themselves. The buildings which are used for Ordnance Stores at Darling Island and Circular Quay are transferred properties, and in the event of a proposal to sell them they must first be offered to the State Government.

100. *To Mr. Mathews.*—I have been associated with the military forces for the past twenty years. During the first part of the war I had charge of all the organization of the German Camps in Australia. Then I was sent up with German prisoners to India and China. Later I was engaged on secret service work for eight months, and afterwards I was taken on the special staff of the Minister for Defence for Ordnance Store work. I have made suggestions in regard to this particular work, not only in New South Wales, but in other States. My work has been chiefly in connexion with organization. I have said that the employees in Ordnance Stores are somewhat different from those in the employ of private enterprise; but I do not acknowledge that private firms "take it out" of their employees by undermanning. In all the private stores with which I have been associated, the employees are well paid and well contented. The two firms with which I am identified pay the highest wages that are paid in the manufacture of their particular class of goods. The reason why the Ordnance Store is a refuge for old men is that there are no pensions paid to the military in Australia. This is the only country in the world in which such pensions are not paid. The result is that when a man is getting old and shaky in the service he is sent into the Ordnance Store. I worked the employees in the Government Service in the same way as I do employees in my own firm. I do not distinguish between officers and men in my statement regarding employees in the Ordnance Store. My remark was a general one. I would pick the best man available for the work to control these stores, and I would give him military rank in order that he might be able to deal with outsiders who might come in. I cannot see how the efficiency of the Ordnance Store will be affected, whether it be under military or civilian control, provided the right men are engaged. I think that a building of four or five stories would conduce more to efficiency than would a single story building. If sprinklers are installed there is very little risk of fire in stores of this character. I would certainly install them. It would pay handsomely to do so on account of the reduction that would be effected in the rates for insurance. The latest sprinklers are very efficient. Those which we have installed were put in eight years ago, and they have extinguished fires. The electric lift is better than is the hydraulic, both from the point of view of efficiency and cost. I have no knowledge of the electro-hydraulic system, but I do know that Sydney cannot undertake any new big electrical works till 1922. The Balmain Electric Supply Company, however, can provide an ample supply of current. I think that the partition walls shown on the plan between the different compartments of the proposed store would prove very valuable. If, for example, a shell from an aeroplane was dropped in one of those compartments it might be burnt out, but the rest of the materials might be saved.

101. *To Senator Newland.*—I said that an extension of the low level line into the proposed building would obviate the immediate necessity for bringing in the high level railway. If a railway were carried through the centre of building A, proposed building C could be supplied from the low level railway, thus cutting out the high level line. At the same time, I think I would

retain the high level line for safety purposes in time of war. We have 4 feet of water at our paper mills water front, and upon that draught we can take a load of 60 tons on a barge. Upon 3 feet of water in a specially constructed barge, we can carry from 30 to 40 tons of goods. With the present depth of water at the site of the proposed store at Leichhardt, you can carry a load of 100 tons. It will be necessary to build a wharf on the canal, because there must be a landing stage there, and also an electric hoist. I see no objection to making the buildings marked B on the low-lying ground more than one story in height. I took one of the leading architects of Sydney out to the site, and he said that that could easily be done. My own idea was to keep the building marked B more for the purpose of storing limber waggons, &c. I have not found the slightest difficulty amongst our employees as the result of their working on concrete floors. They do not complain of rheumatism, and all our floors at the Drutt-street establishment are made of concrete. Nor do we experience any trouble on account of dampness. I suppose that we have £20,000 worth of paper stacked there. If the proposed store be built on the rock foundation it will never get damp. I think that the administrative offices ought to be located in the main building. The receiving storemen ought to have their offices on the ground floor, but the controller and his staff should be located on the roof. The roof should be flat to enable the employees to have their meals there. As only the storemen would have their offices below there would be no running up and down to meals on the part of the employees, thus interfering with the working of the lifts. I take it that a passenger lift would be used to take visitors up to the administrative offices. I think provision should be made for dining accommodation for the employees on the roof. Only this week, we have arranged to put an extra roof on the building of one of our factories where we intend to supply 350 meals daily at a cost of 9d. each. The Commonwealth Bank provides 300 meals daily at a cost of 9d. each, and I am informed that their actual cost is about 8½d. I most strongly recommend the use of steel window frames instead of wood, and I am convinced that they will repay their cost ten times over. But the Works Branch of the Defence Department is rather keen upon having wooden frames. The steel frames can be manufactured in Australia. I have had experience of mechanical packing machines, and I find that, as a rule, the men handle the goods very much quicker than they could be handled by mechanical appliances, save in the case of very heavy packages. I do not think it is necessary to install a travelling crane on the ground floor. There would not be the height that would be required to operate it.

102. *To Mr. Laird Smith.*—If the Ordnance Stores were located farther from the city the manufacturers would charge freight on the delivery of their goods. But the Chamber of Manufactures has assured me that the Leichhardt site is sufficiently close to allow of the delivery of goods without any freight charge. I cannot say that there will be no danger of air raids on the store, because air raiders would go inland 20 or 30 miles if they knew the exact location of a store of this description. The firms which install electric lifts in Sydney are quite reliable. It is a fact that, some time ago, the New South Wales Government spent a considerable sum in resuming wharfs and stores. As the buildings at Circular Quay and Darling Island are transferred properties, before we can sell them to outsiders, we must offer them to the Government of this State. I favour the housing of the responsible workmen and others in the vicinity of the store, just on the other side of the canal. There is some beautiful land there with a north-easterly aspect—land which is not being used, and which is admirably suited for the purpose. By housing its employees, the Commonwealth would get more contented and better workers. If it

became necessary, owing to aggressive action on the part of some Power, to despatch a force quickly to North Queensland, punts could come up to the site, and take delivery of the goods required by that force upon barges. All Sydney Harbor is worked by means of barges. A tow of an additional couple of miles means nothing. I was selected to choose the site for the proposed store because of my practical experience, and possibly because of my successful organization of the camps in which I had been interested. The chaos which I found in the Ordnance Stores in Sydney was largely due to the poor facilities existing for ordnance work, but the *personnel* was poor also. I have no objection to concrete floors, and our workmen have never complained of them. Whether chutes should be installed in the proposed building depends upon the material which will have to be handled. There would be no objection to the handling of bales of clothing by means of chutes.

103. *To Senator Newland.*—When I was looking for this site I had something to do with the arrangement which was made between the Commonwealth and the New South Wales Government in regard to what should ultimately be done with the money derived by the latter from its sale. The State Government said that the park which had to be resumed at Leichhardt was not of very much use to them, but that they were sure an agitation would at once be started against the alleged filching from the people of one of their reserves. In other words, the New South Wales Government had no objection to the Commonwealth taking that park, but they knew that the Leichhardt Council would be bound to object. They therefore said to the State Government, "Will you agree to hand over the money received for the purchase of this park to the Leichhardt Municipal Council?" and the State Government said "Yes." There is a cemetery in the middle of the Leichhardt municipality, and the proposal now is that the bodies in that cemetery should be removed to Long Bay, or some other place, and the cemetery itself utilized for park purposes. The State Government has approved of that being done.

104. *To the Chairman.*—The armoury would have to bear a tremendous weight, and I am in favour of placing it in the main building instead of in a separate building.

The witness withdrew.

John Burcham Clamp, of the firm of Clamp and Mackellar, architects, sworn and examined.

105. *To the Chairman.*—I recently carried out the erection of a factory under the new system of reinforced concrete construction known as the mushroom system. That building has been completed, and is now occupied. Whether the system possesses advantages over the ordinary methods of reinforced concrete construction depends entirely upon the purpose to which the building is to be put (offices or stores). The stories at Wrigleys are 13 feet in the clear. Assuming that the stories in the proposed building at Leichhardt are to be 18 feet in the clear the columns supporting it would need to be larger than those which we erected. At Wrigley's establishment the columns are 18 inches in diameter. If you have a building 18 feet high, you would be liable to put a weight of more than 2 cwt. to the foot upon it if stacked to full height. A factory very rarely exceeds 13 feet between the stories. Any greater height in buildings of that character is usually made for the sake of appearance or for overhead travellers. In a building which is intended for storage purposes I would not advise to go beyond 13 feet, particularly if it be necessary to lift or stack heavy goods. A wool store never has more than 11 feet between the stories unless on show floors. At a large warehouse in Clarence and Kent streets, just completed under our

supervision, the stories are 14 feet high. For efficient handling I would not recommend more than 13 feet from floor to ceiling. With the mushroom system of construction a 10-ft. ceiling would be too low. But you must not go too high unless you have overhead travellers, which will enable you to efficiently handle your goods. To use a traveller you would require more than 13 feet from floor to ceiling. These travellers usually take 2 ft. 6 in. in height for lifting. An engineering firm which has a basement in Kent-street, and which lifts machinery up to 2 tons in weight, has a floor 13 feet high. I would advise electric traction in any store like that now under consideration. To my knowledge Wrigley's factory is the first building erected on the mushroom system in New South Wales. Prior to the outbreak of war I was in America, and since my return I wrote to a friend of mine, who is an architect in Washington, asking him if he was acquainted with any better system than the Turner mushroom system. His answer was "No, except that an endeavour was being made to save some of the steel which was being used in it." The only defect I have noticed is that there is a slight crack at the intersection in some of the concrete floor slabs. This feature is common to all concrete buildings. At a large building in Macquarie-street similar cracks appeared where the beam system was used. But these do not affect the stability of the structure or its weight-carrying capacity. At Wrigley's factory the machinery is installed on the second floor. The oscillation that results from that machinery places a bigger load upon the structure than would be experienced on an ordinary floor. In other words, it is a live load instead of a dead one. In recommending the construction of a building upon that system I certainly would advise the use of reinforced concrete columns in the outer walls. Otherwise, you will have a half-concrete and a half-brick construction. This would make each floor self-contained, so that, if necessary, the brickwork may be taken out of any of those floors and the building would still stand. It should be built upon the same basis as if a complete steel-construction building were required. In the mushroom system, the bars are all tied and interlaced, and thus a solid construction is obtained throughout each floor of the building. I would say, "Let the brickwork act as a filling, and not as a part of the construction." With a long brick building walls have a tendency to bulge on account of their length unless they are tied in some way. No better tie can be devised than that afforded by the mushroom system at each floor. The height to which the building is carried does not matter so long as it is designed accordingly. But whilst in America I was advised against designing reinforced concrete buildings above ten stories high, because there is always so much risk associated with such buildings, no matter what system may be employed in their construction. In the first place, you have to watch your cement, then you require to watch your men, and you also need to watch the mixing, because if one bad lot of cement is put into a building in the columns, the entire structure may come down about your ears. But, so long as proper precautions are taken, I have no hesitation in recommending the adoption of the mushroom system in the erection of the proposed store, even if it be four stories high. I like that system from a practical standpoint. Everything connected with it is so clean and sweet, and there is nothing in one's way. Under it, a man can run his shafting any way that he chooses. I would have no hesitation in erecting another building upon that principle. Wrigleys use electric power in their lifts. We never advise putting in an hydraulic lift in a high or modern office building or store, where the lift is in constant use, as the electric system works out, as far as we can gather (under equal conditions), at about one-tenth to one-twelfth of the hydraulic system, so far as the cost of running is concerned. Of

course, a lot will depend upon the use to which a lift is to be put. I have often installed hydraulic lifts, and prefer same when they are only used occasionally during the day. They are very reliable. The electric lift costs more to install. Roughly, it costs about £1,000, whereas an hydraulic lift would cost only £400 or £500. The general practice is to keep the lifts against the wall of a building if possible. I should prefer to have the lifts in the proposed building located close to the covered way shown on the plan, or even placed on the outside, so that goods might be lifted right off the carts on to them. Similarly, I would have a lift situated as close as possible to the railway. This would obviate double handling for goods to be located on the upper floors. It is customary in some buildings to have dray docks provided. Only the other day I installed an hydraulic lift in a four-story building for £450. I have recently had experience of an electric-driven oil-pump. I installed one of these in a bank in Pitt-street, and I am just waiting to see the effect of it. It is cheaper to run than the ordinary hydraulic lift, but it is noisy. It is an electrically driven oil lift. That is to say, instead of the water doing the work, the motor does it. The other lift, which I said cost £450 to install, has a carrying capacity of 20 cwt. Three tons is a very heavy weight to lift. It is most unusual for a lift to have a carrying capacity in excess of 30 cwt. unless for garages, &c. With an ordinary one-ton hydraulic lift a pressure of a ton of water is used every time it goes up. In a lift which will raise 3 tons, a pressure, or head, of 3 tons of water would be required.

106. *To Mr. Mathews.*—I have not seen an electric movable hoist, which is worked from the floor, in actual operation, but I have seen illustrations of it. I would recommend the use of revolving elevators in addition to the lifts between the floors of the proposed building. These elevators are driven by electric motors, and, of course, any labour-saving device that may be utilized would be of advantage. The mushroom system of construction is designed to suit the weight it is intended to carry. There is not much difference between its cost and the cost of the ordinary method of construction with pillars and reinforced concrete girders. Mr. Turner is understood to have the patent rights of the mushroom system, but a friend of mine, an architect in America, wrote me to say that the patent rights had been disputed in America. I have heard, however, that the system has been patented in Australia. As an architect, I do not know that I would be justified in undertaking the reinforcement of buildings on the mushroom system without taking out a patent for it. The devices which are patented are truly wonderful. At the present time we are not at liberty to use a 3-ft. length of joist as a head piece on a post which has been just cut through without paying a royalty on it. If I had the brains to originate the mushroom system, I would think that I ought to be protected in some way or other. It is true that all cement pillars spread out at the top, but that is often done for ornamental purposes; whereas the mushroom system is designed for utilitarian purposes. The caps over the pillars spread out 4 ft. 6 in., and that enables you to make the concrete flooring thinner. I am not aware of any royalty having been paid in connexion with the erection of Wrigley's factory.

107. *To Senator Newland.*—I would prefer to keep the administrative offices close to the main building. At a large factory at Rosebery we built a mezzanine floor or gallery, where certain officers are installed. This permits of excellent supervision. If you build the administrative offices outside the main building, you will have to build them in brick, and their cost will not be very much less than concrete; in addition to which, they will be right away from the control of the store. I would recommend having a flat roof on the

main structure, and providing dining-room and lavatory accommodation for the employees there. I observe, from the plan of the proposed building, that the mushroom system is only intended to be used up to the second story. Now, if it were carried to the top, its roof could act as the floor of the next story, and all the dining-room and lavatory accommodation could be placed on the roof.

108. *To Senator Needham.*—The ground floor where goods are received should always be 4 feet above the outside ground, so as to avoid the necessity for lifting goods into it. In my opinion, 13 feet is quite high enough for the ground floor, because the same work, I presume, will be carried out there as will be carried out on the other floors. My office has a cement floor, and I have, therefore, had practical experience of it. The building contains concrete floors, and, for office purposes, they are cruel on the feet. We have had to put malthoid or felt on top of them, and carpets on top of that, in order to prevent the cold striking right through to one's feet. I do not like concrete floors being left uncovered, where employees are working all day. We usually put a wooden floor on top of them. Concrete floors have a bad effect on men's legs, and are calculated to cause them to contract rheumatism. Under the mushroom system of construction, the weight placed upon any floors is transferred to the columns. At Wrigley's factory sprinklers have been installed, and with these and with concrete floors, you have an absolutely fire-proof building. There is nothing to burn in a reinforced concrete structure except the stores themselves. If the proposed store at Leichhardt contains four stories, fire-escapes will have to be provided in accordance with the State law, if same be classed as a factory. In Wrigley's factory these escapes are placed inside a brick, fireproof chamber, with fireproof doors leading to them. With the exception of the roof, there would be nothing to burn in the proposed ordnance store outside of the stores themselves.

109. *To Mr. Sampson.*—The position of the lifts should not necessarily be determined by the class of goods to be handled, but the lifts should be placed in the best possible position to save labour. The return of the ordnance stores from the camps ought not, to any great extent, to decide the position of the lifts. As an architect, I would prefer to get my goods in and out of the store as quickly as possible. In order to make it a complete reinforced concrete building, you would require to have your reinforced concrete columns on the outside, and you would also need reinforced concrete beams on every floor in the outer walls instead of having them constructed of brick. In regard to the class of windows to be used, I would point out that steel costs three times as much as wood, and the question arises whether it is worth it. With the class of stores which are to be housed in this building, I am of opinion that wooden sashes would be satisfactory. It would be useless to have steel sashes, in the absence of fireproof glass in the windows. I think that improvements could be introduced into the plan of the building. I doubt whether I would favour the erection of such a long building in the first place. It is cheaper to erect a two-story structure than a single-story, providing the same accommodation. If sufficient space can be obtained to house the requisite stores, I would favour increasing the height of the building. I would go up six stories, if necessary. Unless something is to be gained in the matter of supervision by the erection of a long building, I would certainly put one story on top of another. This would mean less lifts, because everything would be more compact. Moreover, a six-story structure, providing the same floor area, would be cheaper than a three-story building like that shown on the plan.

110. *To Mr. Laird Smith.*—The vibration resulting from the continuous working of a 3-ton lift would not have any injurious effect on the building. When installing an electric lift the motor is usually placed on the top. Provision is made for this by stiffening your piers or walls. In Sydney probably the most up-to-date stores which the Committee could inspect would be the buildings near the wharfs recently erected by the Harbor Trust. For the shifting of goods of small bulk I certainly favour the employment of chutes or slides. I believe in getting gravitation wherever it is possible to do so. In the event of the proposed building being extended to the lower part of the site where the foundation is not good I would hesitate to recommend the building of the structure on piles. The latter are so very expensive, and the question arises "Where would you get the rock?" I should feel very much inclined to build on a reinforced concrete raft. I built a store at Inverell, on very treacherous ground, upon a reinforced concrete raft. That building was taken up two stories, and is quite satisfactory. If the railway were continued into the store it would not necessitate any increased cost of construction beyond a bridging over the top. It would occupy a certain amount of space in your ground floor. You would then have your platforms on one or two sides of the structure, and would get your goods right into the store. Alternately you could have a hoist at the top, and lift your goods direct from the trucks, thereby effecting a saving in handling.

111. *To Mr. Sampson.*—A building of six stories of equal area could be erected at the same price as the building of three stories, which is shown on the plan, if there is a rock foundation. Upon a site like that of Leichhardt it would be wise to keep on the high ground. Instead of erecting a series of buildings it would be more economical to build on the rock even a six-story structure if necessary. Two-story houses are relatively more inexpensive than cottages. The plan which I have suggested would also result in a saving in the matter of railway connexion. There is nothing like concentration. One foreman could then look after the building, whereas if a series of buildings are to be erected, two or three will be required. For the storage of petrol a separate building will be necessary. Such a store will have to be erected for insurance purposes. It need not be an expensive building, but merely a brick shell. I would not put motor cars or anything of that kind in the main building on account of the insurance rates which would have to be paid. If necessary one of the stores may be made absolutely fireproof for the storage of ammunition. But that depends entirely upon the quantity of ammunition which has to be stored.

112. *To Mr. Sinclair.*—I have suggested that the building should be run up to six stories. The lift accommodation provided in the plan would be more than sufficient. Three lifts would be ample in a higher and less-spread building. I would build one store on top of another unless it could be proved to me that six lifts are required to run the store. In one establishment it was found cheaper, in the running of certain machinery, to use the city water than to use our own water over and over again. Of course, if you can use your own water in the proposed store my estimate of the cost of running hydraulic lifts would not apply. I do not think it is necessary to have fire escapes on the outside of the building as well as on the inside. Each of the doors leading to the compartments of the store would need to be fireproof. In the mushroom system of construction the plan is to fill in the beams with brickwork. Of course, you could fill them in with concrete. The concrete floors are not laid in one piece. We provide against weak joints by laying a particular section at one time. Upon a wet day you would not dare to make a start to do that. You simply map

out that a particular bay or area must be done in a certain time. There is no weakness in the joints produced under this system, but there will be the air cracks of which I have spoken. These are caused by the expansion and contraction which take place both in the cement and the steel—principally in the steel. I have no doubt whatever as to the capacity of such a floor to carry the weight required of it. We design up to only one-fourth of the breaking weight. If the lifts were placed on the outside of the building there would be less danger of fire. A lift inside of a building, unless it is in a fire-proof chamber, is one of the most dangerous fire risks you can have. I do not see any provision in the plan for fire-proof doors. The proposed building would no doubt be fitted with automatic-sliding doors. If you are going to have a fire-proof building you must have fire-proof enclosures. I do not think that administrative offices in the main building—offices at which the public would be constantly calling—would be objectionable. If a man came to see me about a certain article it seems to me that the nearer I was to that article the better it would be. Unless the ground floor is required for storage purposes I should be very much inclined to put the administrative offices on that floor. Everybody could then be watched and thieving would be prevented.

(Taken at Sydney.)

SATURDAY, 24TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Ritchie Eagle, Controller of Stores, Postmaster-General's Department, New South Wales, recalled and further examined.

113. *To the Chairman.*—The maximum size of the lifts required in the proposed store at Leichhardt, from the stand-point of its efficient working, would depend upon the class of material which the Defence Department will have to handle there. As a rule, a good lift measures about 8 ft. x 6 ft.; and has a capacity for ordinary goods up to 1 ton. I think that a 9 ft. x 6 ft. lift, with a capacity of 30 cwt., would be a reasonably good one. Unless the Defence Department will have very heavy, or very large, material to handle at the proposed store, lifts measuring 14 ft. x 8 ft., and having a capacity of 3 tons, would be altogether too big. If the average parcels to be handled do not weigh more than from 4 cwt. to 8 cwt., a 9 ft. x 6 ft. lift would be ample for requirements. A lift 14 ft. by 8 ft., with a capacity of 3 tons, is an abnormally large one, especially when it is considered that for a considerable portion of the time these lifts would not be fully loaded, but would, nevertheless, be consuming the same amount of power that would be required to raise the lift itself as with a heavy load. From our stores, we require to send goods to Newcastle, and places along the coast, by sea. We also send goods by motor lorry to various places round the city, and by rail to places in the country. At the proposed store, if only moderately small parcels of goods had to be sent out, a portion from Store "A," and another portion from Store "B," it would pay to send them by motor. Whether the building of the proposed high-level railway for the handling of goods is justified, would depend upon the total quantity which had to be despatched. It would be a very good thing to have a railway into the store to meet emergencies, such as a

possible outbreak of war. It would be better to have the railway close up alongside the building, because you would then be able to load or unload at any point along it. In normal times, the value of our annual output of stores is about £400,000. That output represents about 50 tons or 60 tons a day; but, of course, upon some days it amounts to perhaps 120 tons. We deal with the whole of our stores from the Main Store, Sydney, by motor lorry. We have another dépôt at Sydenham, about 3 miles outside the city, in which bulk and heavy material is stored, and we have a railway siding into it. About three-quarters of our total output goes from our Sydney store, and the balance from our Sydenham dépôt. If I were sending out goods by rail from buildings "A" and "B," on the plan submitted, I would commence work at the north end of the building "A," and load the truck all the way down along the sheds, from the different sections to the south end. Then, if there were sufficient shunting facilities, the truck would be shifted to building "B" on the lower level, provided that the quantity of goods required from there represented 8 or 10 tons. It would be cheaper to shunt round in that way than to carry the goods across. The goods might be handled in such circumstances by means of chutes, and if the slope is not sufficient, a transveyor platform with a train of rollers might be used. I would recommend that the low-level line be continued to the extent of one truck into the store marked "B," or that the line should be roofed over sufficiently outside the store to afford protection from the weather during loading and unloading operations. But I would prefer to have the drays back up to the walls of the building so that goods might be loaded into the lifts direct.

114. *To Mr. Mathews.*—I think it would be found just as economical to dispense with the high-level railway, and to substitute motor transport from the Central Railway Station, in the case of any goods which might have to be brought there, provided that you got good men on your motor lorries so that the vehicles would be properly looked after. But, seeing that the proposed store is to be used for Defence purposes, it is only right that a railway should be constructed into it, in order that goods may be despatched quickly in case of emergency. I would keep my own motor lorries rather than employ outside carters.

115. *To Senator Newland.*—It would be an awkward process to attempt to work Shed "A" with all railway trucks from the low-level railway by means of a turn-table at either end. A turn-table would have to be provided which was long enough to accommodate a bogey-truck, and that would mean about 50 feet.

116. *To Senator Needham.*—Of course, there are cases in which turn-tables prove useful. In the case of this store, if keeping to the railway lines as now shown in the plans, it would almost pay to put in a turn-table for four-wheeled vehicles. I am aware that the triangular system for the turning of engines is more in vogue than are turn-tables.

117. *To Mr. Sampson.*—If the addition of another story to the proposed building would provide ample floor space for all the stores scattered around Sydney; I still think we should erect a building of one story only, so long as we have sufficient room to do it. If a building of more than one story is erected, the working expenses of each lift that is installed in it and working regularly will amount to about £200 a year. That expenditure would be avoided if only a one-story building were erected. On the other hand, if it is decided to build a three-story structure, you might just as well go up to six stories, because when once the lifts are installed, it is not much more expensive to go up a story or two higher. The floors in our dépôt at Sydenham are of concrete, and the basement of our Sydney store is also of concrete, with asphalt on top of it. All the other floors of our

main store at Harbor-street are of wood. The concrete floor is preferable to wood where it can be obtained without too much expense.

118. *To Mr. Laird Smith.*—It would be possible to load up to 60 tons of goods per day at Shed "A" without any fear of congestion, even if the high-level railway were dispensed with, and the low-level line were run into the middle of the store; but, of course, there must be a passage right through the building. Goods could be loaded more cheaply to and from the shed along the upper level railway with each door opening out on to the line, than they could by means of the lower level railway. But the gain would not be material. If proper arrangements were made to load the goods in the order of the stations to which they have to be delivered, 60 tons per day could be loaded without any danger of congestion. If material up to 3 tons in weight will have to be lifted at the proposed store, but not otherwise, it would be advisable to install one 3-ton lift, and to have the other lifts of smaller capacity. In our stores, we have to deal with heavy materials, such as telegraph cables on the drums, telegraph posts, &c. The heaviest cables on drums weigh from 9½ to 10 tons; and cases containing engines and motors weighing up to 2 tons in each case have to be handled.

119. *To Mr. Sinclair.*—I think it would be a good idea to excavate the high-level line down to the ground floor, and to re-arrange buildings "B" so that a loop line could serve buildings "A," "B," and "C." That would obviate the necessity for laying down the proposed low-level line. If it is worth while incurring the expenditure involved in excavating for building "C," it would be a much better arrangement to have all the floors with one level, and the buildings running longitudinally with the railway.

Witness withdrew.

Major Alfred Hudson, Senior Ordnance Officer, Second Military District, Defence Department, recalled, and further examined.

120. *To the Chairman.*—I cannot say what tonnage is annually received into our stores at Sydney. It would take a little time to get that information, but I dare say that it could be obtained approximately. The Department does not make up a record of the tonnage received. Offhand, I could not give even an estimate of what the tonnage would be in and out of our stores. I shall, however, be glad to supply that information. I will also look into the matter of the average as well as the maximum weight of the parcels that we handle. It would be an absolute gamble for me to attempt to give that information on the spur of the moment. If we received parcels weighing 1 ton or more, we should certainly, if at all possible, store them on the ground floor. In the proposed building at Leichhardt, I would not store ammunition. That would be stored in the magazines. A separate building should be erected for the storage of petrol. I cannot locate the spot on the plan where such a building should be placed, because I do not know the purposes for which some of the buildings marked on the plan are intended to be used. Stores of petrol might be delivered from the city. We do not import petrol direct. It is obtained under a contract made by the Contracts Board in Melbourne. I do not make recommendations in regard to the specifications for the supply of petrol. The whole of the arrangements are made by the Contracts Board in Melbourne. If I found that we were paying too much freight upon this class of goods, I might possibly draw attention to the matter. I will consider the question of where the petrol store should be located on the site bearing in mind the need for conforming with the State laws. We have a very large armoury in connexion with our stores in which about thirty men are employed to-day. It is not anticipated that the staff

will increase to any extent. In my opinion, the armoury shops should not be placed within the main building. But, of course, I should be compelled to put them there if a separate building were not provided for the purpose. The armoury workshop at Circular Quay takes up about 90 feet x 30 feet of space. I shall be pleased to supply the Committee with the exact space which is occupied by the armoury shops. At the same time, I shall forward my ideas as to the luncheon and lavatory accommodation which should be provided for the employees in the proposed store as well as the provision which should be made for the clerical staff.

121. *To Senator Needham.*—In my previous examination, I stated that sometimes I receive instructions from the Business Board in Melbourne, and sometimes from the Quartermaster-General. If the Business Board gave me one order, and the Quartermaster-General gave me a conflicting instruction, from a military point of view, I should obey the last instruction received. So far, no conflict of any moment has arisen in connexion with the present system of control.

122. *To Mr. Sampson.*—I will supply the Committee with my ideas as to the practicability or otherwise of erecting a four, five, or six story building on the higher ground of the Leichhardt site, with a view to avoiding expensive foundations on the lower lying portion of that site.

123. *To Mr. Laird Smith.*—During my term of office here, I have never known of any of the lifts in our various stores being called upon to carry a weight of 3 tons in one parcel. During my twenty years' experience in the handling of stores, I have never had occasion to put that weight on a lift.

124. *To Mr. Mathews.*—At the present time, our supplies of petrol are obtained under contract arranged by the Contract Board, Melbourne, and are delivered to our stores here. There may be some small quantities of petrol purchased locally which are delivered direct to the barracks, but otherwise no portion of it is sent direct from the contractor to its destination. Most of the petrol comes into our stores before it is distributed.

125. *To Mr. Laird Smith.*—When forwarding to the Committee the information which I have promised, I will undertake to supply information as to the maximum weight of any parcel which our lifts are called upon to carry, and of the approximate total tonnage which would be carried by any one lift during a day.

(Taken at Sydney.)

MONDAY, 26TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Percy Arthur Fildes, Engineer to the Department of Labour and Industry, and Chief Inspector under the *Scaffolding and Lifts Act 1912*, sworn and examined.

126. *To the Chairman.*—It is my duty to inspect lifts of any character within the metropolitan area, and within a small additional area covering a radius of 15 miles from the General Post Office. Since the inception of the *Scaffolding and Lifts Act 1903*, when there were about 550 lifts in existence here, the number has increased until we have under our control to-day 2,376 lifts. I am familiar with the class of lifts that is installed in our bulk stores. As to the type of lift

which is most popular, a good deal depends upon the character of the operations carried on by these stores, and also upon the size of the buildings themselves. I am in a position to give the exact figures relating to the different lifts, and their various powers up to the year 1918, so far as their installation in the Sydney and Newcastle districts is concerned. Up till that year there were 722 hydraulic lifts, 1,258 electric, and 396 belt-driven power lifts in operation. I had a curve showing the increase in the number installed since 1903. In the earlier years the hydraulic power lifts showed some slight increase, but they then dropped away practically to a horizontal line, whereas the electric lift has shown a more or less decided increase throughout, particularly between the years 1906 and 1914. The decline of the curve then in respect of these lifts was probably due to war conditions. I know of only one electro-hydraulic lift that has recently been installed in Australia, and that is to be found in the new building for the London Bank of Australia in Sydney. It comprises a small electric motor driven directly on to a pump of special design. The medium of transmitting power is oil, which is pumped from a tank into what is known as a direct acting lift, that is, a cylinder with a plunger holding the platform, the plunger extending into a cylinder fixed into the ground. Any new part of any lift has to be passed by me. I think that the best results are obtained by locating lifts upon the ground floors of buildings close to a cart dock, so as to permit of motors or other vehicles backing in and loading or unloading their goods direct into them. I observe from the plan of the proposed Ordnance Store that there is a railway on one side of it, and a roadway on the other. The fact, however, remains that the less handling there is of the goods taken into or despatched from the store the more economical will it be. If the store is to be kept busy at all the handling of goods will be a big item. It is rather difficult to say what capacity lift would be required if the maximum load of any parcel was 10 cwt. But it is generally conceded that for store purposes a load of 1,200 lbs. is a suitable one. The lifts at the Darling Island stores carry a 1,600 lbs. load. I note that the size of the lifts in the proposed building at Leichhardt is 14 feet x 8 feet. Of course there may be special reasons for installing such large lifts, but otherwise it appears to me that there is going to be a lot of waste energy there. I do not know of many stores in which lifts are installed with a lifting capacity of 3 tons. Garage lifts would be the only ones at all comparable with them. There is a 3-ton lift in the *Daily Telegraph* office, but that was installed specially for the purpose of lifting heavy rolls of paper. I cannot say offhand whether a 9 feet x 6 feet lift, with a power capacity of 30 cwt., would be well within the mark for the space and strength required in the proposed store at Leichhardt. If the material there is going to be moved all the time, and the lifts are to be kept continuously running, 9 feet x 6 feet lifts, capable of carrying a load of 30 cwt., would meet all requirements. That, however, is rather an awkward size. Lifts with a well of 10 feet x 8 feet for a building of the dimensions of that proposed would be of a reasonably useful size. I have had no personal experience of the delivery of goods from higher floors to lower ones by means of chutes; but I know of cases in which this form of delivery is adopted, notably in connexion with our wool and wheat stores. The wool stores that I have in mind are those of Dalgety, where the bales run through the tubes direct on to the wharf. Where large quantities of goods of a similar character are being handled, there is a lot to be said in favour of employing chutes. If I had stored in the top story of a building goods such as boots, drapery, &c., made up into parcels, I have no doubt that the use of a chute would prove satisfactory. Quite a number of these appliances have been installed in our wool stores, and our wholesale grocery stores where the packages are lifted by means of the ordinary chain

elevators. I have no figures in my possession which would justify me in saying what is the average load that a lift is called upon to carry. I imagine, however, that the weight would approximate 50 or 60 per cent. of its rated load. There are a number of lifts constructed to carry a load of $1\frac{1}{2}$ tons, but these would not approximate 20 per cent. of the number installed. I do not know of any lift such as is described by Colonel Owen in his evidence, where he says—

The system of lifts provided for in the scheme is a self-contained hydraulic development. They are self-contained, electrically driven high pressure, direct acting plunger lifts. There are to be six lifts. To run them there will be two electrically driven hydraulic pumps working in conjunction with two high pressure accumulators. The speed proposed is 60 feet per minute to lift 3 tons.

127. *To Mr. Mathews.*—That description does not fit the lift which was recently installed at the London Bank of Australia in Pitt-street. It is totally different from that. At Messrs. Anthony Hordern and Sons there are only two direct acting lifts. There are two electrically driven pumps on the premises, but only one is worked at a time, and I am not aware there are two high pressure accumulators in the Palace Emporium, for I am almost sure there is only one. I am quite certain, too, that the speed exceeds 60 feet per minute. I do not say that there are no lifts worked in Sydney on the principle indicated, but I do say that there are none which work under the conditions described by Colonel Owen. There are 25 lifts in Hordern's altogether.

128. *To Senator Henderson.*—When I expressed myself as being in favour of a 10-ft. x 8-ft. lift I was referring to the lift well and not to the car itself.

129. *To Senator Needham.*—I am inclined to believe that the cost of installing an electric lift is much greater than that of installing a hydraulic lift. But I do not think that we could select any isolated cases as proof of the greater cost of maintenance incurred, so far as the hydraulic lift is concerned. I have known of cases in which an hydraulic lift has been running for fifteen years without having anything done to it if we except the packing of glands. Our Department does not concern itself with the question of the cost or maintenance of the various types of lifts. We have had a good deal of experience with automatic lifts, and there is no question that the cost of power and maintenance of the electric lift is considerably less than that of the hydraulic lift. There would be a sufficient margin between the two, I imagine, to pay for any repairs which might be necessary to the electric lift. But when we come to deal with self-contained plants the matter must be viewed from an entirely different angle. You cannot reasonably compare, according to the tests which have been taken, an electric lift supplied by the city council's current at 1½d. per unit, with an hydraulic lift supplied by the Hydraulic Company's power at 3s. per 1,000 gallons and a unit providing its own power. The last named would unquestionably give the highest efficiency. For a private house I would prefer to install an automatic lift.

130. *To Mr. Laird Smith.*—I have permission to supply the Committee with particulars of the hydraulic pump installation which has been carried out in Messrs. Anthony Hordern and Sons. The installation was designed by the late Norman Selfe, M.I.C.E., and was manufactured by Messrs. H. Vale and Sons, of Auburn. The machinery consists of a double set of motor-driven hydraulic pumps and accumulator with an automatic-controlling device for regulating the speed of the pumps from 23 to 70 revolutions per minute, and a bye-pass valve for relieving the load on the motor when the accumulator is at full stroke. The pumps are designed to work at a pressure of 700 lbs. per square inch. The

motor is of the six-pole type, direct current, 480 volts, 180 amperes, speed regulator ranging from 900 to 300 revolutions per minute, coupled to the pinion shafts by a flexible coupling. The pumps are driven by Citroen gearing. The pinion is made of wrought steel cut out of the solid and contains 12 teeth, $1\frac{1}{4}$ circumferential pitch, $7\frac{1}{8}$ -inch face. The main wheel is of cast iron, containing 154 teeth by $1\frac{1}{4}$ -inch x $7\frac{1}{8}$ -inch face. The hydraulic pumps consist of two sets of plunger pumps, single acting, driven from cross heads at each end and connected by side rods. The general dimensions of the pumps are:—Diameter of plunger 3 inches x 15-inch stroke, maximum revolutions per minute 70, working pressure 700 lbs. per square inch. The pump delivers into an accumulator 14 inches in diameter by 20-ft. stroke, and has a storage capacity of 132 gallons. The accumulator is fitted with the necessary relief and limit valves. The largest quantity of pressure water consumed per quarter before the pumps were installed was 1,991,900 gallons in 78 days, say, 55 days of $10\frac{1}{4}$ hours and 13 days of $5\frac{1}{4}$ hours, or a total of 632 working hours which is equivalent to 3,151.7 gallons per hour. The pumps are capable of supplying nearly 89 per cent. more water per hour than the maximum average demand, as shown by the meter records. Although the maximum pumping capacity is 89 per cent. greater than the average demand of the lifts, the maximum demand of the lifts often brings the accumulator down to the bottom stops, but so far there has not been any delay or stoppage through fall of pressure. The following figures showing the cost per 1,000 gallons of pressure water are based on the observations taken during 64 working days:—Water pumped 1,680,000 gallons, Board of Trade units 14,259, which is equivalent to 118 gallons pumped per unit. Cost of pumping 1,000 gallons at 1½d. per unit, 12.72d., as against 3s. per 1,000 gallons, the charge for the Hydraulic Company's water power. Estimated cost of pumping plant installed complete, £2,800. An allowance of 10 per cent. for interest and depreciation on this amount would mean £280 and the maintenance, working charges, and oil, would make another £50, or £330 altogether. The cost of pumping 8,500,000 gallons per year at 12.72d. per 1,000 is equivalent to £450 10s., making the total cost of pumping per annum £780 10s. Now the cost of 8,500,000 gallons supplied by the Hydraulic Power Company equals £1,275 per annum. The saving effected under the former system would therefore be £494 10s. If the pumps were worked with current generated by a gas engine using town gas at 3s. 9d. per 1,000 cubic feet less 20 per cent., and based on tests made in No. 1 engine room, the cost would work out:—16,000 cubic feet of gas per unit at 3s. per 1,000, which is equivalent to 62.5 units per 1,000 cubic feet, would mean .576d. per unit. This is equivalent to 4.86d. per 1,000 gallons. The cost of pumping the 8,500,000 gallons per annum with town gas, would equal £172 2s. 6d., as against £450 10s. with current. There would be a saving effected, therefore, by the use of a suction gas engine of £278 7s. 6d. Altogether there are 25 lifts installed in Anthony Hordern's, comprising fourteen passenger and eleven goods lifts. I make periodical inspections of the lifts in use in Sydney, so far as I can do so with the limited staff at my disposal. I could not say off-hand what would be the difference between the cost of running a lift with a capacity of 30 cwts. for some hours, and that of running a lift with a capacity of 3 tons for the same number of hours. I would have to ascertain what was the cost per run. But the 3-ton lift would cost more than double the other. I think it would be better to have the lifts located on the outside of the proposed building, and to enclose them as far as possible. I have already said that the installation of electric lifts in this city has been very much restricted on account of war conditions. Goods, such as are carried on the 3-tons lift, installed in the *Daily Telegraph* office, would prove a very heavy strain on that lift.

The water consumed in the running of hydraulic lifts in Sydney is charged for on a sliding scale. The best possible conditions were given to Messrs. Anthony Hordern and Sons in connexion with the installation of their plant. They are still connected with the supply from the Hydraulic Power Company's main in case of failure of their own plant, and 3s. per 1,000 gallons is the charge made to them. I think that the maximum charge used to be 12s. 6d. per 1,000 gallons. I have no doubt that there are firms in this city capable of manufacturing and installing electrical lifts.

131. *To Mr. Sinclair.*—I am acquainted with the plan of construction of the various patterns of lifts that are in use. In the case of an hydraulic lift which is connected with the Hydraulic Power Company's supply, the power used is transferred to the lift. Every ounce of it is transmitted to the car, except that which is lost on account of friction and other causes. Some of these lifts are constructed on the reverse principle of the double-gear pulley block, and others direct acting; from these latter you can get an efficiency of 90 per cent., but with the multiple plant the efficiency is very much lower. With a direct-acting lift it is necessary to have a plunger the full length of the height of your building. I think that plungers go up to 200 and 250 feet in height in the United States. People have told me that they have seen the plunger of a lift wobbling about in such a fashion as almost to hit the side of the well. Yet such plungers are perfectly stable. But, although the actual displacement has to be supplied by some outside source, with the accumulator you can save a considerable amount by putting in two plungers and two cylinders. You may have, for example, an 8-in. cylinder and a 4-in. one. The area of the combined rams would be sufficient to lift your maximum load a maximum distance, but coming down again it may be that the amount only displaced by the 8-in. cylinder will go to waste. The amount displaced by the 4-in. cylinder can be driven back against the accumulator, and will help to lift it up again. If you have your own pumping plant you can use the same water over and over again, and you can treat that water so as to get the best results. In the direct-acting lift you have not to lift the full weight of your plunger every time. A plunger in the water and out of the water are two different things. You get your full weight when the plunger is right out of the water. When it is right in it, its weight is less by the quantity of water that it displaces. This is, of course, sometimes counterbalanced by means of chains attached to your platforms. There have been serious accidents occur where the platform has been taken right from the plunger head and driven on to the ceiling. As a rule, the top end of the plunger is turned down on a 6 inches diameter plunger to the extent of, say, $1\frac{1}{2}$ inches, or $\frac{3}{4}$ inch on each side. The crossbeam carrying the platform of the lift proper is made of cast iron heavily ribbed. This fastens on to the tapered part of the plunger, and is pinned to it. There would always be a probability of something serious happening if a workman, through careless trimming, left something projecting over the side of the lift. We have had cases of suspended lifts which have been driven right off the runners. Except in the case of direct-acting hydraulic lifts, a safety brake is fitted to all lifts. There would be an element of danger if a lift caught on the side of the well. I do not say that the danger is greater with plunger lifts than with suspended lifts. In New South Wales we insist upon a more or less flush enclosure right throughout, and this has a marked effect in keeping the lift away from projections. The number of goods lifts in the metropolitan district—Newcastle—and unproclaimed districts is 916; the passenger lifts total 618; the passenger-goods lifts, 129; and the service lifts—that is to say, lifts on which no persons travel—number 238.

In addition, we have 471 whips and hoists and 4 mill hoists. I cannot tell what proportion of the 916 goods lifts is electric and what proportion is hydraulic. I have no doubt, however, that I could easily obtain the information. But the majority of hydraulic lifts are goods lifts. Running all day in a three-story building, in which, of course, there would be only two floors to be served, a 30-cwt. lift, working to its full capacity, would probably be able to handle about 50 tons of goods.

132. *To Mr. Mathews.*—I think that the electric curve crossed the hydraulic curve, so far as lifts are concerned, about the year 1906. I am of opinion that, whilst the electric lift is more costly to install than the hydraulic, its cost of maintenance is less. This is due to the fact that it uses power only in direct ratio to the load that is carried. Very often an electric lift may get out of order. Certainly, this class of lift gets out of order more frequently than do hydraulic lifts. Some systems of automatic working of hydraulic lifts have been devised, but, so far, they have not been carried to completion. I know that one appliance has been invented by Mr. George Massey. I saw it in its initial stages, when it was being submitted to private tests. I think it is an excellent plan in the matter of lifts to have a "stand-by" if you can. For this reason it might be advisable in a building in which six lifts were to be installed to have some of the electric pattern and some of the hydraulic pattern.

133. *To Mr. Laird Smith.*—I cannot say what would represent the difference between the cost of installing electric and hydraulic lifts in the proposed building. I have, however, noticed that on the plans no provision has been made for the use of travelling cranes. If these were adopted, it might be possible to dispense with some of the lifts. I would also point out that with a self-contained hoist a man can handle a 2-ton load himself.

134. *To the Chairman.*—I observe from the plans that in the proposed store there is to be only 10 feet between the floors. That is not sufficient to permit of the employment of the devices which I have suggested.

(Taken at Sydney.)

TUESDAY, 27TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Alfred Bamfield Blackmore, Mayor of Leichhardt, sworn and examined.

135. *To the Chairman.*—I know the site which has been acquired for an ordnance store at Leichhardt by the Defence Department. The Leichhardt Municipal Council received an intimation from the State Government, the precise date of which I cannot give offhand, to the effect that they had dedicated the Blackmore Park to the council. That was during the early part of last year, and about a couple of months afterwards Colonel Sands, representing the Commonwealth, waited upon the council in reference to this particular area. There was a council meeting that night, and before its proceedings commenced, I asked Colonel Sands to interview the aldermen in regard to the matter. The fact that he told us that the Commonwealth had resumed the property created in our minds the impression that that was the end of the matter. We thought that a

notification had merely to be inserted in the *Government Gazette* to give effect to the act of resumption. But subsequently I learned that the procedure in reference to park lands is somewhat different from that relating to other lands. The Blackmore Park was dedicated to the council about 28th February, 1918, and, as far as I know, it has been resumed by the Commonwealth. Had we known at the time of Colonel Sands' visit that the proposed resumption had to receive the assent of the Commonwealth Parliament, we would have held public meetings in the municipality for the purpose of consulting the wishes of the ratepayers in the matter. Colonel Sands was not asked whether the park had actually been resumed, but we were under the impression that it had, and that it would be wise for us to fall in with the wishes of the Federal authorities. Apart from losing this particular recreation ground, the council has no objection to the establishment of the proposed ordnance store there. Our view is that it would improve properties in the locality, and provide work for the people. There is not much sea traffic in the canal close to the site. It is true that the New South Wales Public Works Department gets a good deal of its stores up there by means of barges. We have asked the State Government on many occasions to dredge the channel, so as to provide facilities for its navigation by larger craft, and they are doing that at the present time. I think there is about 9 feet of water, which is available at high tide. As far as I know, there is an ample depth for barges of a reasonable size. I have no idea of the price which was paid by the Commonwealth for Blackmore Park. The Leichhardt Council is not content to be deprived of that park without receiving compensation for it. All we ask is that we should obtain a fair value for it, and we are of opinion that about £5,500 would represent a fair value. But we have not made any claim for that amount.

136. *To Senator Needham.*—I will forward to the Committee the depth of water that is obtainable in the canal at low tide. Prior to the resumption of Blackmore Park, no arrangement was arrived at between the Leichhardt Council and the Commonwealth Government regarding an exchange of sites for recreation purposes. I do not think that we have had any official communication on the matter, but it was understood that the money derived by the State Government from the purchase of Blackmore Park by the Commonwealth should be earmarked for the purpose of purchasing another recreation reserve. We have not heard what amount of compensation we are likely to get. We suggested that we should be given the old cemetery in exchange for the park; but, as far as I know, that proposal has been turned down. We also submitted another site, which is known as Inglis' Paddock, which we thought might be given to us, in lieu of the recreation reserve resumed by the Commonwealth; but that proposal has also been rejected by the State Government. I have no idea of when we shall ascertain the compensation that we are to receive for the resumed area.

137. *To Mr. Mathews.*—In the Leichhardt municipality we are very badly off in the matter of parks. We did not make any demonstration against the action of the Commonwealth in depriving us of Blackmore Park. We had no say in the matter of the price which was paid for it. I have heard from a firm of estate agents that they have been engaged in valuing the park either for the State or the Commonwealth Government. The Leichhardt Municipal Council is not satisfied that the State Government should pay the purchase money received for that site into the general revenue. We are relying on the undertaking of the Acting Prime Minister that that money would be earmarked for the purchase of another park. Our trouble is that we are

not able to find a suitable area for another park unless we are willing to establish small recreation reserves in different parts of the municipality. We have approached the State Government with a view to obtaining the old cemetery for park purposes. But both that proposal and the other that Inglis' Paddock should be secured for a recreation reserve have been turned down. Inglis' Paddock is within half-a-mile of the area which has been resumed by the Commonwealth. It is nearer to the Leichhardt Town Hall, but more towards Balmain.

138. *To Mr. Mahony.*—We received a letter from the Commonwealth intimating that it had been in communication with the New South Wales Government in regard to the proposal to transfer the old cemetery to us, and that the latter could not entertain it. The cemetery is the only large area within the municipality which is suitable for a public park. It would be in the interests of the health of the people if the cemetery were removed.

139. *To Senator Needham.*—The Leichhardt Council have had no correspondence with the Commonwealth over this matter. We had correspondence with the State Government in regard to the dedication of the park before its resumption. The Blackmore Park was used chiefly by footballers on Saturday afternoons, when I have seen 400 or 500 boys playing upon it. We have another park containing about 30 acres situated a quarter of a mile away, but a park more in the centre of the municipality would be much better for us than that particular spot. Our present park is too far distant from the centre of the municipality, and a similar remark was applicable to the Blackmore Park. Mr. Mahony was the first to inform us that the matter of the proposed resumption of the last-named park was before the Commonwealth Parliament. But for him we should have known nothing about it. We thought that the park had actually been resumed. The Bill authorizing its resumption was hurried through the Federal Parliament, so that we had not time in which to protest. The £5,500 mentioned by me would represent compensation for the park alone, and would be exclusive of the money to be paid for any portion of the land comprised in the site, upon which buildings are erected. I know nothing whatever about the price which has been paid for this latter portion. The land across the canal opposite the park is a Government reserve, which I think has been dedicated to the Ashfield municipality.

140. *To Mr. Laird Smith.*—Our council is very anxious to have the proposed store established at Leichhardt. It would be perfectly prepared to accept the old cemetery in exchange for the park land, of which it has been deprived, and to forego any claim for compensation in cash. The canal represents the boundary of the area over which we have jurisdiction. In the Leichhardt municipality we have an oval, and the better clubs pay for the use of it, but the boys and children used the Blackmore Park, which has been taken from us, pretty extensively on Saturday afternoons. No claim has been put forward by the council for the payment of £5,500 compensation by the Commonwealth. We have not been asked to put a price on the property.

141. *To the Chairman.*—At the time of its resumption the Blackmore Park was vested in the Leichhardt Municipal Council. There has been no demand made by us upon the Commonwealth, nor have we had any communication whatever on the subject from the Federal authorities.

142. *To Mr. Mahony.*—I remember the council receiving through you a letter from the Minister for Home and Territories agreeing to grant it another site in lieu of the park which has been taken from us. Our council naturally expect the Commonwealth to honour that pledge.

143. *To the Chairman.*—The Blackmore Park was vested in our council about two months prior to its resumption. But, of course, we always used it previously. Briefly, the position is that the site upon which the State Public Works Store is now built was dedicated to the council some fifteen years ago. Then the State Public Works Department came along, took it from us, and gave us in lieu thereof the Blackmore Park. At the present time the council is losing about £50 a year in rates by reason of the resumption of that park by the Commonwealth. Our council rather welcomes the idea of the establishment of the proposed Ordnance Store, but at the same time we want another park.

(Taken at Sydney.)

WEDNESDAY, 28TH MAY, 1919.

Present:

Mr. GREGORY, Chairman:

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
Mr. Mahony,	Mr. Laird Smith.

Frank Jackson, Deputy Chief Officer, New South Wales Fire Brigade, sworn and examined.

144. *To the Chairman.*—I have seen the plans of the proposed Ordnance Store at Leichhardt, and I am well acquainted with the locality, and with the water mains running through it. I understand that it is proposed to carry a 6-inch main right round the proposed building marked "A." I consider that such a main would provide a fairly efficient supply for the use of the fire brigade. The construction of the proposed building is such that should a fire occur in it, it will be confined to that particular part in which the outbreak takes place. The division of the building into compartments is, I think, necessary. We consider such compartments very essential, inasmuch as they divide the structure into three separate risks. A 6-inch main would furnish an efficient supply for the use of sprinklers within the building, provided that it came from another source than the 6-inch main which has been laid down for the use of the fire brigade. A single 6-inch main would not be sufficient for two installations—that is to say, it would not be adequate to supply both the sprinklers and the needs of the fire brigade. If the brigade had to draw its supply from the 6-inch main which supplies the sprinklers, the latter would be deprived of water the moment the fire brigade got to work. It is not a fact that sprinklers are required to operate only until the fire brigade arrives on the scene of a fire. The brigade may require a full supply of water to enable it to attack another part of the building which the sprinklers are not touching, and for this reason it is desirable that the sprinklers should continue in operation for some time after the arrival of the brigade. I would suggest that the present 6-inch main in Augusta-street should be left entirely for the use of the fire brigade, and that another 6-inch main should be taken off the 8-inch or 10-inch main and be brought in for the use of the sprinklers. Probably you may have to go to two streets away to tap these mains. There is a 4-inch main in Recreation-street, at the southern end of the site for the proposed building, but that comes off the 6-inch main, and is of very little use to supply water in case of fire in a store of the extent that is proposed. I cannot say from memory where a larger separate main can be tapped. It would be better for the Committee to apply for the information to the Water and Sewerage Board. There are several systems of water in this particular locality. The upper parts of the district are supplied from the Prospect reservoir, and the lower portions from the

Petersham reservoir. Therefore, I would advise you to apply to the Water and Sewerage Board for the information you seek. I would not recommend the installation of tanks over the building for the purpose of supplying water except the tanks be put up by the agents who hold the patent rights for the sprinklers. It would be better for the fire brigade to pump from the canal than to depend upon a tank with a limited supply. I consider the sprinkler system is an excellent one for a building of the description proposed. The installation of these sprinklers is carried out wholly by the representative of the patentees in Australia. At present there is only one good sprinkler system in vogue. There are a number of American systems on the market, but the trouble is that in the absence of fire they go off and do a lot of damage. I notice that it is intended to have eight hydrants within the proposed building. These are very essential, because if a watchman is kept on the premises he may be able to extinguish any outbreak before the arrival of the fire brigade. The number of hydrants proposed is ample. Indeed, three of these would be sufficient to draw off a 6-inch main. We have several systems of automatic fire alarms connected with the brigade in Sydney, and in many cases in which a call from them has been received we have extinguished the fire before the sprinklers have gone off. Any installations approved by the fire brigade I have confidence in recommending. We recommend only those systems which have stood the test of time. There are several of these which have been approved. There is, for example, the May Oatway system and the Vigilant system. There is also a system invented by Mr. Kirby, of Melbourne, who has since died, and whose system has not been taken up by anybody. The other two systems mentioned by me are recognised by the fire brigades both in Melbourne and Sydney, and have done very good work. For instance, we received a call on the automatic alarm from the *Evening News* office. The brigade turned out and extinguished the fire, and after it had done this the next thing I saw was a watchman sneaking round with a revolver to discover who was on the premises. We broke open the front door of that office, went up to the second floor, located the fire, and put it out before the watchman was aware of our presence. There was a sprinkler head right over the seat of the fire, but it did not go off. It will be seen, therefore, that the automatic alarm was given very quickly. From a fireman's point of view, the lifts of the proposed building would be better if placed on the side walls, but otherwise I am not prepared to express an opinion on their location. If you have concrete floors in the building, I take it that they will be installed for the purpose of preventing fires getting through to the upper stories. The concrete floors are of very little value if you have an open lift. For the safety of any building both lifts and staircases should be entirely enclosed with fire resisting materials. They should be built either in brick or reinforced concrete, and there should be automatic self-closing doors which would operate in case of fire. If the proposed building were equipped with these doors, any workmen left in it would be able to open them and thus escape. That is a point which has been thoroughly threshed out. Holding these doors open is a cord attached to a counter-weight. On the one end of this cord is a fusible metal link held together somewhat in the same way as the ordinary sprinkler. When an outbreak of fire occurs this metal link parts, and the door automatically closes, but a child could push it open. These doors would hang vertically in front of the door openings into the lift well. The stairs and stair-wells should be made of reinforced concrete. If one part of the building is to be protected against fire, the whole of it should be protected. The evidence which I have given on this matter would not be subject to any modification if the proposed building were several stories high, so long as all the floors were of

similar construction. It would not be necessary to have outside fire escapes provided. The horizontal escape is the best means of escape one can have. The next best means is the escape from roof to roof. The last and poorest method is the outside escape. We never encourage the adoption of this method, especially where a number of females are employed in a building, for the simple reason that when most women get out on to the fire escape they cannot look down and are liable to faint. In this connexion I may mention what occurred at a fire in a building in Sussex-street. The girls employed in the building in which the outbreak occurred rushed to the window, got out on to the outside escape, and, on looking down, became alarmed and were afraid to use it. As a result two of them jumped to the ground. One was killed instantly, and the other was dreadfully injured. In any case these outside iron fire escapes act only as a grill device when a fire is underneath. I have a photograph showing how 28 girls were grilled on one of these outside fire escapes, which are only death traps. If there is to be plenty of space around the proposed building it will not be necessary to fit it with steel window frames. If, for example, there were 150 feet clear between it and the next building, there would be no need for them, but if not, I would advise the use of steel window frames. They are more expensive than wooden frames, but I cannot say how much. If the nearest building is within 70 feet of the proposed store I would recommend the use of steel framed windows and fire resisting glass. It is a common thing for a fire to leap across a street 66 feet wide. The vacuum is created by the burning of the oxygen, draughts or winds are then created by the inrush of fresh oxygen. It is then that the radiated heat is carried right across any ordinary thoroughfare. That is what occurred at the fire which took place at Horderns.

145. *To Mr. Sampson.*—Whether sprinklers are necessary in a building such as that proposed—a building fitted with fire-proof lifts, fire-proof doors, steel framed windows with wire glass, and hose and other fire-extinguishing appliances—would depend on the nature of the stock to be stored there. If anything of a combustible nature is to be stored, I would strongly recommend the installation of sprinklers. Where there is clothing stored, I would advise the use of sprinklers in addition to the other precautions. Under certain conditions, such materials will produce spontaneous combustion. Some silesias used in the lining of clothing, under what would be unfavorable conditions for spontaneous combustion in the case of woollen goods, will bring about spontaneous ignition in the case of cotton goods. A night watchman would not be so necessary in the proposed building if it were fitted with automatic fire alarm and sprinklers, because these appliances would detect an outbreak of fire quicker than he would, especially if he were not allowed to go through the building; consequently, I would recommend the installation of sprinklers, especially in that part in which textiles will be stored.

146. *To Mr. Laird Smith.*—The greater the area of any building, the more likely is there to be a big draught created through it.

147. *To Mr. Sinclair.*—The fire brigade always favours hardwood joists being used in the construction of a building of this kind, because they are safer in case of fire. This is due to the fact that fire will penetrate them only to the extent of perhaps half an inch, so that even if the building is burnt down, they remain practically intact. The moment you get water on to iron-bark, combustion ceases, whereas when steel girders become heated up to 1,800 degrees, the building in which they are used will immediately collapse. We like the mushroom system of construction. It is very good from a fire point of view. Extreme heat has not a more rapid effect upon it than it has upon other methods of

construction. Wrigley's chewing gum factory is the first building constructed upon the mushroom principle of which we have had experience. If such a structure were designed to carry 2 cwt. to the square foot, and if that weight were actually placed upon the first floor, and a fire occurred on the ground floor, the expansion of the iron from below would not cause the first floor to give way. A concrete arch will not give way. There would be no danger of the reinforcing expanding to such an extent as to endanger the upper floors. That would occur only in the case of exposed girders. In a reinforced building, the expansion of the iron is not sufficient to break up the concrete. With concrete floors, you put in only small iron where you would otherwise employ 22-inch girders, which expand very quickly when directly exposed to fire.

148. *To Mr. Mathews.*—If further buildings are to be erected on the site at Leichhardt, it would be advisable for the Commonwealth to obtain an independent water supply from the 8 or 10-inch main. I cannot say what distance the 10-inch main is from the proposed building, but I can get the information for you. Seeing that the store is to have concrete floors with steel windows, fire-resisting glass, and fire-proof lifts and doorways, I think that the automatic fire alarm system would be sufficient without sprinklers, provided the building is kept free from inflammable materials. An automatic fire alarm would ring a bell at the building, as well as at the fire station. With the other precautions which have been enumerated, I think that the fire-alarm system would meet the case.

149. *To Mr. Mahony.*—With a 6-foot staircase, the building could be cleared in about 1½ minutes. At Wills' tobacco factory there are about 400 girls employed. That building is fitted with a partially enclosed outside stairway about 6 feet wide, and all the employees can leave the premises and be on the ground within two or three minutes. That is the result of the drill which they undergo every fortnight. I think that the two stairways shown in the plan of the proposed store will afford the employees ample protection, because the doors are equal in width to two or more stairways.

150. *To Senator Newland.*—There is very little danger of a fire occurring on the roof of the proposed building except it is caused from outside sources. But if a fire did break out on the top floor, and by any means got through that floor, it would not mean that it would travel from one end of the building to the other, because the party walls go right through the roof. A tiled roof building with hardwood supports is far safer than a building on angle iron. If a fire cannot be put out before the wood has gone, it will never be put out before the iron has collapsed. It would not be a detriment to the building to put on a tiled roof on wooden supports.

151. *To the Chairman.*—There is an Act in operation here which deals with the storage of all inflammable oils and materials. The quantities which can be stored are set out in that Act. Any building which may be erected on the site at Leichhardt for the storage of petrol will have to be approved by the Department of Explosives. It will require to be of brick or iron construction, to be properly ventilated, and the bottom portion of the receptacle for the oil will need to be so built that if all the tins containing it were to burst, the oil would remain in the bottom of the structure. This provision applies to the storage of petrol, benzine, and kerosene. All the ordinary business firms have to conform to this regulation. One is permitted to store only 16 gallons of any of these oils without providing special protection for them.

152. *To Senator Newland.*—Petrol gives off a gas which is heavier than air; and this gas, therefore, never rises, but always travels along the ground. Petrol gas cannot be taken away by a vent, unless a special draught is provided.

153. *To the Chairman.*—Large consumers of petrol and other oils are allowed to store up to about 1,000 gallons, provided that their storage places conform to the requirements of the Act. They may keep more than this quantity by storing underground, and we encourage the use of underground tanks.

(Taken at Melbourne.)

FRIDAY, 30TH MAY, 1919.

Present:

Mr. GREGORY, Chairman;	
Senator Henderson,	Mr. Sampson,
Senator Needham,	Mr. Sinclair,
Senator Newland,	Mr. Laird Smith.
Mr. Mathews,	

George Alexander Hobler, Engineer for Ways and Works, Commonwealth Railways, sworn and examined.

154. *To the Chairman.*—I have seen the plans for railway communication with the Ordnance Stores proposed at Leichhardt. I have not visited the site but I think it is possible to pass an opinion from the plans. I have a fair knowledge of the contour levels of the ground from the plans which have been submitted to me. The proposal submitted gives platform communication with the first floor of store "A" and with the ground floor of store "C." Because of the shunting involved that is not a desirable arrangement if it could be avoided. It would be preferable if the railway communication served the ground floors of the stores. That would certainly be more economical in the matter of shunting. I understand that stores have to be brought to and taken from the Ordnance Stores, and that provision must be made for stores required within the Sydney area. I do not think that it is necessary that the wharfs should be connected with the railway at present. A proposition which I suggest should be looked into is the connexion of the wharf with the lower floors of the stores by a tramway, and the high level railway should be connected with as much of the first floor space as possible. I suggest a branch from the proposed high-level siding, and instead of building the "B" stores in the position shown on the plan that they should be built parallel to stores "A" and "C." I think that that proposal could be given effect without interfering with the main building of the New South Wales Public Works Department. I would keep the additional siding on the same level as the proposed high-level siding, and let the railway have direct platform communication with the ground floor of store "C" and the first floors of stores "A" and "P." It might be possible to have embankments for some portion of the fork line I suggest, but probably opposite the stores it would be necessary to build it on small concrete piers and steel joists to keep it up to the high-level railway. I am presuming that lifts would be working for the transfer of stores from one floor to another of the different buildings. With regard to the communication from the wharf to the stores the tramway I suggest could serve the ground floors of stores "B" and "A," and if carried under the railway line would serve store "C" as well. In that case you would have to drop the level of the ground floors of stores "A" and "B" about 4 feet. That would give a height of ceiling from the ground floor to the first floor of 15 feet instead of 11 feet, as shown on the plan, in order to permit of the tramway waggons passing under the site of the railway line between stores "B" and "A" and "A" and "C." That proposal would make provision for all material going to and from the wharfs. If the high-level siding were

brought to the western side of store "A" road communication for the service of the Sydney area could be provided underneath the railway line with the ground floor of store "A." I do not think it would be practicable to bring the low-level line into the position shown on the plan to serve stores "A" and "C," because there is no room for curvature. To bring the proposed high-level railway in on a low level would greatly increase the amount of excavation necessary both for the railway and for store "C." If you depressed the proposed high level railway 11 feet it would necessitate a very large amount of excavation for store "C," and would also do away with access from Charles-street to the first floor of store "C." The advantage of keeping the line as a high-level line, is that, later on, a tramway system from the wharfs could be established to serve the ground floors of all the stores to provide for traffic to and from the wharfs, in the way I have suggested. As a separate proposition to serve one set of stores the proposed plan is all right, but I consider it would be a pity to have two separate systems of siding. That would involve a lot of extra shunting, and when waggons were at the stores for loading or unloading it would be impossible to transfer trucks from one siding to the other without shunting them right back to the main line. That would involve considerable expense in shunting. Shunting charges are generally dealt with by the Transportation Branch of the Railway Department, and the charges are estimated at so much for four-wheel and for eight-wheel waggons. I understand it is usual under the New South Wales practice to fix a time limit for shunting. That is in accordance with general railway practice. It is quite possible that delays in shunting would take place under the proposed lay-out, but the difficulty might be overcome by improvements in the way of providing cross overs. I have only a general knowledge of the military stores such as small arms, ammunition, clothing, and so on, that would be accommodated by the stores. The best method of making up a load for Goulburn of stores taken from "A" and "B" would depend on the design of the stores and the internal arrangements for lifting stores from one store to another, and the arrangements for transferring goods from one store to another. I presume that, ultimately, bridge ways will be constructed between the higher floors of the various stores at a height sufficient to clear the locomotives. If a truck is partly loaded at "C" store, and it is desired to complete its loading at "B" store, it could be easily shunted on to the second line, and that is one of the reasons why I propose the second line for consideration. If an engine were not available for the purpose shunting might be economically carried out with horses. Everything would depend on the amount of shunting to be done. In my opinion it would be more economical to have a railway siding to take the stores to the proposed buildings and load them from those buildings as required, than to carry them by motor lorry to different railway stations. It might not be necessary to build the fork line I suggest at the present time, but only when increased shunting accommodation is required. Perhaps, in the meantime, it would be sufficient to build only the high-level siding between stores "A" and "C." From my knowledge of the matter, if only one siding were to be built I should prefer the high-level siding. I understand that the members of the Committee assume that the ground floors of the buildings shall be on the level of the floor of a lorry or cart. What I intend to convey when referring to the dropping of the level of the ground floor was that I wished to increase the height of the lower story by 4 feet. My idea was to make the height of the ceiling of the lower story 15 feet instead of 11 feet in order that trucks might be passed under the high-level roads.

155. *To Mr. Sinclair.*—There is a difference of 28 feet between the levels of Charles-street and the floor of "A" building. The plan shows an embankment

nearly all the way to point "A" on the proposed line, but embankments of the proposed siding would be lower than the embankment of the main railway line. I assume that space has been left for two additional lines of railway on the New South Wales line. The adoption of a lower level for the siding would greatly increase the excavation necessary. The excavation on the line would be 8 inches at about point "A," and there would be a maximum of about 20 feet, but the average excavation required for store "C" would be about 30 feet, or an extra excavation of 11 feet. Charles-street, on the present design, is level with the first floor of store "C." If you lower the foundations of store "C" 11 feet you will leave Charles-street on a level with the second floor of store "C." There are two approaches from Charles-street shown on the plan. I could not say whether it would be detrimental to come into the second rather than to the first floor of store "C." There would be no engineering difficulty in the way of the adoption of the lower level, but it would involve greater expense in excavation. I propose that the loop should be made and that cross overs should be put in only if they were found to be necessary. In my opinion the loop is absolutely necessary for standing waggons on. To endeavour to make up a train on two sidings when a large number of waggons might be standing at the various doors of the different stores would disorganise all loading and unloading. You might have an over-head tramway from the wharfs to the stores. It would serve the same floors as the railway. I do not see that there would be any objection to that except that it is more expensive to build an over-head tramway. An over-head tramway would better serve all the proposed stores. A low-level tramway to serve store "C" would have to be taken below the ground floor of that store, and the goods raised by lifts to that floor.

156. *To Senator Needham.*—If all the accommodation required for Ordnance Stores for New South Wales could be provided in stores "A" and "C" by increasing the number of stories the proposed high-level line would probably be the best proposition to serve them. It appears to me a pity that the stores marked "B" on the plan should have to be considered at all. Judging by the plan the best proposal in my mind would be to concentrate on stores "A" and "C" if they could be made big enough to meet the Ordnance Department's requirements. Store "C" is on the best foundation.

157. *To Mr. Laird Smith.*—I think that my proposal for a fork line would be less expensive than the whole construction proposed by the plan. I could supply an approximate estimate of the cost. It is essential to have the loop as shown on the plan for shunting; especially if there were heavy traffic, as there probably would be in time of war. I should say that, under normal conditions, it would be quite unnecessary for the Commonwealth to have a locomotive of their own for shunting in connexion with the Ordnance Stores. The New South Wales Railways Commissioners control the working of traffic on sidings connected with their line.

158. *To Mr. Sampson.*—If you took off from the existing line with a low-level line west of "A" stores, that would involve a level crossing south of "A" stores, but I see no objection to that, as I do not think that the traffic would be very great. If it were decided, by increasing the number of floors, that stores "A" and "C" should accommodate the whole of the Ordnance Stores required by New South Wales, the question whether more than two lines would be necessary to cope with the volume of stores would depend entirely upon the anticipated traffic over a given time. If I were designing a line to serve stores "A" and "C" with a floor space of, say, 500,000 square feet, to accommodate the whole of the Ordnance Stores in New South Wales, I should confer with the Ordnance Stores

authorities, and on the information received from them would decide whether two or more lines were necessary. Three lines might be required for the purpose. If a third line would possibly be required in the future, it would be advisable to leave space for it now. A space of 40 feet would accommodate three lines. Apparently the proposed outer low-level railway line is intended to serve the proposed "B" store, but it may have been intended at the same time to serve the wharf. What I propose for consideration is to do away with "B" stores, as shown here, and make them one long store parallel with store "A." A tramway could be run from the wharfs to stores "B" and "A," and under the ground floor of "C." It could be used for the conveyance of goods from "B" to "A" and "C" for transport by rail.

159. *To Mr. Mathews.*—If stores "A" and "B" are to be first built, a line of railway between them is necessary for economic handling of stores. If stores "A" and "C" are to be first built, the line as projected would be required for economic handling. It is possible to secure economic handling of stores by tramway from the wharfs to any portion of the proposed stores, because the tramway would serve the ground floors.

John Thomas Hill, Goodwin, Commonwealth Surveyor-General, Department of Home and Territories, sworn and examined.

160. *To the Chairman.*—The acquisition of a site for Ordnance purposes at Leichhardt was gazetted in March, 1918, but as the proclamation was illegal in part, in consequence of the State having proclaimed part of the area to be a public park, the proclamation was re-gazetted on the 11th July, 1918, subsequent to the passing of an Act authorizing the acquisition. The original proclamation was good so far as any freehold land within the area was concerned. The whole of the area referred to is edged green on plan, which I now display. It was not known at the time that about 5½ acres of the area had already been proclaimed a public park by the State Government in a proclamation gazetted on the 27th February, 1918, the result of which was to render the Commonwealth proclamation of the 18th March ineffective in regard to that particular area, inasmuch as it did not come within the meaning of the definition of land given in the Lands Acquisition Act. Special action had to be taken to acquire the State reservation, and a Bill was assented to on the 28th May, 1918, giving the Commonwealth power to acquire the park. The acquisition was gazetted on the 11th July, 1918, that is to say, the original *Gazette* notice was republished, making the whole acquisition valid. No claim for compensation has yet been lodged against the Commonwealth in respect to the park land. My department was not consulted in regard to the suitability of the site chosen for this special purpose. We were simply asked to acquire the area, and we did so. At times we are asked to report on the suitability of sites, but in this particular case I have given no consideration whatever to the question of whether other sites were available closer to Sydney, with access by water and rail, which would give the same facilities that this site offers. We have already settled claims amounting to £11,700 for the freehold land acquired, and the buildings thereon, and there are claims outstanding as yet unsettled amounting to about £1,000. The cost of the freehold land and the buildings thereon can be put down at about £12,700. The park land, known as Blackmore Park, is estimated at a value of approximately £5,000. No application has been made for compensation for it. There is an arrangement or understanding by which the money which would have been paid by the Commonwealth in respect to the park will be devoted to the purchase of another area to be dedicated to the

Leichhardt municipality as a park in lieu of Blackmore Park. It is more an understanding than an absolutely definite agreement between the Commonwealth Government, the State Government, and the Leichhardt Council. The council has suggested the acquisition of two or three sites in lieu of Blackmore Park. One suggestion was that the Balmain cemetery should be acquired, but the State Government would not agree to it. Another suggestion was that Inglis' paddock should be acquired, but that is the property of the New South Wales Railway Department, and the Railways Commissioners would not hear of it. The position at present is that the Leichhardt Council is on the look out for another suitable site. I have made no special examination of the area to see whether another site of equal value to Blackmore Park is available. I think that the Commonwealth Government would be bound to pay the extra money if another site could be found, even though it should be valued at more than £5,000, the figure at which I estimate the value of Blackmore Park. There is nothing in the Act itself dealing with this matter, but I understand that the Acting Prime Minister made a statement in the House of Representatives to the effect that a sum equal to the value of Blackmore Park would be devoted to the purchase of another area to be dedicated to the State as a park in lieu of Blackmore Park. The Commonwealth is bound by the promise of the Acting Prime Minister, and even if the area available would cost more, the extra amount would, in my opinion, have to be paid. I have been instructed by the Minister to keep the matter in view, and to use my best endeavours to get a site for the purpose of redeeming the promise made in Parliament. We have not found a site yet. As a matter of fact, we rather look to the Leichhardt Council to suggest one. The question is by no means a dead one. We are still in correspondence with the council in regard to the matter. I should not think that there would be any difficulty in obtaining a foundation for the buildings to be erected on the low-lying portion of the area acquired. I have not made any borings or soundings there. It is not my function to do so. It is not proposed to demolish the whole of the buildings on the area. Certain buildings to the south of a red line on the plan will be demolished. The value of the land occupied by those buildings, together with the value of the buildings themselves, is approximately £4,700. At present, those buildings bring in a rental of about £330 per annum. I will supply to the Committee information showing the value of the remaining portion of the area where the buildings will be allowed to stand between the red line and Charles-street, together with the value of the dwellings thereon, and the rentals received from them. There are about twenty-seven houses to remain standing. They are of an average value of about £300. There are eleven houses to be demolished below the red line. I suppose that the material will yield about £600.

161. *To Senator Needham.*—A portion of land near Charles-street has not been acquired. I do not know the owner of that land, but I believe that it is railway property, in which case it could be compulsorily acquired if it were necessary to do so. It is only in case of the greatest necessity that we compulsorily acquire land against the State. If the area is not required by the owner for any special purpose, and the acquisition will do him no special damage, it ought to be purchased for its ordinary value as land, but I would not like to give an estimate of the probable cost of acquiring it without first going into the matter. If the Committee has been informed that the Leichhardt Council estimate the value of Blackmore Park at £5,500, it is not far off the mark. Without attempting to dictate policy, I should say that the promise of the Acting Prime Minister, which was repeated by the Minister for Home and Territories, should be kept, irrespective of the value of the new piece of land given in lieu of Black-

more Park, but I think that some reason should be exercised. For instance, it might be possible to acquire land on which buildings are erected, and clear it of the houses upon it. I do not think that the Commonwealth could be expected to go so far as that. I suppose that if it is impossible to find a suitable piece of land, the cash value will have to be accepted. In any case, the promise of the Acting Prime Minister has to be kept in spirit, but I do not think it was ever intended that the Commonwealth would acquire another park at any price. I think that the Commonwealth Government would take an equitable view of the matter.

162. *To Mr. Laird Smith.*—The estimate of £5,000, which I have mentioned as the value of Blackmore Park, is the Departmental estimate. I have nothing to do with the selection of sites, unless I am specially asked to take action in that direction. My responsibility is to see that the Commonwealth does not pay too much in acquiring a site that has been selected. Of course, if it is very patent to me that a site selected is not suitable for the purpose, I may say so, but it is not my function to do so. I have not given any consideration to the question of the suitability of this site for the purpose of Ordnance Stores. It is not my business to do so. If I thought that the site was altogether unsuitable, I would say so. I do not know the district well. I have visited it for the purpose of settling one or two claims. I have not been asked to ascertain whether land could be easily and cheaply acquired in the vicinity for the purpose of building workmen's cottages for the men working at the Ordnance Stores.

163. *To Mr. Mathews.*—The tenants in the houses to be demolished will be given reasonable time to find other dwellings. Although they are only weekly tenants, I would not ask them to move under a month or so. In fact, I would give them the longest notice possible.

164. *To the Chairman.*—If it were proposed to utilize the area along Charles-street for workmen's cottages, much better use could be made of the land; twice as many houses, and much more comfortably situated could be erected under a proper system. The ground slopes down towards the canal. It is not an ideal site for private dwellings, but it is the best portion of the resumed area for that purpose. If it is proposed to deal with the land as a housing proposition, I would not allow one of the existing houses to remain. I have not gone into the matter at all, but I should say that, under a proper system, the Government could erect about sixty cottages facing Charles-street, and facing a new thoroughfare at the rear. In the lay-out of the ground, I do not think any consideration has been given to the matter of housing workmen.

(Taken at Melbourne.)

TUESDAY, 3RD JUNE, 1919.

PRESENT:

Mr. GREGORY, Chairman:

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Laird Smith.

Harry Benjamin Lee, Chief Officer, Melbourne Fire Brigade Board, sworn and examined.

165. *To the Chairman.*—I have been consulted in regard to the provision of a water supply for the purpose of the prevention of fires at the proposed Ordnance Store, Leichhardt, New South Wales. I have recommended the provision of a 6-in. main connecting with a 9-in. main. I have also recommended covering the

whole of the block with hydrants in the positions indicated on the plan; and I have strongly advised the installation of sprinklers. I hope that the building will be constructed of reinforced concrete. The extra cost would be very little. In fact, the cost of maintenance in the case of wooden construction would be greater than the additional cost of a reinforced concrete building. Furthermore, a reinforced concrete building would be of greater fire-resisting value. In the end it would be really cheaper to build with reinforced concrete throughout. A reinforced concrete building is much superior to a hardwood building from the point of view of fighting a fire. You can work with greater safety in it, and you can remain in it longer. But no matter what the construction of the building may be, it will not save the contents from being destroyed. Both structures have to be looked upon as places in which certain goods are likely to be consumed by fire, and they will be consumed in either. The only difference is that, at the expiration of the time occupied in consuming the goods, the one type of building would be on the ground whereas the shell of the other would still remain standing. It is true that hardwood is often merely charred on the outside when a fire takes place, but it depends entirely on the method of construction. Reinforced concrete buildings have absolutely collapsed under tremendous heat pressure. There is no such thing as an absolutely fireproof building. The Quaker Oats building, in Canada, a most up-to-date reinforced concrete building, collapsed in a fire because the heat was so enormous. There is nothing fireproof. "Fireproof" must not be confused with "fire-resisting." The proposed Ordnance Store should be electrically connected with the local fire station, and they will be connected in this way if sprinklers are installed. I strongly advise the establishment of direct electrical communication between the stores and the local fire station; but, as I have said, that will be established if sprinklers are installed. In addition, I would certainly have direct telephone communication from the building to the local fire station. The sprinklers notify the fire station that a fire has started. The thermostat will do the same. The difference between the two systems is that as soon as the sprinkler notifies the fire station it starts to put out the fire, whereas in the case of the thermostat the fire continues to burn until the brigade arrives. It is quite possible for a fire brigade to be on the spot before the sprinklers commence to operate. On the other hand, it is quite possible for the thermostat not to send the call to the local fire station. In any case, the sprinklers do something towards putting out the fire. The ideal system of protecting a building is to install both the thermostat and sprinklers, but one would be quite justified in omitting the thermostat and installing sprinklers only. I have a great admiration for thermostats—they have done a lot of good work; but, in my opinion, the watchman is a far better means of protecting a building provided he is checked automatically by some system similar to that which we have in operation in Melbourne. When a watchman finds a fire, he commences to put it out pending the arrival of the fire brigade. When a thermostat detects a fire, nothing can be done to check it until the brigade arrives. I would only use the thermostat as a third line of defence. The greatest safety will be obtained by the installation of sprinklers, by employing a watchman automatically checked, and by the use of the thermostat; but I would hesitate about spending the additional money on thermostats if the building were mine. The system in force in Melbourne in regard to watchmen provides that the fire brigade is called out if a watchman does not ring up at certain times. We allow that system in the case of ordinary buildings. The more buildings adopting it the merrier for us. The watchmen employed should be young, intelligent men, and should be paid what a first

class mechanic can earn. I would do away with the poor old chap who is given a job at 30s. a week to act as watchman. The safety of the city depends on the watching of it. If I had my way, I would bring the fire waste down to a minimum. If a fire starts, one can sit down on it and put it out in the incipient stage, but if a man lies down for a few minutes there is little chance of stopping it. The sprinkler acts as a constant watchman; the thermostat also acts as a constant watchman, but it simply notifies the brigade that a fire has started, and does nothing to put it out. The plans would indicate that the 9-in. main in Leichhardt approaches within about 10 chains of Charles-street; but I do not know what the population of the neighbourhood is. There may be a very heavy draw on that main. It must be remembered that a sprinkler will not put out a big fire. If a fire is still going after the 20,000-gallon tank is exhausted, you must depend upon outside appliances for extinguishing it. If the building were in Melbourne, I would say that there would be a sufficient supply of water available for the stores, provided there was not too much draw on that 9-in. main; but that does not involve the question of sprinklers, which have a supply of 20,000 gallons in two 10,000-gallon tanks on the roof, a provision which is ample to extinguish any fire it is possible for sprinklers to deal with. If a fire should start in a stack of clothing, and spread without causing a sprinkler to act at once, it would be kept in check as soon as the sprinkler began to work. It must be remembered that as soon as the first sprinkler-head affected opens, the fire brigade is on the way, and, in the meantime, the full capacity of the sprinkler is at play. If the fire spreads, other sprinklers begin to operate. A supply of 20,000 gallons is pretty well equal to three branches in the hands of the fireman, but, of course, there is not the same pressure; you simply have a spray from the sprinkler to keep the fire in check. It would be quite a new departure in sprinkler practice to have a special main run in, in addition to the ordinary town supply. The sprinklers depend on two sources—the water in the mains and the 20,000-gallon reserve in the tank on the roof. If the pressure in the main falls below a certain point, the water will not rise to the tanks, and the reserve supply begins to operate. When a fire brigade arrives and begins to open up with one or two hydrants, the pressure is so low that the sprinklers will not operate if fed from the mains only. It is then that the reserve tanks come into operation. The draw on the main makes no difference to the working of the sprinklers. When that draw is reduced, the reserve tanks fill up again. I would recommend that the window-frames be steel throughout, notwithstanding the additional expense, because there will be a very valuable interior in these stores. The lifts may be put in the centre of the building, as indicated on the plan, but they must be enclosed in brick enclosures, and must have ironclad doors closing automatically; otherwise the lift-wells will be a great menace to the whole structure. The plans shown make plenty of provision of staircases. I wish that all the public buildings in Melbourne would have the same provision. In a building such as this, where there is plenty of ground, the provision of fire-escapes outside will be a very small matter. Outside staircases are very fine things if there are many people working on a second or third floor. They provide two means of getting out of the floors. I approve of the manner in which it is proposed to divide the stores into sections with ironclad automatic doors between. It separates the risk, and the greater the spread of the risk there is, the better it is for all concerned. If a fire occurs in one portion of the building, it will be quite an easy matter for the employees to escape through the auto-

matic doors. They are very easily worked. In connexion with these stores I would provide an external dining-room.

166. *To Mr. Laird Smith.*—It will not be necessary to have the whole of the window panes wired, unless there is an adjacent risk, or unless the risk of adjacent fires increases at a later date. The use of fire-escapes by employees is a matter of drill. The average man is panic-stricken in face of a fire, and will naturally rush to the spot where he is accustomed to leave a building; but the risk can be materially diminished by systematic fire-drill, indicating to employees how they should conduct themselves in the event of a fire. People often rush away from fire-escapes because they do not know of their existence. All the openings facing an outside staircase must be protected, whether they be windows or doors. Otherwise, such outside staircases cease to be fire-escapes. They should also be made as comfortable as ordinary staircases. Many mistakes are made in the construction of fire-escapes. They are often too steep, and the rise of the step is frequently too high. An instance of a building with unprotected steel girders was Hoadley's Factory, in St. Kilda-road, Melbourne. It is well known that, as soon as iron becomes heated, expansion sets in. It is true that concrete expands in approximately the same ratio as steel when intense heat is applied. There is no telling to what degree heat-pressure in a fire may attain. The Quaker Oats building, in Canada, was one of the finest specimens of reinforced-concrete construction, but the fire was of such duration, and the heat pressure rose to such a degree that the building absolutely crumbled, proving conclusively, if proof be needed, that a building cannot be made absolutely fireproof. It can only be made as fire-resisting as possible. When a fire is started in a long building, it creates an intense draught. A partial vacuum is created whenever a fire commences.

167. *To Mr. Sampson.*—The provision of fire-escapes depends upon the number of operatives employed in a building. There should be an alternative means of escape in case of fire, no matter whether there are only half-a-dozen persons at work, and regardless altogether of the capacity of the inside staircases. The plans would show that the lift-shafts are to be enclosed. I regard the staircases provided on the plan as adequate.

168. *To Mr. Mathews.*—The sprinklers would have a direct connexion with the fire station. It is possible that the thermostats would act more quickly; but there is only one make of thermostat that I would recommend, and it is a very delicate and ticklish contrivance, which fails much more frequently than sprinklers do. If I am asked to recommend the installation of thermostats, I am tied down to recommending one particular make, and I have no desire to do so. There are many makes on the market, and they are all good, but one stands out by itself. However, there is no comparison between sprinklers and thermostats, for the reason that as soon as a sprinkler notifies a fire station that a fire has started it gets to work on its own, pending the arrival of the brigade; and everything depends on those first few minutes, or even seconds. I have never known of a fire to get a hold without the sprinklers operating. Unfortunately, I have known them to operate when no fire has broken out, but that is a very rare occasion; in fact, I have only known of one instance in which this has taken place. That was a few weeks ago, and I am awaiting a report on it. It is the only occasion on which this has happened during the twenty-nine years I have been connected with fire brigades. Fires have occurred in iron foundries. Everything has been consumed in them. It is useless to say that this thing or that thing will not burn. I recognise that it would be an enormous additional expense to install sprinklers in addition to the other safeguards, such as wired windows, the em-

ployment of watchmen automatically checked, and the use of thermostats; but I would rather put them in and save the cost of the other means of protection. I say this as a result of my long experience here and in Sydney. I have seen so many good saves sprinklers have effected, so that I am naturally in love with them. A fire occurred in the basement of the Mutual Store, Melbourne. It started underneath the packing counter in the packing room, where there is plenty of straw and *débris*. It burnt its way through the counter, but the sprinkler operated and extinguished it. However, it ran on below the counter until a second sprinkler began to operate, and it was working, keeping the fire in check, when we arrived. If the sprinklers had not been there, we would have had a heavy job. We would have had to cut through the first floor to get down to the basement. That is only one instance of my personal observation. If you think you are not justified in going to the expense of installing all the safeguards, I would recommend you to cut out the other means of protection and depend solely on sprinklers. The thermostat is not so dependable, and the watchman is dependable only so long as he is automatically checked.

169. *To Senator Newland.*—The difference in cost is considerably in favour of establishing the system of thermostats. I can give you no idea of what the saving would be. Thermostats vary in price. The lifts as shown on the plan are in suitable positions, provided they are protected. The convenience of working the floor has to be studied. Lift wells are really internal towers fitted with automatically closing doors at each floor. They should not be near a stairway. They could be put against the walls, but any advantage gained in that way might not compensate for the disadvantage in the matter of handling goods on the different floors. The wells must be properly enclosed. Wire work will not be sufficient protection. It would be a distinct advantage to the safety of the building and the employees if the lifts were put against the walls and bricked in, and if the stairways were in separate bricked-in compartments, so long as there was no communication between a stairway and a lift well. The flat concrete roof is undoubtedly the ideal system of roofing. In the case of these stores the danger from the roofing point of view would arise from flying *débris* from adjacent fires; but in an isolated building no additional external risk is incurred by having a wood and tiled roof.

170. *To Senator Needham.*—My experience is that fires generally commence on the lower floors rather than on the roof of a building. I believe that the reinforced concrete system of building is the best for fire-resisting purposes. The first line of defence against fires in a city is the street fire-alarms—that is to say, in giving the public as many facilities as possible to acquaint a fire brigade that a fire has started. In this city we say that we have two lines of defence. The first is the street fire alarm, and the next is the motor fire engine, by means of which we get to the scene of a fire as quickly as possible. When a brigade arrives at a fire in a building in which sprinklers are installed, the necessity for using the water in the tank on the top of the building ceases. There will be no need to put in an extra main to supply the sprinklers at the Ordnance Stores. The sprinklers will not require more than the 20,000 gallons in reserve in the tanks on the roof. Youths or girls can easily open the automatic doors which it is proposed to install.

171. *To the Chairman.*—I understand there is only one firm supplying automatic sprinklers in Australia. I speak of the Grinnell sprinkler. There is a well-known firm operating in America and England who supply the Grinnell sprinkler, and I think that the Australian firm has the local right, but I believe that the patent rights have fallen in long ago. Other firms have come

and gone with sprinklers which have not proved a success. In the Sydney Post Office a system of sprinklers was put in many years ago, but it has proved valueless. The Wunderlich Company commenced to make a line of sprinklers, but they gave it up.

(Taken at Melbourne.)

WEDNESDAY, 4TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Laird Smith.
Senator Newland,	

Brigadier-General John Keatly Forsyth, C.M.G.,
Quartermaster-General, Department of Defence,
further examined.

172. *To the Chairman.*—I have not visited the site in regard to which the Committee is making inquiry. We are leaving entirely to the recommendations of the Business Board and the officials the accommodation that should be provided, but there is a considerable amount of mutual discussion on the question, and we work together. I have not sufficient professional or technical knowledge to know all about stores, and I do not know that the members of the Business Board say that they have. But Colonel Wilson has been abroad, and between us we are trying to arrive at something that is the most suitable. I do not think I could arrive at a complete conclusion in regard to this proposed store without a personal inspection; what I know of the site is what I have heard from the others. As things stand now, I think it is an obligation on the Business Board to find us the storage which we tell the Board we require. The existing stores at Circular Quay and Darling Island are suitable; the scattering of storage accommodation should be abandoned, though this scattering was forced on us by circumstances. I think that the proposals submitted, when completed, will provide for the whole of our present requirements in Sydney. When sufficient storage has been provided at Leichhardt, it would be my recommendation to get rid of the sites at Circular Quay and Darling Island. I think that at Leichhardt there is ample room for our requirements for 25 or 30 years. I do not say that the stores now to be built would prove sufficient for that time, but the area there is sufficient. The building of the three-storied store "A" will not give us the floor space for all our requirements; it is difficult to say how much further we may require to go, and, as matters stand, the three stories would give us 126,000 square feet. Some 50,000 square feet of storage accommodation for mobilization stores is being built at Liverpool, and, though this is for another purpose, it will relieve the pressure on the Ordnance Stores. We have no mobilization stores now, and the accommodation suggested will give us about 3,000 feet over what we now occupy. We are getting a whole lot of stores from Home; a somewhat unknown quantity, and you have spoken of putting up another story on building "A" which will give us about 45,000 more feet of space than we have now. I do not know whether that will hold all the stores coming from Home. On the

other hand, a lot of these stores would in normal times be out with the troops. My feeling is that with the other story we might find sufficient accommodation to go on for some considerable time. We might, of course, have to ask for more, but I am inclined to think we shall not; it is impossible to say. My desire is to see efficiency and economical management; and to that end we need concentration of the staff. If this store is erected, we shall immediately send our clerical staff there. I think there has been that collaboration amongst those concerned that is essential to efficiency in connexion with this work, but, of course, if every one is asked to give his opinion there is no finality. There is remarkable diversity of opinion, for instance, in regard to whether there shall be one or more floors; but I have no doubt in my own mind which I prefer; I am of opinion that a multi-storied building is the best. I suggest that the administrative staff should be housed in an adjacent office, probably nearest the approach from the city. I take it that we could make room for the armourers in a portion of the stores to be allotted to them. In Adelaide, the armourers are accommodated at one end of the big store. We must either afford this space or build another place for the armourers. I do not know whether the statement that the armourers would require 320 x 60 feet, or, roughly, 20,000 square feet, is correct. It would certainly be better if these mechanics were provided with additional accommodation outside, but I thought they were embraced in the plans for the stores. At Circular Quay, the men have to get their meals outside, and there ought to be a dining or luncheon room, as at the Clothing Factory and most other places of employment. When the whole of the work is concentrated at one place, we calculate that there will be employed from 100 to 120 men, inclusive of the clerical staff and armourers. The only petrol it would be necessary to store would be that used for the cars worked in connexion with the stores. In peace times we would get petrol on order as we required it; we should require very small accommodation for the storage of petrol. Eventually it is my idea that the cartage from and to the stores would be done by our own motor cars, and at present we carry it out with our horse transport. There would be need of a small space for fumigation and other work of that kind. We fumigate and sterilize blankets and other material. At Brisbane, there is a plant for this purpose outside the stores, and also at Sydney, Melbourne, and Adelaide. We used to get a lot of this work done by contract. Unless there has been disease, we do not disinfect anything but blankets and clothing. No ammunition would be stored in these stores. I could not tell you now the approximate square-foot space we anticipate we shall require in Sydney, but calculations have been made, and the figures could be worked out. It would be hard to estimate the space required for the next 25 years, particularly until we know what the peace conditions are to be. We might be able to give an approximate idea. At present, we are selling everything we can, and anything we have in the near future will be for actual requirements. At present, we occupy about 172,000 square feet; at present a lot of space is required owing to the inefficient character of the building. You cannot stack so successfully in all sorts of rooms as on an open floor space. In Melbourne, we have pulled down fixtures and jammed the things close together in bales. I should like the question as to our ultimate requirements to be left until I can send information to the Committee. The ground floor of the proposed building is 10 feet from floor to ceiling, and I shall consider with Colonel Wilson the question of whether overhead cranes might not be necessary for heavy stuff. The plans show six lifts of an

average carrying capacity of 3 tons each, and I know that Colonel Wilson and also Mr. Swinburne, have pronounced views on that point. In reference to the railway works, I consider that the "B" store on the high ground should be the second to be erected. In camp times we send away goods in train loads. It is very likely, however, that much of the stores, in smaller quantities other than at camp times, could with advantage be taken by lorry to some other railway station for despatch to country centres; but, of course, in war time the railways at the stores would be used largely. I think it is advisable to have railways to the water on the site. The low-level line is probably designed for the purpose of serving the store marked "B." I regard sea transit as an important matter.

173. *To Senator Henderson.*—An armoury is most essential to Ordnance Stores. It is not requisite that an armoury should provide room for testing small arms; that sort of thing is all done at the Small Arms Factory at Lithgow; at the Ordnance Stores, the armourers only do small repairs. I have not heard anything to the effect that the work of the armourers at Circular Quay is futile, or nearly so, because they cannot, owing to their cramped position, test their work. I do not see that there is any need for the armoury to be inside this proposed building. It is news to me that there should be any testing required, because the armoury is more for cleaning and doing slight repairs. Some weapons come in from units in very bad order, and a large part of the work is cleaning and oiling them up. I cannot speak as to the space reserved for the armourers until I go into the matter, only what has been stated struck me as being pretty big. If there be necessity for testing, then it must be done outside, on a range.

174. *To Mr. Mathews.*—I think it desirable that the armoury should be at the stores, for, otherwise, carting would be necessary. It would be preferable to have the armoury in an adjacent building. It is very essential to have a good light in an armoury, and it is in this regard that there is a great drawback at Melbourne, where the armoury is a regular dungeon. The Adelaide armoury, on the other hand, is practically a large room with windows all around it, which give all the necessary light. Of course, an armoury has to be a very substantial building, which cannot easily be broken down by a mob or anything of that kind. I think it would be better to provide extra accommodation for the armoury alongside the stores.

175. *To Senator Newland.*—The armoury, in addition to providing room for the men to work, might also provide for the storage of rifles, swords, and other weapons, and this may account for the large space suggested; I was previously thinking of only the working space. In Adelaide the armourers are at the end of the store, and, as I say, it is a modern building, with windows all around it. In any case the head-quarters of the Stores Department will always be at my head-quarters for the whole of the stores, except in so far as decentralization comes in. The idea is eventually to have an Ordnance Corps, or something on the same principle. Colonel Wilson is now, and will be, Director of Stores, and under him will be the senior Ordnance officer and others. All troubles, disputes, and disagreements, however, will filter into head-quarters, which will lay down the policy; the whole of the stores will be co-ordinated. I think that the clerical staff should be in a separate building as nearly adjoining the store as possible. On the lines of the pay office in Adelaide, there should be a big open space, with only one or two separate rooms for the senior officers. There should be a big counter space for the public, and the place should be well lighted and ventilated. I have not thought of the advantage of a flat

roof to the proposed stores. I realize from what you say that there is necessity sometimes to dry stores, for instance, tents. At Darling Island, the only place available for drying tents and other stores is outside, and that means extra handling. If the goods could be taken up on a lift to a flat roof it would, of course, be better. From that point of view a flat roof would be advantageous, if there were no disadvantage from a structural point of view. It would mean that the lifts would have to go up another floor. Of course, the orders are that all tents and material of the kind should be dried before being folded at a camp, but wet weather often interferes with that, and it is found impossible to avoid rolling them up damp. In that case they have to be dried in the best possible way after return to store. I do not know whether the extra cost of a flat roof would be compensated for by the increased convenience in drying. As to the lifts, I do not think they will ever be called upon to carry a 3-ton package. There would be no aeroplane engines or heavy guns to handle, and, while I do not know, I do not think there will be anything above a ton. I shall make a note of that point. At the present moment I cannot think of any large sized packages, quite apart from weight, that would call for lifts so large as those proposed. Apart from the armourers' shop, it will be necessary to have a carpenter's shop, a wheelwright's shop, and a blacksmith's shop, all for small repairs; large repairs are let out on contract. In peace times we employ a couple of carpenters at an Ordnance Store. There would also be necessary men to do repairs to saddlery, but they would not take up much room. At the present time empty packing cases are stored away in the Ordnance stores, and that is very bad economy. Provision should be made for the washing of tins and crockery. There is quite a number of supplementary stores that have not been shown on the plan, such as a store for paints, and so forth. Space for all the petrol we require might be marked off in an 8-foot square in the paint store.

176. *To Senator Needham.*—I might be able to find out the total weight of the stores, in and out, each year in ordinary peace times. It is not intended to store explosives in the new building. If Colonel Wilson, in his evidence, said, "All explosives, as well as clothing and clothing material, will be stored there," I do not know what he means. There might be some small arms ammunition, but explosives are stored in magazines. This small arms ammunition is not really a dangerous explosive, unless in case of fire, and our intention is to store this ammunition at Liverpool in the small arms stores. It is news to me that it is proposed to store explosives. I think that Colonel Wilson has made a mistake, and, as head of the Department, I say that our explosives will not be stored there.

177. *To Mr. Laird Smith.*—It would be a fine thing, in view of the dearth of houses in Sydney, if the employees could be provided with houses within reasonable distance from the stores. I was not consulted in regard to the position of the lifts. The subject was mentioned, but I did not have sufficient knowledge to know whether they would be better placed on the wall or in the centre; it is a moot point, I understand. I did say, in giving evidence, that I thought the lifts were better in the centre, where they are shown, on the ground that they are nearer all the time to all the stores; but, in thinking it over since, I do not know whether that is so. I have talked the question of the number of lifts over with Colonel Wilson, and he is inclined to think that four would be enough, the other two lift spaces being converted into chutes. I may say that I have never seen chutes working.

The witness withdrew.

John Smith Murdoch, architect, Department of Works and Railways, recalled and further examined.

178. *To the Chairman.*—I notice that Mr. C. A. Reed, of Messrs. James Hardie and Coy. Ltd., of Sydney, stated during the course of his evidence—

Under the mushroom system every floor carries its own weight. I would recommend a skeleton frame building, viz.: with wall columns and wall beams with brick filling, thus making the mushroom floor independent of the brick walls for support, that is not what is contemplated in the plans of the proposed building. This would strengthen the structure enormously, and would give an equal weight-carrying strength all over the floor. It would not appreciably add to the cost of the building. It would merely mean replacing brickwork with concrete.

Personally, I think that the adoption of his suggestion is quite unnecessary and that it would prove very costly. The authority who is advising the Department on this particular form of concrete construction is also of that opinion. But, apart altogether from his advice, I say, without hesitation, that Mr. Reed's suggestion is quite an unnecessary one, and I could not recommend its adoption. Such an alteration is not in any way essential to give the strength desired to carry the weight that will be imposed upon the floors. According to the plans submitted of the proposed building, the necessary cohesion will be secured by a continuous reinforced concrete beam extending the whole length of the structure. When the reinforced concrete floor plate gets to the wall it will engage a solid body of concrete running continuously along the wall 16 inches thick and 2 ft. 9 in. deep. The reinforced steel reinforcing the slab itself will get into that body of concrete, and will stop there, and incidentally that body of concrete will form the lintels of the windows, which are practically continuous right round the walls of the building. The connexion from the piers, therefore, comes to a reinforced mass of concrete which is practically continuous round the walls, and this mass is vertically supported on the piers underneath. Certainly the adoption of Mr. Reed's proposal would involve a big addition to the expenditure on the building.

179. *To Mr. Mathews.*—If the pillars were on the outside, there would still be need for the continuous body of concrete round the walls.

180. *To the Chairman.*—Mr. Crawford, who is the patentee of the reinforced slab system of concrete in Australia, is the expert who has been advising the Department on this matter. I cannot say of my own knowledge that his process has been patented in Australia. I have made no inquiries on the subject at the Patents Office. I have just accepted the engineer's word for it, and I take him to be a man of integrity. He is the chief engineer for Metcalf and Coy., who are erecting the large wheat silos all over the country. I do not think that a man of his standing would intentionally mislead one. Even if the building at Leichhardt be increased to four stories instead of three, the construction which I have designed would be equally suitable. It would merely mean that the same principle would be employed on the additional floor. You could not increase the height of the building to six stories without increasing the sectional area of the walls and the resisting area of the foundations. The alterations that would be necessary to provide an additional story to the building would not be large. The alterations in connexion with the foundations would probably cost about £220. A flat roof could be provided on the building so as to furnish a luncheon room for employees and space for the drying of goods, but

only, of course, at an increased cost. I could not give an estimate of what that increase would be without first having an opportunity to go into the matter. I remember that when we erected the store at Darling Island it was considered an important essential that it should be provided with a flat roof for the purpose of drying tents, &c. This was done, but I understand that the roof has never been used for that purpose. Of course, the conditions at Darling Island are different from those which obtain at Leichhardt. At the former place, the only land available is that upon which the store itself stands. If goods require to be dried at Leichhardt, the work can be done on the grass, but the chances are that it will not be required there. According to the plan of the building submitted the structure will be 10 feet high from floor to ceiling. The floor is 7 inches thick. To make the first floor 12 feet or 15 feet high, so as to permit of the installation of a travelling crane, would add a great deal to the cost of the building, and from my personal acquaintance with designing for this class of store I do not think that a travelling crane would ever be used. The goods which will be stored there will not require the use of a travelling crane for their transport. The method of transport which will be employed in the building will, I understand, be the modern method which is used in America; that is to say, small electric trucks worked from accumulators. These trucks are not on rails. They may be taken to any part of the building, and will carry goods there. They are run into a lift and elevated to any floor that may be desired. Then the workman takes them wherever they are required. These trucks may be designed to any capacity desired. I understand from Major Hudson that in the proposed building at Leichhardt no weights will require to be lifted in excess of 15 cwt. Of course, in times of stress, two, or even three, of these trucks might be taken up in a lift. Their size would depend entirely upon the kind of goods that has to be handled. They are not large, but they are used on most large railway stations throughout America in the handling of passengers' luggage. I have seen these trucks piled to a great height, and I should say that their carrying capacity is about 1½ tons. It was with a view to the employment of such trucks that such large-sized lifts for the proposed store were designed. In fact, the entire structure from the standpoint from the height of its floors, sizes of its lifts, and points of that sort, has been designed from the most modern examples we can find of stores erected in America during the past twelve months on account of the war. The plans of these buildings are 11 feet from floor to floor, and the lifts installed in them measure 15 feet by 8 feet, or 1 foot longer than those which we have recommended. The proportion of lift area to floor area is a little greater in our plans than it is in the American buildings. I think that in the latter a lift is provided for every 28,000 feet of floor space, whereas we have provided one for every 21,000 feet of floor space. The lifts are all counterbalanced, so that the energy utilized in moving them is confined to moving the load in the lift. The actual movement up and down is counterbalanced by weight. The electro-hydraulic lift process has been installed in New South Wales, but the information which I can give the Committee upon it would be of no real value. We have experts in the Department who can give the desired information. According to their calculations, the system of lifts recommended in the proposed building would be the most economical one. My own knowledge of this matter, however, is of a very general character. For convenience and economical handling of stores, I think that 10 feet is as high as any storeman will ever care to go. One of the advantages which we claim for this kind of concrete construction is that a 10-ft. space

from floor to ceiling will be effective throughout the building, because there will be nothing taken off it by means of beams. To add another foot to the height of the building, the value of which is dubious, would entail a large expenditure. It would mean, not only the extra height of the pillars, but also of all the brickwork, glass, &c. The building shown in the plan represents an outlay of so much a cubic foot, and if another foot be added to its height, it will make a very great difference to its capital cost. No man can say what the Defence Department requires so far as the order of the erection of buildings on the Leichhardt site is concerned. The development of the scheme and the order of the construction of those buildings will be dictated entirely by the necessities which arise from time to time. My experience teaches me that it is very difficult to forecast what those necessities will be. I know of so much prophesying which has been entirely falsified by events that the older I get the less disposed I am to indulge in predictions. I cannot say that the proposed building will provide the Department with ample accommodation for the centralizing of all their stores, but I will say that it makes for a scheme which will enable the Defence authorities to store their goods in the best way possible and in the cheapest way possible. The accommodation required for the clerical staff may be provided, to more or less any extent, without affecting the structure by the erection of light glass partitions, &c. Of course, if all the stores and administrative machinery are to be moved to Leichhardt, it may be a good thing to erect an office for the clerical staff. If building "A" shown on the plan be first erected, even if it be continued to another story, I would be inclined afterwards to erect one of the two-story buildings proposed on the flat portion of the site. That would meet the needs of another class of store in the most inexpensive way, and would obviate the necessity for removing any more of the cottages. The next development of the scheme, I imagine, would take place on this flat area, where a two-story building of hardwood and iron might be erected. The foundations of such a building would require to be piled, but that is not a big job at all, although I know that a number of people shudder at the thought of piling. At the present time, it is extraordinarily difficult to judge accurately of the cost of a building. It is almost incredible that quite recently, when we were called upon to erect, in connexion with the Victorian Branch of the Repatriation Department, a building in St. Kilda-road of a temporary character, I found, on going into the matter, that a brick proposition was cheaper than an all-wood one. How long this condition of things will continue, I cannot say, but I understand that the position in New South Wales is worse than it is here. If the Defence Department required 350,000 square feet of space, whether I would provide that space on the low-lying ground by erecting the "B" building or by the erection of the "A" and "C" buildings, would largely depend on the class of stores to be stored. Probably the question would resolve itself into one of erecting a part of one building and a part of the other building. It is not necessary to erect the entire main structure immediately. If the whole of the site at Leichhardt is likely to be required for buildings—as I think it will be in years to come—that portion of it having a frontage to Charles-street will be the most important, and we may reasonably assume that railway communication with it will be required. Unless the low-level line is constructed, I recognise that there will be no railway communication with the stores marked "B" on the plan, but it would cost such a small sum to bring in the low-level line that the point is scarcely worth considering. The low-level railway could be made to provide for the trucks coming right beyond the platform and into a dock within the "A" building

itself. I consider that the best railway scheme possible in connexion with the building has been devised. I think it is an excellent scheme. Of course, I really have not a railway point of view which is of any value, but from a stores point of view the scheme is a most convenient one. It is possible, however, that a railway man may be able to discover drawbacks in it which I do not see. The idea of having two railways on different levels appears to me an ingenious one. I know it has been suggested by some witnesses that motor cars, lorries, &c., should be able to come right up to the building, so as to be able to load directly on to the lifts. According to the plans, that could not be done, because the platform projects from the building a distance of 18 feet. Thus, either in the case of trains or vehicles, the loading would have to be done on the platforms. I have heard the arguments advanced in favour of the lifts being installed inside the building instead of on the walls. I also went into the question of the planning of the building with the experts of the Defence Department, and, after the matter had been thoroughly thrashed out, we arrived at the conclusion that the most convenient situation for the lifts is that shown on the plan. I have heard no argument since which would cause me to change my opinion on that point. I do not think that any covering is required for the platforms outside the building, because goods likely to be damaged by rain would not be left there. It is a good thing to have platforms between the actual vehicles and the stores, and a covering for them is not necessary. To provide such a covering would diminish the light available, in addition to requiring a glass roof.

181. *To Mr. Mathews.*—In practice, I think it will be found that one railway only will be employed. The very first plan considered by us from the railway point of view was whether, if "A" and "B" buildings were first constructed, it would be wise to bring in the line between them, instead of bringing it in to the east of "A." That question was given a good deal of consideration, and finally the proposal was discarded in favour of that set out on the plan. I do not favour a reduction in the size of the lifts, which are already a foot smaller than are the American lifts. The larger lifts are, of course, more expensive to construct, but they are not more expensive to work. If the weight required to be lifted by them will never exceed $1\frac{1}{2}$ tons, I would cut down their size, and thus save floor space. I do not agree with the suggestion that it is proposed to provide too many lifts. Viewed from the American standard of a three-story building, we are providing a slightly increased proportion of lift capacity to floor area, but if another floor be added to the proposed building, I have no doubt that all the lifts shown on the plan will be required. As a safeguard, why not leave the openings in the floors for future lifts and utilize fewer lifts for the present? In normal times probably one lift to each store will be ample to meet requirements. If machinery capacity were provided and openings left in the floors, which could be temporarily floored over, the second lot of lifts could be easily installed whenever they were required.

182. *To Senator Newland.*—The American stores, to which I have referred, and upon which the proposed building has been designed, are larger structures, but we have provided, in proportion to floor space, slightly an excessive capacity of lifts. The proposed store would compare favorably with any Ordnance store in America, but it would be very much smaller. It is not correct to say that as much energy is used in running a lift empty as in running it with a load upon it. When it is loaded it requires more energy. However, it would be wise for the Committee to obtain the evidence of the mechanical engineer upon this par-

ticular phase of the question, because my opinion upon it is of no real value. Primarily, it is electricity that is consumed in the working of lifts, because current is used to compress the water which supplies the motive power for their running. The concrete block which will run along the wall of the proposed building will provide as much anchorage for the reinforcement in the walls as is to be found in the centre of the pillars. The reinforced floors of the proposed building have been designed upon the advice of the principal expert upon this form of concrete construction to be found in Australia. He is a man who does nothing else but give such advice, and I have the fullest faith in his knowledge. Practically, I am of opinion that the provision of wall stanchions is quite unnecessary and would prove most costly.

183. *To Senator Needham.*—It would be quite unnecessary to have fire escapes outside the building in addition to the other precautionary measures which have been recommended against fire. I cannot imagine the workmen in the proposed building being trapped by fire. I am not aware that concrete floors injuriously affect the feet of workmen upon them. Of course, they might so affect a man who had his feet planted idly upon them all day long, but they certainly would not affect a man who was constantly moving about them. The system of construction contemplated in the proposed building is suitable for a structure of five stories as well as for one of three stories. From a storeman's point of view, the one-floor building is the ideal one. But it is not attainable, and yet it must be remembered that the more you depart from the one-story ideal the more you depart from the storeman's point of view. If the Committee recommended the erection of a four-story building on the high ground, it would be possible to do with a single railway system, and to have the trucks running into the building and discharging into the lifts. I dare say that such a plan would prove economical; at any rate, it is one which is worth considering. I think that the lower-lying ground of the site is first rate.

184. *To Mr. Laird Smith.*—The carrying capacity per foot of the sectional area of reinforced concrete is very much in excess of the carrying capacity per square foot of the brickwork which composes the outside walls. But as the brickwork costs only about half the price of concrete, it is far better to utilize the cheaper material. There will be no tendency on the part of walls so constructed to bulge. From a fire point of view, it will not be more costly to protect the lift wells, if the lifts are located in the centre of the building, than it will be if they are located on the walls. But if electric lifts are employed on the edge of the building, an outlay of £900 will be required to provide the towers to take the motors. This represents an outlay of £150 each. If it be decided to house the workmen near the store, the houses which are already on the site can be used for that purpose.

185. *To the Chairman.*—I estimate the cost of a two-story building of galvanized iron and constructed upon piles at 10s. or 11s. per superficial foot of floor space.

186. *To Mr. Mathews.*—The price of corrugated iron is dropping. The other day I read of some of this iron being sold for £39 per ton, but I do not think it can be purchased on the open market at that price. During the war it was practically unobtainable.

187. *To the Chairman.*—I am satisfied that the use of electric trucks on cement floors would not wear away the concrete, because these trucks are fitted with solid rubber wheels. I think that the shrinkage in the case of reinforced concrete floors is a negligible quantity. The same remark is applicable to their expansion.

(Taken at Melbourne.)

THURSDAY, 5TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;	
Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sinclair,
Senator Newland,	Mr. Laird Smith.

Lt.-Colonel Archie John Landles Wilson, Director of Equipment and Ordnance Stores, Department of Defence, recalled and further examined.

188. *To the Chairman.*—It is estimated that the average daily weight of Ordnance material moved would be 13 tons in and 13 tons out, exclusive of ammunition. In one day, however, as much as 200 tons have been taken into store. Weight is not the main factor. Cubic measurement is the main factor. In reply to the questions asked Brigadier-General Forsyth, I am now able to state that the average weight of packages is estimated at 2 cwt. each, but in many cases the weight of packages to be taken into store would be determined solely by the capacity of the lifts. At the average weight of 13 tons per day the estimated intake would be 4,069 tons per year, but owing to the return of equipment from overseas, this estimate will in all probability be greatly exceeded. During the war it was not uncommon to send abroad from this State, by one ship, 1,000 tons measurement of goods, and that ship would be loaded in about a day and a half. All the goods would come from our ordnance stores. Such large quantities of goods would not be shipped direct from the manufacturers, but through our ordnance stores. They are all sized, baled, and packed in the ordnance stores, and marked there for shipment. I think that by one vessel we sent away over 5,000 packages. We are seldom concerned about the weight of goods handled in store. You may get a gun into the stores which will weigh 15 or 20 tons, but that would be an isolated instance. All goods manufactured in and around Sydney would ordinarily be sent to the Leichhardt ordnance stores for sorting, baling, and preparation for shipment overseas. That being so, it would be very advantageous to have an efficient means of bargeing our stores to the ship, and I should very much like to see such means provided. My idea is that when the Leichhardt stores are erected, we should dispense with all other ordnance stores in Sydney. It is proposed to begin with the erection of the store marked "A" on the plan. Accommodation will have to be provided for the clerical staff at Leichhardt, including a building in which the staff can have their mid-day meal. My idea has always been that the low ground on the site should be reserved for a workshop, except that there would, of course, be no objection to the erection of luncheon rooms, and accommodation of that kind, also on the low ground. When the whole of the artillery is returned from overseas, we shall undoubtedly have to consider the erection of large, up-to-date workshops. The workshops in New South Wales at present are at the Victoria Barracks. They are practically out of date, and the accommodation is hopelessly inadequate. I know that that may be said of the workshops in Melbourne, and I am almost sure that the same applies to the workshops in Sydney. At present these workshops are under the Chief of Ordnance, that is to say, the Artillery Department. The organization of the British Army is that these workshops are controlled by a specialist officer under the Quartermaster-General's department, which is my department. In any case, we shall have to look to the erection of workshops, and, to my mind, the most suitable spot for them will be on the low-lying ground at Leichhardt. The biggest work would be in connexion with the repair of big guns; but, on the requirements of the workshops, I sug-

gest that the Committee might obtain the evidence of an artillery officer—Major Coghill, for instance. It is anticipated that 30,000 square feet of floor space will be required for workshops at the Ordnance Stores site, Leichhardt, during the next ten years. I should, perhaps, explain that when this plan was considered, it was proposed that we should erect one building, and the rest of the site should be left for development. We have now reached a stage at which, perhaps, we can go further into the matter and express an opinion as to the buildings that would be required for all services outside the general ordnance stores, and make suggestions as to where they should be placed. I understand that one of the reasons for bringing the railway through as proposed, is that the State Government intends, at an early date, to bring their railway to the division line between their property and ours, and it is only a matter of extension. A tramway line such as you inform me has been suggested would appear to be the only means of connecting the wharf with the stores. It would probably be on the lines of what are called Deckanville railways, which are in quite common use overseas. I believe that if you could bring a railway in on a lower level, between stores "A" and "B," it would prove a distinct advantage. For a general ordnance store in the city, I would prefer a building up to four stories; but for the mobilization stores, which could be placed anywhere, I would prefer one story. I do not think that the officers in Sydney have had experience to enable them to express a very valuable opinion as to the respective advantages of the two classes of buildings. At the building at Circular Quay, for instance, they have to raise everything four stories high on hoists, which is quite out of the question. At the building on Darling Island the lifts have always been very unsatisfactory, and the building is so narrow as to provide accommodation for only a small amount of goods on each floor. I can quite understand officers working in those buildings preferring a building of one story. I think that a platform, and a fairly wide platform, is essential to deal with heavy traffic. Goods can be loaded on to the platform and so save demurrage, and it should be wide enough to enable two hand-carts to pass without difficulty. The idea in the provision for lifts suggested is that we may be prepared for a busy time. During the greater portion of the year we might be able to carry on with two, but we must be prepared for the heavier traffic when we might be called upon to load a ship or to fit out a camp in a day. It is, perhaps, debatable whether the lifts should be in the centre or on the side of a building; but we have a tremendous amount of sorting to do of goods coming into the stores, and it is very handy, for this purpose, to have space right around the lifts. Another advantage is that in sending goods down, we could have them stacked around the lifts to avoid delay in work. Taking into consideration the length of the proposed building, I do not think that the expense of covering the platform, which would mean carrying the cover right over the trucks, would be warranted. I should prefer some provision for movable covering to put over the trucks. I do not agree with the opinion which has been expressed to you that 15 cwt. would be the maximum weight which would be likely to be put in the lift at one time. Take, for instance, the ordinary items of trench tool heads, or other items, which are of solid steel, one case of these goods might weigh 15 cwt. It would not do to take only one case up at a time. Provision is proposed for 3-ton lifts, but if it could be shown that a considerable saving might be effected by reducing the capacity, it might be reduced to 2 tons. There will always be some stores too heavy, or too big for a lift, but we should aim at a reasonable thing,

and if it would represent a material financial saving, the capacity of the lifts might be reduced to 2 tons, but not lower. The platform is based on the American idea, where they do most of their work by little electric tractors, to which I have previously referred. They unload from the trucks to the tractors, which are run into the lifts, are raised to the floor where the goods are to be stored, and the tractors run from the lift to the places selected for the storage of particular goods. For very heavy goods lifting machines are used. They can be obtained with tilting platforms. They lift about 8 feet, and the platform being tilted throws the goods on top of the stack. These would not be required, except for metal stores. The style of building proposed is that adopted as the result of a conference of leading warehousemen of New York, who were asked by the American War Department to make suggestions as to the most suitable ordnance stores. They did not advise the adoption of buildings of over six stories high. I think it would be a distinct advantage to bring a railway in on the low level as suggested. It need not interfere with the high-level railway to serve stores "A" and "C" in the future.

189. *To Mr. Mathews.*—I did not understand that it was intended that fireproof walls should be constructed around the lifts, but if that is the intention, they would have to be constructed for lifts at the side of the building, as well as for lifts in the centre. The provision for lifts in the centre represents the loss of about 700 square feet of space in 40,000 square feet on each floor. By reducing the lift accommodation by one-third, only 233 square feet of floor space would be saved. I do not think that the cost of the installation of the lifts in the centre is a material objection in such a big proposition, in view of the advantages which they would provide. If possible, we should avoid the storage of heavy goods on the lower floor, in order to keep it clear for the issue and receipt of goods. I do not think it would be necessary to increase the height of the first story. I understand that to do so would involve some engineering difficulty, as, if it were raised 3 feet, that would carry it 3 feet over the railway, which would be on the level of building "C." I do not think it is necessary to make the lower floor more than 10 ft. 5 in. It is better not to stack too high. It becomes too costly if you stack over 8 feet. I think that the erection of building "A" four stories high, with provision for workshops and other accommodation on the side of building "B," would meet all the requirements of the Department for the next ten or twelve years.

190. *To the Chairman.*—With reference to the suggestion made to you that accommodation covering 320 feet by 60 feet would be required for armourers and artisans, I should like to say that our idea is that men employed in our workshop should have nothing to do with stock. The old idea here was that the chief armourer should be in charge of rifles, machine guns, and spare parts pertaining to his section. That idea has been altered, and he is now regarded purely as an examiner and repairer of small arms and machine guns. I think that in Sydney they have a staff of armourers, carpenters, and so on, numbering about twenty all told. It is ridiculous to say that they would need a floor space of 320 by 60 feet. They do not need any machinery, except, perhaps, the carpenters. Some of the armourers may be good tradesmen, but they are employed merely to take the broken or worn parts out of a rifle and put in new parts supplied by the Small Arms Factory. They naturally like to think that they could do a bit of mechanic's work, and manufacture a part, but that would not be a paying proposition. We would never have any machinery in the new armoury—the equipment would be chiefly benches and vices.

191. *To Senator Newland.*—I think that the suggestion that floor space of 320 by 60 feet would be required for the armoury was made under the impression that rifles would be stored as well as repaired under the charge of the senior armourer. That is wrong in principle, and I am opposed to it. If the armourers were in a separate building, rifles coming to the ordnance stores would be delivered at the armoury, where they would be inspected, and all that were serviceable would be passed on to the general stores. As soon as the armourers fixed up a case full of rifles, they would be passed on to the general stores, and the further handling of them would be by storemen and packers, who would not be as highly paid as armourers. When cleaning up a camp, many thousands of rifles might be brought in at one time; but you would hardly provide for that by increased accommodation for the armourers. Rifles are issued to militia units, and the commanding officer issues a rifle to each man. Those rifles are sent to the camp, and are taken away again by the men to whom they were issued, and they do not come near the ordnance stores at all. In normal times circumstances might bring rifles into the store-house with a big rush; but, no matter how big the armoury might be, it would not hold them all. We should have to make provision for them wherever they could be accommodated until they could be examined. I think that a building 60 feet square would provide sufficient accommodation for the armoury. For the present I favour putting the armoury in the main building; but when workshops can be erected, all tradesmen should be under one officer. That insures better supervision, and keeps down the cost. I do not like to have a carpenter in one corner, a blacksmith in another, and an armourer in another corner of a building. My idea is that we should provide six lift wells properly fitted, but that two of the wells should be fitted with chutes. I am favorable to giving two chutes a good trial. If, later on, it were found that they were unsuitable, the alteration to lifts could be made without great expense. We would take in a lift as big a package as it would carry. Some of the aeroplane cases are too big for any lift, and they would have to be broken down. Our contractors used to deliver hats, for instance, in cases about 5 feet square; but we always complained of these big cases, because they are so hard to handle. We like to get packages as light as possible, and for clothing we endeavoured to get them about 18 inches square. The number of packages of that measurement that could be carried at one time would depend on the floor space of the lift.

192. *To Mr. Sinclair.*—I should like to keep very heavy loading out of the Ordnance Stores altogether. Where it is possible, we arrange that a very heavy consignment shall pass through the Ordnance Stores in transit direct to the officer for whom it is intended. The heavier stuff would probably be for fixed defence, and would include items weighing 6, 7, and 10 tons. In the Sydney Ordnance Store they had a gun weighing 22 tons on the ground floor, but I would absolutely discourage anything like that going into the Ordnance Stores. Apart from that, practically all the packing of heavy goods should be done on the bottom floor. If a low-level railway were constructed as suggested, that would overcome the difficulty of lowering heavy goods from the first floor of building "A," which would be approached by the high-level line proposed. I would regard that as a good argument in favour of the proposed lower-level railway.

193. *To Mr. Laird Smith.*—So far as I am aware, the lay-out of the lifts proposed was arranged by the Director-General of Works, the Business Board, and Mr. Wakeman. The plan was all prepared before I returned from overseas, but I was shown the plan and

asked for an opinion regarding the lifts. I agreed they should be as shown on the plan, with the exception that I thought we should have two chutes instead of two of the lifts. By cutting out two of the lifts and putting in two chutes we would insure a much quicker service in clearing the stores. In rush time, loading standard packages on to barges, I think that a chute would carry six times as much as a lift in the same time. The work by the chute would be a continuous operation. The big rushes in an Ordnance Store are always outward. I do not agree with the evidence given you that a 3-ton lift would cost more than double a lift with a capacity of 30 cwt. My idea is that to reduce the capacity of the lifts from 3 tons to 2 tons would not effect a saving in the proportion of 3 to 2. Major Hudson was in South Australia most of his time, and would not have had experience of lifts in Ordnance Stores there, which are of one story. The lifts at Darling Island have a capacity of 30 cwt., but I may point out that there are a number of oil engines taking up valuable space on the bottom floor of the building at Darling Island, because the lifts were not powerful enough to take them out of the way. I do not think it would be an advantage to have one or two 3-ton lifts and the others of smaller capacity. That would involve the storage of material according to the position of the lifts, which would not be satisfactory. In nearly all the Ordnance Stores I visited overseas they have a special place and a special staff for packing. The storemen do not pack things at all. They tie a string around a parcel and attach a label to it, and on the bottom floor spaces are set out in bays marked "1st Battalion," "2nd Battalion," and so on. Goods are brought from all over the store to the bays. Half a truck may be allotted to a particular unit, and the bay set apart for that unit is cleared out into the truck. Our bottom floor would be allotted in similar bays to receive goods for different units. If the lower-level railway, as suggested, were constructed as well as the high-level railway, the usual practice adopted in similar circumstances elsewhere is to have a transit shed at the junction of the two lines with the main line. If a field gun and a machine gun were brought on the main line in one truck, and it was desired to put the field gun in store "B" and the machine gun in store "A," the machine gun could be left at the transit shed until a truck was available to carry it to store "A." If the proposed low-level line would serve store "A" as well as store "B," it would be a great advantage. If the levels permitted, it could be worked with a turntable. I think that later on it would be an advantage also to have the low-level line, particularly as the New South Wales Government propose to bring their line to the boundary between their property and ours.

194. *To Mr. Mathews.*—The chute could be used to transfer goods direct from the top to the bottom floor of the building. Wooden springs are put in across the chute at intervals, which regulate the fall of the goods, and they could be transferred by the chute direct from the top floor right out to the truck. If the lower-level railway could be continued to serve stores "B" and "A," that would avoid the necessity for a transit shed, which would be required if the two railways were used.

195. *To the Chairman.*—The number of clerks estimated to be employed in connexion with the Leichhardt stores is 50. We use at present 6,000 square feet of office accommodation for the clerical staff, but that could be reduced by almost one-half if they were all accommodated on one floor. They should, as far as possible, be accommodated on one floor and in as large rooms as possible.

196. *To Mr. Sinclair.*—For the accommodation of the staff I should prefer a separate building of one story as close as possible to the southern end of building

"A." I do not think that it would be sound policy to utilize the present buildings for a time as office accommodation. In the administration of an Ordnance Department, if the officer-in-charge is at some distance from the store house he will never get round as he ought to do, and it is absolutely essential that he should make regular inspections.

The witness withdrew.

Hon. George Swinburne, Chairman of the Board of Business Administration, Department of Defence, sworn and examined.

197. *To the Chairman.*—As a result of inquiry into the ordnance storage accommodation in every State, I am convinced that we must have extra accommodation and a more economical method of storage. Soon after I had been asked to accept my present position, but before I had actually taken office, Senator Pearce asked me to go to Sydney and inquire into the question of increasing the ordnance store accommodation in New South Wales. I went to Sydney with Generals Stanley and Ramaciotti, and spent a week there in studying the requirements of ordnance stores, and making full inquiry as to suitable sites. The site at Leichhardt had been recommended to the Minister by Lieutenant-Colonel Sands, and the Minister desired me to express my opinion regarding its adaptability. I interviewed the chairman of the Sydney Harbor Trust, who informed me that there was no other available site in the harbor with a water and railway frontage. I consulted the Railway Commissioners regarding the possibility of acquiring some other site without water frontage, and the engineer for existing lines, who is very well informed as to the land available, told me that he did not know of another site within reasonable distance of Sydney which would give the same area and facilities. I made numerous inquiries from estate agents and others, and ultimately was forced to the conclusion that Leichhardt was the best site obtainable, and that it could be adapted very well for the purposes of ordnance stores. In a report to the Minister, a copy of which I produce, I explained both the disabilities and advantages of the site, and recommended that there was no other available piece of land equally suitable. At that time the Defence Department had its stores scattered through about twenty-two or twenty-three different buildings—all the drill halls were full, the stores at Circular Quay and Darling Island were packed to their utmost capacity, and we were also renting a place in George-street, at a cost of about £250 per annum. The problem of improving the storage accommodation was very serious, because, unless the drill halls could be vacated, civilian training could not be resumed after the cessation of hostilities. That has been the position in every State. A great many drill halls have been utilized during the war period as stores, and until the material could be cleared out of them, a resumption of civilian training was impossible. Our idea was to obtain in Sydney a central store in which to concentrate the whole of the ordnance stores for that city, with the exception of vehicles. We knew that we could not get vehicle storage at Leichhardt, and, in any case, it would be improvident to store vehicles on what is comparatively an expensive site. We decided that they should be stored elsewhere. But for ordnance stores, apart altogether from mobilization stores, the Leichhardt site is the best we could obtain, and, in my opinion, it will fully answer the purpose. The quantity of traffic to and from the proposed stores must vary. At times there may be large quantities of goods going out and coming in, and at other periods there will be very little stuff distributed. Our main purpose was to get a central place which would be convenient for goods coming from the Clothing Factory, Woollen

Mills, and Harness Factory, in Victoria, and within reasonable distance of the Sydney factories, which would be supplying the stores with boots and clothing, so that the cost of delivery would not be too great. I inquired carefully into the question of road facilities. The State Public Works Department had motor lorries of one ton and four tons capacity running at that time on the road that leads to the Leichhardt site, and I saw that the road presented no difficulty to motor traffic. There is an alternative road on the eastern end, but there is very little difference between it and the main road—in the case of each there is a hill to be negotiated. I considered that the access by road was satisfactory. The railway also offered very considerable facilities, for, whilst the stores would not have the immediate advantage of the through railway to Darling Island, which has been authorized, but not yet finished, we were assured by the Railway Commissioners that within two years the railway will be connected right through to Darling Island with the line that passes the Leichhardt site. In addition, there is to be a receiving station within about 300 yards of the site, and there is also a big marshalling yard about a mile distant from the proposed stores; so that ultimately the site will be in a much better position, so far as railway facilities are concerned, than it is to-day. The outlook from the point of view of delivery to the country was very satisfactory. In regard to water access, we estimated that in time of peace the Long Cove Canal would not be of great value, except occasionally; but in time of war, if ships had to carry stores to the Pacific Islands or elsewhere overseas, it would be of considerable advantage to be able to send barge-loads of stuff quickly to the ship's side, instead of having to carry the goods by road. At high tide the canal has a depth of about 9 feet, which is quite ample for barges; the State Public Works Department uses it regularly for the transport of heavy goods. It is impossible to estimate what will be the normal requirement of storage accommodation until one knows what is to be the policy of the Government after the war. At the present time the military position is in a state of flux; but we do know that, even before the war, the Circular Quay stores were insufficient. All through the files I found repeated requests from New South Wales for accommodation in addition to the Circular Quay stores. Ultimately, about 1914 or 1915, the Department obtained the use of the Darling Island stores. But, even with that addition, the accommodation was inadequate. We shall have left over from the war period more material in every State than will fill the stores existing before the war. I cannot yet see where any reduction in storage requirements can take place, because we have immense quantities of material to store from the hospitals and many other establishments as they gradually come into disuse, and the disposal of those goods will be a very important and serious problem. In addition, the authorities in London have cabled repeated requests to us to build large stores at each port to accommodate the immense quantities of material that are being sent back with the troops. I have tried hard, by cabling to London, to ascertain exactly how much stuff is likely to be returned, but I can get no satisfactory answer. The Government have, during the war, paid for an immense equipment in the form of guns, aeroplanes, ordnance stores, shells, and warlike material generally. Briefly stated, equipment is being returned for, say, two mounted divisions and five infantry divisions; but it is difficult to estimate exactly what that equipment really amounts to. In addition to the stores, officers say that we shall receive from abroad about 1,500 vehicles for which the Government have paid. To-day we have not storage accommodation for 300 vehicles. The basement of the Exhibition build-

ing, in Melbourne, is full, and we have no Government storage ready. In New South Wales large numbers of vehicles are stored in the Royal Agricultural Society's show-grounds, but when the show is held each year, those vehicles must be shifted out and then returned. The Addison-road artillery sheds are full of vehicles. The Business Board is waiting until definite information comes to hand about the quantity of material that is being returned before advising the Government what to do in the matter of providing storage accommodation. Independent mobilization stores are being established at Liverpool, and certain vehicle sheds there will, to some extent, but far from completely, accommodate the vehicles being returned to New South Wales. To provide storage accommodation for a large number of vehicles in or near the city would be too expensive; that is why the vehicles are being sent to Liverpool. The stores there are being built primarily to provide storage accommodation, but with the ultimate idea that other accommodation may be provided for ordnance stores, and that the Liverpool buildings shall be used to store mobilization equipment. It is the desire of the Defence Department to establish complete mobilization stores, where the concentration of troops may take place; but even that provision in some States has not yet been definitely settled. So far as those States are concerned, we have made no definite recommendation regarding increased storage. Our policy is to concentrate the ordnance stores at one spot, as far as practicable, and I think the site which has been secured at Leichhardt can be utilized by subsequent buildings to supply all the ordnance stores requirements for many years to come. A floor space of from 500,000 to 700,000 square feet can be obtained, and that is likely to be ample for all purposes. The site has cost about £12,000, and, in addition, there is an item of about £5,000 for compensation. It has been suggested that a building (marked "A" on plan), to cost approximately £70,000, should be erected, and the idea is that when it is completed there shall be no other ordnance stores in Sydney. Our best policy will be to complete building "A," and even to proceed with either plan "B" or plan "C," rather than continue the use of some of the existing stores. Neither the Circular Quay store nor that at Darling Island is suitable for ordnance purposes. We feel that concentration of stores is essential for efficient handling and economic administration. The suggested building "A" will provide 126,000 square feet of floor space; but we could not possibly pack all of our present stores into that building. In addition, the armoury question has yet to be decided. The troops will bring back with them about 100,000 rifles, and we have about the same number in Australia to-day. No decision has yet been made as to how those rifles will be distributed throughout the various States, but the question of establishing an efficient armoury, either as part of the ordnance stores or attached to them must be decided within the next six months. At Circular Quay there is a very poor armoury, and that provided at Victoria Barracks, Melbourne, for the purpose is the worst that could possibly be obtained. It consists of a series of small rooms, and large boxes of rifles must be dragged from one room to another. The arrangement is absurd. Undoubtedly the armoury should be close to the ordnance stores; but I am not prepared to say what floor space will be required for the armoury in Sydney, until I know how the rifles are to be distributed. The policy of the Department in regard to future buildings after the completion of plan "A" has yet to be decided. If we require simple ordnance stores as an extension from building "A," it may be advisable to proceed with plan "C," on account of the superior railway accommodation they will have. But if we require workshops

or any other one-story building, plan "B" should be proceeded with. My idea was that probably plan "C" might be postponed until we knew the actual prospective conditions, even if we continued to use the Darling Island building or part of the Circular Quay store. It may be necessary to erect a building on the north end for workshops or an armoury. I should think that probably plan "B" would be the next extension; but until the Government have decided what troops are to be provided for after the war, it is inadvisable to proceed with any scheme beyond what will meet the bare requirements at the present time. The construction of building "A" will enable us to dispense with the Circular Quay store, which is about the worst we could possibly have. The employees in the ordnance stores at present number from 230 to 250 persons, including about 40 on the clerical staff. We shall have to make provision for an armoury, and a luncheon room for the employees would be advisable. Part of building "A" might be used for the purposes of an armoury for the time being, and later we could erect a less expensive building for the purpose on the north side, as part of plan "B." It would be far better to have the dining-room in a wooden building apart from the general store, because it is inadvisable at any time for the employees to have their meals within the stores. If it should be decided that the accommodation provided by the three-story building in plan "A" is insufficient, I should prefer that another story should be added to building "A," and that some of the buildings in plan "B" should be proceeded with, rather than that we should proceed immediately with plan "C," which will involve a big expense. We are endeavouring to keep down the initial cost as much as possible. In regard to the utilization of the canal, goods entering or leaving the stores would be handled either by carts or a light tramway. I think access to store "C" from the canal could be easily solved by chutes down to the lower level or by traversers. An enormous amount of work can be done by mechanical traversers, so that I anticipate no difficulties in regard to the handling of goods between store "C" and the canal. When Colonel Wilson was in America he investigated the various mechanical appliances in use; but his visit was a great disappointment, because he was unable to see any American stores which had been built for ordnance purposes. Nearly all the ordnance stores he saw had been erected hurriedly, or were comparatively small. The private stores were the best he saw. So far as the railway facilities are concerned, I can see that there may be advantages in having the whole of the railway services on one low level. The adoption of two levels may lead to expense in handling, but the main consideration is the best and quickest method of despatching goods in time of war. Peace conditions are simple to deal with; but in time of war the problem is to send out an enormous quantity of material in a minimum time. I shall give consideration to the question of having the railway lines on the one level, and will submit to the Committee a memorandum on the subject. Occasionally the mouth of the Long Cove Canal will require dredging, but that is the only water site we can get in Sydney; and if a water frontage is essential, that one must be adopted.

198. *To Senator Newland.*—In deciding upon the Leichhardt site, we had in mind mainly the possible railway facilities, together with the desirability of getting a water frontage, if possible. If we could have gone beyond Strathfield, we could have found other sites, but the carting distance to Darling Harbor would have been too great. I preferred the Leichhardt site because it has water facilities, which, in certain eventualities, I was informed, would be exceedingly valuable. In selecting Leichhardt, we were aware that park lands

were involved, and that a special Act of Parliament would be required to enable us to take possession. I had nothing to do with the negotiations between the Leichhardt Municipal Council and the Government of New South Wales. My report on the site is dated the 13th March, 1918. At that time I had not taken up my position on the Business Board, but the Department had already had the site under consideration, and Lieutenant-Colonel Sands, who had been deputed to make an investigation, had already recommended that it should be acquired. The Minister for Defence asked me to express my views on the proposition. I consulted the ordnance officials, spent a lot of time with Mr. Brown, the senior ordnance officer, and visited all the ordnance stores, including that at Goat Island, where the small arms ammunition is kept. I could not help bearing in mind that the space required at that time was a war necessity, and that it would be reasonable to surmise that after the war much less accommodation would be needed. The whole question is now reduced to one of Government policy, which will determine the quantity of stores to be kept. The accommodation will vary according to whether the Government propose to provide for the immediate equipment of 100,000 or 200,000 or 300,000 men. When I inspected the site at Leichhardt, I had the advantage of the company of Mr. Kendall, engineer for existing lines in New South Wales. I attended at his office several times, and he courteously prepared a plan to show how the railway could be taken into the site, and how the connexion with the main line would be made. So far as the buildings are concerned, I prefer concrete construction. I would not recommend a wooden interior, because a concrete building gives more space between the pillars, and provides greater facilities for the moving of goods and the arrangement of the bins. I understand that Colonel Owen has recommended the installation of hydraulic lifts. On that point I differ from him. Hydraulic lifts will involve a separate plant for pumping, and an accumulator. It will be necessary to keep not less than one engineer at the stores, and that will mean a considerable addition to permanent working costs. If electric lifts are installed the current can be supplied by the Balmain Electric Light and Power Company, and the employment of a permanent engineer will not be necessary. I am of opinion that for weeks at a time, while peace continues, the lifts may not be much used, and the keeping of a pumping plant going week in and week out in the mere expectation of the hydraulic lifts being used, would be a heavy charge. There is very little difference between the advantages offered by lifts placed against the walls and those situated in the centre of a building. I believe that the store officials would prefer to have the lifts in the centre of the building. If the building plan were altered, as has been suggested by the chairman, and a low-level railway were brought into building "B," I think it would be better to have the lifts at the sides, because they would then deliver the goods right alongside the trucks. I understand that the plan provides for an 18-ft. platform between the store and the railway trucks; but I cannot see the necessity for a platform of that width. In nearly every commercial building the lifts are placed against the wall, and that arrangement gives a greater command of the floor space. Lifts in the centre of a floor must occupy a great deal of space, because a certain area must be kept open around each lift. In commercial buildings the lifts are against the walls, and the carts are able to back in close to them, thus saving a lot of labour in handling. I know of nothing to warrant the proposal to install six lifts each of 3 tons capacity. The lifts in the New Zealand Loan and Mercantile Agency Company's warehouse and in other big warehouses have usually a capacity of about 1 ton

or 30 cwt. Some warehouses may have one larger lift for special purposes; but I suppose that out of 700 commercial lifts in Melbourne, there are not more than 50 with a lifting capacity of over 1 ton. The ordnance stores will not handle any very particularly heavy goods. If the lifts are to be placed in the middle of the floor I do not think six will be necessary. I have had a long talk with Colonel Wilson in regard to mechanical appliances in warehouses, and his investigations show that very much can be done in sending goods out by chutes or other conveyors. Chutes will deliver quicker and more regularly than lifts. Under certain conditions goods will always come into the stores slower than they require to be sent out. My ideal ordnance store would be one which gave the maximum facilities for getting goods out quickly under war conditions. I believe it would be an advantage to substitute one or two chutes for some of the proposed lifts. We are endeavouring now to get more information from England and America upon the subject of mechanical appliances for the rapid and convenient handling of goods. I think that the rifles should be stored adjacent to the armoury. If, as is proposed, you provide one long building, 320 feet by 60 feet, for the armoury, one end should be used for the storage of the rifles, which would be conveyed to and fro by a light tramway. Storage adjacent to the armoury is necessary, for the reason that the rifles must all be overhauled and examined periodically. Nothing like the suggested space would be required for armoury workshops alone. When the new stores are built, we shall recommend that the Circular Quay building be sold. It is a good building for commercial purposes, and we think that there would be good competition for it. We have taken no steps yet to ascertain its probable selling value.

199. *To Mr. Sinclair.*—When the purchase of the Leichhardt site was recommended, Colonel Sands submitted a valuation by Arthur Rickard and Company, of Sydney. That related only to the actual site, and not to the land in the vicinity. I think the valuator estimated the cost of acquisition at under £20,000. Leichhardt is not a manufacturing centre, but it is as adjacent to manufacturing districts as any site of which we could hear. The principal manufactories are about Botany and Annandale. In regard to the vulnerability of the buildings to air attack, the opinion of airmen who have had experience in the war is that it is much more difficult to pick out a factory situated in a city, and surrounded by other buildings, than one that is isolated. They say that very little damage was done in England to particular buildings. Stores are much more likely to be damaged by enemy air raids if the enemy knows the location, and the buildings are separated by a considerable space from other buildings. The Circular Quay and Darling Island stores are not transferred properties. The Commonwealth Government built the Darling Island store for the Postal Department; but I do not know whether it was placed on transferred land. I made no inquiries as to whether there are any restrictions upon the Commonwealth's disposal of those sites. We cannot sell transferred property, but I think the Darling Island site must belong to the Commonwealth, because the Federal authority erected the building.

200. *To Senator Needham.*—The rise and fall of the tide in the Long Cove Canal is about 2 ft. 6 in. That would leave a depth at low water of 6 ft. 6 in., which would be quite sufficient for a barge towed by a motor launch. A building of three or four stories is more economical than a series of single-storied ones, and it will present no disadvantage in working. We have to assume that we shall be more at peace than at war, and in the ordnance stores will be a large quantity of material required only for war purposes, which will lie

undisturbed for years, except for periodical inspection. To put one-storied buildings of any extent on land as expensive as that at Leichhardt is not an economical proposition. If we had been building at Liverpool, I would have recommended the erection of cheap one-storied buildings, subject, of course, to investigation as to whether the saving in buildings would not be more than counterbalanced by the cost of duplicating the railway sidings. Another consideration is that if the stores were stretched over a large area of ground permanently, they would not be so well supervised, on the whole, as if they were concentrated in a building of two or three stories, which the manager could get about quickly. I would not advocate carrying a building beyond four stories when provision has to be made for quick delivery. The use of chutes or other mechanical appliances to great heights might present disadvantages, and compel reliance upon the lifts; and if you have to rely on lifts for delivery of goods from great heights, you always get slow delivery. I do not think the walls should be more than 10 or 12 feet between floors. When the building at Darling Island is vacated by us, its future will be determined by the Home and Territories Department. We shall simply tell that Department that we have no further use for the store, and the Department will require to ascertain whether any other Department needs it, and, if not, sell or rent it to the best advantage. If building "A" at Leichhardt is carried to only three stories, we shall still require the store at Darling Island.

201. *To Mr. Laird Smith.*—Any suggestion I made for continuing the use of the Darling Island store was based on a possible decision not to develop the Leichhardt site to the full extent required. I am of opinion that we should not develop that site just yet beyond what is absolutely necessary, until we know definitely what our future requirements will be. Expenditure of every kind in connexion with storage has been requisitioned; but we are delaying action in several of the States until we can have some idea of what is to happen in the future. We should aim at concentrating our stores on the one site, and I would not advocate the retention of the Darling Island store as an ultimate proposition. An electrical lift consumes power only in proportion to the load lifted. An hydraulic lift, on the other hand, consumes the same power whether the load is 1 lb. or 3 tons. The same quantity of water is used to fill the cylinder, regardless of the load on the lift. I should say that a 3-ton hydraulic lift would cost 60 to 70 per cent. more to operate than would a 30-cwt. hydraulic lift. I should think that the average weight of goods to be handled by the lifts in the ordnance stores would be much less than 7 cwt. I have seen very few packages weighing more than 10 cwt. each. I can see no necessity for installing lifts of 3 tons capacity. In peace time the deliveries are in comparatively small lots to units. Big packages are sent out only when they are to be transported by sea, except in time of war, when nearly all the goods are coming down and going out, instead of being taken in and lifted. The site at Leichhardt has not sufficient area to allow of the housing of 200 employees. I have never considered the housing of the employees from the Government point of view; but I do know that house accommodation is very scarce in Sydney at the present time. The adjacency of the State Public Works Depot will help our railway transport. The State Department is often shunting, and facilities are increased by other people as well as ourselves requiring shunting. The delivery work of the stores will often be very light, and a large quantity of stuff, especially that for the metropolitan area, in which there are from twenty-five to thirty units, will be delivered in motor waggons; but periodically an enormous quantity of stuff must be sent to camps. About the middle of last

year the Department in Victoria had to equip Bendigo Camp, and we had to cart from the ordnance stores at Victoria Barracks to the railway thirty trucks of stuff, which later had to be carted back at a big expense. Practically all the Sydney factories from which the ordnance department will get supplies will be within a radius of 4 or 5 miles of the stores. No available site would be more conveniently situated. I do not know what are the Commonwealth's rights in regard to the foreshore at the Darling Island stores. I should think that the foreshore rights probably belong to the Harbor Trust; certainly the foreshore is public property.

202. *To Mr. Mathews.*—If the lifts are to be placed in the centre of the building, I do not suppose they will be walled up. They will have automatic doors, and, of course, the wells will have the usual wire protection. I have never seen any lift that is completely walled in. It seems to me that the danger, in case of fire, would be greater if the lift were walled, because the well would act like a chimney. However, if I were building the stores for myself, I should put the lifts against the walls.

203. *To Mr. Sinclair.*—I do not think there is any great likelihood of damage to the plunger of a hydraulic lift through the burden projecting over the platform and jamming against the walls of the well. Either the pressure would be sufficient to smash the goods and allow the lift to proceed on its way, or, if the resistance equalled the pressure, the lift would be brought to a standstill.

204. *To Mr. Laird Smith.*—I am quite satisfied that a reliable electric lift can be obtained.

205. *To Senator Needham.*—If building "A" could be extended to four stories, instead of three, I would be very glad.

206. *To the Chairman.*—My recommendation to the Department and the Committee regarding the accommodation to be provided in building "A," in combination with plan "B," is for normal requirements; but, assuming that there is sufficient area to allow of ultimate expansion, I do not think it would mean a great saving to have a low-level railway entering building "A," so that trucks could be shunted in and unloaded on either side, because we might require to load several trucks at once, and that would involve bringing all the goods down to the ground floor. If we had merely a dock, we could handle only one truck at a time, and it would be necessary to have a traverser to shift the loaded truck and remove it down the spare open line. A dock of that kind would take up a great deal of space in the building.

(Taken at Melbourne.)

FRIDAY, 6TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson	Mr. Mathews
Senator Needham	Mr. Sinclair
Senator Newland	Mr. Laird Smith.

Percy Thomas Owen, Director-General of Works, Department of Works and Railways, recalled and further examined.

207. *To the Chairman.*—At the outset the Defence Department indicated to me that they would prefer a three-storied building. I brought forward the factor as to the width of building necessary to allow for proper lighting and an economical general lay-out. I then prepared rough sketches of buildings such as have been put before you, and was told by the Department

that they would fulfil their requirements, so far as the first portion of the project, involving a floor space of over 126,000 square feet, was concerned. The Department did not give me any idea of the approximate floor space they would require in future. I thought that before any buildings were designed I ought to prepare drawings, showing what could be the maximum development on the site, having regard to its physical and other conditions. These buildings, with the number of floors which I suggested, on the diagram of development, namely, store "A," the four "B" stores of two stories each, and the "C" building of four stories, gave roughly a floor area of 500,000 superficial feet. I was not in a position to say, nor do I think the Defence Department could determine at the time, whether that would be ample to meet future requirements. I submitted the drawings as showing the normal maximum development of the site. I have seen a schedule which shows, if my memory serves me rightly, that in Sydney the Department is using for this purpose more than 170,000 square feet of floor space, in the way of various gun parks, drill halls, and other buildings. I cannot say to what extent that area may be unloaded with the termination of the war. I understood that in selecting this site, the Department desired to abandon the ordnance store at Circular Quay, and the abandonment of the Darling Island store was also under discussion. I suggested to the chairman of the Business Board that that building might be used for stores that would not be subject to daily or even weekly handling—stores which would go in for quick issue on mobilization. I thought it would be a mistake for the Government, having spent so much money on the building, to abandon it unless they could dispose of it profitably. In the general lay-out that I prepared, I showed the possibilities of adapting portion of the lower ground level for workshops, but no provision was made for luncheon rooms other than within the buildings themselves. The space required to provide luncheon rooms for 100 men would not be very extensive. The question is whether the Department desires to erect a separate building to be used as a luncheon room, or to make provision for it inside the building itself. The latter would mean less cost. The price per foot inside the building is not very high. You tell me that Major Hudson has informed the Committee that the approximate area required for workshops for armourers and artisans is 320 feet by 60 feet, and that the clerical staff, numbering thirty or forty employees, would require a fairly large room. As to a luncheon room, I think that the point you make as to the desirableness or otherwise of the men having their meals in the stores—having ingress and egress to and from the buildings with their luncheon bags—and the fact that scraps of food scattered about might encourage rats, is of some importance. Still, this building will have a concrete floor, so that there should not be much trouble in regard to rats. We have a large number of buildings on the remainder of the site, and, without considering the capital cost of putting up a luncheon room or workshops, it is possible that one or more of those buildings might be appropriated for the purpose. None of those buildings would give sufficient accommodation for workshops. I thought that for the time being, having regard to the desire to keep down the capital outlay, such space as might be required for the armourers could be appropriated within the building itself. I am not quite sure, whether when we first discussed the matter, the views as to how the building should be appropriated had been thoroughly sifted. I think it would tend to economy and efficiency if the whole of these facilities could be concentrated on this site, provided that the Government could make use of the Darling Island store, or sell it at a profit. There are,

however, many items, which do not come within the category of warehouse stores, for daily or weekly handling, that might be housed in the Darling Island stores. Some articles required for the use of an army could be put into a building and the key turned on them, so to speak, since they might not have to be handled for some time. Such goods might be placed in the Darling Island store. On the other hand, I have heard a rumour that the Navy Department is in need of a store. If it is, I think the Darling Island store should be admirably suited to its purpose. It is alongside the present Naval Store building. If good use could be made of that capital outlay by the Commonwealth, the Department should concentrate the whole of its military store buildings on this site. I do not think that of recent years many ships have come alongside the Darling Island store. The Darling Island site was purchased by the late Sir William Lyne, when in office, to provide wharf accommodation. The site was handed over to me, and I was told to make the best of it. I was advised that water, rail, and road connexion were required. It was a very awkward site to deal with, but we made provision for ships to come alongside. In actual working, I do not think that ships will come alongside it, unless the greater portion of their cargo is destined for the stores. As for the Leichhardt site, I am satisfied that we shall have reasonable communication by rail, road, and water. Having regard to what is available, I think it fairly fills the bill. If the Committee said that, having regard to efficiency and economy, the Leichhardt stores should be the sole ordnance stores for Sydney, I consider that the "A" and "C" buildings should be gone on with, and, if the requirements demanded it, some of the "B" stores. For instance, a store shed for transport to be connected with water would probably be proceeded with as well as the "A" and "C" buildings. It might be that the "A" and a large proportion of the "C" building would be sufficient. In the developmental scheme I provided for a "C" building of four floors, but it could readily be carried up to six stories. Each floor would provide an area of 46,000 square feet. It is proposed that building "A" shall consist of three floors, so that the two buildings would provide a floor space of 310,000 square feet. The whole of the "B" buildings, of two stories each, would provide a floor space of 144,000 square feet, giving an approximate total of 450,000 square feet. When, earlier in my evidence, I spoke of a floor space of, roughly speaking, 500,000 square feet, I had in mind the possibility of building four or more stories in the case of building "C." There is no reason why store "A" should not be of four stories. When we were discussing this matter, we found that there were two schools of thought. One section thought that all these ordnance stores should be on the one floor level, while the other considered that we might go up to six floors. We induced the two schools to compromise on a three-floor building. I do not know what Major Hudson's views are. You tell me that he favours one-storied buildings. We were put in touch with Mr. Wakeman before Colonel Wilson returned, and had to be guided by his views as those of one who, to us, was really the higher officer. Mr. Wakeman had been nominated by the Defence Department to consult with us, and we looked to him as representing the Department. As to whether it would be better to begin with the building of "A" and portion of "C" building, or with the "A" building and portion of the "B" stores, I should say that, if the Department intends to develop this as a big sectional dépôt, we should proceed with the "A" and "C" buildings, otherwise the erection of building "A" and one or two of the "B" buildings would meet requirements. In any event, it would be necessary to erect one of the "B" buildings as a

sea transport depôt. I refer to the most northerly of the "B" buildings—that shown on the plan as fronting Augusta-street. The high-level railway would tap that building, but it would not be a good tapping. The "B" buildings ought to have a railway and a platform running alongside, and, in addition to that, any tapping of the northernmost building fronting Augusta-street should be on the west level, and not on the first-floor level. I wish to make it quite clear that the scheme plan is not put forward as a building plan, but merely to disclose what are the developmental possibilities of the site. The shape and size of the buildings shown on it may be modified to meet specific requirements before the scheme is carried out. You ask whether, if the present requirements of the Defence Department in Sydney amounted to 200,000 square feet of floor space, it would not be wise to erect the "A" store of four stories, which would give 168,000 square feet, and one of the "B" stores, giving approximately 40,000 square feet, provide for the artisans' workshops and luncheon rooms outside the main building, and bring in the railway as proposed in the original plan marked red, but on the lower level, the line to come in on the western side of store "A" and with a turn-table in the centre, so that any further stores, if erected, could thus be served. If the Department wanted 200,000 square feet of floor space at the present time, I should see no objection to adding an additional story to building "A." There could be no objection to four floors. As to the wisdom of building one of the "B" stores, as you suggest, that would depend on the purpose for which a building was required. A "B" store might be set down for certain functions which do not require a low-level railway. It might be used for housing such categories of stores as would be sent out by lorry. Stores for delivery in the metropolitan area, for instance, might well be handled in that way. If the category of stores for which a "B" building was required demanded railway platforms, the cost of carrying on the siding from the railway boundary would be involved. The cost of a railway siding on the west side would be comparatively small. I am informed that the Railways Commissioners intend to bring a siding to their sleeper yards, which adjoin this property. That would mean that we should simply have to incur the cost of an extension from that point. Coming to the question of the two levels, the reason for adopting the upper level was to prepare for a railway platform connexion with building "C" without going to the cost of cutting away the sandstone formation extending up to Charles-street. Further, the general level of the floors in building "C" evolved from the contours of the ground by which cart loading platforms were given on the lower level, the ground floor level, and the first floor level. To put forward a scheme which would not develop railway platform connexion to building "C" would be to disregard efficiency. To get a railway connexion and a platform to building "C" we should have to cut away the whole of the sandstone hill, in order to bring our building down to the required level. We must have regard to the development of the site. I have always considered building "C" as likely to be in the future the most important on the site. One of the reasons for not developing the whole site at the present time is that the part on which "C" is proposed to be erected is occupied by houses. There is a shortage of housing accommodation, and we do not wish to interfere with these, from which the Department is deriving rentals. We have, therefore, tried to avoid making building "C" the first to be erected. If we designed a plan for a low level for building "A," it would be most difficult to come in with a future railway on a higher level from building "C."

The Committee may be interested to learn that the proposition for a low-level siding branching off and running along the western side of the proposed building "A" was considered at the outset. I have here a plan which I prepared at the same time that the preliminary sketches were drawn. It was prepared, amongst others, when I was first considering the scheme. I was striving to determine the possibility of constructing two parallel railways, one on the east of building "A," and another on the west. There were two difficulties in the way. One was that the approach would not be a good one—we should either have a down gradient from the present railway system, or would have to carry it a long way back. I do not think the Railways Commissioners would care for a gradient of anything more than 1 in 200. That is the gradient at which a truck will not run away. The other disability—and this is most important—was in regard to the development of the greatest possible amount of floor area in direct touch with the platforms without the intervention of lifts or chutes. I had in mind the school of thought that favoured single-floor buildings. Where you can get a direct connexion on the horizontal between any floor area and a railway you have really a single-storied building. In this scheme we have two single-storied buildings, one single story with the lower level line and the other with the upper level railway. With the scheme as now proposed, the amount of floor area having direct connexion, on the horizontal, with railway platforms is 274,000 square feet. We thus have the equivalent of a single-story building, whereas if the alternative of the two parallel sidings were adopted, we should have a floor area of only 250,000 square feet. In other words, by this means we obtain 24,000 square feet more of single-story building space or its equivalent. Under the scheme which we propose it was always proposed that we should connect the first of the "B" buildings with the first floor of building "A," so as to secure direct connexion across. If we ran the railway across to the "A" building, and later on built the "C" building between "A" and "B" blocks, we could not have that direct connexion, because a locomotive would not go under. It must be remembered that I was working on the idea of having two floors on the low level. Another reason that constrained me to abandon that proposal was that even if a siding parallel to building "A," on its western side, were carried through, it would not do away with the necessity for a siding which would run along and develop the building having a harbor frontage. I was afraid that if I did not develop the building on the harbor front—not on the canal front—the scheme would have certain shortcomings. In the circumstances, I determined to submit to the Defence Department the scheme now before the Committee. I do not agree with your view that under this scheme, if it were desired to load for an inland destination goods from "C" store and a "B" store, those goods would have to be brought over by lorry to the railway truck or the truck would have to be shunted back to the beginning of the siding and then on to the lower level. Under the scheme I put forward the whole of the first floor of building "B" would become connected with the "A" building platform, and any stores which the Department had to take out of building "B" to put on to the railway trucks for inland loading would be dealt with on the "A" siding. There would be no necessity to take the trucks round to the western siding. The section I have shown is only diagrammatic. We did not lay out the position of the jetty, but I assume that the jetty would in course of time be developed from the foreshore east of the Long Cove Canal. I did not plan that, because we had no information as to what would be the future requirements. All that I attempted to give was the development of the site itself. The Public Works Department

has a wharf on the western end, and the State Railway Department has also a wharf there. I think, however, that there should be an independent gun wharf. You ask whether, assuming that the buildings marked "C" were not required for many years, it would be possible to serve these buildings with only a low-level railway, with a turntable worked by electricity, instead of having a high-level and a low-level railway. I would still advise having the two levels, since it would develop the greater floor area. In this case, I do not think a turntable would be a very attractive proposition. It would occupy a large area, and is somewhat cumbersome for quick transit. If a low-level line were brought in on the western side of building "A," it would still be possible to bring in a high-level railway on the other side. I think, speaking offhand, that it would be feasible to bring in a line on the lower level with the idea of some day in the future altering the line to the upper level. There would be some difficulty in the way, but it would not be insuperable. The saving in this would be the cost of the earthworks for a considerable length of the siding, as proposed by my plan. It would be a great advantage to have the two lines coming in, since in time of stress the Department would have two stores from which it could get its material away by rail. I think it would be seldom that you would have two shuntings in peace time. In drawing out our plans, we had regard to the provision to be made for an emergency. Even assuming that the average quantity of stores, outwards, in a year at present were not 4,500 tons, as you say it is, but 3,500 tons, we should still have to provide for emergencies. My staff experience guided me as to what I should try to accomplish in respect of an Ordnance Depot on this site. I think it is wise to have a wide platform to meet the functions required of it. We have provided for 18-ft. platforms. In my first sketches, I showed 20-ft. platforms, but in the evolution of the scheme I brought them down to 15 feet and finally up to 18 feet. Bearing on that point, I might mention that I now have some plans which Colonel Wilson sent from the United States. We did not plagiarize them. We had prepared our scheme when we received them; but in discussing them subsequently I noticed some similarity between ours and those of Rock Island. There they have adopted the 18-ft. platform. The Rock Island warehouse plans are interesting only as disclosing the American notion of what should be the design of buildings for this purpose. It has been suggested by Colonel Wilson that chutes should be provided, and I think we can arrange for those chutes to deliver direct into the trucks. One can do almost anything with them. These plans were prepared before Colonel Wilson returned, and in submitting them to the Department I pointed out that any appliances suggested by Colonel Wilson could be provided for. Chutes or any other appliances can be provided for. We could not have electric trucks on the railway platform, and I do not think I would recommend the use of trucks for the loading of road vehicles on the road side of building "A." Coming to the question of lifts, the system that I had in mind when these plans were prepared, and even as far back as when the Darling Island scheme was prepared, was that goods should not be handled in the lifts themselves. That process means a waste of time on the lifts, and, perhaps, a waste of time on the part of men going up and down in the lifts, both of which contingencies should be avoided. It is a fundamental principle that all goods should be dealt with by mechanical trucks, which can be run into the lifts and run off again to the points at which the goods are to be loaded. The men should need only to collect their stores on the trucks and place the trucks in the lifts, so that there may be no delay. This has a bearing on the question as to the time that is going to be involved when mobilization and a quick

discharge from the Ordnance Store are necessary. With the provision of these trucks running into the lifts themselves, the bringing of vehicles right up to the lifts is of secondary importance. I have not seen electrical trucks at work, but have examined drawings of them. Mr. Murdoch, I think, saw them at work in America. I am inclined to think the requirements of these stores will be better met by the use of a large number of ordinary trucks rather than by the installation of electric trucks; but I am not expressing a definite opinion on the subject, since I have not worked it out. A large number of the trucks would be simply pushed or pulled.

208. *To Mr. Mathews.*—The drawing or pulling of a truck on a concrete floor would not involve much labour. We shall have concrete floors in the stores.

209. *To the Chairman.*—The floors of the platforms will be of wood. In the case of rough timber floors the pushing of a truck would involve a far greater effort. I would not say that the electric trucks are not the best, but they involve the use of electrical plant and accumulators, and with me accumulators, where their use can be avoided, are almost anathema.

210. *To Senator Newland.*—One phase of the question of installing lifts, and as to whether six 3-ton lifts will be more than the work demands, is the consideration of normal peace-time working. The other matter which must be kept in mind is the requirement of quick despatch in emergency. Mr. Wakeman has stated that the small-arm ammunition should be kept on an upper floor; it would occupy considerable space—I think two bays of the upper floor. That might mean considerable loads, so far as weight is concerned, to be taken down on the lifts. Undoubtedly, a large equipment of lifts would facilitate rapidity of despatch. As to the actual load upon the lifts, we were advised that 3-ton lifts would do, and should be installed. I understand that the loads set down for carrying in lifts are now very much less than would require lifts of 3-ton capacity. But that consideration, again, depends upon what system is adopted for the handling of goods. Colonel Wilson, when he came back, indorsed the principle of loading trucks upon the floors and despatching them by way of the lifts. The lifts are designed for cages with platform area of 14 feet x 8 feet. With that size cage, should there be a stress of activity in any one portion of the building, you might get a considerable load on by running in three or four trucks. One could not suggest putting in to one bay a 3-ton lift and into another a lift of less capacity. The lifts must be capable of carrying the utmost load liable to be put upon them in time of stress. I have examined some American drawings, and have noted that they have installed lifts of a floor space of 15 feet x 8 feet. I think their ideas generally must have been the same as those which I am now citing. That is to say, that they installed the system of trucks, and would load them and run them into the lifts. The whole problem was investigated by my branch upon the basis of the 3-ton lift. If I were told that it was not intended to store ammunition to any extent in these stores it would alter my views with respect to general utility; but, taking a broad view, I still maintain that we should build on the principle of general utility for all time; and thus, to preclude the future storing of small arm ammunition in such a building, might prove a great mistake. Once we admit the necessity for installing a lift with a cage floor of 14 feet x 8 feet, so as to get trucks into them, we must at the same time admit the possibility of the full load of the trucks which can be got into the lifts having to be carried in those lifts. It is no use putting in a large lift and then curtailing its possible capacity of usage. In considering the question of the power required for the lifts there is involved the matter of judgment as to what capacity one should

allow in the lifts. I understand that it has been stated in evidence that the quantity of stores in and out would be about 9,000 tons a year. To deal with such quantity in normal times I would not favour putting in lifts of such capacity and design as have been proposed. The question of goods in and out was considered in consultation with Mr. Wakeman, but in my opinion that is not the dominating factor. The whole point is the question of maximum demand. Upon the question of power the first idea of the Department was electric power. Subsequently the Mechanical and Electrical Engineers together drew up a report based upon both aspects of the whole subject, and in which they concurred. The result of their deliberations was to advise the installation of the self-contained hydraulic-electric lift. I have a document before me which indicates how they arrived at their decision. One of the principal factors was the capital involved in the two schemes, assuming that those capital costs would bear interest and that they should be considered in ascertaining annual costs. They worked upon a basis of a load of $1\frac{1}{2}$ tons—that is, for a 3-ton maximum load, and an unbalanced load of $1\frac{1}{2}$ tons. The capital cost of the electrical proposition was £12,000. The capital cost of the hydraulic, or the hydraulic-electric system, was £9,000. That is, exclusive of lift enclosures. One of the principal reasons for the high cost of the electric installation is the cost of the motors for the six different lifts. The running cost in the two cases, and using current at 2d. per unit for the hydraulic-electric per run, was .216d.; and for the electric, .26d. But when it comes to the maintenance costs, the cost of the electric lifts—which includes rope renewals, oil waste contacts, labour, inspections, and adjustments—worked out at £305 per annum. But for the six hydraulic-electric lifts of the counterbalancing type, the sum—including rope renewals, oil waste belts, packings, &c., labour, inspections, and adjustments—works out at £215 per annum. Therefore I am advised that on the basis of the loads proposed for these lifts the hydraulic-electric self-contained proposition is the cheaper. There are other advantages with the hydraulic-electric lift, and on the whole it is a proposition which under stress is more likely to give complete satisfaction. That is from two points of view, one of which is certainty of running; namely, that with a 3-in. ram the sources of failure are small. And with the wire-rope lift, depending entirely upon the electric motor, you have an element of risk of disability. There is more of such element of risk with the electric lift than with the hydraulic-electric lift. It would undoubtedly mean periodical inspections and the employment of an operative in either case to run the lifts. But the amount of maintenance necessary would be to some extent reduced by having the type of lift such as is favoured, where the water is used over and over again, in distinction to a lift from a hydraulic main where the water is used only once. The packing that is put into the hydraulic lift lasts a long time; and the use of water with soft soap facilitates the running. But if there is any question of working on a smaller load my figures, of course, would have to be revised. There is the cost of the motors for operating the wire ropes, and a reduction there would reduce the interest upon capital. I am told that the hydraulic-electric type of lift has been adopted in the *Age* office. They had electric lifts there, and have now replaced them with the hydraulic-electric. The firm of Paterson, Laing, and Bruce Limited have the self-contained system also, and are running seven of them. I believe that they had the hydraulic lift before that. Messrs. Buckley and Nunn have thrown out their electric-lift system and have put in the self-contained system; they employ four of them. Ackman's have three of them. In Sydney, Anthony Hordern and Company, I understand, have fourteen of them working in their emporium. In most of those cases I do not

think the loads would be 3-ton lifts. The lift is worked like an ordinary hydraulic lift. Although you waste a volume of water, whether it is a 3-ton lift or a 15-cwt. lift, the same amount of water under pressure is used, and it would be a matter of judgment whether for the actual annual cost of that water or extra current we would be justified in curtailing the possibilities of the lifts during periods of stress. As to whether it requires as much water or power to send this type of lift up empty as if it were loaded, I might mention that with the hydraulic lift the amount would be exactly the same. That is the great bone of contention between advocates of the hydraulic and of the electric system. I am asked, in the matter of enclosing the lifts in fireproof walls, whether it would be better if they were built on the side of the building rather than in the centre. From the fire-risk point of view I cannot see very much advantage to be gained in keeping the lifts to the sides of the building. I think it would be better to construct on the outside wall unless such a type of lift were installed as would require us to break through the roof. Where the lifts are proposed at present it would not be necessary to break through the roof for the overhead gear. If we built at the side of the building we would have to break through the roof. As to the matter of two doors being required with the lifts in the centre of the building, there is compensation in that very fact. The central construction of the lifts certainly means breaking up the floor areas rather more than would be the case by having the lifts at the sides. The hydraulic gear would be all on the ground floor, while on the top there would be the counterbalancing pulleys. With the electric system, to avoid wear and tear on the ropes, it is considered better to place all the gear above, but it could be installed at the bottom. If the electric type of lift is installed and built at the side of the building, it would again cost more to put the whole of the gear at the top of the building. As to the question of installing chutes, or of substituting a certain number of them for a certain number of lifts, it would depend on the class of goods to be put into the store. I would favour putting in chutes if the goods were suitable for them; and I feel sure that the chutes could be made suitable for most of the goods which would be handled. The advantage of the chutes, of course, is the quick despatch outwards. If there is any consideration of putting another floor upon the proposed stores the area of floor space per lift would be more than is provided, according to the blue prints which I have studied, with regard to the Rock Island scheme. But if the total of lifts is reduced to four, then, with the three floors, we would be providing more floor area per lift than they have at Rock Island. There is one possibility about these lifts, that if it is considered that four were sufficient to carry on, we could plan so as not to put in the full eventual number of lifts straightway, but so that they could be installed if developments warranted it. I am informed that it has been stated in evidence that a floor space of 320 feet x 60 feet would be required for an armourers' store. I may say that it was thought that all that would be brought within the buildings proposed. There is an earlier plan in which I provided for a workshop, but that was abandoned in preparing the present scheme, as it was considered that it might all be brought within the four walls. It is far better to have the armourers close to the small arms racks. I believe that even with the areas which have been stated to be required it is again a matter of judgment as to whether it would not be better to propose a type of building—that is, one structure to provide the whole of the additional storage necessary—than to put up independent buildings for various purposes, which would be only bad fire risks. As for the matter of quarters for the employees, that question may be taken

into consideration on the point whether they could not be accommodated within the building itself, but having them cut off from the remainder of the building. Reverting to the question of lifts, our first plan was to construct them on the outside wall; and it was only after three discussions where we were told what would be the functions to be performed on the various floors near the lifts, combined with the idea of using trucks instead of loading the lift cages themselves, that I came to the view that we should use the inside lifts instead of the wall lifts. But it is a very moot point, and I do not think there would be much difference in cost. I should say, indeed, that it is a matter for the military authority to come to a conclusion upon as to whether the centre or the side would be the best position for the handling of stores.

211. *To Mr. Laird Smith.*—As to the question of the advantages claimed for the lifts proposed over the installation of up-to-date electric lifts—where the work has been done by a reputable firm, which gives guarantees for given periods—I may say that quite apart from maintenance costs, the running cost of the hydraulic-electric self-contained lift would be lower than with the electrical installation. Upon the question of efficiency and security against failure and break-down I hold that the self-contained hydraulic-electric is the surer proposition. I am aware that in his evidence Mr. P. A. Fildes made the following statement:—

“I could not say offhand what would be the difference between the cost of running a lift with a capacity of 30 cwt. for some hours, and that of running a lift with a capacity of 3 tons for the same number of hours. I would have to ascertain what was the cost per run. But the 3-ton lift would cost more than double the other.”

Personally, I cannot say why it should be more than double, because the capital outlay is not going to be more than double. To answer that question adequately, it would be necessary in the case of both the electric and the electric-hydraulic lift to analyze the capital cost of running expenses. I shall endeavour to furnish that information. To arrive at the maximum amount of goods that each lift could shift per hour from the top of a building, it would depend entirely on whether we adopted the truck system or loaded into the cage direct. To load on trucks and run them into the lift would be quicker than to load the cage floor. If the truck system is introduced the lift is capable of many more journeys per hour. The power employed for driving the hydraulic-electric lift would be an electric motor supplied from the main. The water would be drawn from the ordinary water supply main. The charge for water under this system is practically negligible. I do not think it would be necessary to have an engineer on the works to supervise the hydraulic-electric lifts. Occasional inspection should be sufficient. I am asked whether the installation and cost of running the hydraulic-electric system would increase to any great extent as one ascended. If another story were built the capacity of the accumulator would have to be increased, and, of course, the depth of the holes for the rams and cylinders would have to be extended. But the increase would not amount to any very great sum for an additional story. I strongly favour the system of handling goods in trucks and running the latter direct into the lifts. As to whether it would be an advantage for the Commonwealth Government to house the employees within reasonable distance of their work, I do not know the locality well enough to state what land and houses are available; but I should say that it would be wise to avail oneself of them so far as they

will go. I understand that there will be fourteen or fifteen buildings available on the site taken over. As to whether it would be an advantage to have a certain portion of the stores set apart for packing and unpacking, my idea has been that each floor should have for every class of goods a certain space allowed where packages could be made up. But if a general class of goods were to be cased that would be done upon the ground floor.

212. *To Mr. Mathews.*—I am asked whether it would not be rather an expensive proposition to retain the Darling Island store to accommodate goods which would not be frequently handled. In answer to that I might state that if it is not wanted for important Commonwealth purposes a good price could probably be obtained for the Darling Island site. But before it is got rid of it should be fully considered that there is a difficulty in getting any sites in Sydney to-day adjoining both railway and the water. Some day there may be urgent need for despatch of stores by water. It may be necessary for air-craft or their parts or supplies, or stores for air-craft, to be shipped with all haste for Pacific operations. The possession of a store with a water frontage as well as with railway facilities is always a great advantage, and it might be considered highly important for the authorities to secure and retain adequate water and railway frontages. From that point of view it might be wise, perhaps, for the Commonwealth to retain the Darling Island store. Undoubtedly, it will be very difficult in future to secure a site in Sydney with both rail and water frontages. In the future there may be much greater call upon sea transport of ordnance than has been the case during the war just ended. I am informed that it has been stated that with store “A” fully occupied, and building “C” also fully stored, under working conditions the double line of railway would not be sufficient. And I am asked, further, whether there has been sufficient room left to permit of three or four lines of railway in all to be constructed. With regard to that, we could shift building “A.” It should not be forgotten that all the stores will not be coming and going by rail. There will be the considerable factor of motor transport by road. In the original plans I showed three lines of rails. It was after railway consultation that the project was cut down to two sets. They told us they could handle the traffic as well with the two lines. It would be possible to put in cross-overs from one line to the other so as to facilitate traffic at the stores, but a traversing table would be a very useful provision. That would be worked by electricity. To construct a third track of railways it would be necessary to move building “A” a certain distance westward. It would possibly mean curtailing the size of building “B”; you could get practically the same floor area, although the building were constructed 20 feet smaller. I will consider further whether the two rail tracks are considered sufficient for the stores.

213. *To the Chairman.*—I am informed that my estimate of £12,000 in the case of the electric lift as against £9,000 for the hydraulic-electric installation is very much in excess of estimates furnished to the Committee. In the matter of the proposal for installing 30-cwt. lifts, and as to the cost of installing electric lifts and maintaining them, I will furnish a schedule showing each item of cost for a 3-ton lift and for a 30-cwt. lift.

214. *To Mr. Laird Smith.*—In the matter of suggested additional railway accommodation, if it were deemed necessary to construct another line there would be no engineering difficulty in coming off the main road at the low level.

(Taken at Melbourne.)

TUESDAY, 10TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,	Mr. Mathews,
Senator Needham,	Mr. Sampson,
Senator Newland,	Mr. Sinclair,
	Mr. Laird Smith.

George Townsend, Commissioner of Patents, Commonwealth of Australia, sworn and examined.

215. *To the Chairman.*—With regard to the system of reinforced concrete construction proposed to be used in the erection of the Ordnance Store at Leichhardt, it is understood that royalties were collected by C. A. P. Turner in the United States of America for the use of American patents for a similar system of reinforced concrete construction. The use of Turner's American patents was ultimately held to be an infringement of a prior patent in the name of one Norcross. So far as can be ascertained from a perusal of the American abridgments, Turner's patents in America corresponding to his Commonwealth patent No. 7296 of 1906 are as follows:—Turner, 985199 and 1003384. The Norcross patent, which was held to have been infringed by the use of the two Turner patents, is:—Norcross, 698542. A report of the case wherein the use of the Turner patents was held to infringe the Norcross patent appears in the *Federal Reporter*, vol. 219, p. 188. Turner's Commonwealth patent, No. 7296, is dated 7th November, 1906. Norcross' American specification, No. 698542, referred to as having been infringed by Turner's American patents, was published in the Public Library, Perth, Western Australia, on the 7th May, 1904. I wired to Perth to ascertain these particulars. That is the only place where the recent American specifications may be seen. We have not got them here. That is all the information I have to furnish. We have not the full specifications in these matters, but we have the abridgments, and I will hand in copies. Turner's patent is registered in Australia, and is still in force. A renewal fee was paid in 1913, and it ceases on 7th November, 1920. There are two other patents, but they do not appear at present to be concerned in this matter at all. Those are No. 1799/1911 and 19558/1910. The first expires on 19th January, 1925, and the other on 5th October, 1924. As I have pointed out, however, they do not appear to be concerned with this other patent.

215A. *To Mr. Mathews.*—Turner's patent was objected to in the United States. There was a case at law, and the use of Turner's patent was held to be an infringement of Norcross' patent. That had no effect upon Turner's patent in Australia. Since Turner registered a patent in Australia in 1906, that protects him up to the date mentioned in 1920. It is good at law until upset. Although the Courts of the United States deemed Turner's patent to plagiarize the other, it holds good in Australia until the same conditions obtain here as in the United States; that is to say, until the Court upsets it. The fact that it was declared invalid in the United States would not make it invalid here. It is all a question of what the evidence is. The same facts may not obtain here as in the United States.

216. *To the Chairman.*—His patent holds good until some one contests the claim, and then it goes before the Court.

217. *To Mr. Sampson.*—When application is made for a patent of this character—any application, in fact—it is referred under the Act to the examiner, who makes his report. He searches the State and Commonwealth records, and, if he has it within his own

knowledge that the application is not novel, he quotes that authority also. Then it is open for opposition for three months. Any member of the public can oppose it, and a decision is given on the evidence. Those are the safeguards. Our investigations are made prior to the public coming in. It is examined before it is accepted, and when the office expresses willingness to accept it, there is a three months' period in which the public may step in, after which, if everything is all right, a patent is issued as a matter of course.

218. *To Mr. Mathews.*—There has been no opposition to the registration of this patent in question.

(Taken at Melbourne.)

WEDNESDAY, 11TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson	Mr. Sampson
Senator Needham	Mr. Sinclair
Senator Newland	Mr. Laird Smith.
Mr. Mathews	

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

219. *To the Chairman.*—Through the Director-General of Works the requirements with respect to lifts at the proposed ordnance stores, Leichhardt Park, were indicated; that is, as to their number and load capacities. The size of lift suggested is 14 feet x 8 feet, and the maximum capacity 3 tons. As to the method of driving, consideration was given concerning using power available. Hydraulic power is not available, but electric power is, at 2d. per unit, from the Balmain Electric Supply. No other power is available, nor was it proposed to instal any local power plant. Consideration was then given as to the best and cheapest method of driving the lifts, and comparative estimates were prepared using the electric power at 2d. per unit—and either using the electricity direct or of putting in, with electric drive, a hydraulic service. Alternative estimates were prepared regarding the two methods. The costs worked out thus:—Direct electrically-driven, 3-ton lifts, initial cost £11,880. Using the intermediary of hydraulic pumps, driven by electric power, the initial cost for 3-ton lifts worked out at £8,920. In round figures, the totals are £12,000 as against £9,000—a difference in the capital cost of installation of 25 per cent. The amount of energy used was also considered, and the amount of upkeep, and I present a list showing the capital or initial cost, the cost of energy used, and upkeep and maintenance cost for 6 3-ton lifts and 6 1½-ton lifts. Inspection of this table will show that the 3-ton electric lifts would cost initially £11,880, and the electric hydraulic £8,920—as I have just indicated. The cost of energy for a journey in either of those cases is approximately the same—.26d. direct electric, as against .22d. using hydraulic intermediary. But the upkeep and annual costs vary. In the case of the electric the total would be £305, as against £215 for the electric-hydraulic lift. There is a difference there of capital cost for 6 3-ton lifts amounting to approximately £3,000; and with regard to the inspection and upkeep annual cost, a difference of approximately £100; whereas the actual current used in either case is practically the same—a difference of between ½d. and ¼d. per journey. I also submit on the same statement comparative figures for 6 1½-ton lifts. The initial cost of 6 electrically-driven lifts would be £10,200, and for 6 electric hydraulic lifts £7,680. The cost of

energy per return journey is approximately the same, namely, .16d. and .13d. The upkeep and annual inspection costs would be £265 as against £200. That does not include interest on capital. All these figures make no allowance for interest upon capital. I would have prepared particulars with regard to that but that I was not aware what the Committee would regard as the basis for the value of money. Taking it at 6 per cent., however, in the 3-ton lifts it would be necessary to add another £180 to the cost of the electric plant, and for the 1½-ton electric it would be necessary to add, roughly, £150 per annum. In making these comparisons the conditions taken were that the lifts would operate between each of the three floors, having a total travel of 20 feet, and with a carrying speed of 60 feet per minute, which would be quite sufficient. In other words, it would occupy one-third of a minute for the whole travel. The pumps installed in the electric-hydraulic lifts would be each capable of operating 1½ lifts in an upward direction continuously, and the accumulators have a sufficient capacity to operate four lifts for the one upward journey without the use of the pumps; so that with the accumulators charged, and with the pumps working, 5½ lifts could be simultaneously going upward. That gives an idea of the capacity of the plant. For continuous operation the pumps would be capable of supplying sufficient water for six lifts to enable them to make one journey in a little over 2½ minutes, or at the rate of one car each 26 seconds. And the total lift capacity at that rating amounts to 360 tons per hour. That gives the full capacity of the plant. Of course, that is much in excess of what the average conditions would be, but it shows what a simple plant would meet if desired for a rush in time of stress. The average time of each return journey, including loading and unloading, is estimated to be between ten and forty minutes. That is, the time would vary between those two limits, so that the pumping and accumulator capacity would be more than ample for the service required. It was the difference in capacity cost that I then submitted to the Director-General, that in the case of these stores and for this particular application, apparently, the electric-hydraulic lift was the best proposition. It was a matter of keeping down the capital cost and of the annual cost being less. I heard no mention of the Defence Department going in for a scheme of electric power within the buildings themselves for the handling of goods. I am given to understand that why the authorities wanted these very large lifts was that they would have electric trucks—the idea being that they would fill them and run them loaded, by the use of electric power, to the lifts; and then they would take them into the lifts, take the trucks out at the floor required, and then run them round that floor under electric power. It would make no difference in the matter of the lifts themselves whether that system of electrically-driven trucks was adopted in the stores or not. We are using electric power in the proposition which I favour, but in an economical manner. My idea is to reduce the capital cost. Instead of having six independent motors, each, say, of 16 horse-power capacity, and their six cars, each capable of lifting 3 tons, by installing the hydraulic-electric system it would be possible to run the lifts with two 16 horse-power motors. There would be six rams and two accumulators, and this system would not be increasing the cost of current for carrying it on while at the same time the cost of maintenance would be reduced, while it would give just as efficient service. The question of the use of electric power within the stores for running the trucks would not be a factor for consideration. In any case, electric power would be required for ordinary power and lighting purposes within the buildings. My estimates regarding the cost of electric lifts have been very carefully revised, and I have carefully gone

through my figures again. If anything, I think they are in both cases cut very fine. Probably the figures with regard to the electric lifts are cut the finest. Lifts upon the same principle as that which I favour are working in several buildings in Melbourne to-day, also in Hordern's emporium in Sydney. I inspected those latter lifts in company with the engineer, and was very much impressed with the system. The advantage over the ordinary hydraulic principle is that you can use water with a soft soap solution without any grit or tendency to rust the parts. What you get really is a medicated solution which is used over and over again, and thus troubles are reduced to an absolute minimum. But to me the main appeal of the hydraulic-electric principle is the reduction in capital cost. In all of my statements and estimates the factor of efficiency is not being overlooked. I am satisfied that the one is just as efficient as the other. With the hydraulic-electric system there would be no waste of water. As I have remarked, you would use the same over and over again. One must take care that it is very clean and well oiled water, after which such troubles as are known with ordinary hydraulic lifts are practically eradicated. I understand that Messrs. Buckley and Nunn are working four of this type of passenger lift. I am not acquainted with their capacity. Paterson, Laing, and Bruce Limited have seven of them, and Ackman's have three. I understand that all these latter are of the passenger type. I am informed, also, that the Age office has done away with an electric lift for goods and replaced it with an hydraulic-electric. At Hordern's this type of lift was in use both for conveyance of passengers and carriage of goods. There were, I think, twenty-one lifts in all. I am informed that an objection stated by a witness with respect to this type of lift, running in the Royal Bank, Sydney, is that it was very noisy. The only possible noise would be from the pump, and I should say that if that was properly maintained there should be no inconvenience on the score of noise. The ram and cylinder, cage, ropes, counter-pulleys, weights, pumps, accumulator, &c., are all of standard pattern, and I am not at all in doubt as to the efficiency and general satisfaction which this type of lift would give. It is not a novel principle. I can remember numbers of lifts hydraulically driven, having a belt-driven pump, say, from a gas engine. The introduction of the electric-hydraulic lift is not recent. Those installed at Paterson, Laing, and Bruce's have been going for about seven years, I believe. I can remember lifts worked on the same principle for probably twenty years. It was quite common once to work lifts from the ordinary water pressure, and to have as a stand-by a gas engine in case of failure of the water supply or lack of pressure. The hydraulic lift, in many cases with the ordinary pressure from the street mains, was formerly the class of lift generally installed. At present the more generally used lift is the electric; but the whole proposition varies with considerations of height of lift and capacity. With a low lift, say, of one or two floors, and hydraulic power available, I should say that the hydraulic system would win every time. But in the case of a tall building, say of eight stories, the electric system would probably be the better proposition. I understand that evidence was given in Sydney to the effect that the majority of the lifts there were electrically driven. That would be the case, seeing that the majority of the main business buildings are tall; and when you get beyond a certain height of building, I should be inclined to say "electric every time." I am asked to consider that the proposed stores might be erected at some time to a height of six floors. I think that for a six-story building, the same type of lift as I now favour would still be in the running. If the Committee saw fit to recommend that the building

"A," as proposed for the Leichhardt Stores, were constructed of four stories, my recommendation would stand; but in that case there would be an addition, say, of 10 per cent. to the figures concerning initial costs. That would hold good for each type of lift. I mean to say that the schedule as I have presented it would stand, plus 10 per cent., for one other floor. However, I might amend the design to suit that circumstance. For the three-floor building I propose the ram sunk in the ground, but for a store of four floors it would be wiser, probably, to bring the ram and cylinder on to the surface and place it in the lift well. I am asked to assume that the Committee recommended that three or four lifts should be installed at this stage, and that the building should be so constructed that further lifts might be put in should the circumstances warrant. That would not affect the design or the type of lift. With either type of lift an extension of the number of floors could be provided for quite readily. In the event of the lift being constructed against a wall of the building, instead of in the centre, breaks would have to be made to the roof—I am given to understand. That circumstance, however, would apply less to the hydraulic-electric than to the electric lift. With a 10-ft. floor to ceiling height on the top floor it would be quite easy with the hydraulic-electric lift, leaving the space which we generally like to leave, of 3 feet in the clear. You could so place the sheaves and pulleys with the hydraulic-electric that there would be no interference with the roof. But with the electric lift it would be more difficult, although I do not say that it would be impossible to erect it without breaking through the roof. In the case of the electric lift, it would be necessary to put the machinery further inside the building and try to drive direct over the lift, keeping the machinery well back in the building, where the difference between the ceiling height, or roof, is more considerable.

220. *To Mr. Laird Smith.*—The question of fixing the maximum carrying capacity did not come within my purview. It was arrived at in conference between officials concerned, and the decision was given to me. I am asked, taking into consideration the floor space available for storing goods, whether I think there is any necessity to have within a building of this character six 3-ton lifts. My reply is that it is good provision. Taking into consideration the quantity of goods to be stored, and the necessity for emergency work at times, I should certainly consider the placing of the heavy goods on the ground floor and reducing the size and load of the lifts. And I should consider putting in a smaller number during the early stages, with provision, if necessary, to add to the number of lifts later. The proposed total certainly seems a very large provision. If the proposed lifts were reduced to a carrying capacity of 30 cwt. that would not reduce the installation costs very considerably. It would reduce the cost in the case of the electric lift from £11,880 to £10,200, and the reduction with regard to the electric-hydraulic lift would be from £8,920 to £7,680. I am asked if it would not be practicable to put in much lighter travelling ways for the lifts to work on if the capacity were 30 cwt., and I would say that it would not be practicable in this particular instance. There are only three floors. The travelling distance is only 20 feet, and the reduction does not amount to much. If the building were very much taller such a contention would have great weight. My attention is called to the following evidence of Mr. J. B. Clamp (question 105), as follows:—

Wrigleys use electric power in their lifts. We never advise putting in any hydraulic lift in a high or modern office building or store where the lift is in constant use, as the electric system works out, as far as we can gather (under equal conditions), at about one-tenth to one-twelfth of the hydraulic system as far as the cost of running is concerned.

Of course, a lot will depend upon the use to which a lift is to be put. I have often installed hydraulic lifts, and prefer same when they are only used occasionally during the day. They are very reliable. The electric lift costs more to instal. Roughly, it costs about £1,000, whereas a hydraulic lift would cost only £400 or £500.

I should say that that witness is comparing hydraulic lifts, as supplied from the power mains of the Hydraulic Supply Company, as against the ordinary electric lifts. And in an eight-story building his contention would be correct. The price for water would be some 5s. per thousand gallons. It varies with the consumption, but in the method proposed here the price of water would work out at about 1s. per thousand gallons. That is, using the electric current for your own hydraulic purposes and not taking it from the power mains. I think Mr. Clamp's statement is correct as regards the conditions which he mentions, but he does not refer to the hydraulic-electric type of lift. As I say, he is referring to water purchased from the mains of the Hydraulic Power Company. My attention is now called to the evidence of Mr. P. A. Fildes (question 130) as follows:—

I could not say offhand what would be the difference between the cost of running a lift with a capacity of 30 cwt. for some hours and that of running a lift with a capacity of 3 tons for the same number of hours. I would have to ascertain what was the cost per run. But the 3-ton lift would cost more than double the other.

It works out, with current at 2d. per unit. for the 3-ton electric lift, at .26d.; and for a 1½-ton electric lift, at .16d. The witness is not far out. It is a matter of .16d. as to .26d., or, in the case of the electric-hydraulic, of .13d. as against .22d. I do not concur with his contention. It is a considerable reduction, naturally; but I would not agree that it was even half. Our Department has installed a good many lifts in Melbourne. We have built one having a 3-ton capacity in the new General Post Office, at the corner of Spencer and Bourke streets, for the conveyance of mails to the upper floors. That is electrically driven. I do not think there would be any danger of loading a car with a 14-ft. x 8-ft. floor space, in the case of a 3-ton capacity lift, and of smashing it up. There is always a notice placed inside the car calling attention to the capacity load, and it is hardly likely that the capacity would be exceeded. In the case of the electric lift in the General Post Office building, we carried in it a load of more than the 3-ton capacity. There was no trouble. We can overload a lift very considerably without danger. There is always a certain factor of safety over and above the stated load. With a 3-ton lift I could not imagine that it would be likely to be overloaded at the Ordnance Stores. That would not be the case knowingly, at any rate. But I think that if the capacity were reduced to a 1½-ton lift, and you still kept the same size of car, there would be a danger that the lift might be overloaded. If the 30-cwt. lift were installed it would not necessarily entail a reduction of the size of the car. With regard to electric power attached to trucks, I have seen that system at work in the General Post Office in Sydney, where there were electric trucks conveying the mails around the floors. A truck of that type could carry a 3-ton load, but it would have to be remembered that your floors must be able to sustain such loads.

221. *To Mr. Sampson.*—I have read portions of the evidence given before the Committee in Sydney, and have noticed that several witnesses compared the hydraulic with the electric systems of lifts, showing preference for the latter. I read those comparisons as applying to the hydraulic type—the type securing its supplies from the power mains of the Hydraulic Supply

Company, and not as applying to the electric-hydraulic type as proposed in this instance. I may add that Messrs. William Gardiner and Company, of Sydney, have five lifts of the electric-hydraulic type. All hydraulic lifts are working from their own plant. Messrs. Grace Brothers have twenty-three, and eight or ten also electrically-driven lifts. All the hydraulic-electrics are worked from their own plant. The system is very simple. Instead of having the water supplied under pressure mains from the Hydraulic Supply Company, you install your own pump and accumulator, using whatever power you have available—the cheapest—some such power as gas or steam or electricity. All those lifts which I have just referred to in various Sydney establishments are electric-hydraulic, or are hydraulic with some other method of power driving. I put in some goods lifts in the stores at the King's Warehouse some years ago, where we installed hydraulic lifts, with the water right off the mains. That was because the mains were handy. The lifts were only 10 feet, and it was a question of the low capital cost of installation to put them in in that manner, although the water used was much dearer than if the lift had been electrically driven. At Victoria Barracks the lift is of the electric type, but the current supply is alternating current; and for the better use of the lift we changed it with a motor generator to direct current, using the alternating current for the motor, and changing to direct current and running the lift with a direct-current motor. It is a purely electric lift, with a converter change. In the case of the General Post Office electric lift, that is a proposition where we were able to secure the current pretty cheaply. The building is a tall one, so that the lift proposition there has to be taken as a whole; and, in that instance, with cheap direct electric current available, the electric system works out probably as the best proposition. The point is that the whole proposition in the next building wherein we may install lifts might be entirely changed. The factors are, as to the height of building, the power available, and the load which the lifts have to carry. I should say that at about six stories the factors would begin to become about equal—that is, as between the one system and the other.

222. *To Mr. Mathews.*—With regard to the installation of lifts at the Ordnance Stores, I think consideration might be given to the point whether the lifts are not being asked to carry too great a load, and whether the size could not be cut down. With regard to the point of placing the lifts in the centre or at the side of the building, in relation to the using up of storage capacity upon the floors, I am quite seized of the fact that to construct the lifts in the centre uses up some of the storage capacity compared with building them at the side; but I understand that there is the question of goods going in and out on both sides of the building, and as to whether the best place, therefore, would not be in the centre. If it were my own store, I would very carefully consider the class of goods and the whole of the factors, and try to arrive at the best solution as to where the lifts should be. There is this one factor—that you desire to get your goods in and out on both sides. Then the width of the stores must also be taken into consideration. I would not like to give a definite opinion without going very closely into the whole matter. With respect to fire risk, the lifts should be enclosed, whether in the centre or on the side wall. If they are built on the side there is the advantage that the wall itself forms one of the sides of the lift well.

223. *To Senator Newland.*—The question of providing stairways and fire escapes depends, again, on who is occupying the building, and upon the numbers of employees and the character of the various floors. In this case I do not think that outside fire escapes would be necessary. There are to be two stairways, brick enclosed, and if one should be blocked the other would be available. I am aware that to construct six lifts

and two stairways, all brick enclosed, would mean a great use of available space, and that would be a factor in considering the construction of the lifts in the centre or on the side walls. But if the lifts were in separate shafts alongside of each other, that, I take it, would be a good plan. It must not be forgotten at any time, however, that the stores have to be worked from both sides. To work the six lifts as I have proposed, two pumps would be required, in two batches of three lifts. That is to say, there would be three lifts on the one pump and three on the other; but, again, interchangeable. One should expect scarcely to hear the working of those pumps at all. If the size of the lifts were reduced by half, the space occupied by the lift wells would also be reduced by one-half. One would only build the lift wells to take the type and size of lift installed. I am asked whether, in view of the comparatively small saving between the 3-ton and the 1½-ton lift, of either type, it would be worth while interfering with the suggested size of the lifts. I am quite seized of the fact that it does not amount to much of a reduction on these small 20-ft. lifts. I am asked whether a 3-ton lift loaded to full capacity would add anything to the cost of working. It would not do so. My estimate has been taken as upon an average journey. It is based upon a 3-ton load. It is meant up as averaging over a year, and counterbalanced to 1½ tons. You do not lift the actual 3 tons; you lift 1½ tons. That is a coefficient of .5. I am asked whether the estimate of .22d. is the full cost of a 3-ton lift working at full pressure or an average. It is the cost per journey, carrying 3 tons. In the case of the electric-hydraulic lift, there would be no reduction in the estimate of .22d., working on an average. It would be the same all the time. In the matter of installing chutes, I understand that a lot of the material to be held in the stores is clothing. Judging from the success which has been secured in the postal stores, handling the mailbags with chutes, I should suggest that chutes might well be installed to the greatest extent possible and practicable. It would be well during the course of construction to provide openings for chutes, but if the system were deemed worth installing afterwards, there would be very little difficulty in arranging to cut out the spaces necessary. Of course, it would be better to make provision in the initial stage.

223A. *To the Chairman.*—I am asked whether I think a system of electric hoists might be established so as to serve the first floor from the railway, the idea being to secure greater economy. I should say that for general application in a building of this sort, the lift principle would give the most use. It should not be forgotten that you would be really dealing with three floors. I do not think the installation of some electric hoists would be necessary. I would go for the lifts only. I certainly would concur in the use of electrically-propelled trucks. In a building of this length there should be a marked use for that type of conveyance. I understand that Mr. Clamp, in his evidence, stated that, roughly, the cost of an electric lift would be about £1,000. It would be very difficult at the present time to install an electric lift for that sum. Of course, it would depend upon the size and on the height of the lift.

224. *To Mr. Sinclair.*—With regard to railway connexion, I feel emphatically that the provision of two lines between stores "A" and "C" are necessary. The original proposition was for three. There would be no insuperable trouble in the matter of marshalling. The bridge shown on the plan as being alongside the drain was to give access from Charles-street underneath the railway to the rear of the store. In the matter of constructing instead a level crossing, to lower the line you would have to drop something like 15 feet. Then a level crossing would suit as well as a bridge. I think the level crossing project, in view of the aggregate of traffic, would be quite sufficient.

(Taken at Melbourne.)

FRIDAY, 13TH JUNE, 1919.

Present:

Mr. GREGORY, Chairman;

Senator Henderson,
Senator Needham,
Senator Newland,
Mr. Mathews,

Mr. Sampson,
Mr. Sinclair,
Mr. Laird Smith.

Percy Thomas Owen, Director-General of Works, Department of Works and Railways, recalled and further examined.

225. *To the Chairman.*—Mr. Hobler has put in a plan of a proposed railway which shows the immediate approach to the stores on a gradient of 1 in 100, with a down-grade to the lower level platform, and an up-grade to the upper level platform. The grade is 1 in 100 from point E to point F on the upper, and from point E to point G on the lower. I look on that as a disability for both platforms. The plan of Mr. Kendall, Engineer-in-Chief for Existing Lines for the New South Wales railways, gave level sidings outside the platform lengths from E right through to the buffer-stops. In my discussions with him, I understood that the handling of trucks would be done on the tracks outside the platform area. A truck will not stand on a gradient of 1 in 100. It should not be less than 1 in 200, if a truck is not to get away when it is left. Mr. Kendall's scheme for the levels outside the platforms is much preferable. Mr. Hobler's way of getting over it is ingenious, but I would certainly put that down as one defect. Mr. Hobler has introduced a 7-chain curve. I do not know whether the Railways Commissioners would agree to that. Mr. Kendall, to the best of my recollection, wanted an 8-chain, but they might agree to 7. It is feasible to carry the tracks in the way Mr. Hobler has shown, but I do not think it will give so satisfactory an arrangement for the handling of the trains adjoining the platforms. On the general principle of the handling of goods from store A to the platform on the low level to the west, it would interfere with the lengths of platform which have been designated for handling by road vehicle. During times of peace, the handling of road vehicles across the track would not be a serious disability, but you must look in a work of this sort to what may happen in an emergency. Such a system would not be good in times of war.

226. *To Mr. Mathews.*—That roadway could be formed straight away on the upper level, but you must remember that you are taking some of the goods to the high level. This plan would preclude the use of the lower platform during an emergency for road vehicles. I notice that the level of the railway which crosses the storm-water channel is approximately ground level. The point at which the level begins is within 150 feet of that channel. The channel will carry a good flood discharge, but if the depth for water discharge were reduced, the consequences in very heavy rains might be serious. That is not a very big item, however, but the point would need careful consideration in designing the crossover. Mr. Hobler has given a price of £1,600 for this railway siding. I am afraid there are two different bases of estimating, because the Engineer-in-Chief for Existing Lines in New South Wales gives an estimate of cost, excluding earthworks, of £3,213, for practically the same extent. There is very little difference in the length of track, so that the two estimates are not reconcilable. I see, now that you point it out, that Mr. Hobler takes his estimate only from point E; so that I must add the length of line that is common to both plans. The comparison, therefore, is between £1,600, and the length of track on Mr. Kendall's plan between E and the buffer-stops. You cannot eliminate all earthworks, because Mr. Hobler rises to E, entailing some

earthworks, and then drops again, entailing more. The total cost of the earthworks under the scheme submitted by the Department is £2,397 10s., and of the bridge, £1,578.

227. *To Mr. Mathews.*—The £2,397 10s. does not comprise a cutting between A and C. It is for earthworks up to the culvert.

228. *To the Chairman.*—To get a comparison between the cost of the two schemes, it will be necessary to go over the cost of the original siding as far as E, with the altered gradient. I do not think you can get a direct comparison with Mr. Hobler's figures. If store C is not going to be built for the next 10 or 20 years, that opens up another aspect. Some further consideration is necessary of Mr. Hobler's plan, as to what would be the cost later on of bringing in a siding on the upper level. He has not shown cross sections, but there is a difference equivalent to 1 in 50 between the levels of the two rails, and with the distance he has shown, it might mean something in the way of retaining for the upper level as you go along. As far as feasibility is concerned, I do not think his suggestion is as good a railway scheme because of the gradients outside the platforms. If I were instructed to build store A and nothing else until the development of the lower ground had been completed, I would not hesitate to carry on the lower railway, that is, to develop the lower level, and put in the upper railway to develop the first-floor levels, and be ready to carry on with the building "C." I look on the western railway coming along the front as highly important to develop any future propositions, such as building "D." It would be more effective than running in a butt railway. Of course, running in a railway on the western side to store A precludes the development, such as I have suggested, of connecting the first-floor levels of building B with the first-floor levels of A, because an 11-ft. floor would give insufficient clearance for locomotive loading gauge.

229. *To Mr. Mathews.*—If the level of the first floor of A was 14 feet, I do not think that would give enough clearance under the supporting joists carrying the connecting bay.

230. *To the Chairman.*—All the buildings B would have their floors at the 3-ft. 6-in. level—the level of a lorry. If you made the lower levels 14 feet high, quite apart from the expense, you would throw out the general levels of the approaches to store C, which meet the topography of the ground. I do not think Mr. Hobler's railway proposition is good with those gradients. We ought to have nothing less than 1 in 200 outside the platforms, and it would be preferable to have them level for the working of your trucks outside your platform area, as Mr. Kendall put it.

231. *To Mr. Sampson.*—The principal objection is to the gradients, but there is an objection from the point of view of development also. The proper development for the lower level, looking at the broad scheme, is to bring in a track which will run along the front, and also pick up the lower level. To reduce the grades on Mr. Hobler's scheme would immediately add expense. You could take off much further back towards the signal-box, but you are immediately confronted with difficulties as to the space required for your two sidings so as not to interfere with the Public Works Department's depôt. I presume that is partly why Mr. Hobler put in the scheme as it is.

232. *To Mr. Mathews.*—If the Defence Department is going to increase the present proposition to any large extent, I have not much doubt that building C is going to be an economical way of giving a large floor area, because that floor area can be developed several stories in height without the necessity for piling. If, on the other hand, the development is going to be only small, one or two of the two-story sheds might meet requirements.

233. *To the Chairman.*—If store C was going to be developed, I would carry it up to its full height for a section of the building at once. You could quite well put part of that building up for a start to six stories high.

234. *To Mr. Laird Smith.*—Mr. Hobler's railway will not materially interfere with the general lay-out and subsequent development of the scheme of the Department, if it does not interfere with the proposal that the higher-level track shall be ultimately put in when building C is put in. Then, to put in the lower-level track would not interfere with the development of the whole scheme. To omit the lower railways marked in blue on the plan running to store D would be a blemish on the full development of the store proposition as time goes on.

235. *To the Chairman.*—It is not proposed to construct those railways now.

236. *To Mr. Sinclair.*—It is easier to work trucks on the level. A truck left on a gradient of 1 in 100 would get away. On the lower line, the trucks would run back into the dépôt. I have given the Committee an estimate of the cost of the higher level line right through, but you have not got an estimate of the lower level right through. You can get an approximate estimate for the lower based on Mr. Kendall's figures. Assuming that the earthworks would cost £300 or £400, it would bring the cost of Mr. Hobler's lower-level line to, say, £3,500. I do not know whether Mr. Hobler has included a figure for crossing the culvert. I do not know whether, with a scheme of this magnitude, it would be a sound proposition to put in anything in the way of a tentative siding. Whatever you put in ought to be left as a permanent siding. It should not be proposed to put in a siding which would be rooted up when you went on with the upper siding.

237. *To Mr. Mathews.*—If the waterway was not sufficient, it might mean flooding all our ground where store B is to stand, unless works were carried out to increase the waterway by making a bigger horizontal section. It would cost more to make the culvert 8 feet wide instead of 4 feet, where the line crosses it; but, as an engineering proposition, I prefer to see a parallel culvert rather than one swelled out to give a bigger waterway at a given point. You could not raise the track more than 6 inches where it crosses the culvert, owing to the levels. I am afraid the waterway would be interfered with by the girders holding up the tracks, as you could not span that distance without girders. I assume that the culvert has sufficient capacity to prevent the flooding of the lower levels, otherwise there would probably have been trouble with the New South Wales Public Works Department.

238. *To the Chairman.*—If Mr. Hobler's scheme was approved, there would be no objection to the line being run as far as the water across the road. I believe that is not a traffic road.

239. *To Mr. Sampson.*—I do not know that, if the railway were put on the lower side of store A so that goods could be landed on the ground floor, it would be a justification for reducing the capacity of the lifts. I do not think that, in putting those lifts at 3 tons, it was ever contemplated that any single article of 3 tons would go in. Extra heavy articles would be always brought in by lorry and run along on rollers. I do not know whether you have been given any evidence by the Defence Department as to what class of goods are to be stored. If the line were extended to the jetty, heavy goods might be brought in from the jetty.

240. *To Mr. Laird Smith.*—Before agreeing that 9 feet by 7 feet would be big enough for the lifts, I would like to know the length of a field-gun carriage with the gun dismantled. The upper floors would

easily stand field guns running over them, because the field gun is always a light load, seeing that it has to be pulled by horses. In my conference with the Defence Department, the question of putting field guns up there was discussed. Generally speaking, making the lifts big is an error on the right side if it is an error at all. The only objection to the big lift is the amount of floor space that it takes away.

241. *To the Chairman.*—Wide platforms, such as proposed, are a wise provision for any emergency such as the Defence Department might have to face. I originally proposed platforms 20 feet wide, and I think the 18-ft. width was agreed upon when we saw what had been provided at Rock Island, which was quite enough there. It gives flexibility in the handling of stuff for the loading of trains in an emergency. I have tried all the time to picture these places as being used during war. That is what has to be considered, and not what is going to happen in peace time. I have provided 18-ft. platforms also for the smaller stores. That allows the accumulation of stuff for the loading of trains. In fixing the width of platforms, you have two factors—fire-break, and the location of the platform and rails. If you have the space between the buildings, and you think that 18 feet is a good thing, you should give it. If we were tied in a knot for space, we could perhaps make it less. I think cross-overs will be provided between the lines in the working scheme. I do not think Mr. Kendall, in preparing the plan, proposed to put them in in the first instance. I do not know why. I would put cross-overs in myself straight away opposite to building A.

242. *To Mr. Sinclair.*—Even if cross-overs were put in, I think the loop line ought to be retained for collecting up the trucks. I think that is one reason why Mr. Kendall carried the loop so far.

243. *To Mr. Laird Smith.*—The loop would carry a train. I believe Mr. Kendall considered that point also when designing it.

244. *To Mr. Sinclair.*—We discussed the question of wooden or concrete platforms, and came to the conclusion that timber would be the best proposition for goods. I am inclined, on that site, to put in timber; but I would not say definitely that concrete would not be a good proposition. Timber platforms become rough in time when used for goods on railways, but I doubt whether we shall have here anything approaching the traffic of a railway platform. I see by the plan that the eastern platform is of wood and the western of brick. For electric hydraulic lifts, you want enough clearance for your balancing sheaves, say from 18 inches to 2 feet. The motors to drive the pumps could be put anywhere convenient, but I would rather keep them fairly close to the accumulators. It is not necessary to put one over or under each lift. They could be housed, but they should be kept close to the accumulators, and you should save as much as you can on distribution in the cost of the piping. I should not favour a suggestion to put the lift cages outside the building. The floor space in the building is worth 15s. per super. foot. If the lifts were put outside, there would be some additional cost. They would have to be weather-proofed outside. There is an advantage in being able to get to your lifts from more sides than one. With six lifts, and reckoning four floors to the building, the value of the floor area taken up by the lifts would be £2,016.

245. *To Mr. Laird Smith.*—There is a filling of earth under the western platform, with a brick-on-flat surface. If concrete was used, all that would be required would be a layer of 6 to 8 inches of ordinary concrete, or about 5 inches of re-inforced concrete. I think Mr. Murdoch came to the conclusion that, for the eastern platform, wood was the cheaper proposition.