PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

REPORT

TOGETHER WITH

MINUTES OF EVIDENCE AND APPENDIX

RELATING TO THE PROPOSED

EXTENSION OF BUILDINGS, PLANT, ETC., SMALL ARMS FACTORY, LITHGOW.

PRESENTED TO PARLIAMENT IN ACCORDANCE WITH THE PROVISIONS OF THE "COMMONWEALTH PUBLIC WORKS COMMITTEE ACT 1913-1914."

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

F.1124.

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

No. 36 OF FRIDAY, 30TH APRIL, 1915.

5. PUBLIC WORKS COMMITTEE—REFERENCE OF EXTENSIONS, SMALL ARMS FACTORY, LITHGOW.—Mr. Fisher moved, pursuant to notice, That, in accordance with the provisions of the *Commonwealth Public Works Committee Act 1913–14*, the following work be referred to the Parliamentary Standing Committee on Public Works with the request that the reference may be dealt with as an urgent matter :—

Small Arms Factory, Lithgow,—Extension of buildings, plant, &c.

Mr. Fisher laid on the Table estimates, plans, &c., and not having concluded his speech, the House ordered that he have leave to continue his speech when the debate is resumed.

Ordered—That the debate be now adjourned, and that the resumption of the debate be made an Order of the Day for Wednesday next.

No. 37 OF WEDNESDAY, 5TH MAY, 1915.

6. PUBLIC WORKS COMMITTEE—REFERENCE OF EXTENSIONS, SMALL ARMS FACTORY, LITHGOW.—*The Order of the Day* having been read for the resumption of the debate on the following motion of Mr. Fisher :—That, in accordance with the provisions of the *Commonwealth Public Works Committee Act* 1913-14, the following work be referred to the Parliamentary Standing Committee on Public Works with a request that the reference may be dealt with as an urgent matter :—

Small Arms Factory, Lithgow—Extension of buildings, plant, &c.

Debate resumed.

Question—put and passed.

INDEX.

LIST OF WITNESSES.

MEMBERS OF THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS.

First Committee.

EDWARD RILEY, Esquire, M.P., Chairman.

Senate.	*House of Representatives.*
Senator the Honorable John Henry Keating.	James Edward Fenton, Esquire, M.P.
Senator Patrick Joseph Lynch, Vice-Chairman.	William Fyfe Finlayson, Esquire, M.P.
Senator William Harrison Story.	The Honorable Henry Gregory, M.P.
	Sydney Sampson, Esquire, M.P.
	William Henry Laird Smith, Esquire, M.P.

PROPOSED EXTENSION OF BUILDINGS, PLANT, ETC., SMALL ARMS FACTORY, LITHGOW.

REPORT.

THE PARLIAMENTARY STANDING COMMITTEE ON PUBLIC WORKS, to which the House of Representatives referred for consideration and report the question of the extension of buildings, plant, &c., Small Arms Factory, Lithgow, has the honour to report as follows :—

INTRODUCTORY.

1. The passage of the *Defence Act* 1903 conferred on the Commonwealth the power of establishing a Small Arms Factory. In 1907, Engineer-Captain Clarkson was commissioned by the then Minister for Defence to make inquiries and submit recommendations for the establishment of such a factory in Australia. After submitting his report, he was instructed in July, 1908, to proceed to England and invite tenders for a complete plant capable of manufacturing 50 rifles per day of eight hours. It was subsequently decided to invite separate tenders in Australia for the power plant, and the tender of the New South Wales Government Dockyard was accepted at £7,980.

2. The tender of the Pratt and Whitney Company, of Hartford, Connecticut, U.S.A., was accepted for the factory equipment at £68,144. Shafting, belting, &c., to the value of £3,400, and spare tools to the value of £5,000, were also purchased subsequently from the Pratt and Whitney Company.

3. In the meantime, the Minister for Defence had instructed two military officers to select a site for the proposed factory, and after examining various sites, they fixed upon an area in the vicinity of Lithgow, N.S.W. The selection was indorsed by the Inspector-General of the Military Forces, the Director of Naval Forces, and the Military Board, and approved by the then Minister for Defence.

It might be mentioned that up to this time the Commonwealth Parliament had not passed the *Seat of Government Act* 1908, which determined that the seat of Government of the Commmonwealth should be in the district of Yass-Canberra.

4. The Department of Home Affairs, at the request of the Department of Defence, thereupon obtained executive approval for the purchase of the area in question, comprising 122 acres 3 roods 15 perches—at a cost of £2,777—being at the rate of £40 per acre for seventeen acres, and £20 per acre for the remainder. Of this area, it was considered that about 3 acres would be occupied by the factory buildings, and most of the remainder would be used for rifle range purposes.

5. It was suggested that it might be advisable to obtain a further area to meet probable extension, but the then Minister for Defence indorsed the papers to the effect that as apparently 50 acres of the land purchased were fairly suitable for buildings or works, he was satisfied that the area obtained was ample.

6. In December, 1909, the Department of Home Affairs commenced the erection of the buildings in accordance with the lay-out plans prepared by the Pratt and Whitney Company.

7. It was at first intended to erect buildings of galvanized iron, at a cost of about £16,000, but it was subsequently decided that brick would be more suitable for the climatic conditions of Lithgow, and the buildings were therefore constructed of that material at a cost of about £55,890.

8. The buildings are of one story, well lighted, and ventilated, and appear to be well arranged for economically handling the product. They consist of :—

	Area in square feet.
General offices	2,288
Drawing office	792
Main machine shop	24,000
Forge shop	8,500
Engine and boiler rooms, sheet-metal shop.. ..	8,500
Stocking, polishing, browning, and scabbard shops ..	10,900
Assembling shop and finished part store	8,500
Testing range and proving house and general store ..	5,280
Drying kiln and timber store	9,600
Steel and forging store and oil filtering house ..	2,480
Gatehouse	480
Luncheon room	1,800

the total floor space being nearly 2 acres.

9. The grounds have been well laid out with roads formed and kerbed. Grass has been sown and trees planted to serve as wind breaks as well as for ornamental purposes. A complete system of water supply, underground drainage, and sewerage has been installed.

10. On the 8th June, 1912, the Factory was formally opened by His Excellency the Governor-General.

PRESENT PROPOSAL.

11. The contract of the Pratt and Whitney Company was, briefly, for the supply of a complete plant capable of manufacturing 50 M.L.-E. short rifles of the latest approved War Office pattern, with sword bayonets and scabbards complete, per working day of eight hours when operated by 144 unskilled and not more than two skilled Australian workmen. This staff to include all labour other than that required for supervision, clerical duties, tool room staff, engine and boiler tending, and shop labouring.

12. During the year 1913, certain additions were made to the machinery, thereby increasing its estimated producing capacity by 33⅓ per cent., so that the existing machinery, under favorable circumstances, should be capable of turning out 20,000 rifles per annum when working eight hours per day. This output has not yet been attained, but is gradually being overtaken by working twelve hours per day. The total number of men at present employed is 480.

13. It is the desire of the Government to double that output, and to achieve that object it has been proposed to extend the Factory to about twice its present size. It has been suggested that this be effected by adding an extension and wing to the existing main building, by extending the present steel store, oil room, boiler house and coal bunkers, and by erecting a new front building of two stories and a basement.

14. In these extensions further power, plant, and machinery, would be required which, with the machinery already in the Factory, would be capable of turning out 40,000 rifles per annum, when working eight hours per day.

ESTIMATED COST.

15. The cost of the proposal is as follows :—

Buildings.

	£
If carried out separately—	
New front building	32,000
Extension to present main building with wing ..	8,000
Extension to present steel store and oil room ..	5,000
Extension to boiler house and coal bunkers ..	1,500
	46,500
If carried out as one work	45,000

Power Plant.

	£
2 Babcock and Wilcox boilers	2,000
1 400-H.P. steam driven electric generating unit, with auxiliary apparatus	2,000
Additional piping, water heater, feed pumps, and necessary flues, &c.	1,800
	5,800

(This does not include power transmission apparatus.)

Machinery.

Manufacturing machines	31,559
Machines for tool room	7,168
	38,727
Total	£89,527

Since these figures were submitted an intimation has been received that the price of portion of the machinery has been increased by upwards of 10 per cent., so that it may be taken that the total cost of the proposal will approximate £95,000.

COMMITTEE'S INVESTIGATIONS.

16. The Committee took an early opportunity of visiting Lithgow and carefully inspecting the Factory and surroundings. It also obtained evidence from the Manager, Assistant Manager, Assistant Tool Foreman, the Mayor of Lithgow, and others, and made every effort to familiarize itself with the principal machines used, with the system of organization and conditions of labour, and generally with the advantages or disadvantages of Lithgow as the location of the Small Arms Factory.

MACHINERY.

17. It is generally conceded by those most competent to judge that at the date of erection of the Factory the machinery installed in the Small Arms Factory at Lithgow was the most up to date amongst arms factories in the world, and probably there are few manufacturing plants in the world to excel it.

CONDITIONS OF LABOUR.

18. The conditions of labour at the Factory are from all appearances satisfactory, and such as to attract workmen of the best class in all branches of the work required. The Factory is well lighted, clean, and well ventilated, and provision is made for heating the various shops in winter.

19. The ordinary working hours are from 7.30 a.m. to 5.15 p.m., Monday to Friday inclusive, and from 7.30 a.m. to 11.45 a.m. Saturdays—or 48 hours per week. At the time of the visit of the Committee, however, the men were working a 12-hour shift and receiving time and a half for the overtime.

20. Employees are granted twelve public holidays per annum on full pay, namely :—

1st January,	King's Birthday,
26th January,	Prince of Wales Birthday,
Show Day,	Eight Hours Day,
Good Friday,	Union Picnic Day,
Easter Saturday,	Christmas Day,
Easter Monday,	Boxing Day,

and in addition are entitled to two weeks' leave of absence on full pay for recreation annually.

21. All employees continuously employed for twenty years are entitled to six months' leave of absence on full pay, or twelve months' on half pay.

22. Under the award by the Commonwealth Court of Conciliation and Arbitration, dated 9th April, 1915, apprentices to the trade of tool, jig, and gauge maker as part of the small arms trade are required to take up a course of technical education, Subject to good conduct, those who at the end of each year succeed in obtaining at least 75 per cent. of the possible marks for the subject prescribed are entitled to a refund of all fees paid for tuition, and every apprentice who completes his apprenticeship at the expiration of five years to the satisfaction of the manager is to be presented with a set of precision tools, to a value not exceeding £10 sterling.

LOCATION.

23. The location of the Factory at Lithgow is admittedly not an ideal one, and the considerations of proximity to coal and iron which, it is understood, influenced the selectors of the site in the first instance, carry no great weight by reason of the fact that a comparatively small quantity of coal is used at the Factory per annum, and the steel at present manufactured in the neighbourhood is not suitable for the purposes of the Factory, which so far has had to import all its steel.

PRELIMINARY REPORTS.

24. Early in its investigations the Committee occupied itself with a consideration of the question of obtaining an increased output from the existing Factory, and to that end issued a preliminary report recommending that arrangements be made forthwith for the starting of a second shift. (*Vide* Parliamentary Paper, No. 130).

25. In recommending the introduction of a second shift, the Committee referred to the difficulty which would naturally arise in obtaining housing accommodation for the extra employees required. Inquiries on this point were made by the Committee, and representations were made to the Mayor of Lithgow, and to the proprietor of the *Lithgow Mercury* as to the possibility of obtaining the co-operation of the residents in providing such accommodation. The Mayor subsequently convened a public meeting for the purpose of discussing this question, and has since advised the Committee that immediate accommodation is available for 220 men.

26. Since submitting its preliminary report the Committee has also been advised by the contractors supplying the Small Arms Factory with steel that further shipments have been received, and there is no doubt as to their ability to meet the needs of the Factory on the basis of the increased quantity required to increase the output.

27. The Committee shortly afterwards recommended the purchase of such additional machinery as would be necessary to duplicate the present producing capacity of the existing plant. (*Vide* Parliamentary Paper, No. 150).

ALTERNATIVE PROPOSAL.

28. In the course of its investigations, a proposal was placed before the Committee by the Commonwealth Director-General of Works that instead of incurring the expenditure attendant upon the proposed extension of the Lithgow Factory, a factory should be erected at Canberra of a size equal to the existing Factory at Lithgow, plus the proposed extensions. In this factory, which could be completed in about eighteen months or two years, would be installed the new machinery to be purchased, and the existing machinery at Lithgow could be transferred at a favorable opportunity later without, it was claimed, materially affecting the output for any considerable time.

29. Two apparently suitable sites were indicated where the area available will permit of ample expansion of the present factory if ever considered necessary, as well as for the establishment of any factories required for the manufacture of machine guns, field artillery, &c., should it at any time be decided that the Commonwealth should enter upon those activities.

30. Both these areas are of such extent as will admit of suitable land being available should it be decided to establish workmen's homes for the purpose of accommodating employees of this or other adjacent factories. The present railway from Queanbeyan to Canberra is handy to the suggested site No. 1, while the proposed railway from Yass to Canberra will pass through the suggested site No. 2.

31. A statement comparing the cost of establishing such a factory at Canberra with the proposal to extend the present factory at Lithgow was submitted, *vide* Appendix "A." This shows that the cost of extending the present factory, plus [redacted] power plant, &c., would amount to about £66,000, whereas a new factory of twice the capacity could be erected at Canberra for £92,000 (including cost of transfer of existing machinery).

32. The Committee gave earnest consideration to this proposal, and carefully weighed the advantages and disadvantages of Canberra and Lithgow as sites for the Small Arms Factory.

33. The principal considerations urged in favour of Lithgow were:—

(*a*) the excellent supplies of water and gas obtainable at a cheap rate;
(*b*) a healthy climate;
(*c*) the fact that the Factory has already been established, and a large expenditure has been incurred by the Commonwealth in preliminary expenses, installation of plant, and overcoming initial difficulties;
(*d*) that nearly 100 employees have either erected houses or purchased land for the purpose of so doing;
(*e*) that there is a possibility of steel suitable for use in the Factory being manufactured locally;
(*f*) the possible danger that any change of site may affect the immediate output of rifles;
(*g*) the advantage on general principles of avoiding centralization of industries; and
(*h*) the disadvantage in particular of centralizing factories of this description and so providing but one objective for attack by a possible enemy.

34. The principal considerations urged in favour of Canberra were:—

(*a*) that the water supply now being completed at Canberra will quite equal that of Lithgow, and a gas manufacturing plant capable of supplying the needs of the Factory could be installed at a comparatively small cost;
(*b*) that the climate is, if anything, more pleasant at Canberra than Lithgow from an industrial point of view, having less fog, rain, and snow;
(*c*) that the Lithgow site is not a suitable one, and it would be unwise to perpetuate a mistake by extending the Factory at that place;
(*d*) that Canberra possesses an up-to-date power plant capable of supplying all the electrical energy required for a factory twice the size of the present one at Lithgow, while further expenditure on power plant would be necessitated if the Factory were extended at the latter place;
(*e*) that Canberra affords practically unlimited room for expansion of the Small Arms Factory or any correlated factories that might be established in its vicinity in the future;
(*f*) that a considerable area of land is also available for workmen's homes in the event of its being decided to adopt a scheme of housing workmen;
(*g*) that the areas suggested were acquired by the Commonwealth at about £4 10s. per acre and £5 3s. 4d. per acre respectively, whereas the land purchased for the Lithgow site originally cost the Commonwealth up to £40 per acre, and it is improbable that the additional land required could be obtained at the present time excepting at a considerable advance on that figure;
(*h*) that there would be advantages in the Commonwealth having a factory for the manufacture of small arms in its own territory, and subject to its own jurisdiction; and
(*i*) that incidentally the establishment at Canberra of a factory employing about 1,000 persons would be a means of settling in the Federal Territory at least 5,000 people.

CONCLUSION.

35. Viewing the matter from a broad national stand-point, and bearing in mind the possibility of the Commonwealth in the future greatly extending the field of its activities in the matter of small arms, field guns, and other warlike material, the Committee is of opinion that the Small Arms Factory should be located at Canberra, and recommends accordingly.

36. It is considered that the erection of a building twice the capacity of the present factory at Lithgow should be commenced as soon as practicable, and that the machinery which it is understood has recently been ordered as a result of the Committee's

recommendation should on arrival be installed therein; the machinery at present at Lithgow to be removed thereafter as early as practicable, and in such a way as to interfere as little as possible with the output.

37. With regard to the present factory at Lithgow, the Committee suggests that inquiries should be set on foot without delay in the direction of ascertaining what wood working or other machines might with advantage be left at Lithgow, with a view to the factory being adapted by the Commonwealth for the construction of vehicles for the Postal, Defence, or other Government services, or utilized in some other way for Commonwealth purposes.

38. The Committee realizes that some inconvenience and perhaps even hardship may be occasioned to the present employees of the Factory in the transfer to Canberra, as it has information that 95 employees have purchased land at Lithgow, of which 55 have either erected or are in process of erecting, dwellings thereon. On the other hand, it may be pointed out that those employees who accompany the Factory to Canberra will be appreciably better off as regards healthiness of climate and surroundings, and should be placed by the Government in the position of obtaining much better housing accommodation than can now be obtained by them at Lithgow, and at a lower cost.

39. Owing to the distance of the proposed site from any settled centres of population, the Committee considers that some system of establishing workers' homes must of necessity be taken in hand in connexion with the erection of this factory, and every facility exists at Canberra for the establishment of a model industrial centre based on the most modern approved town-planning principles. The Committee visited Sunshine, Victoria, where a scheme has been adopted in connexion with the Sunshine Harvester Works, which were removed from Ballarat to that place, and from inquiries made is satisfied that a scheme can be arranged on such a basis as would prove attractive to the employee while at the same time being a sound business proposition on the part of the Commonwealth.

40. In conclusion, the Committee suggests that in connexion with the erection of the new factory, as much of the machinery required as is possible should be obtained in Australia.

DECISION.

41. The decision arrived at by the Committee is shown in the following extract from its Minutes of Proceedings:—

Mr. Finlayson moved That it is desirable to transfer the Commonwealth Small Arms Factory from Lithgow to Canberra, and that a building of double the capacity of the present factory be erected in the Federal Capital area.

Seconded by Senator Story.

Mr. Gregory moved as an amendment That it is advisable to extend the present Factory at Lithgow, making provision by the purchase of land north-west of the present site, of an area of land for workers' homes. Seconded by Mr. Sampson.

The Committee divided on the amendment—

Ayes (3).	Noes (6).
Mr. Gregory	Mr. Fenton
Senator Keating	Mr. Finlayson
Mr. Sampson.	Mr. Riley
	Senator Lynch
	Senator Story
	Mr. Laird Smith.

And so it passed in the negative.

The Committee divided on the original motion—

Ayes (6).	Noes (3).
Mr. Fenton	Mr. Gregory
Mr. Finlayson	Senator Keating
Mr. Riley	Mr. Sampson.
Senator Lynch	
Senator Story	
Mr. Laird Smith.	

And so it was resolved in the affirmative.

Edward Riley

Chairman.

Office of the Parliamentary Standing Committee on Public Works,
120 King-street,
Melbourne, 6th July, 1915.

SMALL ARMS FACTORY EXTENSION.

MINUTES OF EVIDENCE

(Taken at Melbourne.)

THURSDAY, 6TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

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

1. *To the Chairman.*—The existing Small Arms Factory at Lithgow is shown in the natural colour of the paper on Plan B189. The proposed extensions are indicated, approximately, in red on the same plan. They consist of one main building to the north of the main workshop, as shown on Plan AA, with connecting wings extending back to the main shop at the west end, and an extension of the main shop at the east end marked B. Extensions will also be proposed of the oil-extracting and pickling departments. The purposes for which it is proposed to extend the existing buildings have not been explained to me by Mr. Wright. It is true that some weeks ago I went with him into the general form which the extensions would take. But the actual allotment of the various floors on the buildings has not been explained to me, and I propose to see him again soon, with a view to obtaining full details in that connexion. The slope on the northern side of the present buildings is such that to maintain continuous floor level from the existing main workshop it would be necessary to form a basement under the ground floor extension. The main workshop floor, it will be observed, is shown on the front of an isometric projection of this proposed entire group. If the plan be carried out, room will be provided in the basement. It is proposed to use the basement at the eastern end to provide the workmen accommodation for dining and, possibly, for recreation, whilst it is intended to utilize its western end for stores. Another point connected with the proposed extension is that, instead of there being only one floor—as in the existing building—there will be three floors, namely, the basement, the ground floor, and the first floor. In the existing buildings the workshops are all on the one floor level. Other accessories have been introduced into the scheme which do not bear on the main project, such as additional latrine accommodation. The proposal is that the extension to the north shall be such that a large area will be contained between it and the existing front of the building, and that the present office buildings shall remain in use by the factory, although they will be situated between the front of the present workshops and the proposed extension A. The sketch plan depicts a building of brick with steel stanchions, steel framing, and concrete floors. The estimated cost has been prepared by the Works Director of New South Wales on the basis of sketch plans. I may explain to the Committee that the plans now put forward are only sketch plans. They are not working plans, and until working plans have been prepared a detailed estimate of the cost of the buildings cannot be forthcoming. The sketch plans are put forward by the Department in accordance with the approved practice. That practice is that when a project is first mooted, plans are prepared to enable the Minister of the Department concerned to decide whether he will ask Parliament to vote the requisite money or not. Should he decide to do so, the procedure laid down in our regulations is that we shall then proceed to get our working plans, and on those plans an estimate of the working cost is prepared for submission to Parliament. In the present instance, for reasons of urgency, I understand, the Minister has intercepted this procedure at the stage when only sketch plans have been prepared. I would be afraid to say at the present moment that eighteen months would suffice for the erection of the proposed additions to the existing Small Arms Factory at Lithgow, because the rapidity of their construction would depend entirely upon the preparation of the steel work that would be involved. I am practically certain that we would not get in stock all the required scantlings in Australia—the firms in the Commonwealth do not carry the stocks that would be necessary for the completion of a large structure like this. The proposed extension would certainly involve importation unless the steel works at Newcastle were prepared to run sections for us. That is a matter upon which I would have to consult the management of those works. Assuming that we could get the steel work promptly, I think that we might accomplish the erection of the buildings within eighteen months. But the Committee will recognise that those buildings will form a very large structure, and when we allow for the time necessary for the preparation of drawings, for obtaining proper estimates, and for securing the requisite material, I think it will be admitted that eighteen months would be a very quick period within which to complete the preparatory work and construction. In connexion with the existing factory, I may mention that after the main workshop had been completed, considerable delay was involved in the erection of shafting—in the erection of stringers to carry the shafting, and of the shafting itself. Then much time would be occupied in the installation of machinery even after the buildings were completed. Before being in a position to make a definite statement as to the time within which the erection of the buildings could be completed, I would have to consult the manager of the Small Arms Factory, for the purpose of ascertaining what machinery will be required, and also what accessories, in the form of steel piping, oil piping, &c. I assume that in connexion with the proposed extension the pipes

would have to be laid in a way which would render them accessible, and that there would be many cases in which the space under the floors would have to be accommodated to machinery. The estimated cost by the Works Director could only be based on the cubic measurement or floor space. I may again explain that the estimated cost given on sketch plans is merely a tentative one, in which I have no say. I have consulted with the manager of the Small Arms Factory regarding the general design of the buildings, but the Works Director of the State—Mr. Todd—has given his estimate of the cost. When that estimate comes before the Minister it will be my province to go into it, and if I consider it too high, or too low, to correct it. Until I see Mr. Todd I am not sure whether he has provided in his estimate for the accessories which we find necessary in connexion with every large project. It is impossible to foresee everything that will occur in the construction of buildings of this kind, from the foundation until the roof has been put on them. Consequently, after one has taken out the total cost of everything which can be foreseen, the practice is to allow a percentage to cover the unforeseen. The estimate supplied by Mr. Todd will, when revised by me, be subject to the application of that practice. His estimate of the cost of the structure shown on these sketch plans is £45,000, if the additions be carried as one undertaking. If, on the other hand, they are carried out independently or separately, his estimate of their cost is £26,500. There is nothing in the official papers before me to disclose either whether Mr. Wright or Mr. Todd has added an item for erection of plant and machinery. When the existing factory was established, the Department of Home Affairs was not expected to do anything in relation to the erection of machinery, shafting, &c. However, we were asked to undertake that subsequently, and we found that the installation of oil and steel piping cost, in round figures, £4,000. Then there was an item of £300 for office fittings and furniture, and of £700 for factory fittings. The Committee, therefore, will require further information as to whether there is any hiatus between the cost of machinery, as given by Mr. Wright, and its total cost in position. Of course, it is quite possible that Mr. Wright has allowed for all that. His estimate of the cost for an increase of the power plant is £5,800. The section of the power plant buildings is included in the estimate of the Works Director, because further boiler-house space will be required. But the estimated cost of the plant itself is £5,800. Again, without first seeing Mr. Wright, I do not know whether there may not be a hiatus there. The installation of machinery will include brickwork, foundations, &c. However, these are not big items when considered in relation to the whole plant, and they will probably cost less than £1,000. More power is required for the factory, and that power would include the cost of transmission right to the machines. I do not know whether Mr. Wright, in his calculation, has allowed for that. Possibly he has.

2. *To Mr. Fenton.*—I distinguish between plant and machinery. Mr. Wright has given estimates of the cost of the power plant and of additional machinery for manufacturing, independently. Regarding the cost of the power plant, I shall have to talk that matter over with him, because the functions of the Home Affairs Department extend to the installation of such machinery, and I presume that we shall have to supervise that work, instead of the machinery being ordered by the manager as part of the manufacturing plant. Consequently, I do not know whether I shall corroborate his estimate of £5,800. But I think that the Committee may accept that sum as an approximate estimate of the cost of the power plant.

3. *To the Chairman.*—When the first building was erected at Lithgow, all the material had to be carted to the works. There is no railway to them now. That involves additional cost. When Lord Kitchener visited the works, the question was asked why there was no railway to them, and the reply given was that the amount of raw material used in the manufacture of the present output of rifles, and the weight of the product, were so small that they would not pay interest on the working expenses of such a line. In the first place, a siding would have to be put in by the Railways Commissioners, and upon that there would be an annual charge. In these circumstances, it was felt that it would be better to adopt road haulage to the works, and subsequently Mr. Wright arranged for a motor lorry.

4. *To Senator Story.*—The works are distant from the township of Lithgow about 1½ miles.

5. *To the Chairman.*—Before I am able to tell the Committee whether it would be cheaper to construct the proposed buildings with concrete or bricks, I would have to ascertain the cost of bricks at Lithgow. Since we erected the Small Arms Factory there, I understand that the price of bricks has gone up. Whether concrete could be used in the buildings is a matter which requires further investigation. Possibly for this undertaking we would require to use reinforced concrete. The quickest way in which to erect the proposed extensions would depend upon whether we could obtain steel scantlings of the dimensions we require without delay. If any very long period were occupied in securing these supplies it might be quicker for us to use reinforced concrete, because probably we would be able to obtain reinforced steel quicker than we can secure steel scantlings. I will make it my business to get that information. The plan to which I have directed attention shows the front elevation of a building of three stories. On the whole, it is a plain and substantial structure. In the existing building all steel sashes were used, and we experienced considerable trouble in getting them. Then we were delayed in connexion with the roofing, although there was a good deal of work to be done before the steel roofing was required. That was constructed under tender in Melbourne. If we were undertaking structural steel work, and got up to the first floor level, only to find that we could not get the requisite stanchions, we should probably be tied up. Regarding the question of whether Lithgow constitutes an ideal site for the Small Arms Factory, or whether such an establishment should not be located in Federal Territory, I have submitted to the Minister the following report, which is dated 6th March of the present year:—

1. At the request of the Minister of Defence, I have had an interview with Mr. Wright, the manager of the Small Arms Factory, and learn that the Minister desires information as to cost and other matters for extension to the Small Arms Factory at Lithgow.

2. Mr. Wright has told me that the additions to the buildings would amount to about a duplication of the existing factory floor space. An architectural draughtsman is being sent at once to Lithgow to prepare sketch plans on which to estimate costs.

3. I regard, however, this juncture as the critical one in which to decide whether the manufacture of small arms and other weapons for the Commonwealth can be brought under a comprehensive, economical, and extendable scheme, under Commonwealth sole control at Canberra.

4. (There has also been a conference regarding the extension of cordite manufacture to embrace gun cordite.)

5. Small arms are manufactured at Lithgow, and cordite and small arms ammunition at Maribyrnong. It is particularly in respect to the manufacture of small arms and weapons that I am writing, because, related to small arms manufacture, I foresee future developments for manufacture of field guns, gun ammunition, fuses, machine guns, pistols, and, later, the manufacture of other munitions of war; in fact, an arsenal. I apprehend that, unless steps are taken now it will be impossible or inexpedient to make the change later on.

6. Before stating the advantages of Canberra, some objects to be aimed at in laying the foundations of an arsenal are assumed, which are briefly as follow:—

(*a*) Control by the Commonwealth, without possible interference by other authority.
(*b*) Grouping of kindred manufactures—correlation and co-operation.
(*c*) Comprehensive system of workshop management.
(*d*) Inaccessibility from seaboard.
(*e*) Best environment, hygiene, and climate for workmen.
(*f*) Garden settlement or suburb for workmen.
(*g*) Space for extending the operations of factories, and founding fresh factories in future.

7. Whilst not traversing the exigencies which some years ago led to the location of the Small Arms Factory at Lithgow and the Cordite Factory at Maribyrnong, it is evident that Canberra alone can properly meet all requirements for an arsenal.

8. At Canberra the conditions (*a*), (*b*), and (*c*) mentioned in paragraph 6, can be fulfilled, and a site suitable in every way could be located; the climate is good —very much better than Lithgow; the environment would be good and healthy; the centre of the Commonwealth Defence organization will be there.

9. Lithgow possesses few advantages and serious disabilities, especially as the location of an arsenal. One of the advantages assumed was the existence of coal and of the steel works at the town. I have it from Mr. Wright, however, that the coal bill is not a serious item in the factory costs. The most up to date and largest steel works in Australia are at Waratah, Newcastle; it is probable that the manufacture of special steel is more likely to be accomplished at Waratah than anywhere else in Australia.

10. Mr. Wright is emphatic that Lithgow is not a suitable environment or site for the works. He favours what I have advocated, namely, the laying out of a workmen's suburb, thus improving the general conditions of life and welfare of the workmen. This could not be accomplished at Lithgow without very great expense in acquiring land, and even then it would never be very good.

11. An equally vital matter is the difficulty in the way of extension of factory buildings at Lithgow. The extensions now under consideration will occupy a large portion of the remaining available suitable building site, but there is no prospect of establishing other manufactures without acquiring more property. Even if property were acquired, it would not be possible to make such a good lay-out for future factories as at an undisturbed and open site.

12. The first question which arises, however, is how could the Small Arms Factory be transferred to Canberra without financial loss, and without discontinuing work.

13. If the existing factory is to be nearly doubled, then the opportunity has come to build at Canberra instead of at Lithgow, and to erect a structure which would accommodate the existing machinery (excepting power plant) and the prospective additional machinery. The additional machinery would be ordered and installed at Canberra (some duplication would probably be necessary); subsequently the existing machinery—excepting such as should be left at Lithgow, vide paragraph 15—would then have to be moved to Canberra. It would undoubtedly take about two years to accomplish the whole project; but it would appear that, so far as the existing war emergency is concerned, the erection of additional buildings at Lithgow and importation of machinery would in any case take many months.

14. It would cost somewhere about £40,000 to extend the buildings at Lithgow (including additional power plant and boiler house). On the other hand, by expending about £60,000 at Canberra, workshops for the entire machinery could be erected. It would not be necessary to erect power house and power generating plant at Canberra, because the central station could supply power, not only for the present equipment, but for extensions and future factories. (It would be an advantage to relieve the factories' management of power generating.)

15. The question arises, however, as to what would be done with the existing factory buildings at Lithgow There are three possible courses—

(*a*) Use them for the manufacture of waggons and vehicles for Commonwealth use generally; the power plant would be used together, perhaps, with part of the forge shop plant, woodworking machinery, seasoning kilns, timber storage sheds, offices, and so forth.
(*b*) Use them for mobilization stores.
(*c*) Sell or transfer them to the State Government, who are, I believe, thinking of erecting workshops at Lithgow.

16. There is another important aspect of the matter, viz., the administration of Federal Territory. The Commonwealth is undertaking to found a town at Canberra and to transfer to it the Seat of Government. By establishing an arsenal at Canberra, the Commonwealth would introduce an activity and population which would be of financial advantage.

17. It also would pave the way to manufactures for other Commonwealth Departments, because there is no doubt that one general organization for manufacture could attain economy in managerial, actuarial, and other charges; the correlation and co-operation of factories should result in economies in the number of hands employed, which could not be accomplished under a system of dispersed, self-contained organizations.

18. I have referred to a garden suburb at Canberra for workmen of the factories and future arsenal. Mr. Wright has told me what an effect good environment and conditions of living have on the general output of a factory: the more extensive the future manufacture, so much the greater would be the advantages which would accrue.

19. If the foregoing is concurred in, I see no reason why, as soon as the city plan is prepared, a site should not be determined, and every preparation made to begin the factory construction.

20. I have not mentioned particularly what might be done in relation to cordite manufacture and small arms ammunition manufacture, as the dominating factor is, in my opinion, the manufacture of arms.

21. Subject to the Minister's approval, may the foregoing be transmitted to the Minister of Defence as a report made in my capacity of Director General of Works and Consulting Military Engineer.

I omitted to mention in paragraph 6 what must be obvious to all, namely, that if several factories were grouped, one Stores Administration would suffice for the whole. In the same way, one tool construction shop will turn out tools for all branches. Another point is that if we are going to undertake the manufacture of field guns which require special gauges—these being most expensive tools—they could all be brought under one organization. In other words, where several factories are grouped together there are several functions which can be discharged by one organization for the lot. Upon the question of the climate of Lithgow, Mr. Wright was very emphatic, and in order to get more definite information on this matter I wrote to the Commonwealth Meteorologist, who was kind enough to forward me a statement, which I ask leave to embody in my evidence. One of the principal objections which Mr. Wright has to Lithgow—and having worked as an engineering pupil in workshops, I appreciate his contention—relates to the cold that is experienced there—particularly the frosts. Speaking of the frost, Mr. Hunt points out—

The latter—

meaning Canberra—

is less subject to frost, and the period extends from April to November, with an occasional frost in December, with some severe visitations during the winter months, they being more the rule than the exception, and average twenty-two days per month. At Lithgow the frosts are very much more numerous, the period extending right throughout the twelve months, and

averaging 129 frosts for the year, against ninety-six at Canberra. Snow is not of frequent occurrence in either district, although two or three falls, mostly light, occur at Canberra during the year, and on a few occasions during the past years it has been estimated at 1 foot in depth, and can also be observed on occasions during the winter period on the surrounding hills.

I have been in Canberra a good many times, and only once have I seen snow there. I think that Mr. Hunt refers to the fact that snow does occur on the hills around Canberra. He continues—

At Lithgow the snow that falls is generally a mixture of sleet and snow, but has been known to extend to a depth of one-third of a foot. At Lithgow there is no self-recording anemometer, but winds appear to be much stronger than at Canberra, and the frequency of heavy winds and squalls is much greater; some of the latter are of a violent nature, and approach, on many occasions, the velocity of a whole gale.

From the summer point of view, my experience is that Canberra is a hot place. But, after all, that is only the personal factor. Temperatures do not show very much difference. I have never experienced at Canberra an enervating heat in midsummer. Although the altitude of Lithgow is higher, the township is enclosed by hills, and I have felt a more trying heat there than at the Federal Capital.

6. *To Mr. Fenton.*—I do not know that any statistics have been compiled relative to the amount of work that can be done by men in different temperatures. It is an accepted fact, however, that atmospheric conditions exercise a very great effect upon the volume of work which men can put out. Even in Sydney I have experienced weather during which, for the first twenty minutes in the morning, I could not work. My fingers were so numbed that I could not feel them.

7. *To Mr. Gregory.*—At Canberra I have had to warm my hands before I could do anything. I have been told that snow is often to be seen lying on the ground at Lithgow.

8. *To Mr. Sampson.*—I do not know that the real test of climate is whether the atmosphere is light, clear, or muggy. If we were to experience what Mr. Hunt terms a "half gale" accompanied with cold, the conditions, I imagine, would be very unpleasant. To a great extent, I admit that climatic considerations depend upon the character of the temperature. In portions of New South Wales I have felt the temperature of 90 degrees much more than I have a temperature of 110 or 115 degrees in South Australia.

9. *To Senator Keating.*—Mr. Hunt says that the conditions at Lithgow are worse than those at Canberra. I do not think they are as bad as are the climatic conditions at Chicago or its neighbouring towns, or as those of Petrograd, Norway, or Sweden. Climatic influences were taken into consideration when the Small Arms Factory was established at Lithgow. The Minister of Defence of the day exhibited a personal interest in the matter, but at that time it was quite impossible to consider Canberra. There was no basis upon which they could work, and there was no prospect of atttracting population to Canberra The conditions now, I take it, are quite different. Within the next two years we shall have a large population at Canberra. But even if we have not, with the prospect of establishing a garden suburb, workmen will be quite satisfied to live there. I do not think that the advantages of centralization were considered when the Small Arms Factory was set up at Lithgow. I took the liberty of mentioning the matter to one member of Parliament, but he assured me that it was necessary to get to work at once. The presence of coal and iron deposits at Lithgow was also a factor which entered into consideration. But in discussing the general plan which I have outlined, with Mr. Wright, he expressed the opinion that the coal bill cuts no ice.

10. *To the Chairman.*—We have sufficient power plant at Canberra to enable us to carry on the Small Arms Factory there. If the Government decided to locate the works at the Federal Capital, that power could be utilized for conveying the requisite materials close up to the proposed buildings. We would use electricity for all purposes. In placing the reservoir at Red Hill, regard was had to the possibility of sending water to Queanbeyan. I have in my mind two sites in the Federal Capital area which are worthy of consideration if it should be decided to establish the Small Arms Factory at Canberra. One of these is situated near the present railway line from Queanbeyan to Canberra, about 3 miles from Queanbeyan. It is well on the outskirts of the town. The other is on the northern side of the Molonglo River, opposite the Royal Military College, and distant about 2 miles from it, on the opposite bank of the Woolshed Creek. The levels are sufficient to take the sewerage from it by gravitation. Lithgow has recently been sewered. I would like to make one general explanation in respect to the establishment of an arsenal. There are two big spheres of activity which Australia will probably have to face during the next half century. One is the manufacture of from light to big guns. An arsenal, such as might conceivably be established at Canberra, would, of course, not be intended to manufacture big guns or armour plate. The plant for these would undoubtedly be placed near the source of our fuel supplies, and would have to be on the seaboard. The port which occurs to me as being suitable for such an arsenal is Port Stephens. It is already defended, and is to be one of our Naval Bases. An arsenal might be established there, and big-gun construction and shipbuilding operations embarked upon. That port is not far removed from the coal-fields. I believe that in India, at the Dum Dum arsenal, small arms and small arms ammunition are manufactured. The question has been put to me, "Why should there be any correlation between field guns and small arms?" It is true that the machinery required in each case is different, but in workshop practice it has been found that they should be kept together for the purposes of organization and control. Although they are dissimilar in their constructional methods, economy would result from having them close together. The present price of coal at the factory site which I suggest at Canberra would be about 10s. per ton. Its future cost I cannot say. I understand that it is proposed to open mines at Appin. I know that there is coal near Moss Vale. Probably, in course of time, the supplies of coal will be brought closer to that factory. At present a plant of 334 horse-power is being used in the factory. But even if we lay down a plant of 600 horse-power not much fuel would be consumed. With the plant that we have installed at Canberra we would obtain higher efficiency than can be secured by any small plant. In addition, we would be able to supply current from the central station there at a much cheaper price than that for which it could be generated at an independent factory. The site of the existing factory at Lithgow is a poor one to permit of the additions proposed. To the east it is very low-lying.

It would never do, I think, to put factories on today. There is a valley running down to the west of it, a road running along the north of it, and there are hills at the back at it. To assume that it is a suitable site for the manufacture of field guns would impose a serious difficulty at the outset in securing a proper lay-out. What we require is a good open site with a general fall of one in a hundred—a gravitation site, so that the products may come in at one end of it and go out at the other. It should be a *sine qua non* that there should be a railway running into it, and that is not likely to be the case at Lithgow. If we double the existing factory there, what shall we do when we require a further extension of activities? Shall we locate them there on a bad site, or undertake a separate organization? I come now to the proposal to manufacture vehicles. The number of vehicles required for an infantry division, which includes 20,000 men, is, approximately, 700. My reasons for suggesting the manufacture of vehicles at Lithgow may be briefly summarized. Australia is spending a large sum upon its Military Forces, and when those Forces wish to fight they will require a certain number of vehicles. It would be bad policy to delay commencing the manufacture of these vehicles until we experience the stress of conflict, because their production would then have to be undertaken by workmen who had never made them previously. If the Commonwealth manufactured its own vehicles it could make a percentage of them now, and distribute them amongst the troops. It would require to have in stock large quantities of timber and forgings or component parts for this purpose. In addition, it would thus have in its midst a number of men who were experienced in the manufacture of these special types of vehicles, so that when the emergency arose they would have to follow a well-trodden track instead of being required to enter upon their novitiate. In addition, the Postal Department requires a large number of vehicles for all parts of Australia, whether they be carts, or hand barrows, or vehicles for linesmen. This morning I had a consultation with Mr. Oxenham, the Secretary of the Postmaster-General's Department, who has promised to prepare a statement of the number of vehicles which that Department has actually in use. I do not go so far as to say that my advice will be that, in any circumstances, we should start manufacturing vehicles for the Postal Department. But if we commence manufacturing for defence purposes, we might bring in the Postal Department as an accessory.

11. *To Senator Story.*—Undoubtedly it would be an advantage to have the carriage construction shops established at Canberra. But I look upon the manufacture of arms as being the vital function for laying the foundation of an arsenal. The reason why I have suggested that the work should be undertaken at Lithgow is that we already have a shop there which is well adapted to the purpose. We have a large assembling room, the power plant, the wood storage sheds, and the kilns for progressive seasoning of timber. There is also a large amount of machinery with the appliances for burning the shavings. Then there is also a forge shop. The wood-working machinery, such as copying lathes, planing machines, &c., would probably be essential for making vehicles. With a factory equipped with modern forges, such as we have there, with modern furnaces, and with good machinery, the Commonwealth could more than hold its own with smaller manufacturers. Such machinery as would be essential for the manufacture of vehicles might remain there, and that machinery could be duplicated in the new premises. I should think that a comparatively small sum would be required to convert the existing factory into a carriage-building shop. It would mean the erection of a certain number of machines, of benches, and of the supply of tools for wheelwrights, but that is all.

12. *To the Chairman.*—There may be some special machinery at Lithgow which would be useless for the manufacture of vehicles. That, of course, would be removed.

13. *To Mr. Gregory.*—I do not know that the long freight upon vehicles to remote portions of Australia would cost as much as would their manufacture. I think, however, that probably there is a good deal in the suggestion as regards repairs. But, at any rate, if we had a well-equipped forge shop at Lithgow, we might make axles and wheels there for repairs.

14. *To Mr. Laird Smith.*—A good deal of shafting would be used in the equipment of modern workshops similar to those at Lithgow. The only other point to which I desire to refer relates to the accommodation of workmen in a garden suburb at Canberra. To my mind, there is a unique possibility of giving effect to some such scheme, thereby enabling the workmen to live under the best conditions at a reasonable distance from their place of employment. Thus their lives would be made happy, whilst at the same time we should be giving effect to a business proposition. Mr. Hill is now working on this project for me from the standpoint of what is the most economical material to use in the construction of workmen's cottages. At Canberra we have presented to us an opportunity to secure a good suburb, which does not exist in any other part of Australia. As to the lay-out of such a suburb, I may mention that we are purchasing land there for a very small amount per acre.

15. *To Mr. Sampson.*—There is no mature scheme connected with this matter at present. If we can let men a nice little cottage for 10s. per week—a cottage which is not going to cost the Commonwealth much for repairs—we shall be in a good position financially, in addition to which we shall be able to keep the men there.

16. *To Mr. Gregory.*—The construction of the additional buildings connected with the Small Arms Factory within six months, so as to enable the Commonwealth to increase its output of rifles, is absolutely impossible. We could not get the steel work out in that time. Before fixing an approximate date for the completion of such an undertaking, I would like to be afforded an opportunity of making some inquiries in regard to the steel market. It is for Mr. Wright to say how long it would take to erect the machinery which will be required.

17. *To the Chairman.*—That machinery has not been ordered.

18. *To Mr. Sampson.*—I cannot say what increase of output would result from the proposed extensions. It would take longer to erect the requisite buildings at Canberra for a Small Arms Factory than to construct the additions proposed at Lithgow, because, in the former case, it would be necessary to erect a large number of workmen's cottages. There are 480 men employed in the Small Arms Factory. At Lithgow we have not erected any cottages. The installation of additional boilers and power units represents a big

thing. Our experience is that if we want turbines we have to wait for them, and I understand that Mr. Wright has a turbine in view. Of course, that remark would not apply in the case of Canberra, where we already have the necessary power plant.

19. *To the Chairman.*—The site at Lithgow does not lend itself to the expeditious erection of single-story buildings. It would be quicker to erect a one-story building at Canberra, but it would be more expensive, because of the additional roof construction.

20. *To Mr. Sampson.*—To perform a similar amount of work at Canberra to that which is being done by the Small Arms Factory at Lithgow, we should require an establishment of about the same size. Assuming that the factory at Lithgow were converted to some other use, I do not think it would take longer to erect works of the same size at Canberra than it will take to effect the proposed additions at Lithgow. If I were asked to suggest what should be done at Canberra, I should take as my working basis the floor area of the existing factory at Lithgow, plus that of the additions. In other words, I would make provision for a factory twice as large as the existing one. I cannot say offhand how much longer would be occupied in erecting such a factory and workmen's suburb at Canberra than would be absorbed in making the proposed additions at Lithgow. The question involves also a consideration of whether the factory should be built of reinforced concrete or whether it should be a steel structure.

21. *To Mr. Laird Smith.*—I think that operations could be carried on at a factory at Lithgow while the proposed additions were in progress.

22. *To Mr. Gregory.*—I have said in my report that we cannot achieve a gain such as I have outlined there without suffering some temporary losses. We cannot make omelettes without breaking eggs. I admit that there are difficulties in the way of giving effect to my scheme. But the object in view is such an important one that the inevitable temporary losses ought to be faced.

23. *To Mr. Laird Smith.*—In all big countries it is the custom to scrap huge quantities of machinery whenever it is deemed necessary to instal superior appliances. The Ford Company discarded £20,000 worth of machinery, with a view to saving one dollar on the manufacture of each car.

24. *To Mr. Sampson.*—Before I could say the minimum time that would be occupied in erecting the additional buildings proposed, and in installing the necessary power plant, I would require to talk to Mr. Wright regarding the form that those buildings are to take. Then it would be necessary for me to consult Mr. Hill as to the cost of reinforced concrete, and I would also have to learn the condition of the market as to scantlings. It is very possible that if we were constructing fresh factory buildings at Canberra, we would deviate from the sketch plans. For example, these provide for 50-ft. spans, and we might be able to put in 75-ft. spans, which would be factors in celerity of construction.

25. *To Senator Keating.*—If the Commonwealth gave me a free hand in this matter, it might be possible for the men to work more than one shift per day. At Canberra, we have electric light, and consequently we have a better chance of employing men continuously on three shifts. If the Commonwealth said that time was the essence of the contract, we would work three shifts.

26. *To Senator Story.*—If these works were erected in Federal territory, the Department would be in a position to make arrangements with the workmen to accept the same rate of wage, irrespective of the shift upon which they were employed. The State award would not be applicable in such circumstances. Tentatively we have adopted the State award, but it is quite at the option of the Government.

27. *To Mr. Fenton.*—I do not know whether the Small Arms Factory, if erected at Canberra, could be converted to another use if the conditions which obtain after the war warranted the adoption of that course.

28. *To Mr. Sampson.*—Quantities of steel scantlings the more likely to be produced by the up-to-date plant which has been laid down at Newcastle than they are at Lithgow. Mr. Todd has informed me that he has heard that the New South Wales Government intend to establish workshops at Lithgow. I do not know whether that is a good place to locate such workshops.

(Taken at Lithgow.)

MONDAY, 10TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Arthur Creed Wright, Manager, Small Arms Factory, Lithgow, sworn and examined.

29. *To the Chairman.*—In August next, I shall have been managing the Small Arms Factory for three years. I received instructions some time ago from the Minister of Defence to formulate plans for the extension of the factory. Accordingly, I prepared a scheme, upon the basis of which the Home Affairs Department drafted out a tentative plan, which I have indorsed. So far as I can judge those plans, which are now before the Committee represent a complete unit, and there is not likely to be further additions to it. If the proposed extensions are carried out, they will mean practically a duplication of the present plant, so as to bring the daily output of rifles up to 100, plus a 20 per cent. extra supply of barrels. That is equivalent to an output of 35,000 rifles per annum. When those additions are complete, we shall have here a medium-sized factory, compared with other similar establishments in other parts of the world—comparatively speaking, a small factory for military purposes. Three months ago, I received a letter from Messrs. Pratt and Whitney, the contractors for the plant at present installed, stating that they could commence to ship the new machinery from New York in twelve months' time, or possibly a little earlier. We may reckon that it will be fourteen months before the first shipment of machinery reaches the factory. The time which will be necessary in order to get the plant erected will depend largely on the order in which the machinery comes. My idea is to order from the contractors the machines we need first, have them installed, and put into operation, and install the balance as it comes in successive shipments I am hopeful of having part of the machinery in

operation before the new buildings are complete, and before the whole of the machinery has arrived. Three months after we receive the first machinery we can start to slightly increase the output. It would be a fair estimate to say that we could have an increased output in eighteen months' time. I am not sufficiently acquainted with the local resources to say whether there would be any difficulty in regard to the early supply of the requisite additional power plant. I do not know how the Australian manufacturers are situated for pushing ahead with a big job like that. I have recommended a 500 to 600-h.p. engine in one unit. I do not think that engine can be made locally. We may possibly get reciprocating engines made in Australia. The engine at present driving the plant was made in Australia, but it has only 200 h.p. Whether it would be quicker to import the driving plant or to have it manufactured locally I cannot say, because the conditions of manufacture in England are much disturbed at present, and it is impossible to get a positive statement of delivery. I am not sufficiently acquainted with the possibility of producing that type of engine in Australia to give an opinion as to the advisability of ordering locally. We might get information on that subject from Mr. Thompson, of Castlemaine, who has the largest engine-making establishment I have seen in Australia. In regard to the possibilities of extension on the present site, if, after the completion of the additions we are now considering, it were desired to further add to the factory, we could extend practically to Main-street; but it would be necessary to resume land for the purpose. About three years ago, I recommended the resumption of the land extending from the engineer's cottage to Main-street. The price I had in mind at that time was about £10,000; but since that date building has taken place, and only about two-thirds of that area is now available, at a price of £11,000. There is about 13 acres in that block. The ground is not altogether lowlying, it is undulating, and I think it is suitable. I do not think that much refilling would be required. This site was a poor one to commence with, but the factory is here, and we have to make the best of the position. Had I been asked to select a site in the first place, I should not have put the factory where it is. The only steel we have obtained locally is a little building material. Steel of the standard we require could easily be made at Lithgow, but the local steel works were never intended to make the grades we use; and our requirements will not be sufficient to induce a local firm to install a special plant, even when the factory is extended. Outside the factory, there is no market for the finer grades of steel we use. We obtain our coal supplies locally, using about 8 tons per day, which costs us 6s. 6d. per ton at the mine mouth. We are not using the best coal produced in the neighbourhood, but what we do use is quite satisfactory. Not any of the timber used in the manufacture of rifles is obtained locally. I can let the Committee have an approximate statement of what the factory has paid for railway carriage of our supplies during the last twelve months.

30. *To Senator Story.*—The cartage between the railway station and the factory is done by motor lorries. Until three weeks ago, we had only one lorry, which went into service three years ago; it was laid up for repairs for four months; but up to that time it had travelled 9,800 miles, and carried 10,250 tons. We have now two lorries.

31. *To Mr. Laird Smith.*—The scheme of extensions now before the Committee makes no provision for workmen's cottages. In my recommendation of three years ago in regard to the acquisition of the land up to Main-street, I strongly recommended that the Government should take into consideration the purchasing of that area, and the selling of it in building blocks at a nominal cost to employés, who are willing to erect their own cottages with financial assistance from the Government. I have urged that scheme two or three times. A number of the factory employés have built their own cottages on the flat below the factory, and there is also a long row of cottages which were built by a private citizen, and are rented by the employés, who pay 14s. a week, and 6d. for sanitary fees. We have difficulty in getting men to remain at the factory on account of the lack of educational facilities, and other advantages which workmen are accustomed to have when living nearer a bigger centre. The road leading up to the factory was made by the municipality after an urgent request from us. The employés pay rates on any property they own, but the property of the Commonwealth pays no rates. In extending the factory, the manufacture of quick-firers and other guns, besides rifles, is contemplated. There would be no advantage in having the Commonwealth Cordite Factory adjacent to the Small Arms Factory; in fact, cordite and powder factories are invariably isolated from other establishments. I do not anticipate having to suspend the work of the factory at all during the carrying out of the extensions. When the new high-power engine is installed, the present driving plant will still be in use. The whole of the power plant will be concentrated in the one building. The men now at work in the factory have been practically all trained since they came to the establishment. When the factory was first proposed, six mechanics were sent from Australia to Pratt and Whitney's factory in the United States of America. Pratt and Whitney are not rifle manufacturers; they only manufacture machinery for the production of rifles, other munitions of war, and typewriters. Those mechanics were sent to America to gain experience in tool construction; but, up to the time they left Pratt and Whitney's factory, they had not seen a gun made and put together. They had been instructed in the use of machine tools, and they were the men who made the test for Pratt and Whitney on which the estimate of the machinery to be sent to Australia was based. I do not think it will be necessary to send other men abroad, because we have in the factory facilities for training men to take up the additional work as the factory extends. I have no fault to find with the Australian workman; in fact, I consider him quite bright if he is not interfered with. I do not think there is a better climate in Australia than that which we enjoy at Lithgow.

32. *To Senator Keating.*—I came to Australia with the present plant, under a special contract to demonstrate it for the builders. Mr. Ratcliffe, the assistant manager, was here from the time that the buildings were constructed. I have been in factories of this character in the United States of America, and England, nearly all my life. When I said that this factory, when extended according to the plans now before us, would be only of medium size, I was comparing it with similar establishments in the United States of America, and England. The factory at present employs 480 men. When the extensions are in operation as fully as the present plant is, the

factory will be employing about 1,100 or 1,200 men. The extension is planned with a view to extending our operations to the manufacture of quick-firers and automatic revolvers, as well as rifles. Of course we also make the bayonets. We do not make the cartridge cases, but we do make the clip in which five cartridges are packed. At present the factory is working one shift a day, totalling sixty-eight hours per week. The working of two shifts is impracticable. In the first place, the locality has not a large enough mechanical population to supply the number of men needed for this work. In the second place, if another 500 men were engaged for the factory, where are they to be housed? What we would have to pay to men for night work, if the second shift were operated, would be regulated by the arbitration award. The mere fact of having to pay 900 men does not influence me against working two shifts, but that is practically impossible. A good portion of the work in the factory can be done at night, but some of it is too delicate to be handed successfully by artificial light. The area owned by the Commonwealth in connexion with this factory totals about 129 acres, including 14 acres of land which was resumed recently for the extension of the rifle range further south. That range was given to the factory by the Lithgow colliery people. When I proposed the resumption of that land, a question was raised as to the mineral rights. I understand that the Commonwealth have the complete mineral right to the main block, and a question was raised as to whether we should acquire additional land, the mineral rights of which we did not enjoy. I was against that being done, but the colliery people had the land surveyed, and, finding that it had no mineral value, they gave us the title to the land gratis. The area which I am now proposing should be acquired by the Government extends from our present boundary to the main road. The proposed extensions are to be situate entirely on property at present owned by the Government; it will not be necessary to acquire any land for the purpose. I never did think this site a good one. I said, when I first came here, that I could see no reason why this site had been selected for a Small Arms Factory; but we must take into consideration that the factory is here, and that nearly all the hard pioneering work has been done. Henceforward, we shall progress much more rapidly. I am speaking of the unsuitableness of both the locality and the environment; but, having done most of the rough work, we can now proceed faster than we did at first. The configuration of the land makes the site unsuitable to commence with; and another very important consideration is that Lithgow is not a mechanical community. It is a mining community in every sense; and there was no possibility of finding locally men who had had any mechanical training to speak of from the point of view of a manufactory like this. It would have been advisable to have placed the factory near a mechanical population from which its supply of labour could have been drawn.

33. *To Mr. Gregory.*—I think that the new works could be completed and in operation in eighteen months' time. Whether or not there is to be delay in getting the steel girders for the new buildings, depends on how the extensions are to be erected. If the whole building is to be finished before we can put the machinery into any portion of it, it will, of course, take longer to have the additional unit in operation; but my idea was that we should first of all make an addition to the present building, then move in portion of the machinery temporarily, and get the benefit of its operation as quickly as possible. Then, as another section of the building was completed, we could bring that into use. The estimated cost of the new building is £46,000, and of the new machinery about £60,000. I cannot say definitely what has been the total expenditure on the factory up to date. The 1913 report mentions the total of £280,000, including stocks in hand of raw material, finished and partly finished products, and products in course of manufacture, totalling about £150,000. Since that time, there has been a further expenditure of about £6,000 on buildings. I have found nothing enervating in the climate of Lithgow. It has never been moist enough in the summer to bother me, and I have not taken the trouble to get the wet-bulb temperature. In my opinion, the climate is quite good for a manufacturing centre. The objection I have to Lithgow on account of the absence of a mechanical population would apply equally to Canberra. We are not thinking at present of building naval and fortress guns at this factory; but, with a reasonable addition to it, we could make 18-pr. field pieces. We could not get the additional machinery delivered under fourteen months, even if the order were cabled to-day. The only possibility of getting an earlier addition to the output would be by obtaining the few machines already in Australia that are suitable for inclusion in the present plant. I think the best output from this factory will be obtained by allowing us to continue the one shift per day, as at present. Working two full shifts will not produce the number of rifles we are turning out to-day. That is my conviction, based on a life-long experience. As a matter of fact, at Enfield, they have been trying for the last six months to work two shifts, and they have not succeeded yet. Our difficulty in obtaining skilled workmen would be infinitely greater than it is at Enfield. I do not anticipate very great trouble in getting additional skilled artisans in eighteen months' time, when the new portion of the factory is ready. We are training boys every day; and every boy who stays in the factory permanently is becoming more efficient, and can be promoted to a higher class of work. The factories in England experience difficulty in working a night shift. At the present time, the daily shift in our factory is from 7 a.m. till 9 p.m.; but, as I have already explained, some of the operations cannot be carried on by electric light. I am aware that, in the *précis* of proceedings in connexion with the tenders for the machinery at present installed in the factory, an output of 15,000 rifles per annum is mentioned, but no such guarantee appears in the contract with Pratt and Whitney. What this plant was contracted to produce was 50 M.L.E. rifles, with bayonets and scabbards, per day. In the early stages of the factory, there was difficulty in getting a good output because of the men not being acquainted with the machinery.

34. *To Senator Story.*—I do not favour the proposal to erect the additional unit of the factory at Canberra, with a view to the ultimate removal there of the Lithgow plant. The supervision of two establishments so widely apart would present serious difficulties. You suggest that I and the assistant manager might be able to run the two establishments without serious inconvenience or loss during the time that they would

necessarily have to be conducted as separate concerns; but that would be a very difficult job. I have moved a factory a distance of 60 miles, and attended to the work at the old and the new sites; but there we had good facilities for travelling backwards and forwards between the two places. We had the best of railway facilities. We could load up a train at 5 o'clock in the evening, and unload the cars at 7 o'clock next morning. There would be no advantage in being able to run the railway trucks with our material right up to the factory instead of carrying it by motor lorry, as at present. If the factory were at Canberra, there would be an advantage in running the trucks direct to the factory, because an immense amount of material would require to be carted. A big consideration is whether the condition of the roads allows the use of large motor lorries. There is a slight saving in running the railway trucks into the works to take material in and out. My objection in regard to the remoteness from a centre where there is a good supply of skilled labour obtainable applies with equal force to Canberra; but if a factory were established in the Capital Territory, and provision were made for the comfortable housing of the men, that fact would have an influence in inducing skilled artisans to settle permanently in the locality. If a man has a comfortable house to live in after his day's work, he feels more contented; and if there are good educational facilities for his children he does not hesitate so much about leaving the large cities where he has always enjoyed those advantages. I reply again that I do not know why the factory was placed here; but, in the existing circumstances, we are doing the best we can; and if the Government can spend money to provide educational facilities and comfortable houses at Canberra, they can spend that money here with less detriment to the factory. Certainly the difficulty in regard to getting good workmen to take permanent employment in the factory and settle in the locality would be greatly relieved if comfortable houses were provided; but what the Government could do in that way at Canberra they could do at Lithgow. The provision of workmen's cottages is of the first importance. For three years I have strongly urged that the Government should acquire land for workmen's cottages, and assist the workmen to establish their own homes. If the Government will assist the men to get comfortable homes and educational facilities, I can get good workmen to remain here. It is all a matter of making men comfortable. A man is not going to work hard all day and live in a little bit of a shoe-box. If you desire to have here a contented community of workmen, the Government should provide facilities for the men to erect their own homes.

35. *To Mr. Laird Smith.*—I have not seen any of the garden cities of the Old World, although I have read of them; but I have seen small towns in the United States of America where the proprietors own the whole business, and there one finds comfortable homes, good educational facilities, and contented workmen. There is no doubt that it is a good investment to make your workmen comfortable.

36. *To Senator Story.*—The plant at present installed was supplied under contract by Messrs. Pratt and Whitney, of the United States of America. Such machines as they themselves did not manufacture they purchased from other American manufacturers. I can give no information as to the calling of tenders, because a contract had been let about eighteen months before I became connected with the factory. It is absolutely impossible to manufacture these machines in Australia, and there is not sufficient of this class of machinery used in the Commonwealth to induce anybody to undertake its manufacture.

37. *To Mr. Sampson.*—We have a considerable difficulty at the present time in getting raw material. I was born at Enfield, in England, and served my apprenticeship with W. and T. Avery, of Birmingham. For four months I worked for the British Small Arms Company. That would be about the time of the Russo-Turkish war. In 1880, when I was seventeen years of age, I went to the United States of America, and I have not been to England since. I have designed and built a good number of plants for the manufacture of small arms. The plant in these workshops, when first established, was one of the best I ever saw, and there was no better plant to be bought in England. As a matter of fact, the establishment of this plant in Australia has been the means of a good many hundreds of thousands of dollars' worth of this same machinery being installed in the Enfield and Birmingham factories, and also in Indian, German, and French factories. I do not think the output could be increased by the duplication of certain parts only, because all the machines we have are specially designed for this work, and are running a little below their normal capacity. I do not think that the addition of a few machines could substantially increase the output of the factory unless we went in for practically a complete duplication. The blacksmith's shop was over-supplied, and it could meet an increase of operations with less additions to plant than would be required by any other branch of the factory. The proposed extensions would result in the present output of rifles being doubled; but that would involve almost a complete duplication of the plant. By the establishment of a similar factory in some other part of Australia two separate managements would be necessary, and that would be more expensive than doubling the size of the existing factory. To commence with, there would be no trained staff available for the installation of the machinery. It would not be possible to draw from this plant a sufficient number of skilled men to get the second factory into full working order, and immediately reach a maximum output. In fact, it would take the second factory longer to attain the maximum output than it has taken at Lithgow. A complete duplication of this plant at some other centre, working in competition with the Lithgow factory, might result in a speeding-up of the work at the existing establishment; but a second staff could not be got together to take control of a second factory at Canberra, and get it in operation as quickly as could be done with an extension of the plant here.

38. *To the Chairman.*—If the Government decided to establish a small arms factory in each State under my general supervision, we could not spare the men to go from Lithgow to those other establishments. I do not know of any men who have had sufficient training to allow of their being given responsibility at another factory. The same difficulty does not apply to the extension of the existing works. I have here a staff of six foremen who are fairly good. Each one of those, with a sub-foreman and with men of experience

coming along, can supervise a considerable number of men; but to take the next best man, that is to say, the sub-foreman, and place him in charge of another gang of men to produce what his foreman was producing, would be suicidal. If this factory were twice its present size, I should not ask for another manager. I should put on additional men below me, and work them up. I can handle a factory making 500 rifles per day better than I can manage one making only fifty. To draw a considerable number of men from this factory to assist in the operation of a duplicate factory somewhere else, would be a very bad policy. With an addition to this factory rifles will be made cheaper, and the work will be easier for the staff than it would be if there were two separate factories. With a larger establishment, the work would become more systematic, and generally the conditions would be easier than they are now. If our plant is duplicated, and we have to employ an additional staff equal to the present staff, it would take us about two years to reach the maximum output. But if a second plant were established in some other place, it would require fully three years to reach its maximum output.

39. *To Mr. Fenton.*—Twenty acres of land between the factory and the main road could have been obtained three years ago for about £10,000. About one-third of the area has been built upon, and I estimate that about £11,000 will be asked for the balance. The price of the land has risen about 33 per cent. I do not think that the present abnormal conditions in Australia, and the consequent lack of employment, have improved our chance of getting good men for the factory. It is always the good workmen who are retained till the last, and they are never discharged except as a last resort. The first men who are put out of employment are the shirkers. In eighteen months' time, when the extensions will be ready, we shall want a large number of additional men; but if we cannot offer inducements to the men to come here, I do not think we shall get them. Good educational and residential conveniences are an absolute necessity if we are to get and retain the best class of workmen. If the factory employs an additional 720 men, that should mean an increase in the population of Lithgow of at least 2,160. Whether the present establishment is increased or not, one essential for attracting good workmen is the provision of suitable residences, and, in my opinion, the Government should purchase land for building sites, even if they have to pay a big price for it.

40. *To Senator Story.*—The erection of the extra machinery in the new building would be done under the supervision of the general staff. The men who manufacture the rifles would have nothing to do with that work. We have a millwright and two or three men under him, and with the experience they have had, they could each be placed above two or three men, and carry out a section of the installation work, under the direction of the millwright. The work would, of course, be under the supervision of the assistant manager and myself. I have the nucleus of the staff necessary to carry out the erection of the machinery.

41. *To Mr. Laird Smith.*—All the houses in Hassan's Wall-road have been built since the establishment of the factory, and a good many of them have been erected by the employés of the factory. Last month twenty-three building lots were sold, and that means the building of twenty-three more houses.

42. *To Mr. Sampson.*—The cable I received from the contractors in regard to new machinery stated that they would deliver, f.o.b. New York, certain portions of the machinery in twelve months' time, or possibly ten months, the balance to be sent along at intervals extending up to eighteen months from the placing of the order. We should be able to establish portion of the plant in eighteen months' time. The time which would be required for the installation of the whole plant would depend on the quickness with which the manufacturers could supply the machinery. I estimate that it would take the extended factory about two years from its completion to reach its maximum output. If a duplicate factory were established somewhere else a longer time would be required. I have been at this factory for three years, and it has not reached the maximum yet. I am trying to bring the output up to the maximum by August next. Approximately speaking, the new factory would reach its maximum output in four years' time.

43. *To Mr. Gregory.*—I am satisfied that the Pratt and Whitney plant is the best that can be obtained. The plant has not given the output that was guaranteed. For that the economic conditions in Australia are responsible. In order to increase the output, I have exerted all my energy and influence to get the men to do what I call a day's work. I have never tried the bonus system. My interpretation of the arbitration awards is that a man on piece-work shall be paid a sufficient rate to enable him to earn anything up to 33 per cent. more than the daily wage. Under those conditions, piece-work is not a good policy. Again, these men are not used to these conditions of manufacture, and they have their own opinion as to what is a day's work. Often that opinion is not mine. It is only by coaxing them along that we get anything like the number of pieces that should come from the machines. I have no sympathy with piece-work. Under that system either one party or the other gets the thick end of the stick. I would rather give a man a good day's wage and make him do a good day's work, or else leave the job. I do not think that the institution of a bonus system would lead to quicker work and a bigger output of rifles. What we might gain in one way we would lose in another, because there would be more waste of material. The output of the factory last month was 1,400, although there were three vacation days. In the previous month the output was 1,500, whilst this month I expect to turn out over 1,500 rifles, and afterwards to gradually increase the number until we reach 1,800 per month. From last June up to next June, the factory will have turned out about 15,000 rifles. In the present calendar year we have had hard luck, because on account of the quality of the metal we had to give the barrels special treatment. That fact threw us behind to some extent. But, continuing the present twelve-hour shift, I expect to reach an output of 20,000 rifles in the current calendar year. The *précis* of the proceedings in connexion with tenders for the plant mentions a cost per rifle of £2 18s. for labour and material, and 11s. 1d. for interest and depreciation, making a total of £3 9s. 1d., or 15s. 11d. cheaper than the rifles could be bought in England at £4 5s. I do not think, however, that Pratt and Whitney guaranteed the price of the rifle at all. What they guaranteed to do was to produce a rifle in twenty-three working hours. They did not know the rate of wages paid in Australia; that was not their business; but on the basis of 1s. 3d. per hour, it is easy to calculate what the rifle should cost if the men met the test made in America. If, however, the men do not meet the test, that is no reflection on Pratt and Whitney. I will endeavour to supply the Committee with an estimate of the cost of rifles manufactured this year. Unfortunately, the accounting department is behindhand. The 1913 report was only presented about three months ago. We anticipate having the 1914 report available by the 1st August, and the 1915 report two or three months later. I cannot say that our system of accountancy is such as to enable us to say at the end of each half-year what has been the cost of each rifle produced. Last month the factory turned out 1,500 rifles, and the pay-roll was a little less than £7,500, including all expenses, such as the maintenance of ground, &c. That gives a rough cost of £5 per rifle. The material costs about 14s., and the overhead charges are about £2 per rifle. I expect the cost will be less at the end of the year. An increase in the plant will mean an extra capital cost; but if we can turn out another 15,000 or 20,000 rifles per year, our overhead charges per rifle will be reduced. I have absolutely no faith in the bonus system as an incentive to increased output. To some extent, we have the same difficulty here as the newspapers report in connexion with the workmen on the Clyde—the men are getting more money than they know what properly to do with.

44. *To the Chairman.*—The minimum wage for adults is 9s., and overtime is paid for at the rate of time and a half. Actually the men receive seventy-eight hours' pay for sixty-eight hours' work.

45. *To Mr. Gregory.*—We are making the full number of component parts for every gun produced to-day, plus 10 or 15 per cent. of some pieces, which go into store, and extras put out for the troops to make good breakages. I can assure the Committee that we are not getting behind in that way.

46. *To Mr. Fenton.*—The Government plant at Springfield, United States of America, turns out from 250 to 300 rifles per day; but in an emergency it is capable of producing 500 per day. The plant is so large that some of the machines are always idle. I possess a rifle which I bought from the United States Government six years ago at cost price, which was 16 dollars 80 cents, approximately £3. I can say without egotism that this factory has progressed better than any other factory that ever started, so far as my knowledge goes. We have had bumps, but, taking all things into consideration, we have done very well.

47. *To Mr. Gregory.*—A statement of the estimated cost of the rifles produced from the 1st January up to the present would not be much of a guide to the Committee. We ran into a lot of poor material. That may or may not have been our own fault; but, at any rate, we had to give it special treatment to bring it up to the standard. That trouble threw us behind; but now our output is steadily increasing. We have practically averaged 1,450 rifles per month for the last three months, although there were three

vacation days. I have stated that the accountancy department at present is not very satisfactory, but the mechanical staff are taking the question of costs under their supervision, and I am installing a system by which we shall be able to tell what each component part costs almost as soon as it is produced. In regard to the overhead charges, the only objection I have is that we have to pay heavy interest charges on a large amount of money that was poorly spent.

48. *To Mr. Sampson.*—I cannot believe that Pratt and Whitney guaranteed to build the rifle for £2 18s. we are producing. The contract says distinctly that they will guarantee to build a rifle completely in twenty-three man hours. The tests on which the plant was bought were conducted by Australian representatives, and they, and not Pratt and Whitney, supplied the estimate. The contract provided distinctly for a rifle in twenty-three man hours. That would work out at 43s. 3d. for absolute prime labour cost, excluding light, heat, and managerial expenses. The factory burden—that is to say, all expenses outside wages and material—varies in different factories from 50 to 125 per cent. It depends on the size of the plant and the character of the work being done. Different factories distribute their expenses differently. In some factories the expenses are carried down very minutely, and it takes eight or ten years before you can get that system into accurate operation.

49. *To the Chairman.*—We obtain our steel through the Eagle and Globe agency, in Sydney. The first shipment of steel to come here was furnished by the British War Office through its contractors. The present supply was contracted for through the Eagle and Globe Company, of Sydney. It comes from the firm of Siebohm and Dieckstrell, of Sheffield; but the Committee must not be alarmed at the German sound of the name. That firm established their plant at Sheffield some seventy-five or eighty years ago. Our steel supplies are bought under the War Office specifications, and Siebohm and Dieckstrell are a very reliable firm. The present chairman is Sir Arthur Balfour, who was master cutler in Sheffield a few years ago, and he is not the man to tolerate the sending out of any material which is not in accordance with specifications. We have at the factory now a machine with which we can test all material, and if the material is not up to the War Office specification it is rejected. If it is up to the specification, but does not give the results which we look for under ordinary working conditions, we subject it to special treatment to bring it up to the required strength. The second supply of barrel steel which we received from Enfield was so treated. Our last contract for steel supplies was based on an output of 20,000 rifles per annum. We get about 1,000 tons of steel per year, and if the factory is doubled in size, we shall require double that quantity. About three years ago I approached Mr. Hoskins on the subject of supplying the factory with steel; but our requirements are not a sufficient inducement to him. Our steel contracts were let about a year ago, and represented ample provision for the manufacture of 60,000 rifles. Nobody anticipated an outbreak of war, but we ordered supplies for three years. We have not obtained all the material because of the outbreak of war. We also ordered the wood for 15,000 butt stocks, in addition to the wood for 25,000 stocks

we had in hand. The front stocks and hand-guards did not arrive at that time—they were taken off the ship last November.

50. *To Senator Keating.*—I will candidly admit that the plant is not turning out a rifle every twenty-three hours, as was guaranteed; but I do not admit that the fault lies with the plant. The principal reason is the lack of experience on the part of the men, and, as I have already said, I do not know why the plant was established here at all. I have had to take miners out of the hills and train them to work these machines, so that they now do a fairly good day's work. When it is remembered that those men have been trained in the factory, and are working to one-thousandth of an inch, it will be admitted that we have accomplished something. I anticipate being able to produce a rifle in twenty-three hours. In large manufacturing places like Birmingham, Sheffield, Springfield, Providence (Rhode Island), and Boston, the families of the mechanics have lived there for years, and the young fellows have had the mechanical instinct bred in them. When, however, you have to engage boys who have been brought up in a mining community, it takes some time to get the mechanical interest drilled into them. The estimate that the plant would produce one rifle every twenty-three hours was based on the supposition that there would be something like normal proficiency amongst the workers. I see nothing in the present lay-out of the factory which militates against its success.

51. *To Mr. Sampson.*—We cannot work two shifts for these reasons: In the first place, we cannot get an additional 400 men who are sufficiently trained, or who possess any mechanical capability at all to better the output of the factory. If men are brought from Sydney there is no housing accommodation for them when they come. It has been suggested that we should accommodate the men in tents; but the class of artisan we require for a factory of this description cannot be induced to put up with that sort of accommodation. I know of such an attempt having been made in the United States of America. The Bewick people's business in one particular place extended so rapidly that the growth of the town could not keep pace with the growth of the factory. The consequence was that the workers had to be housed in tents. The single men remained, but the married men would not put up with those conditions; and the consequence was that the whole show collapsed.

52. *To Mr. Sampson.*—Assuming the labour were available, the principal obstacle in the way of working two shifts at the present time is the insufficiency of material to carry the factory on for any length of time. Altogether we have in hand material for about eight months' work. There are further supplies of iron and steel in prospect, but not of wood. Australian timber could be used if a supply of seasoned timber were available; but green timber is of no use for our work.

53. *To the Chairman.*—Cedar would not be of much use for rifle stocks. I think we shall be able to pull out of the wood difficulty all right. I have commandeered timber from the Home Affairs Department through Colonel Owen. Some of it which came to hand was not sufficiently good to be used; but the Department is selecting for us every piece of suitable timber from their supplies at Canberra and Melbourne. I have also gone into the matter with the furniture dealers who have small supplies. I question, however, whether the supplies we could get from them would justify them in displacing their men. Tenders were invited about two months ago for 50,000 pieces of wood, which would represent 100,000 stocks; but, owing to delays in the tender department, tenders were not let immediately. In consequence, the price of the logs rose, and that necessitated, according to departmental regulations, the re-invitation of tenders. That happened about a month ago. That wood was ordered through two Sydney firms, and was Queensland maple, which was to come from Cairns. I was told that I could get 20,000 stocks from timber available at Canberra; but when the wood came to hand we found that the quantity suitable was only equal to 10,000 stocks. If I can get this local supply, and am successful in my negotiations for American black walnut, I think we shall be able to pull through the wood difficulty all right. My view is that there would be no advantage in working two shifts, and then having to shut the factory because of lack of material to continue. It would be better to keep going as we are doing now. Briefly summarized, the obstacles to the working of two shifts are the obtaining of trained men, the housing of the men if they were obtained, and the procuring of sufficient supplies of raw material. Within the factory itself there are no mechanical difficulties. We are handicapped in regard to the barrel straightening. That is skilled work which cannot be done at night, and it is in the hands of one man. I have a boy being trained to the work now, and I have also obtained a man who did the same class of work about eight years ago. So far as teaching men the work is concerned, we cannot force the one skilled man to teach young fellows if he does not desire to.

54. *To Senator Story.*—The overseeing of a second shift would present difficulties, because I have only six foremen on whom I can absolutely rely. If we were working two shifts, what I should do would be to leave each foreman in charge of his section for portion of each shift, the remainder of each shift being under the subforeman.

55. *To Mr. Sampson.*—I would not superimpose another eight-hours shift on the present twelve-hours shift, but would work two shifts of eight hours each. The twenty hours overtime per week which the men are working now is paid for at the rate of time and a half; but if the present force of men were divided into two bodies for the two shifts, and were reinforced by untrained men, the cost of producing a gun would be higher than it is at the present time. Even if we got over those difficulties, I do not think it would be possible to extend the work to three shifts. I do not think there are enough competent mechanics in Australia to work three shifts at this factory, and still give the accuracy, interchangability, and output that are necessary. The question would be bound to arise as to whether the second shift working at night should not be paid at the rate of time and a half.

56. *To Mr. Laird Smith.*—The additional power plant I propose to install in the factory would cost approximately £5,000. I should like to explain to the Committee that when the contract for the Pratt and Whitney plant was let, it provided for a complete set of tools, gauges, jigs, and two sets of cutting tools only to be supplied.

Before the plant was shipped, the question arose as to what extra cutting tools would be necessary in connexion with the starting of the plant. A factory could not be started with two sets, because it would not take a greenhorn long to break them. At that period I had just connected myself with the Pratt-Whitney people on behalf of this establishment, and in the previous January I had supervised a close stocktaking for Hopkins and Lane for financial and other reasons, and we found that for 600 men we had about 80,000 dollars worth of small cutting tools on hand to draw upon immediately. The large tools were bought from the standard plants, because it was cheaper to do that than to install a plant to manufacture them. I was asked by Pratt and Whitney to give an estimate of the extra cutting tools required to keep this Australian plant running for a year. I recommended 100,000 dollars worth of tools; but my estimate was laughed at. The same estimate was given by Mr. Hansen, the manager of Pratt and Whitney. We took every drawing, and I wrote down what I thought would be a sufficient number of each tool to carry this factory on for a year. For some of the more difficult and expensive ones, we marked down a greater number, and the value of the whole lot of them came to 150,000 dollars. We received information from Australia that 100,000 dollars would not be allowed for extra tools. Accordingly we reduced our estimate to 60,000 dollars, and eliminated all duplicates of big milling cutters, which we reckoned would last sixteen or eighteen months. That estimate was still too high, and finally we were authorized to purchase only 25,000 dollars worth of tools for a year's working. That was one of the reasons why the factory could not make progress at the start. Some of the cutters were broken, and we had to wait for others to come to hand. The men were not trained to the making of higher-grade tools of this kind, and we had to take fitters and blacksmiths, and train them to the job. They knew nothing about the making of gauges and grinding tools; but we had to teach them to do the work until we could get a staff of men trained to do all our tool manufacturing. All that trouble and delay was due to the expert advice given in the first place in regard to the tools being ignored.

57. *To Mr. Gregory.*—We have a few apprentices in the tool room.

(Taken at Lithgow.)

TUESDAY, 11TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Robert Pillans, mayor of the municipality of Lithgow, sworn and examined.

58. *To the Chairman.*—The Small Arms Factory is situated within the municipality of Lithgow, and there is a large area of land close to the works suitable for any extension of the factory. On the opposite side of the road from the present factory, between the rifle range and the academy, there is a considerable stretch of country of a suitable character; that is the land adjoining the western boundary of the factory ground. That land runs right up to the main road, and on the opposite side of the road there is a good portion of fairly level land suitable for factories or workmen's dwellings. That land belongs to Mr. J. L. Brown, from whom the land on which the factory is now situated was bought. I should say £50 to £60 per acre is a reasonable valuation for good building land in that vicinity. The land which is now being built on has been sold at prices ranging from £1 to £3 per foot for picked blocks. The land to which I refer as being suitable for factory extension and workmen's dwellings is higher than the land which has been built on, although it is somewhat farther away from the mines and the ironworks. I should think that land could be purchased for £50 per acre. One of the subdivisions near the town was sold for £60 per acre. It was close to the main thoroughfare, but it was also much nearer the flat. The duplication of the present Small Arms Factory would be beneficial to Lithgow from an employment stand-point, and would be also of advantage to those people who hold land for sale. I do not agree with the statement that Lithgow is not a suitable place for obtaining the class of workmen required for a small arms factory. Mr. Thornley, who is controlling an engineering establishment at Sydenham, informed me that the men trained at the Lithgow ironworks are the best class of workers he can get. I am convinced that the factory can get plenty of skilled labour at Lithgow. There is not a large surplus working population here, but there are always enough workmen available to do all the work that is offering. We have never had any scarcity of labour, and I believe there are a number of applications for work at the factory, but the applicants cannot be employed because the staff is already at its maximum. A number of the men at present at the factory belonged originally to Lithgow. Others were brought from Victoria and other States, but those workmen are constantly changing. They come and go and return. The defective condition of the roads in the vicinity of the factory is due to the mistake made by the municipal council in the past. They took over that subdivision without having the necessary work done beforehand. To some extent the present council has to carry the sins of its predecessors, but we are now making provision to not only build roads, but to also drain the flats. On the opposite side of the railway we are spending nearly £1,000 on drainage alone. There is a covered 4 ft. 6 in. barrel drain, with two tributaries of 3 feet each, which will drain all the area between the Small Arms Factory and Main-street. We have not had time to make the roads on the newly-built portions of the town, because, as I have explained, the subdivision was taken over too hastily. There are no vacant houses in the town. Every fortnight the council deals with from six to ten applications for building permits. The present building operations are mainly on the subdivision between the Small Arms Factory and Main-street, but new buildings are being erected all over the place. I do not think that there would be any trouble about the housing of additional men if the factory were increased. The extra 700 men which the factory may require will not arrive here immediately in one body. The extensions to the building would have to be carried out first, and I feel confident that by the time the factory was ready for the men, provision would have been

made for housing a considerable number of them. We have in Lithgow men with money who, I believe, would be prepared to make provision to meet any great increase in the demand for housing accommodation. At present rents are fairly high. For a decent workman's cottage the rent is 14s. or 15s. per week. The buildings, if erected in pairs, would cost about £300 each, and the land would average £2 per foot, so that the landlords are getting good interest for their money. There will be no difficulty in regard to a water supply. During the last twelve months the council has been making provision for an extra supply, and we have now a storage capacity of 126,000,000 gallons, which is gravitated from two reservoirs about 2½ miles from the centre of the town. There are no residences on the catchment area. For water for domestic purposes we charge a minimum rate of 10s. per annum, or ½d. in the £1 on the unimproved value, whichever is the higher.

59. *To Mr. Sampson.*—The householders may use as much water as they like. Meters are only on the larger industrial establishments. If, however, a householder has a garden, he has to pay a garden rate of 10s. per annum. Those concerns which receive water through the meters are charged 3d. per 1,000 gallons, and that rate pays us very well. At the time of the drought we were supplying Portland for five or six months at 6d. per 1,000 gallons.

60. *To Mr. Fenton.*—We have increased our storage by raising the height of two reservoirs by 3 feet. That will give us an extra storage of 16,000,000 gallons and a better pressure. Even if the augmented supply proves inadequate we have a reserve supply in another river in the direction of Marangaroo, which has been ear-marked for the Lithgow water supply, should it ever be necessary. From that spot we could get practically an unlimited supply, and bring it here by gravitation, I believe. The increased storage will not mean any increase in the rate. Recently we have put down an extra 9-inch main as far as Albert-street, and, if necessary, it could be continued right to the factory gates. The diameter of the mains from the reservoirs are 12 inches and 9 inches respectively. The Small Arms Factory is charged 3d. per 1,000 gallons, like any other industrial consumer. The water rate of ½d. in the £1 on the unimproved value is in addition to the general rate. If we were to abolish the annual charge and meter the water to all consumers, I do not think we could sell it for 3d. per 1,000 gallons. We could easily sell it at 6d. per 1,000 gallons. At the present time the water scheme is making a profit of £500 a year, after paying all expenses.

61. *To the Chairman.*—We would like to reduce the water rate to the householders, but the law will not allow that. We are also in a very good position in regard to the gas supply. That is a municipal concern, and the Small Arms Factory consumes about 3,000,000 feet per annum, the last month's bill being £41 cash. We are prepared to supply the factory with as much gas as it may require. A new gasometer has been installed, and we have now a storage capacity of 180,000 cubic feet. The council last night decided to order a fresh set of retorts. If the gas bill is paid within seven days the consumer pays a cash rate of 3s. 4d. per 1,000 feet, but if the account is allowed to stand over he is charged 5s. Last year we established sixty-two additional street lamps. The factory is connected with the sewerage system, and any extensions would also be connected.

62. *To Mr. Gregory.*—I have not the slightest doubt that the factory could be extended on the land on the western side of the factory. The system of sewage disposal in operation here is the septic tank, with filter beds, the effluent running over 40 acres of land into a creek. So far the system has been quite satisfactory. We met with the difficulties that all septic tanks present in their early stages until the handling of them is understood. It was installed on a Government plan, and has been operating about thirteen months. So far there has been no offensive smell from it. We have not started to cultivate the area over which the effluent runs, but we can graze horses there, because it is a good grass paddock. Farmer's Creek, into which the effluent runs, is a tributary of the Nepean River, and is not used for domestic purposes; there are only a few farms along the creek between Lithgow and Penrith, and only stock water from it.

63. *To Mr. Fenton.*—A few of the private concerns in the vicinity have their own electric generating plants to work the electric cranes, and they also light their establishments by electricity.

64. *To Mr. Laird Smith.*—There is not much sickness from typhoid fever in Lithgow. The unpleasant smell which is noticeable about the lower part of the town is caused by the ammoniated water from the gasworks. That ammonia is a deodorant, and does not affect the health of the community.

65. *To Senator Keating.*—The population of Lithgow is about 10,000. There is always a small floating population in connexion with the mines and the ironworks. The establishment of the Small Arms Factory has increased the population during the last three years by from 1,500 to 2,000, but the increase was not very noticeable, because almost simultaneously with the starting of the factory the Cobar smelting works closed down, so that the net increase was not very great. There is very little movement amongst the employés at the factory, so that its establishment here has not increased our moving population at all. The reason why we have not a big mechanical population at Lithgow is that, in the past, the mechanical trades did not develop at a rate to keep pace with the training of the men. A great number of men have been trained in mechanical occupations at Lithgow, but, there being no work for them, they had to shift to other centres. If we had the mechanical industries we would have the trained men. We have the human material, and we have had the experience of training a mechanical population, but centralization has affected us just as it has affected other towns. There are always a few unemployed about Lithgow, and one could rely on being able to get hold of from fifty to one hundred men at any time. The unemployed do not include many skilled labourers. No relief of unemployed has been necessary here on account of the war and drought. There is plenty of land available for the extension of the factory; none of it has been reclaimed, nor do I think it requires reclamation. Some of the land on the north side of the factory has been levelled up in order to improve the entrance to the factory. Prior to that the land was sloping towards Main-street for some distance. The land I am recommending is in its natural state, and is on about the same level as the land now occupied by the factory. It would allow of the existing buildings being continued, and would not require the extension to be a separate structure.

66. *To Mr. Laird Smith.*—The municipality has a man in charge of each department. We have a fully licensed sanitary inspector in charge of the health department; he is subsidized by the Government, and is practically a Government servant. The council have not gone into the subject of town-planning, but we are prepared to do as much as the law will allow us to do. The present Local Government Act does not give us sufficient power, but I believe it is the intention of the State Government to introduce an amending Bill at an early date to give additional powers to the municipalities, and that will be immediately taken advantage of by the Lithgow council. In regard to the climate, we do get snow occasionally, but it does not lie for more than a day or so. The summer climate is ideal. Our water supply has been declared by Government officers to be one of the best in the State.

67. *To Senator Story.*—To some extent, the high rents are caused by the high price of land, but the cost of material and labour also has risen in recent years. I do not think that the selling price of the building sites, which I think can now be obtained for £3 per foot, will be increased if the Small Arms Factory were considerably extended. The council is being asked to take over two other subdivisions, and the present supply of land available for workmen's cottages is greater than it has ever been at any time in the history of Lithgow. In the past much of the land was held by private capitalists, who refused to sell. No doubt if the extension of the Small Arms Factory led to a sudden increase in the population there would be a boom in land prices for a time, but that very increase would bring other subdivisions into the market. The population of Lithgow has doubled in the last fifteen years, and the land is cheaper to-day than it was fifteen years ago. The tax on unimproved values for municipal purposes has forced land into the market. I do not think that the extension of the factory would lead to any permanent increase in the price of land. For a while there might be a boom, and people might buy up blocks they did not require, but that would be regulated by other subdivisions being brought into the market. Probably while the boom was on the men who wanted land for building sites would have to pay a high price for it, but I think that ultimately normal prices would be restored. I think that the tax on the unimproved value would prevent owners from holding on to their land in anticipation of high prices on account of a probable large increase in population. The municipal, lighting, water, loan, and general rates amount to 5d. in the £1; there are no exemptions. The owners of vacant land pay water rates if their areas are close enough to the main.

68. *To Mr. Sampson.*—The net return from rented house property works out at about 3 per cent. If several hundred additional men were brought into the factory within a short period, I think they could be accommodated in Lithgow. In the case of a sudden influx of workmen I would suggest that the Federal Government should acquire a subdivision for their employés. The only evidence I can give to the Committee as to the willingness of private capitalists to build extensively in order to meet any increased demand for houses is that there are several men in Lithgow who are building continually. One man owns close on 200 houses, and is still building. Another owns 100 houses, and is erecting more. The only definite evidence the Committee can get on that subject is that of Mr. James, Mr. Gray, and Mr. Hoskins, all of whom have built extensively in Lithgow. Taking the past as a guide to the future, no place in New South Wales stands as well as Lithgow does at the present time. I am confident that if it is known that a certain number of men will be coming to Lithgow to work, houses will be provided for their accommodation.

Charles Henry Hoskins, ironmaster, sworn and examined.

69. *To the Chairman.*—My firm controls large ironworks in Lithgow. We take the crude ores from our mines at Tallawang and Carcoar, and limestone from Ben Bullen and Havilah, and assemble them at the blast furnaces. The crude material is there converted into pig-iron suitable for either foundry purposes or steel. We send large quantities of pig-iron for foundry purposes all over Australia, and for steel-making to our steel and iron works in Lithgow, where it is made into steel rails and other products. So far, our output of steel rails has been sold to the Commonwealth Government and the Victorian Railways. We have not supplied any steel to the Small Arms Factory for the manufacture of rifles. Mr. Wright did interview me, and we would have been very pleased to have made the steel he uses, but we found that his requirements were so small that it was not worth our while to consider the proposal. The least steel we put through our furnaces in one charge is from 30 to 50 tons. If one charge would supply the factory with steel for three years the business would not be worth entering for. Another consideration is that our steel is basic, whilst for most of the factory requirements acid steel is preferable. We could supply some of the steel the factory used if its requirements were larger. I understand that the Government are thinking of enlarging the factory, which will then require a larger supply of material, and that may put a different complexion on the proposition. We would like to get that trade if we could. In regard to the girders and other steel work required for the factory extension, I may say that when the present buildings were erected I regretted that we could not tender for that business. We were just commencing operations at that time, and we were not quite in a position to tender. If the Government decide to extend the factory, without doubt we will tender for the steel work, as I hope a large proportion of it will be supplied locally. Time, I understand, will be the essence of the contract, and that is one of the reasons why Lithgow would be better able to tender for the steel work than any other place, because we could proceed with the work immediately. If the buildings were to be completed in six or seven months we could supply the building steel to keep the job going. I quite appreciate the fact that the Government will expect the new factory to be built by the time the machinery arrives.

70. *To Mr. Laird Smith.*—The Small Arms Factory uses various classes of steel; the barrel steel is different from that which they use for bayonets. If we undertook to supply the factory with the steel it requires that would not mean the erection of special furnaces to produce the different varieties. The difficulty is that our method is basic, whilst the better steel for the purposes of the factory is acid steel. An order of 10,000

tons a year would certainly be worth our consideration; as, indeed, would a much smaller contract. I would like to see everything we use made in the Commonwealth, and it has cost us many thousands of pounds to endeavour to give effect to that idea. We build here in Lithgow our own blast furnaces, and everything else we use in the business. It would not be necessary to erect special works for the production of the steel required by the Small Arms Factory; it is a question of getting a sufficiently large order to allow us to handle the material properly. If we were given an order for 100 tons of the material our furnaces are suited for, we would be pleased to supply it.

71. *To Senator Keating.*—Basic steel for a number of purposes is quite equal to the acid steel, but the latter is looked upon as a finer and better steel, and it can be tempered to a higher degree. The difference in the steel is accounted *for by the class of ore and the lining* in the furnace. There is no ore in Australia with which acid steel can be manufactured.

72. *To the Chairman.*—Mechanical engineering is part of our business, and we have had a shortage of men, because, when the Small Arms Factory started, it stole a lot of our men. Nearly all the men in the factory to-day are from our works. We have not had a great deal of trouble, because engineering is a trade that a young fellow likes to adopt. I think we have about forty or fifty houses which belong to the firm. The workmen would like us to provide houses *which could be* rented at from 9s. to 12s. per week; but it is difficult to do that, because a house that could be let for 8s. or 9s. per week would be a very poor one. So far as the Small Arms Factory is concerned, I do not think there will be the slightest difficulty in getting the men housed. The anxiety on the part of persons who might be prepared to build will be as to whether the factory will continue its increased output. We know that at the present time ten times as great an output would be welcomed. But the question presents itself whether, when the war is over, the Small Arms Factory will continue to employ as many men as it may employ under the present abnormal circumstances. That is a question men with money will have to answer for themselves before they will embark upon the building of a number of houses. However, I think there will be found in this town people enterprising and venturesome enough to build quite sufficient houses for the workmen. In addition to that the workmen are building homes for themselves. This is a very prosperous town, as will be understood from the fact that the average Savings Bank deposits per head of the population, comprising men, women, and children, is £25.

73. *To Mr. Laird Smith.*—Ben Bullen is distant 28 miles from here, Havilah 60 miles, Carcoar 90 miles, and Tallawang 110 miles.

74. *To Senator Story.*—The Small Arms Factory obtained a number of our employés because the Government had cancelled our contract, and many men had to be thrown out of employment. I have no reason to suppose that the men would not have remained with us if the contract had not been cancelled.

75. *To Mr. Laird Smith.*—We employ about 100 engineers, and in Lithgow about 1,000 men altogether. At all our establishments here, in Sydney, and elsewhere, we employ 3,000 men.

76. *To Mr. Sampson.*—We have in hand now the first order for steel rails we have had from the Government of New South Wales. Hitherto we have not been in a position to meet further orders for rails. In fact, I have taken orders for a greater quantity of work than I can execute in a reasonable time. We are spending an enormous sum of money in extending the works, so that we will be able to handle much larger quantities, and it is safe to say that within a short time no more steel rails will be imported. We have never given consideration to the manufacture of wheels. Steel rails represent a big business, but corrugated iron is bigger still, and its manufacture would require two blast furnaces. I hope the Committee will help us to secure the corrugated iron business. There is no reason why railway carriage wheels should not be made here.

77. *To Senator Story.*—The sizes of steel required for the proposed extension of the Small Arms Factory are, I am informed, 12-in. x 5-in., 10-in. x 6in., 10-in. x 5-in, 6-in. x 3-in, 13-in. x 8½-in., 10-in. x 6½-in., and 20-in. x 7½-in. With the exception of the 20-in. x 7½-in. size, the whole of that material could be made by us. The 20-in. x 7½-in. is a big size, which is not saleable. To manufacture that size would be like stocking 7¾ hats, when only one man in the country wore that size. In regard to the competition of imported steel we enjoy a duty of 17½ per cent. on rolled joists, but the protection on other articles is not sufficient, and we are asking the Minister of Trade and Customs to give us further assistance.

78. *To Mr. Fenton.*—I am pleased to say that the ores of Australia enable us to turn out an article that is superior to the best imported, and infinitely superior to most of the imported. For that we can thank bountiful nature.

79. *To Mr. Laird Smith.*—I cannot say offhand how many apprentices the law of New South Wales allows me to train. We have engaged in the making of bolts and nuts fifty boys, whom we term "the mosquito fleet," and as they become efficient we draft them to other positions.

80. *To Mr. Gregory.*—The Small Arms Factory employs a great number of men from our works, but I admit that Mr. Wright would have to train men to the use of the machines in operation there.

(Taken at Melbourne.)

TUESDAY, 18TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Captain William Clarkson, Third Naval Member of the Naval Board, sworn and examined.

81. *To the Chairman.*—I was acting manager of the Lithgow Small Arms Factory while the machinery was being installed, and had to do with the purchase of machinery in America and Great Britain. I had nothing to do with the selection of the site; indeed, I never saw it until I arrived here in 1911, after the factory had been pretty nearly built. I may say that I queried the site at Lithgow several times; in fact, I cabled from London that I did not think it was satisfactory on account of the large amount of levelling

that would be necessary, and the consequent expense. I further objected to the site because Lithgow is so far away from any large centre of population; and I thought that the labour difficulty would become very acute. Had I had my way, I should have had the factory near Melbourne or Sydney. There was great difficulty in regard to the supply of labour up to the time I severed my connexion with the place. We were, however, more fortunate than I thought we should have been, because, at the time the factory was started, Hoskins' works were closed and, therefore, we found more labour at our disposal. Many of the men, however, went back to Hoskins' place after the trouble. The housing accommodation was undoubtedly a factor against the success of the factory; and it ought to be arranged so that there is ample accommodation of the kind for the workmen. I visited both Government and private small arms factories in various parts of the world, including that at Enfield, near London, which has been going for a great number of years, and in regard to which, seeing that it is so near to the metropolis, there is no difficulty about housing. Many of the houses in the immediate neighbourhood of the factory belong to the Government, who let them to the men. In the case of the Birmingham Small Arms Factory, the housing problem does not enter owing to the proximity of the city, and the same may be said about the London Small Arms Factory. These are practically all the factories which were turning out rifles in England on Government account when I was there. There is now Vickers' factory at Erith, where rifles are being turned out. I visited the Springfields Small Arms Factory, Massachusetts, and there, again, there was a pretty large town. There is another Government factory in America at Rock Island, Illinois. I also visited a factory near Tokio in Japan, and at Liege, in Belgium, where, again, no difficulty of the kind was experienced. I found that most of the workers in the Liege factory were women, who use the same class of machines as we have at Lithgow. In fact, it is quite a question as to whether women are not the most suitable for this class of work; and my own opinion is that they are. In Germany, the principal Government factory is at Spandau, near Berlin; in fact, all such factories are near large centres of population, and all that I visited were larger than that at Lithgow. If it were decided to remove our Small Arms Factory to the Federal Territory, it would certainly be necessary to consider the housing of the workmen; but I should imagine that the cost would be enormous. Comparatively little of the labour employed in a small arms factory is what can be called "skilled." It is repetition work, and certainly not the kind of work to which you would put a skilled mechanic. As a matter of fact, I should say that it is a heart-breaking kind of work, consisting of the same thing over and over again. The man has to take a forging, fix it into the machine, and then in the majority of the operations the machine does the rest, stopping automatically when the work is finished; then the operator has simply to put in another forging. That kind of work I think is calculated to break down a man's spirit, owing to the monotony. Apparently, however, women do not mind monotony of the kind; and, so far as the physical conditions are concerned, there is nothing that a woman or a boy cannot do outside the forging, and a few other operations. There are no women at Enfield or Birmingham, but at the latter place numbers of women are employed on similar kinds of work on bicycle parts, which is also repetition work on interchangeable parts. There would certainly be difficulty if a real effort were made to work two or three shifts at Lithgow at the present time, because there are not the people trained up to run extra shifts. I should say that a person could learn in an hour, or an hour and a half, to attend to some of the machines, whereas in the case of other machines it would, probably, require a month. I think at Lithgow, at the start, we had about 150 men employed, but when I left they were not exactly trained; they had not turned out any rifles then. It is difficult to say how long it takes to train 150 men; it really depends on the class of labour you get. Even if the Government did not stand in the way regarding high wages, but considered only the necessity for rifles, it is still a difficult problem. They tried to run three shifts at Enfield at the beginning of the war, and I believe they are doing it now; but for many months they could not do so. Quarrels arose amongst the men because of complaints about the condition in which the machines were left by the men employed on one shift, for the men who succeeded them on another. I have not seen any more than one shift in any of the factories I visited. A second shift could be put on, but it would take time, and I do not think there would be very much gained. It would take several months before you could *work it, even provided you had a sufficient supply* of suitable labour. I am afraid that you could not get the labour, even if you offered good inducements. There were bitter complaints at Lithgow when I was there about the housing accommodation—about the rent they had to pay, the poor accommodation, and all that sort of thing—and that would militate against the success of any factory. Men came to Lithgow time after time, but left because they could not stand the conditions. When I came out to Australia, the building at Lithgow was practically complete; only the *interior fittings were required, and these we really* supplied ourselves. Time was a very important factor in the contract with Pratt and Whitney, the contract having to be completed in twelve months. This undoubtedly had an influence or bearing on that firm getting the contract, and it was not their fault that the conditions were not complied with. I specified that the rifles had to be interchangeable with the British rifle, we supplying the drawings and model rifle. I also said that if there was any difference between the model rifles and the drawings, the drawings had to be considered as accurate; because I was rather doubtful whether I could be supplied with an accurate model rifle. I got the rifle and the drawings, which were sent over to America, and we were not very long in finding out that the model rifle was not like the drawing. I got some model component parts at Enfield to see if we could do any better with them, and we found that these were neither like the model rifle nor like the drawing. The next thing I found out was that the dimensions on the drawing were not according to the standard British inch—that is, they really had an inch of their own at Enfield. I found that some of these dimensions were according to the Enfield inch and others according to the standard inch; and altogether there was a terrible mix-up. We were hove-to for months trying to find out how to construct a rifle that would be interchangeable with the British rifle; and that was all due to the discrepancies I have mentioned. Finally, we came

to the conclusion that the rifles made by the Birmingham Small Arms Company were more to be depended on for interchangeability than the rifles *turned out at Enfield. Consequently we got a* dozen rifles—Pratt and Whitney bought them at my request—from Birmingham, and we measured *them over very carefully, and arrived at a con*clusion as to what dimensions we should make our rifle—we struck a mean of errors. When I *talk about "errors," and about the Enfield inch* differing from the standard inch, I am not talking about sixteenths or thirty-seconds of an inch, but about one-ten-thousandths of an inch, which is really a big measure when you come to interchangeability of parts. We found that, in order to make the parts interchangeable with the British rifle, we had to work out very much finer limits than either at Birmingham or Enfield, and we did so; and to these they are working at Lithgow now. There is a difference between the rifles turned out at English factories, but they are all gauged to the Enfield gauges; and in that way interchangeability is secured. We, however, could not take the Enfield gauges over to America, and we had to evolve a set of our own. It was specified that the rifles had to be interchangeable, and they are interchangeable with the British rifle, but it was in the endeavour to secure the interchangeability that we experienced such a tremendous loss of time. Before we found out all these errors, a whole lot of fixtures had been made, and these had actually to be thrown away and others provided. It is a fact that I recommended that Pratt and Whitney should have the contract on account of their having, in my opinion, the best machinery. *The machinery of that firm was very much in* advance of machinery of British manufacture in design. At the time, I was told many things about *the American machinery that I found it very hard* to believe, and I was really against the tender being accepted; as a matter of fact, I recommended *the tender of the Birmingham Small* Arms Factory. However, I was induced, with the consent of the Minister, to go over to America, and I found *that the firm undoubtedly had many* new machines which were not on the market in Great Britain or the Continent of Europe. These machines I found meant a great reduction in point of time and money. For instance, as to the vertical grinding machines, no one knew anything about them in Europe, and there was also a very much improved rifling machine. Some of their milling machines were quite new, and reduced very considerably the time occupied in the work. I understand that, since the factory started, there has been an increase of about 33⅓ per cent. in new machinery and additions, and yet the output has not reached the figure mentioned in the contract. That, however, is not the fault of the machines. Pratt and Whitney did not tender to produce rifles, but to supply plant capable of producing those rifles. I tested the plant, and I know that it is capable of producing the stipulated number of rifles and more. I saw the plant at work in America, and timed the work on different parts—that is, either myself or the foremen who were assisting me. The time that was taken up in America was very much less than the time that is necessary to produce the fifty rifles per day of eight hours. I consider that the tests made were absolutely fair. If a machine were running for a whole day, instead of for the time occupied in the tests, it would produce more, because, when the men get into the swing of the work, the work must be swifter. The men who carried out the tests for us with these machines were only toolmakers, and not operators; and the man, skilled, and with his "hand in," would turn out far more. I calculated all the tests on the basis of an eight-hours' day. It is rather a difficult question whether, if we were now to secure duplicate plant, I should be of opinion that the American machinery is the best. In Great Britain *there are machines being turned out just as excel*lent as in America; but, at the time this tender was accepted, the special machines produced by *Pratt and Whitney were far in advance of any at* Home. No doubt things have changed since that time. I dare say that we could obtain from England ordinary lathes *just as good as any to be* found in America. As to Canberra, as a site for the Small Arms Factory, I should say that the climate would be suitable, but I do not quite see how you are going to get the necessary labour. A great deal of the work does not require full-grown men; indeed, it is a waste to put full-grown men to it. It is not a man's job at all, but one that boys or women can do. Where are you going to get the boys and women up at Canberra? Young people must have their parents with them; and where are those parents going to get work in the Federal Territory. I am supposing that there is no intention to employ women in the factory. No doubt the climate at Canberra is a little cold in winter, and it happens that the oil, a great deal of which is used on these machines, gets very thick and freezes. I should say Canberra is quite as cold as Lithgow.

82. *To Senator Keating.*—I mean by what I have said that Pratt and Whitney's machines require less skilled labour to operate them. At the time I selected Pratt and Whitney's machines, I had many times seen the corresponding machines at the Birmingham Small Arms Factory. At that time I had not the slightest hesitation in deciding that, for our requirements, Pratt and Whitney's machines were, in many respects, the superior. In fact, I may say that I induced the Birmingham people to send their secretary over with me to America to see Pratt and Whitney's machines; *and the result was that he gave very large orders* for those machines to be sent to the Birmingham factory. The machines thus ordered were all sub*ject to patent rights. It is now four years ago* since all this happened; and I am not in a position, from personal observation, now to institute *a comparison between Pratt and Whitney's ma*chinery and the English machinery; these things go ahead very fast. If the factory were duplicated it would be advisable, I think, to have the same class of machinery, because, if you get another set of machinery, you will have to design new fixtures, and there will be rather a mix-up. Fixtures are a very important item, and cost a good deal of money. If other machinery were put up side by side with Pratt and Whitney's machinery, to the extent of half of each, the advantage to be gained by the superior class of machinery would balance, to some extent, the difficulty, about the fixtures. There would be other difficulties connected with this matter, but they would not be insuperable. I should say it would be very wise not to give all the orders to Pratt and Whitney in the future. The Commonwealth authorities are not in any way bound to that firm, and each case should be decided on its merits. As to the nature of the tests of the output to which we subjected the machinery in America,

I may say that we got the material, which is the important factor, from England, according to the specifications of the British War Office; and we actually produced rifles. We carried out the tests on hundreds of more parts than were actually assembled into rifles subsequently; that is, in many cases the work was not satisfactory, and the ma*chine had to be altered until it did the work as* I required. I passed machinery only when it carried out the different operations in the time de*sired, for an output of fifty rifles a day. The men* who worked the machines for a test were not rifle makers, but ordinary mechanics engaged in building the machine. They were, of course, familiar with the machines, but not with the operating of them, and I would not regard *them by any means as experts in operat*ing. In fact, in a great many cases the machinery did not do the work which it was required to do, simply because *the men were* not sufficiently expert in the operating. But after a man tried a few times, and got his "hand in," he went along flying. I should say that with a little practice, youths, boys, and women here would run rings round the operators in America. When I was at Lithgow, one man from a coal mine, who had never done anything but mining work, made a first-class operator in a few days, possessing, I suppose, good sense and handiness.

83. *To Mr. Laird Smith.*—There are many questions involved in the proposition to duplicate the present factory, or remove it to a more suit*able place.* We have made a start with the factory, and whether the place be good, bad, or indifferent, it would be a pity to throw away all *the preliminary work.* The site at Lithgow is not an ideal one for turning out larger armaments, such as quick-firing guns, if only because *of the fact that there would be varying* levels to contend with. That difficulty, however, is not insuperable. I think it would be very costly to *remove the existing machinery from Lithgow to* Canberra; and even only 200 houses for workmen would mean a great expenditure. Land may be cheaper at *Canberra, but I do not suppose* you could put up a workman's cottage there for less than £500. It would be a great inducement if such houses as those for which the men are paying 14s. a week at Lithgow, could be provided for them at Canberra at 10s. per week, but my trouble is, how employment is to be *found* for the other members of the families of the young people in the arms factory. If one is near a large centre of population, the father may find work in the neighbourhood, and the children find employment in the factory for a time, though I should say that it would not be good for them to remain all their lives. There would, however, be a constant circulation of labour, a very difficult thing to find at places like Canberra or Lithgow. There were no women employed in the American factory; it was only on the Continent that I found women so employed. I do not think that the output of rifles is regulated by the rapidity of production of the most intricate parts. The machinery is so arranged that the intricate parts are produced at the same relative speed as are other parts. There are not some parts that require very skilled labour to produce; the skilled labour is in making the tools and setting up the machines; the actual operating of the tools is not skilled. As to the men whom the Committee saw looking down barrels and straightening them by hand, much skill is required if a bent barrel be produced, and it has to be straightened; but there ought to be few bent barrels; if all are produced straight, then there is no skill required. Not more than 1½ per cent. of barrels should require straightening. Of course, it all depends on what you regard as skilled labour as a factor in the working of two shifts at the present factory. As I have said, the skill lies in setting up the tools or machines. Screw-cutting on a lathe in an ordinary factory is different from the operations at the Small Arms Factory; so long as a machine is properly set up it will do the work accurately. As an illustration, take the profiling machine which members of the Committee saw at Lithgow. There is a pattern on one side and a cutter on the other; a *pointer goes around the pattern* and the cutter cuts a piece exactly the same as the pattern. That has to be done by hand; and in some cases, the *operator goes round one way with one hand and* another way with the other. You may call that "skilled,' but I hardly do; it is more "knack" *and ambidexterity. It all large factories it* is regarded as absolutely wasteful to have machinery lying idle for any length of time. It *is not possible, however, to make an invariable* rule to that effect. There is a lot to consider in a proposition whether we should duplicate all this *machinery, and only work eight hours a day,* or not duplicate it, and work sixteen hours a day. Night work is never so efficient as day work, and, besides, it would mean a *duplication of foremen,* and, perhaps, even managers. It is a question whether you would gain in economy or very much in output. At any rate, I would advocate a duplication of machinery in preference to working double shifts. As to the provision of garden cities for workmen, I saw Cadbury's place near Birmingham; and a very beautiful city it is. It is undoubtedly an advantage to have workmen employed under such conditions, if the necessary capital can be found.

84. *To Mr. Sampson.*—The factory was not in full working order, nor had we the full complement of men when I left. If the machinery be duplicated, it will be necessary to duplicate the employés, and that would mean the training of additional numbers. It would take longer time to initiate an additional number of men under present conditions by doubling the shift, than it would if they were placed in a new factory. You cannot keep managers and assistant managers, together with the foremen, working night and day. *It is possible that a foreman could look after* double the present number of men, but he could not work night and day. As to the duties of the *section hands who rank below the foreman,* you must not examine me on the matter of running the factory, because I have not been in the place for *two years; and I do not know how it is being run.* Further, I am not an expert rifle manufacturer. I was in charge of the factory simply for the pur*pose of setting up the machinery and getting it* into working order. I was a member of the Naval Board at the time, and this meant that I was at *the factory only once a fortnight. A considerable* amount of work was done before I left, and a lot of rifles were in train. There were foremen, section hands, and operators when I left. *Skill is* required in the section hands, who have to see that the machines are properly set, that the work is up to gauge, and so forth. As I say, I do not think it can be said that it requires great skill to operate the machines under the supervision of the section

hands. I could not give any idea of the percentage of the skilled labour required, because the thing has been out of my mind for over two years and a half; my mind is at present filled with transports and ships. However, it ought not to be a big percentage, but, on the contrary, a fairly small one. If the Government undertook the responsibility of supplying the necessary labour, and of housing the men at Lithgow, it might be practicable to run three shifts; it depends greatly on the conditions. I am afraid, however, you would have one shift fighting the other as at Enfield. Again, you would have to consider for what period you were going to run the two or three shifts. It would be practicable to do so if you had the labour and could train it. Given time, it would be possible to take untrained labour and press it into the service; but a reasonable output depends on the sort of labour you get. There were about 300 men employed when I was there last, and to obtain these the management probably had to sift 500 or 600. When a man proved unsuitable he had to go; and all this would have to be gone through again if new hands had to be taken on. It is probable that only one hand out of two would be suitable. I really do not think it is practicable or advisable to run two or three shifts; at any rate, it would take a long time to do so. It may seem extraordinary that this machinery cannot be utilized for the whole twenty-four hours, but, to begin with, you would have to train foremen and section hands. The foremen there at present have grown up with the place. I had them with me in America, and they saw the machines manufactured and learned to operate them. Now, however, we cannot send men to America to be trained, and they must be trained at Lithgow. Then, when you have got your foremen and section hands, who presumably might be collected from men working there now, you would have to get the operatives themselves; and go through the same process we went through at the start. This, as I have said, would take a long time. It might be—I do not know—possible to select from the subordinate ranks men to fill the higher positions. Some of the section hands might be qualified to act as foremen, and some of the operators as section hands; but I do not know anything at all about it. As to Mr. Swinburne's report about a disinclination on the part of the section hands to train operators to take the higher positions, things had not gone far enough in my time for such a difficulty to arise. When I was there, everybody seemed to be trying to do his level best. All were enthusiastic, and there were no rows or quarrelling of any description. In training men, an enormous number of tools are broken, and that is a very serious matter, for they take time to replace here, or they have to be ordered from America. While the work is, generally, of an unskilled kind within the reach of any bright and intelligent boy, every boy is not bright and intelligent—there are not many to pick and choose from. It would take a long time to select men in the large centres of population, and to sift them out as we did at the beginning. No doubt there would be applications if housing were provided at Lithgow, and the manager would have to go down to the city and sift them out. A great number of those he sent up would, no doubt, turn out unsuitable, no matter how careful the selection had been, and numbers of them would simply refuse to live in a place like Lithgow. That actually happened in the first instance, and no doubt would happen again. Probably by the time the three shifts had been got to work the war would be over. Pratt and Whitney guaranteed that the machines were capable of turning out fifty rifles per day, not that they would turn out fifty rifles per day, which is quite a different thing, and depends wholly upon conditions obtaining. I have proved that they can turn out fifty rifles per day; and I can only speak from hearsay as to the reason why they do not turn out that number. Apparently, the men are fighting among themselves, and are not giving that work they ought to give for the wages they are getting. This, however, is only what I have been told. The machinery should be capable of turning out fifty rifles a-day when operated by, I think, 144 men, not counting foremen, shop labourers, boiler attendants, storemen, clerks, and tool makers. The number of the men necessary is stated in the second clause of the specifications. In the recommendation for the acceptance of Pratt and Whitney's tender, the estimated cost of the rifles is set down at £2 18s. each. That estimate was drawn up by the Secretary of Defence, in Melbourne; but, taking the time and the cost of labour in 1908, I myself reckoned that they should be turned out at that price at the outside. This allowed for several machines being operated by one man; but they did not altogether agree with that view in Lithgow. In other countries, a man works as many machines as he has time to work. He puts a piece in, and does not stand by until that is completed, but goes and utilizes another machine, all the machines stopping automatically when the operation is completed. As I say, I have been told that at Lithgow they object to a man working more than one machine. If you, Mr. Chairman, tell me that some men are now working four machines, I can only say that they did object at first. Mr. Pethebridge put the cost at £2 18s., and added 11s. 1d. for interest on capital and depreciation, but I think that was taking the cost of the factory at £16,000, whereas the actual cost was over £50,000. As to the cost being £5 for rifles it is, I take it, purely a question of labour. The men in America were making high wages, but all on piece-work. I think that piece-work gives satisfactory results, because these machines are adapted to it. Under a proper system, if proper work is not given, the men are not paid, so they look out. This is all piece-work in the United Kingdom, America, and on the Continent.

85. *To Senator Story.*—If the erection of public and private buildings at Canberra had the result of attracting a large industrial population to the Territory, labour would, to some extent, be provided for such an establishment as the Small Arms Factory. The fact that employment was offering for young people at the Small Arms Factory might induce some men, even with large families, to go there and seek work in the building trade, and under such conditions Canberra would have an advantage over Lithgow. I have been speaking of Canberra under present conditions. It must be a costly business to duplicate the factory and the employés, and remove the whole to Canberra. If I am asked whether the cost would be prohibitive I can only say that, if I were running the factory as my own business for my own profit, I should think twice before I entertained such a proposition. If I were the proprietor of works at Lithgow, with its present disadvantages, and I owned a large amount of property at Canberra, which was not bringing me in very much, I am afraid I should still have the

same objection to moving the works. The estimated cost of the buildings, in galvanized iron on steel frame work, was £10,000. The Department of Home Affairs found out that at Lithgow a brick building could be built almost as cheaply as the proposed building in galvanized iron. They were reckoning on all the steel work being produced in Australia; that is, the joists, angles, and that sort of thing being imported and worked up here. I am afraid that the conditions for working up those sort of things in Australia are not very good. It is a question of standardization. In other countries they have standards for all iron work. If an architect gets out a design without any regard to the standard design, and he calls for tenders, he is told in America, England, or on the Continent that the cost will be, say, £25 a ton, whereas if he takes the standard design it may be £12 or £12 10s. Firms who go in for this class of work in England, America, or on the Continent, have their own standard designs, and equip their works for their production. As a matter of fact, they produce a lot of the standardized work and kept it in stock, so that when they obtain an order they can proceed with the work at once and do it cheaply. If the work they undertake is not according to standard, then they have to adapt their machinery, with the result that the cost is much greater. In Australia there is no standardization at all. Every architect designs according to his own particular fancy; and each hole in the steel work has to be punched or bored separately. The time has come when, I think, some attempt should be made at standardization, though I do not know whether the Government can enforce it, or whether it is a matter which must be left with the manufacturers. One would think that the manufacturers would do something in their own interests, for there is a big demand for those sort of buildings if they can be produced at moderate prices. It was on this account that the cost of the building at Lithgow so greatly exceeded the estimate. The levelling and getting the foundations proved very expensive, as did also the carting of material a distance from the railway station. The roads were awful, nearly impassable, and the local authorities would do nothing. It would have been a great advantage, as things had turned out, if there had been a railway running right into the factory or close by; but if there had been a decent road, the railway would not have been a payable proposition. In the case of a new and enlarged factory, I think a railway on the site would be a great advantage; and that I think could easily be arranged. It would cost less to do that than to make a good road, because there are no foundations and any weight breaks through.

86. *To Mr. Fenton.*—The difficulties in Great Britain as to a double shift are not nearly so great as they would be here. If a commencement were made with the training of operatives before the extra accommodation were provided, I think it would reduce the output of the factory—that is, if the machines were used, not for producing parts, but for training men—and a lot of material and tools would be wasted. We should have to wait until we got the machines, just as we did at the start; that is, as I have already said, if we do not wish to reduce the output. I am afraid that under the same conditions it would in reality, with a duplicated building and plant, take nearly as long to double the output as it has taken to get the factory to its present position. There are the difficulties associated with the obtaining and sifting of labour, and so forth; under the same conditions as prevailed at the start, it would be about four years before things would be in anything like decent order. It must take some time if you cannot get labour to take a more reasonable view of things—if they are going to quarrel as they have been. Of course, if, in view of the war, those difficulties do not arise, the progress will be quicker. If it could be done it would be preferable, from a national point of view, at the end of the present long shift of twelve hours, to get sufficiently skilled men to train future operatives on the machines during the idle hours, though I see a lot of difficulties in the way. Just before the tender was accepted, the Birmingham Small Arms Company, Pratt and Whitney, and others were carrying on a sort of Dutch auction, one saying they would give so much, and the others saying they would give so much more. I did not pay much attention; indeed, I think I cabled out that no regard should be paid to those silly statements. I had no hesitation in recommending the acceptance of Pratt and Whitney's tender, in view of their improved machinery, and I stated that, in my opinion, it would turn out nearly double the quantity of work that the English machinery would. I also said that an M.L.E. rifle could be made in twenty-three hours, of which only ten minutes was occupied with skilled labour. That is the actual time employed in producing the different parts; but it all depends on what you called "skilled labour." I take it that a "skilled" man in a certain trade means a man who has served several years, in order to attain skill. The amount of skill required to work these machines in the factory takes only a matter of weeks to acquire. It is more practice than skill, though, at the same time, a man must show a sort of natural aptitude for the work. There are some men who would never be able in 100 years to work one of these machines, while we have others who can pick it up in a few hours. All industries may have to put up with such disabilities, but they were felt at Lithgow to a greater extent than at other places. There was no hesitation in stating that a few skilled or practical men could teach Australian workmen to do this work. Pratt and Whitney never said that the rifle could be produced for £2 18s. It was Commander Pethebridge who made that estimate, and I concurred in it under proper conditions. It would cost more to turn out the work with English machinery than it would with Pratt and Whitney's machinery.

87. *To Mr. Gregory.*—I do not think it is a business proposition to remove the factory to Canberra. The circumstances would be different, of course, if there were big building operations going on in the Federal Territory; but, in any case, the cost of the removal would be very great. What are you going to do with the factory at Lithgow? I do not consider Lithgow a good site at all; and if I were selecting a site now, I should go near some centre of population where there is a bigger choice of labour. In this regard there should be constant circulation. It is a bad thing to take on boys and keep them on at such work all their lives, or until they grow old. It is like putting on a boy to work a lift, and keeping him there until he is an aged man. It is a poor business altogether—good enough for a time, but not for always. We had a number of mining men at the factory when I was there, and they did very well. Before the factory was opened, and was getting near completion, Hoskins' works

were in full going, with the result that there was *no labour available, and all the houses were full.* We were then very seriously considering laying out an area of land some 200 or 300 yards to the west, *as a site for workers' homes. In fact, plans* were got out, and the Department of Home Affairs had a survey made. Then the strike occurred at Hoskins' factory, and we managed to get sufficient accommodation and men. I am not in a position to say whether a house can be built more cheaply at Canberra than at Lithgow. I cannot at this moment give any idea of the rate of wages per day that entered into my estimate of 58s. per rifle; but I was certainly considering Australian conditions. So far as I remember, I put the daily rate at 8s. or 9s. a day for these unskilled operatives. I have not advocated the piece-work system, but only pointed out that it is the universal custom elsewhere. I am afraid the unions would object to a bonus system. There is no doubt that there could be a double shift, but it would take a long time to get it into operation; and I am inclined to agree with the manager that it is impracticable. Further, I am afraid it might, if pushed, actually have the effect of reducing the present output. It is rather difficult to say off-hand whether I would advise the erecting of the proposed building at Lithgow for the duplication of the plant. I do not know anything about this matter of duplication. Whether I should recommend the particular plan of the building before me, I cannot say; it would require very full consideration, but from a casual glance I do not quite like it. The estimated cost of the building, as I have stated, was about £16,000, and the actual cost about £50,000.

88. *To the Chairman.*—Galvanized-iron buildings would be no colder here than they are in Scotland, the north of Europe, or America, where there are many such erections. The Argyle Motor Works, just outside Dumbarton, are of galvanized iron. The last time I was there it was 15 degrees below zero, and yet they managed to keep the building warm all right with one or two coke stoves.

89. *To Mr. Gregory.*—If it were proposed to move the factory on account of the industrial conditions, I *should certainly* say do not go to Canberra, because I honestly think that it will be several years before there is much building going on there. *If it be decided to remove the factory* from Lithgow, I should say remove it to near some large town—I do not care which town or *city, so long as there are plenty of people to come* and go on. It would be wiser in the future to have the same class of plant as in the past. There *are certain machines that must be obtained from* Pratt and Whitney, but there are others in regard to which that necessity does not arise, and we *should go into the open market and buy the* best possible.

90. *To Senator Keating.*—The estimate of 58s. that I made included labour, supervision, and material only. I notice that Mr. Pethebridge added 11s. 1d., as interest and depreciation; and in view of the difference between the estimate and the actual cost of the building, it would be a fair thing to multiply 11s. 1d. by three, making it £4 11s. 3d. That, of course, does not allow for the increased cost of labour, and, therefore, I should say the variation is not so great, taking all the circumstances into account—the estimated cost and the actual cost of the rifle do not differ so much. In making the estimate 58s., I thought at the time that there would be piece-work in Australia—indeed, I did not see how we were otherwise to get along. The real reason why men in America and elsewhere work more than one machine is supplied in the fact of the piece-work. In repetition work of the kind such as bootmaking, I believe it is all piece-work. There may be *no piece-work in any iron industry* in Australia; but my view was that the making of small arms was an entirely new trade here, and that none of *the awards applicable to iron work should operate* in regard to it; in short, it should be regarded as a trade in itself. A man working a milling machine in an ordinary *engineering shop does a* great deal more than the man working a similar machine in an arms factory. The same rates *should not be applied to both.*

91. *To the Chairman.*—Milling machines in an ordinary shop may run for a great length of time with only oiling, but the men have to set up the work to a line or something of that sort; whereas in a small arms factory the operator cannot influence the machine at all.

92. *To Mr. Sampson.*—I did not recommend that a second story should be put on to the factory, but that a second story should be put on to the little office for the clerks. It was found that in Australia some departure was being made from the plans I sent from London. This could not possibly be permitted, and expense was incurred on that ground. I believe a tender had actually been accepted for the altered plans, and some agreement had to be come to with the contractor. Everything was eventually built according to the original plan, except the miserable little office, and in that the matter was arranged by building another one alongside. When I made my estimate as to the cost of the rifle, I did not include interest on the building, because I did not know what was the cost of it. But the estimate included supervision, factory burden, office expenses, and all that sort of thing.

(Taken at Melbourne.)

WEDNESDAY, 19TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Robert Wilson Knox, of Messrs. Knox, Schlapp, *and Company, sworn and examined.*

93. *To the Chairman.*—We are the Victorian agents for Messrs. Greenwood and Batley, of Leeds, whose business includes the manufacture of machinery for small arms factories. We act in conjunction with Messrs. Cowlishaw Bros., of Sydney, who are the general representatives for Australia. I have no data at hand, but, speaking generally, Messrs. Greenwood and Batley have completed contracts for the supply of several British factories, as well as foreign orders, and they tendered for the original contract to establish the Commonwealth Small Arms Factory in accordance with the specifications then provided. I think their plant would make a rifle the parts of which would be interchangeable with those manufactured by the Commonwealth, since the Commonwealth rifle is

interchangeable with the British rifle. Having regard to the present unsettled conditions, and to freight difficulties, I should be inclined to say that if they received an order to duplicate the present plant here, they would require from two to two and a half years to carry it out. I have no definite information on the subject, but that is my impression. The machinery would have to be made to the Commonwealth's specifications; so that I do not think they would be able to draw upon any stock which they might have. After consultation with your secretary, Mr. Whiteford, I cabled to Messrs. Greenwood and Batley, inquiring whether they were in a position to quote, and, if so, whether they could give prompt delivery. Their reply was that they could not quote; *so that I assume that at present* they are so fully occupied in attending to Home requirements that they could not entertain *outside orders. I have sent a further cable to them* expressing the hope that they will reconsider their decision, and have also asked Mr. Milne, *the British Trade Commissioner, to push on the* matter through the British Board of Trade. As soon as I receive a reply to this later message, *I will furnish it to the Committee. American* firms are keen competitors with British manufacturers in the supply of machinery of this class. *I am naturally particularly anxious, from a* British stand-point, that our firm should be able to give the Commonwealth a quotation, and Mr. Milne, as a representative of the British Government, is also anxious to do what he can to enable a British tender to be submitted. I should like to emphasize the point that my estimate that it would take from two to two and a half years to supply and set up a duplicate of the present factory is a purely speculative one, based upon the time within which deliveries were promised to the Commonwealth under the original contract.

James Ryan, Editor and Manager of the *Lithgow Mercury,* sworn and examined.

94-5. *To the Chairman.*—I have resided in Lithgow for about thirty years, during twenty-six of which I have held my present position. The town was small and scattered when I arrived there, and stumps were numerous in what are now well-formed streets. I am familiar with the location of the Small Arms Factory, and cannot conceive of any better site for such a factory in or about Lithgow. I was the first to suggest the establishment of the factory at Lithgow. That was twenty years ago, and the proposal was then regarded very much in the nature of a dream that could not be realized in the immediate future. After Federation the agitation was renewed, and *I understood from the then Minister of Defence* that one reason why the present site was selected was that it comprised a large area in the immediate *vicinity of the public rifle range. As to* the suggestion that difficulty would be found in providing housing accommodation for an addi*tional 500 men if that number were suddenly* sent up to work at the factory, I would point out that such a difficulty would occur in any *centre of the Commonwealth. Housing accom*modation could not be found immediately for such a number, no matter where the factory was *situated.* Some years ago Mr. King O'Malley, who was then Minister of Home Affairs, had formulated for him a gorgeous scheme for housing the employés at the factory. Owing, apparently, to financial difficulties, that scheme fell through. For the fact that a housing scheme has not been adopted the fault rests primarily with the Federal Government. The opportunity offered, but advantage was not taken of it. The site which Mr. O'Malley proposed to acquire for this purpose is south-east of the factory, between the factory and the town. Portion of the land has since been built upon. It is neither flat nor swampy, and any water coming down from the hills after a heavy rainfall could easily be carried away by means of a barrel culvert. There is *an excellent ridge of land on the western side* of the factory, with natural drainage, and fronting the Bowenfells-road. I do not think that Mr. O'Malley proposed to *acquire that site for* the building of workmen's homes. Speaking generally, housing accommodation at Lithgow is, *I think, fairly well occupied. Rents for work*men's cottages there are low as compared with the metropolitan area, but high as compared with country centres. *I should say that they vary from 12s.* to 14s. per week, but I have no definite knowledge on that point. The best evidence I can give you as to the healthiness of the district is my own experience. Lithgow is an industrial centre, and as such is not a good place for the publication of a provincial newspaper. There is not the business attaching to a considerable circulation, even when you have developed it, that there is in some districts. But, notwithstanding that disadvantage, I have remained there all these years primarily for health reasons. The birth-rate of Lithgow must be amongst the highest of the State, and its death-rate amongst the lowest. It is an ideal centre for rearing a healthy, virile people, and as such is, in common with all the mountain centres, a national asset. Coming to your further inquiry as to whether the district is one from which large numbers of men could be obtained to work in the factory, I may say that at present there is not much unemployment there. Some time after the outbreak of war business began to "sag." Employment in the coal industry was intermittent, and the same may be said of employment in the ironworks. But latterly there has been a revival, with the result that there is now very little unemployment. Lithgow is primarily an industrial centre. Its population is migratory only in the sense that all industrial populations are. When I am asked why the Small Arms Factory should remain in Lithgow, my reply is that the onus of proof rests upon those who advocate its transfer. To local residents the proposal that it should be transferred to Canberra has come rather suddenly, and seems to be quite fantastic. We have heard no reason which would justify the transfer of this factory, the setting up of which has cost the Commonwealth something like £250,000. *I cannot con*ceive of any advantage possessed by Canberra that Lithgow does not possess in equal if not *greater degree, except that it is the Federal Capi*tal. Canberra has not an industrial population, nor has it such a suitable climate as that which *Lithgow enjoys.* We *rarely have a day which is* too hot or too cold to prevent every man there doing a good day's work. We have also various *natural advantages. We have cheap coal, and* the cheapest water and gas in Australia. We have also the advantages of an established town *—good schools, municipal activities in full swing,* including the provision of a sewerage system, and also a church for practically every denomination.

96. *To Mr. Gregory.*—Unfortunately there is no general Workmen's Home Act in operation in New South Wales. I have advocated for many years the passing of legislation for the proper housing of workers; but beyond the building of Daceyville, near Sydney, nothing has been done. If the Commonwealth Government resumed land at Lithgow for the housing of employés of the Small Arms Factory, and had to pay £50 or £60 an acre for the land, the investment would be absolutely sound. The tenants would be Government employés, and I have no doubt that the enterprise would prove remunerative to the Commonwealth. Mr. O'Malley's proposal naturally disturbed local builders. They would not open out while such a project was in the air. It remained in the air—it hung fire—with the result that building in Lithgow did not proceed as it should have done. The proposal, after all, came to nothing, and meanwhile there was congestion. I am surprised to learn that it has been suggested to the Committee that the population of Lithgow is composed, to a large extent, of coal-miners, and that the conditions—the environment—of workers there is rather antagonistic to the selection of men suitable for a small arms factory. The population is not largely composed of coal-miners. Speaking broadly, we have there three main industries — coal-mining, the iron-works, and the Small Arms Factory. In the Small Arms Factory some 475 men and boys are employed. At the iron works about 1,000 men are employed, of whom from 200 to 300 will probably be carrying on mining and quarrying operations outside Lithgow. In round numbers, the coal mines employ some 500 or 600; so that you will see at once that it cannot be said that the population consists mostly of coal-miners. Lithgow is not noted for its industrial troubles. I am afraid that the big iron works strike earned for it a rather bad reputation in this respect; but as an old resident I assert that it is not noted for industrial troubles. Its industrial population is amongst the most respectable and orderly that I know of in Australia. In the matter of industrial trouble, we have certainly no such reputation as that of Newcastle or Broken Hill. If it be true that it is difficult to obtain from the factory the output that was expected of it by those who supplied the plant, that cannot be the fault of the district. It may be claimed that it is, to some extent, due to the class of labour obtainable there; but I am unable to find any justification for such a claim. If you pay your workmen a fair wage, treat them properly, and give reasonable conditions, there is nothing in the environment of Lithgow to prevent your obtaining and keeping the best class of labour in the State. But even if the claim of which you speak were true—even if it were difficult to obtain in Lithgow the class of men suitable for the Small Arms Factory—would not that difficulty exist in an intensified degree in a new place like Canberra, which is far more remote from Sydney, which all people in New South Wales regard as their centre?

97. *To Senator Story.*—If it were necessary to send a large number of men to Lithgow to provide for working a second shift at the factory, they could be accommodated without inconvenience in tents for a few months from the beginning of October. The climate in winter, however, is rather severe for tent life. When I spoke of purchasing land at £50 per acre for workmen's homes, I had in mind municipal valuations and prices realized at sales of local land in considerable areas. No doubt, if a man wished to purchase a single allotment there he would have to pay from £1 to £1 10s. per foot for it. But if the Government proposed to purchase a large area the position would be different. Some of the best land near the factory was obtained by a syndicate some time ago for about £60 per acre. I dare say that the duplication of the works, and the consequent arrival in Lithgow of several hundred more families, would have a tendency to increase land values. The best plan for the Government to adopt would be to provide in advance for the housing of these 400 or 500 additional hands. There would be a natural tendency for land values to go up in such circumstances, just as there would be in Sydney, Canberra, or anywhere else. Any considerable increase of population always accounts for increased land values. When I am asked whether, as a business man, I should regard as fantastic a proposal to remove a factory from a district where I was required to pay a high price for land necessary for extension purposes to another district where I had a considerable area of undeveloped territory and the development of which, in this way, would be materially increased, I should say at once that, as a business man, I would, of course, weigh the pros and cons very carefully. But the consideration that you have mentioned is not the only one in this case. In the first place, you would have to take into account the cost of transfer and the time lost. You would also have to consider the depreciation in the value of the buildings already erected. The Small Arms Factory at Lithgow, if dismantled, might possibly be used for a waggon or a harness factory, but it was not created for either of those purposes. You would also have to consider whether you could bodily transfer your staff from Lithgow to Canberra. Some of the men employed at the Small Arms Factory, I presume, have acquired local interests. They have their families there, and some have their own houses. I doubt if you can fairly assume that the Government could transfer the factory staff bodily to a practically unoccupied place, such as Canberra is to-day. I spoke of the suggested transfer as "fantastic" because we in Lithgow know of no adequate reason for incurring the expense, delay, and depreciation that such a large transfer would involve. We further claim that the position of Lithgow as a railway centre, and consequently as a distributing centre for all manufacturing industries, is unique. If you glance at the railway maps you will find that of all industrial centres in Australia it is absolutely the best distributing point. It now commands the whole of the west of the State. It commands Melbourne and the southern State generally *viâ* the Blayney to Harden line. The Condobolin to Broken Hill line is being started, and will open up the route to Broken Hill and Adelaide, and thence on to Fremantle on the completion of the trans-Australian railway. The Dubbo to Werris Creek connexion is one of the certainties of the immediate future, and will open up the whole of the north to Lithgow. Since receiving your invitation to give evidence, I have been considering a question rather of public policy than of detail. Canberra, I understand, is to be the legislative and administrative centre of Australia. Is it advisable, taking our general experience into consideration, to make it also an industrial centre? In putting to you that phase of the question I am not speaking wholly from an artistic stand-point. I am taking rather a common-sense view. If you establish a large industrial centre round the

Capital, where the Parliament meets, you are bound to have, no matter what your arbitration laws may be, certain industrial disputes. Is it advisable, as a matter of public policy, to have your employés in Government workshops interviewing members of Parliament and detailing their grievances while the manager is waiting on the Minister? The time of Parliament would be frequently occupied in discussing details of industrial disputes in Commonwealth factories. As a citizen, I am inclined to doubt the wisdom of such a policy. I do not think it would be advisable. Consciously or sub-consciously, I may be influenced in my judgment of Lithgow; but I think that of all industrial centres in Australia it has the major advantages as the site of a small arms factory. I take it that it will be agreed that a coastal site would not be suitable for a factory so essential to the defence equipment of the Commonwealth, but at the same time so vulnerable. The fact that steel and iron could be manufactured at Lithgow was one of the reasons advanced for the establishment of the Small Arms Factory there. It was not, however, a major factor. Steel and iron have been, and will be, made there, and made in higher qualities as the industry develops. But in advocating Lithgow as a site for this factory, we also contended that the iron works and the Small Arms Factory would work in with each other—that apprentices in the iron works would pass to the factory, and young fellows might pass from the factory to the iron works. We thought that the one would be the natural feeder of the other. The fact that coal was cheap and plentiful in Lithgow was also catalogued among the advantages of the district. We did not put forward these advantages as likely in themselves to determine the selection; they were simply included in the catalogue. The chief virtues of the district for a small arms factory are that it is an industrial centre, that it has the natural advantages of cheap coal, water, and gas, that it is up to date in educational equipment and church establishments, that it has an active municipality and a complete municipal service, including sewerage, that it has the best climatic conditions for securing good work, that it is not vulnerable, as a seaboard site would be, and that, if a sufficient number of men of the skill required are not forthcoming, locally, it is within easy distance of Sydney—the chief commercial and industrial centre of Australia. All these factors were taken into account. I still think that the selection of Lithgow was a wise one, and I know no reason why, because Canberra is destined to be the Federal Capital, the Small Arms Factory should be transferred to it, and transferred at considerable expense. If the climate of Canberra were more favorable than that of Lithgow, that would weaken my argument, but only to that extent. This factory has been established at Lithgow at considerable expense, and the onus of proving that the site is not a suitable one rests upon those who advocate the transfer.

98. *To Mr. Sampson.*—We have a technical school at Lithgow, but its value is limited by the smallness of our population. If the need for a technical college existed at Lithgow, I have no doubt that we could secure one. There is no definite move in that direction at the present time. There is greater justification for a technical college at Lithgow than there is in the case of Bathurst, but Bathurst got in first. I started the agitation for a technical school at Lithgow. It took us some time to secure it. With the establishment of a technical college there, Lithgow, having regard to the iron and steel industry of the district, should prove a first-class training-ground for those who have a mechanical or engineering leaning. I should say that of all inland industrial centres it would be the best training-ground. If it were proposed to work an additional shift so as to increase the output of the factory as it exists at present, a considerable number of juniors could be secured locally. If, say, 500 additional hands were to be employed, and 100 juniors were required, it would not be possible to obtain these juniors locally within a day or a week. They would be secured gradually. It must not be forgotten that a certain proportion of these skilled mechanics brought up to Lithgow to work in the factory would have sons available for employment there. The local market could not at once supply 100 juniors. It is true that at present youths between sixteen and twenty years of age can secure better wages in other industries than at the factory, but with a proper system of apprenticeship at the factory, and a proper grading of employés, so that apprentices could pass on to the machinery and mechanical departments, I think that the position in regard to obtaining employés for the factory would be much improved. If it were thought necessary to send at once 400 or 500 mechanics to Lithgow, in order to enable an additional shift to be worked, it would be possible by organization to accommodate them in the town. We should not be limited entirely to the town itself; we could take in the immediately surrounding centres, where men could also be accommodated. I should not like to promise too much, but by organization a great deal could be done to provide the necessary accommodation. It would need the co-operation of the residents, and that co-operation, as a matter of material personal interest, would be cheerfully given. A percentage of the men and boys required for an additional shift could be obtained locally.

99. *To Mr. Laird Smith.*—The public school accommodation at Lithgow has been increased from time to time. We have an excellent district school, and as soon as we can show that we have a sufficient number of intending pupils to warrant the establishment of a High School the Government of the day will have a lively time if they do not provide one. The difficulty in regard to advanced education at Lithgow has been that, as it is an industrial centre, a large proportion of our young fellows leave school when they reach the age of fourteen or fifteen years. I agree with you that that difficulty would be reduced to some extent if the earning capacity of the men were improved. No great cost would be involved in supplying water to the site on the western side of the factory if it were required for the erection of workmen's homes. The price of water would not be increased. As a matter of fact, the water supply is practically free. Only a water rate has to be paid in respect of water for domestic purposes, whilst the charge for water required for industrial purposes is only 3d. per 1,000 gallons. There was a serious outbreak of typhoid at Lithgow over twenty years ago, but there has been no periodical recurrence of the trouble. Lithgow is the healthiest town in the world. It is quite as healthy as California. Our sewerage system is just coming into operation, and we have an ample water supply for the purpose. There has never been a shortage, but if there were such a danger

we could tap the Middle River at Marrangaroo, and secure a never-failing supply of pure mountain water at very low cost.

100. *To Senator Keating.*—The present population of Lithgow, according to the police estimate, is 10,500. There has been no considerable fluctuation in the population, in the literal sense of the word, during my residence there. When I first went to Lithgow, in 1885, there was a population of from 2,500 to 2,800. In times of depression the population has slightly declined, but, on the whole, taking any ten years' period, we have had a steady increase. There is a drift of population to Sydney—more particularly in regard to young men—from every town in New South Wales. As a social and amusement centre, Sydney is the Paris of Australia, and has great attractions for young men. When I said that the population of Lithgow was not more migratory than that of any other centre, I had in mind the fact that, in the case of any slackness in the coal-mining trade, unmarried men might be persuaded by relatives in the Illawarra and Newcastle district to go there in order to secure full time. And so with the iron works. During the long strike many ironworkers sought employment elsewhere, but now that a revival has set in some of them are coming back. A worker has only his labour to sell, and naturally he will sell it at the place which offered him the best wages and the most regular employment. As to there being any perceptible drift of locally-born population because of lack of local opportunities, I think that, on the whole, we retain a larger proportion of our local lads than do most places for the reason that, as soon as they leave school, they can obtain employment on the mines, at the iron works, and, latterly, at the factory, at fairly good wages. If the factory were removed there would be a noticeable drift. There are, roughly speaking, 475 men and boys employed there at the present time, and if the Government were able to transfer the whole of them—which I doubt very much—they would automatically transfer 2,000 people from Lithgow. They would also render valueless, to a large extent, the present factory building. I take it that those who refused to be transferred would be men and youths who could find other employment locally, and who would make some shift to remain because they had some ties or vested interests there.

101. *To Mr. Fenton.*—I am surprised to hear that experts have informed the Committee that if the selection of a site for the Small Arms Factory had been left to them they would not have chosen Lithgow. I know of no higher expert than Lord Kitchener, who visited the site just after the first sod had been turned, and who declared at that time that it was a very nice one. I understand, also, that Colonel Legge, Chief of Staff, was one of the selectors of the site. As to the evidence given before the Committee that twenty acres of land in Lithgow were obtained at a cost of £10,000, or £500 per acre, I can only say that when the Government go into the land market they will find—I think it is the general rule—that the owner of land is not very modest in his demands. I was speaking of the purchase of a large area of land when I mentioned £50 or £60 per acre as the price at which the Government would probably be able to secure it. Assuming that the Government wished to obtain 100 acres, and had to pay £100 instead of £50 per acre, the additional cost would would be a mere bagatelle compared with the cost of the factory itself. The factory site cost £20 per acre, and that is a mere trifle compared with the cost of the complete building and plant. I recognise that the provision of workmen's homes is a most important factor, and but for the neglect of State Governments the matter would have been attended to long ago. I have quoted what I regard as the fair wholesale price of land in the district. A block purchased for subdivision has to be surveyed and roads have to be made, whilst a considerable time elapses before the owner can sell the whole of it at per foot frontage, so that he expects to sell at a considerable advance on the price paid by him. I agree that if land were purchased by the Government for erection of workmen's homes it would also have to be surveyed, and that roads would have to be made, but the Government would not part with the fee-simple, so that the cost would be made good by the rentals. Last year the establishment of State iron works came prominently before the Government and people of New South Wales. The Government entered into negotiations with Messrs. G. and C. Hoskins, and it is a matter of common knowledge that they offered to sell them their works at Lithgow at a fair valuation. This movement developed about March or April of last year. Inquiries were set on foot by the Government as to the value of the properties, but before they could be completed the war broke out, with the result that there has since been a suspension of activities. Recently, however, when the question of Federal iron works cropped up, Mr. Holman stated publicly that he hoped that the New South Wales scheme would not be interfered with, because the Government were nearing the close of their investigations. I assume from that statement that they have not dropped the idea of acquiring the Lithgow works. The selection of Lithgow, or an adjoining site, for locomotive works and locomotive repair shops was advocated in a report made many years ago by Mr. Thow, then Chief Mechanical Engineer in the State Railway Department. He was distinctly favorable to the selection of a site west of Bowenfells, and 2 miles, in a direct line, from the Small Arms Factory. I admit that the transfer of the factory to Canberra, and the consequent depletion of the population of Lithgow to the extent of 2,000 or 3,000 souls, would mean a valuable accession of population to the Federal Capital, and that, when considering this matter from an Australian stand-point, every aspect of the question must be taken into account. But the point I tried to make at the beginning was that it rested with the advocates of such a change to justify it. Personally, I can conceive of no argument to support such a transfer. I do not own an acre of land at Lithgow, and have no material interests there, except in respect of the newspaper. While it is true that you have electric power already installed at the Federal Capital, and that you are making provision for a water supply and sewerage scheme, we already have all those services at Lithgow, and, in addition, the cheapest gas and water supply in Australia. There is a proposal, I now understand, to expend between £5,000 and £10,000 for additional power plant to meet the required extensions at the factory, and while it may be quite true that that expenditure would be avoided at Canberra, since you have the necessary plant already installed there for other purposes, I would point out to the Committee that a far greater expenditure would be involved in making the suggested transfer from Lithgow to Canberra.

(Taken at Sydney.)

SATURDAY, 22ND MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Guillaume Daniel Delprat, General Manager, Broken Hill Proprietary Company, sworn and examined.

102. *To the Chairman.*—Steel for rifles is made chiefly in Sheffield. It is a specialty of that place. So much so, that before the war Sheffield sold steel for rifles even to the Germans. It is most difficult to manufacture, and it must be perfect. You cannot monkey with steel for rifles. We intend to make it, but I should not advise the Government to rely upon getting our steel for small arms within the next two years. I do not think that we are clever enough yet to make it. In the meantime, I should like the Commonwealth Government to give me a specification of the kind of steel they require for small arms, in order that we may focus our attention upon that. Everything depends upon the chemical composition of the steel which is used for the manufacture of rifles. If I am given a specification of the chemical composition of the steel required, I shall readily be able to say how soon we can make it. We should need to instal an electrical furnace plant, which otherwise we would not require; but we are anxious to be in a position to supply the Commonwealth Government with all they want. We should have to serve our apprenticeship with the electrical furnace before we could undertake to make steel for rifles that could be relied upon. Without seeing the specification of the steel required, I could not say whether we have any steel in stock that would be suitable for the manufacture of rifles; but I do not think that we have any. Within certain limits, it is our ambition to make all the requirements in our line for the Commonwealth and State Governments. I understand that it is proposed to erect some very large buildings, and I have been furnished with the dimensions of the steel girders and all iron works in connexion with them. We can roll 18-inch by 6-inch beams, and also the sizes 24 inches by 7½ inches, and 20 inches by 6½ inches. We did not lay ourselves out for the production of these larger sizes, but the Board have realized that it is necessary to roll them, and I have therefore been instructed to get an additional mill for the purpose. It will be six or eight months before we shall be ready to operate it. I do not think we could be ready to give you the big sizes before that time has elapsed, but after that we should be able to do so. We are prepared for the other sizes, but the rolls for all of these have not arrived yet. They are lying waiting in New York, and we are unable to get any freight. We are considering the advisability of sending them across the United States to San Francisco, and shipping them from there to Australia. I am not yet quite sure that we can arrange for that, but I think it is a question of only a few months now when we shall have them. From a knowledge of Colonel Owen's statement, I might say that we can supply the iron which he first requires, but we could not supply the heavy sections for the next six or eight months. I have said that it might be two years before we could supply steel for small arms, but I shall require to see the specification before I can speak definitely on that point. If the Government decided to manufacture big guns our steel would be good enough for that purpose, but we would have to buy the brains with which to make them first. We would need to get experts from Armstrong's or Vickers' or some of those people to teach Australians to make those guns; and it would, of course, involve very large capital outlay. Their manufacture might be made the subject of a contract with the Government. Our ambition is to fill in Australia exactly the place that Armstrong holds in England.

103. *To Mr. Fenton.*—We hope to fill that position in shipbuilding also. That is our ambition, and I do not see why we should not realize it. We shall give a good push for it. All that is required here should be made here, and we should not have to depend on any one outside. We can do a good deal as it is. We are already making 80-lb. steel rails at the rate of one per minute. We have a means of testing all the steel we make, and if we got the Government specification of steel required for rifles we should very soon find out whether we can make it or not. I do not know what the War Office specification is for the steel they use for that purpose. We are very anxious to make this steel if it is possible for us to do so.

104. *To Senator Story.*—When I say that it will be six or eight months before we can supply the heavy sections required, I have in mind my general impression of the freight market, but after the rollers arrive we could turn out the stuff within a week. We intend to manufacture T and all other kinds of iron. The new mill we are getting now will be very elastic, and we shall be able to turn out the small sizes required. I think that Mr. Hoskins could make the small sizes now. We intend to go in for the manufacture of every kind of structural iron and steel, but we do not intend to undertake the manufacture of wire. We want some other firm to put up a wire mill, and we shall supply them with the necessary steel. In the same way we want some other firm to establish a factory for the manufacture of galvanized and corrugated iron, and we shall supply them with the steel. The other sizes specified in the dimensions mentioned to me are those commonly used for structural purposes, but the 24 inches by 7½ inches is the biggest size I have seen in the market.

105. *To Senator Keating.*—We had about 1,500 men employed at our works in Newcastle a little while ago, and we have about 1,000 employed there now. We are assured that the labour we require will be readily available. We have had no difficulty about men. We have a great many labour-saving appliances, and the great majority of the men we require are men of a superior class, with whom there is no trouble at all. Notwithstanding the fact that the machinery is largely labour-saving machinery, the proportion of unskilled labour that we employ is large. All the machines are very valuable, and they must be in the hands of skilled men. There is, however, always room for labour with the use of blast furnaces. When we do not require a very large number we are able to pick our men better, and so we have no trouble with them. We have had no trouble at all since we started at Newcastle. Some doubts were raised about the advisability of starting at Newcastle on account of the frequency of labour troubles there, but we had none to contend with.

106. *To Mr. Sampson.*—Our first cargo of American machinery for the blast furnaces was landed on 3rd January of last year and we have been manufacturing now for the last couple of

months. Most of our superintendents are Americans. We introduced a number of leading hands *from America to teach the Australian workmen.* We brought out forty-eight or fifty of the 1,200 or 1,000 that we have employed. All the men we brought out are not foremen, some are just leading hands. One man, who knows all about the work, teaches others, and we are able to work three shifts. There is no difficulty in teaching the local workman. It is remarkable how quickly the Australians pick up the work. After they have been at it for a little while, if you were to watch them at work, you could not say whether they were Australians or Americans. We have had no difficulty with the unions in passing men from a lower to a higher grade. I cannot grumble about the labour at all. The men have treated me awfully well. I was with Armstrong and Whitworth for many years, in charge of their mining department, and I went through their gun factory, but I do not know much about the business. I was with the firm as mining engineer and metallurgist. I was through their works many times until seventeen years ago when I came to Australia, but everything there has changed since that time. We had no difficulty in arranging to work a second shift at the Newcastle works. We divided our experts between the two shifts, and in a comparatively short time the Australians were able to work without their assistance. If you pick out a good Australian you cannot beat him as a workman. I could not compare the difficulty of working the machinery in our works with that of a small arms factory. If a man makes a slip in our works there may be damage to the extent of thousands of pounds done right away. We need a cool, careful man of steady nerve. In a small arms factory different qualities would be required. The difference might be explained by suggesting that in one case a watchmaker is required, and in the other case a gunmaker. I think it is sufficient to allow 10 per cent. for interest and depreciation. Our steel buildings rust pretty quickly, because being near the sea they are affected by the salt. It has to be remembered that our system of working changes to such an extent that the chances are that in ten years' time, although the existing buildings will not be destroyed, their utility will have gone, and we must erect another class of buildings to meet the requirements of the new system. We could not have brick buildings for that reason. If a brick building would always serve the purpose it might last for a hundred years, and I could not suggest an estimate for depreciation in that case. We did not start our second shift until the men we put into it were efficient, so that as soon as we started it, it produced a satisfactory maximum output. In training men for the second shift we made them work alongside a man who knew the work. He showed them what to do, and made them do it under his supervision. The length of time it takes to teach the work depends, of course, upon the individual, but usually it is not very long.

107. *To Senator Keating.*—Where it is a question of judging heat, it may take a long time before a man becomes accustomed to heat. Some men never learn it, and others pick it up very quickly.

108. *To Mr. Fenton.*—The iron ore of Australia is excellent. I could not ask for anything better. The limestone is absolutely all that we want. The coke might be just a little better, but it is quite good enough. It is all that is required. With the raw materials available in Australia we can turn out steel against any firm in the world, if we have the skill. We might, it is true, have to go to other countries for the dope which must be added to the steel to comply with particular specifications. To make steel we must have magnesite. It has been obtained in the past from Austria. We have magnesites in Australia, but they are not quite so good as the Austrian magnesite. Then there is vanadium, used in the manufacture of steel for motor-car bearings and axles. I am not sure that vanadium can be obtained in Australia. It is too much to say that we have all the raw materials here to make all classes of the best steel in the world. I do not know that we have any vanadium here, and there are several other things used in connexion with the manufacture of steel which we might not have. For rails, structural steel, shipbuilding plates, wire, and all the big lines, we have everything we want. We might have everything we require for all the small lines also, but I have not gone into that so closely. The steel which requires for its manufacture the special chemical constituents to which I have referred, is used only in small quantities. We do not intend to do anything in copper at our works. But the Mount Lyell people, at Port Kembla, ought to be able to do all that work. I could not say how long it would take to train men to take part in the manufacture of rifles, but if you get hold of a good Australian you can teach him anything.

109. *To Mr. Gregory.*—Steel may be made with acid furnaces, the open-hearth furnace, or the electrical furnace. If we manufacture with an electrical furnace we have got exactly what we want, and I am sure it will be possible to manufacture all the steel required. With the acid furnace you could only use ore that carries no phosphorus, but with the basic furnace you can use ore which contains phosphorus. It is quite possible that the specification for the steel required for the manufacture of rifles would require ore that contains no phosporous. As we have very little phosphorus in our steel we should have no difficulty in producing it. I understand that there is a very fine deposit of iron ore in the northwest of Western Australia which carries but a very small percentage of phosphorus. I have not seen it, but if that be so, it would be good for acid steel. The presence of phosphorus in the ore makes the steel hard and brittle. The limit of the percentage of phosporous in ore which can be manufactured by the acid process is as low as 0.04. I do not think that the Bessemer process is used in Germany at all now. I was there a few years ago, and I found that they had discarded it, and that they use the open-hearth process. With the open-hearth process it is possible to remove the phosphorus with greater facility than with the Bessemer process. The Bessemer process is a good process where there is no phosphorus in the ore.

110. *To Mr. Laird Smith.*—I have seen the ironworks at Blythe, in Tasmania. I was in Tasmania recently, and the Government there treated us very well.

111. *To Mr. Gregory.*—I am aware that it is said that where two or three shifts are worked in a factory containing intricate machinery, difficulty arises through workmen in the second or third shifts complaining of the condition in which the machines have been left by those who preceded them. But I do not see why that difficulty should exist in a small arms factory. We use complicated machinery at Broken Hill and in other places, and work three shifts, and we have not had a single complaint of the kind yet.

112. *To Mr. Laird Smith.*—If you treat your men well they will treat you well.

113. *To Mr. Gregory.*—With respect to the outside sizes, I should say that the one size would do for the 20 inches by 7½ inches, and the 20 inches by 6½ inches. We could supply the 18 inches by 6 inches size. Steel is not turned out absolutely uniform, and the difference between the two big sizes would fall within the margin of accuracy. It is possible that a beam 20 inches by 6½ inches would stand a bigger strain than another beam 20 inches by 7½ inches, whilst with two other beams of the same sizes the position might be the other way about.

(*Taken at Canberra.*)

MONDAY, 24TH MAY, 1915.

Present:

Mr. RILEY, *Chairman*;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.
Mr. Finlayson,	

David Miller, C.M.G., V.D., I.S.O., Administrator of the Federal Territory, sworn and examined.

114. *To the Chairman.*—In my official capacity I have had all to do with the purchase of land within the Federal Territory. I know the land which you have inspected to-day, and which it is proposed should be set aside for a factory and industrial site. When that land was acquired the price which the Commonwealth Government paid by way of compensation was £4 10s. per acre, exclusive of the river flats, which are not included in the area suggested as a site for a Small Arms Factory. There is practically an unlimited area of land available for factory sites. When I say that the area is practically unlimited, I mean that there are many thousands of acres eminently suited for industrial purposes. The climate in the winter is very bracing indeed. The lowest ground temperature registered on the low-lying land last winter, which was an exceptionally severe one, was 17 degrees Fahrenheit, which is 15 degrees below freezing point. That temperature would be registered only in the very early hours of the morning, before sunrise. There is no snow whatever on the city site or on the sites for industrial purposes, to which I refer. It is restricted to the hills and mountains. It is very rare indeed that any snow falls below the 2,000-feet level. Snow has been known on Mount Ainslie and on the Black Mountain, but it is of very rare occurrence. The sites to which I have referred have natural drainage. The nature of the land is a loamy soil with a very good subsoil, and it could be very easily drained. The Cotter water supply would be available for the purpose of any industrial institutions which might be established, and is ample for all requirements. These sites might be easily linked up with the sewerage system proposed for the city, which could be made to serve the site you inspected to-day without any difficulty. The power house is within three-quarters of a mile of the site you inspected, and there would be no difficulty in transmitting whatever power might be required for factories established there. The present railway line traverses the site, but it would be necessary to put in a loop line to bring trucks into the very centre of the factory. We have had some experience in getting skilled labour for the buildings erected here, and there has not been any difficulty whatever in obtaining any class of labour we required for the works which have been carried out in the Federal Territory up to the present time. They comprise every class of construction, including concrete workers, bricklayers, carpenters, plumbers, men of almost every trade, and labourers. If a factory for the manufacture of small arms were erected on the site you have inspected, it would be a wise precaution to build homes for the employees at the same time. It would make the employees much more contented, and I think it would be a sound business proposition. In doing so, I should certainly suggest that each cottage should be erected upon an allotment of not less than 50 feet frontage with a depth of two chains. There is ample land available here for the erection of workmen's cottages, and I think it would be a serious mistake to contemplate the erection of anything pertaining to terraces. With respect to the population of Canberra at the present time, I may say there are 650 workmen employed here now. At least 100 of these have their wives and children with them. The general health of the community speaks for itself, and it is excellent. There has not been any serious sickness here amongst the employees since the Home Affairs Department has been established here. There have been two cases of typhoid, but the patients were men who came from other places, and were undoubtedly affected with the disease before they came here. There has been only one case of diphtheria, that of a child of an employee. At Duntroon there are 350 persons living in the College buildings, and, in addition, there are 80 employees engaged on the works you saw to-day, and, with their wives and families, I should say that the community there numbers altogether about 500. I do not think there are any young men in the district who would be likely to take up factory work. I think that the hands required for the factories would have to be brought here.

115. *To Senator Story.*—If the workmen's cottages were built upon allotments of the size I suggest they would be suitable for the cultivation of vegetables and flowers. We regard the soil on the site you inspected as "first class agricultural." With water, vegetables, flowers, and fruit would grow in profusion on that soil. There are very few children of fifteen or sixteen years of age amongst the population here who could be employed in the Small Arms Factory. But I am quite certain that as soon as the construction of such a factory was actually entered upon, and encouragement was given to men to come here and work for a living, and bring their wives and families with them, there would be plenty of labour of the description you require available. At present there is no opening for that class of labour.

116. *To Mr. Finlayson.*—If the Government did not provide workmen's homes for the employees of the Small Arms Factory, should one be established here, the only alternative would be that they must be provided by private enterprise. That means that the public would have to build the cottages for the workmen. The workmen would prefer to have their own cottages, and might build them for themselves. I should favour such a proposal very much indeed if, by some financial arrangement, the Government could assist the men

to build their own homes. In planning out the area suggested as a site for the factory and industrial centre, I should recommend that space should be reserved, so that those who wished to do so might select and lease land on which to build their own homes. I should regard that as part of the scheme. I have suggested what I think should be the minimum size of the allotments for those who would be engaged in the works. No detail plan of the Capital site has yet been prepared so far as I know. I think it would be most unwise to come to any definite decision in the matter until the plans for the lay-out of the city have been definitely settled, or, at any rate, until the plans for that particular section have been completed. So much depends upon the design for the lay-out for the city, and particularly with regard to the route chosen for the railway from Queanbeyan, that I strongly urge that no decision should be arrived at until that has been definitely settled. If Mr. Griffin's amended design, as I understand it, is adopted, a considerable deviation of the existing line will be absolutely inevitable. So far as I am aware, Mr. Griffin's original plan did not provide for an upper lake with a level of 1,845 feet. A lake at that level would interfere with the existing railway. There are other sites within the Federal Territory which have advantages, in my opinion, superior in some respects to the site you have inspected, but they would not be so economical. The site you inspected is the best and most economical available at the present time. The other sites I referred to are in the Duntroon valley, beyond the College, and lying under the spurs of Mount Ainslie and Madura. The special advantages of those sites is that they comprise a far greater area from which to make a selection, and are more sheltered than that which you have inspected, although that is an excellent site. Owing to the cost which would be involved in making them available, the sites in the Duntroon valley are, at the present moment, out of consideration. A separate railway line to them would be essential, and that would render the cost of adopting them prohibitive. Their distance from the city would be a disadvantage also. The site you inspected is about 1 mile from the city boundary, and that is just about the distance from the city at which such a factory should be established. It would be about 3 miles from the site selected for Parliament House. I take it that the power used would be electric, and there would, therefore, be no difficulty to be anticipated from the effect of fumes or smoke in the city. The erection of the workmen's homes should proceed absolutely concurrently with the building of the factory, so that they might be ready for occupation when the factory was ready to start work. The homes should be of a permanent character, of brick or concrete, and of first-class construction. I believe that the first kiln for the brickworks will be ready within three months from now, and within a reasonable period bricks would be available, if required.

117. *To Mr. Sampson.*—Whether the Government should own the workmen's cottages, or should sell them to the workmen, is a matter of policy. If the Government owned the cottages there would have to be rent paid for them. I think the better policy to adopt would be one under which the workmen could own their own cottages. I believe that an allotment 50 x 132 feet would give the men a sufficient area for the vegetable or flower gardens they would require. I have suggested that as the minimum size of the allotments.

118. *To Mr. Laird Smith.*—On the site you inspected, 700 acres would be available of the land which has been acquired at £4 10s. per acre.

119. *To Senator Keating.*—The river flats that you saw would not be included in the area required. Under the Capital design, as amended by Mr. Griffin, those flats would be submerged by the waters of the proposed upper lake.

120. *To Mr. Fenton.*—The workmen who have come here are perfectly satisfied. I have not met a man in the Territory who is discontented or dissatisfied. The climate and conditions are good, but Canberra is under a serious disability in the matter of the provision for education. The only education provided is that suitable for very young children. Men having boys and girls at thirteen years of age and upwards hesitate to come here for that reason.

121. *To Mr. Sampson.*—There is ample provision on the site you have inspected for the establishment of a factory for the manufacture of field guns. I presume by that you mean 18½-pounders and machine guns. There is plenty of room there for expansion, but I am not able to say that you could manufacture there the naval guns of larger calibre.

122. *To Mr. Gregory.*—I am aware that there is an area for the testing of rifles at Lithgow, but there is a perfectly safe rifle range up to 600 yards provided for the Military College at Duntroon, and I believe that a site suitable for a rifle range up to 1,000 yards could be found adjacent to the proposed site for a Small Arms Factory.

(Taken at Sydney.)

TUESDAY, 25TH MAY, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.
Mr. Finlayson,	

Frederick Russell Ratcliffe, Assistant Manager, Small Arms Factory, Lithgow, sworn and examined.

123. *To the Chairman.*—I have been assistant manager at the Small Arms Factory for three years. I was the engineer on the construction of the factory before it started operations. I was nominated by Pratt and Whitney specially to deal with the engineering construction of the buildings. It was my business to advise on the construction of the buildings, the machinery, power plant, and general lay-out of the factory. As a matter of fact, I drew the plans of the scheme in America while I was working for Pratt and Whitney. The present buildings are satisfactory for a small arms factory, and the machinery is up to the specification. It has not been able to turn out the number of rifles specified according to time, in eight-hour shifts. There are many reasons for that. It is due chiefly to the fact that the workmen have not so far been able to attain the Pratt and Whitney times in most of the operations, but that will improve as time goes on. There has been marked progress in that direction during the past few months. If the

Government made provision for the housing of the workmen employed, that would remove one of the main objections at present advanced against a double shift. It might be possible to increase the present output by crowding up with more men, although I think we have pretty nearly all we have room for now with the present machinery. It would require some preliminary study of the work to decide how more men could be employed with advantage. I will not say that it is impossible to work two shifts, but I doubt if you could ever run three shifts at the factory. I should draw the line at three shifts altogether. I admit that in most of the factories in the Old Country and in America they work two shifts. There is a difficulty here in getting the necessary men to occupy supervisionary positions, and in the problem of housing the employees. When giving evidence on the point before the Public Accounts Committee, I stated that the double shift hinged largely on the continuance of the war, or the probable continuance of overtime. I said that the institution of a double shift at the present time would cause some confusion and disorder for a time, but if the extraordinary demand for rifles were to continue for an appreciable length of time, there might be some advantage in overcoming the preliminary disorder. I think that the institution of a double shift would lessen the output for a time, and the duration of that time would depend upon the success we should have in securing men fitted to supervise the work, and on the class of men it would be possible to obtain to work on the second shift. There are plenty of men available, but to secure the men we want involves a continual sifting-out process. We should have to engage quite a number and select the best after an actual trial of their capacity. I think that inquiries might be made to discover in what way we should first act to arrange for the employment of a double shift. That you might have the information you require, it would, I think, be necessary for you to formulate certain questions as to the steps which could be taken to start a double shift, and as to whether there would be any portions of the factory in connexion with which a double shift would be impracticable. I think that answers to such questions might be given after a little consideration. The information might be given in a couple of weeks, but it is difficult for me to deal with the matter at the present time. I shall take advantage of what opportunities I have to look into the matter. I am aware, generally, of the arguments which Mr. Wright has advanced in support of the view he holds.

124. *To Mr. Sampson.*—Varying grades of labour are required, and though it might be possible to get sufficient labour to carry on some of the work there might be a deficiency for the higher grades of work. The shortage of material is a serious difficulty, but further shipments are beginning to arrive, and that, I think, could be got over. The supply of suitable wood was a very serious difficulty. The supply we are obtaining from Canberra at present is all that we have to depend upon. I think that we have now eight months' supply. It must be borne in mind that doubling the output involves for a time at least a very much higher percentage of scrap. The employment of untrained men naturally increases the percentage of spoilt work. If, as you suggest, I presuppose the removal of the principal difficulties, and we have a sufficient supply of suitable labour, accommodation for the additional men, and sufficient material, a double shift could be instituted, and in two or three months the men would get the hang of things.

125. *To Senator Keating.*—I came from Pratt and Whitney's to Australia. They do not turn out rifles. They make small arms machinery and machine tools generally. Before I came to Australia I had no experience working in a factory devoted exclusively to small arms, but I had had a great deal to do with the instalment of machinery and the laying out of plants. I had to make out the plans for the laying-out of plants for several Governments. I was concerned more with the lay-out of plants and the arrangement of factories. I had some knowledge of the conduct of a small arms plant, and I claim that my general engineering training has been sufficient to qualify me for my present position. Ordinarily, small arms factories in the United States are run with a single shift. I cannot recall any instance of such a factory working two shifts. It is generally considered that working two shifts is rather wasteful, and should be resorted to only in cases of extreme urgency. It is wasteful in the matter of responsibility. If you are working more than one shift and tools get broken, the blame is always thrown on the absent man, and confusion always arises. That objection would not be confined to the working of more than one shift in a small arms factory. I am not prepared to say whether the Eveleigh workshops, near Sydney, work two or three shifts. I know of factories that have worked two and three shifts, and have discontinued the practice because it was found to be by no means profitable. Piece-work is the practice in most of the small arms factories in England, and there is a great deal of piece-work done in the United States. No piece-work is done at Lithgow, and there never has been any piece-work done there. Under the Australian labour conditions, I think the introduction of piece-work there would lead to dissatisfaction. I do not think the piece-work system is desirable in Australia. Under that system almost everything depends on the discretion of the authorities who set the rates. The success of the piece-work system depends upon its tactful handling. Very many phases of the work require to be considered. A man may produce so many pieces a day, and suddenly he produces 50 per cent. more. The extra production may be due to quite a number of causes. It may be due to personal exertion, or to the conditions of the factory working, or to increased facilities in bringing the work to the machines and getting it done. It may be due to many factory reasons, and is not at all necessarily dependent on the operator's exertions. If, in such a case, the rate is altered, and the times for the production of the particular pieces are reduced, workmen may consider that they are being cut out of the results of their labour, and dissatisfaction and discontent arise. These difficulties frequently arise where piece-work is the practice, although I admit that piece-work or the premium system is largely adopted in the United States and in England. I have said that I would not advocate three shifts at the Lithgow works under any circumstances. Something might be done with two shifts, but I put three shifts out of the question altogether because of the time which is required for ordinary repairs to machinery, cleaning up, and so on. In the references I have made to the establishment of two shifts at Lithgow, I have had in mind the institution of two shifts each of the duration of the shift at present worked there, and not two eight-hour shifts. Speaking generally of the class of labour required in the factory, I should say that it needs men with mechanical instincts and a good deal of adaptability. They should have the faculty of being able to learn mechanical processes readily. There is some of the work which

youths could do, and I have heard of girls being employed in some of the works in England. Their employment is not general in the United States, but I know of instances in clock factories and typewriter factories where girls are employed to run some of the lighter machines. They are employed to a considerable extent in Continental small arms factories. Men of intelligence and adaptability are required to work the majority of the machines. There is a vastly greater outlook for men employed on these machines than is generally supposed. Such restrictions as are put on a man's possible advancement are largely due to questions of wages and the conditions imposed by unions. Personally, I believe that if a man can do work he should be allowed to do it. It is really immaterial whether a man took a month or seven years *to learn how to do a certain piece of work*. What do you care? The chances are that the more intelligent man is the man who learnt it in a month, and he is also the better man. Where work is hopelessly tied up by wages and restrictions, and by trade union regulations that a man *shall not do this and shall not do that*, the effect is to hold a workman to one position, and he will stay there. The way the awards now stand in New South Wales an effort is tried to gauge the value of the services a man renders by the instrument or machine he operates. That, I contend, is an entirely fallacious method. For instance, one man will use a paint brush to paint the side of a barn, and another will use the same instrument to produce a work of art. A schoolboy will use a pair of compasses to do some of his work, and an architect will use the same instrument for his work. For these reasons, I contend that the instruments used do not indicate in any way the remuneration which all who use them should receive. If you give two men a certain piece of work to do, one will do it perfunctorily, while another, possessed of brains and insight, and knowing the reason why a piece of mechanism works in a certain way, will naturally be able to do much better work. The second man being receptive and intelligent, studies the construction of his machine, and fits himself to take up a superior class of work. The first man, on the contrary, says, "There is nothing in it. This is a monotonous job." I do not care how monotonous a job is, even if you come down to the simplest kind of manual work, such as shovelling dirt, the man with the better intelligence knows best how to husband his strength, the best size of shovel to use, and how the work can be done to the best advantage. The chances are that such a man will do twice as much even of that kind of work as a man who does not use his intelligence. The operator who studies his machine and familiarizes himself with its movements, will do better work with it than the man who operates it in a purely mechanical manner. This question of the personal association of man and machine is one of the causes of the trouble I have referred to in connexion with the working of two shifts, because different men are called upon to operate the same machine. Of course, periodically, cutters wear out, *and a machine gets slightly out of adjustment*. If the man on the earlier shift is not a conscientious man, he may say, "I will not stop to sharpen that cutter, or adjust the machine," and he may leave it to the man who takes up and machine on the new shift. This man finds the machine in a defective condition, and he may complain of the waste of time in having to correct the other fellow's mistakes.

126. *To Mr. Laird Smith.*—Efficient supervision should be a check on that kind of thing. An efficient supervisor would look carefully into details, would follow up operations closely, and should be able to correct a tendency on the part of the men to allow machines to run down.

127. *To Senator Keating.*—The driving of the locomotive by different men at different times is hardly a parallel case. One man may be familiar with the working of a locomotive, and it may be a new machine, to the next man. One man may get more out of a locomotive than any other man. If I were the proprietor of the Small Arms Factory at Lithgow, and I was informed by the Government that they wanted quickly a greater output of rifles, the course I should follow would be to find out my weak points first, and, if possible, reinforce them by extra machinery, or in *any other way that seemed* desirable. The constant aim should be to secure the full producing capacity of each machine, so as to establish a balance in the chain of manufacture. That is not always done. Certain points are weaker than others, and it would be my business to find them *out and reinforce them*. That would be the first step, and I should have to consider whether it would be an advantage to run longer hours or to provide additional machinery. If I were competing with rivals to meet the demand of the Government, and could not otherwise strengthen weak *points which might keep me out of the running*, I should have to consider the necessity of providing additional machinery, or of working the factory longer hours. We have lengthened the hours of working already at Lithgow. I am firmly of the opinion that the Lithgow factory should be twice as big as it is. The employees at the Eveleigh workshops would not, I think, without a good deal of preliminary training, be suitable for working in the Small Arms Factory. The men engaged in the tramway workshops might be suitable for certain portions of the works. When I am informed that the State Governments recently decided to place all their resources at the disposal of the Government in the present emergency, I say that I do not think the men referred to could be directly utilized because of the lack of machinery for them to work upon, and because it would take them some time to get used to the Small Arms Factory machinery. But, other things being equal, I grant, of course, that men who have been used to machinery or mechanical work of any kind would be infinitely better for our purpose than outsiders who had never seen a machine before. In the transference from one shift to two shifts, for a time at any rate, the output would be lessened as compared with what we are doing now with the twelve-hour shift. The lessened output might be due to the higher percentage of spoilt work by new workmen. A man may be getting 1s. an hour, and may spoil a piece of work which it takes him an hour to perform. He loses that 1s. But suppose that up to the stage at which he receives the piece of work it had cost 10s. to produce, the total loss would be 11s., because he would have lost to the factory the work of all those who had handled the same piece before him. It would scarcely be possible, during the transference period, to work a twelve-hour shift and then an eight-hour shift unless you are able to select a sufficient number of trained men from the present twelve-hour shift to help to establish the new eight-hour shift. With 20 or 30 different departments, while you might get men who could take care of some of them, it might be difficult to get men who could take care of others.

128. *To Senator Story.*—The life of one of the machines in the Small Arms Factory would be 20 or 30 years. I am aware that Mr. Wright puts down the cost of depreciation at 7½ to 10 per cent. per annum. I think that that is entirely too much. I consider the machines at the factory are as good to-day as when they were put up, and the market price of machine tools at present is at least 25 per cent. more than it was four or five years ago. I do not think the machines at the factory have depreciated at all. These machines do not soon become obsolete. Generally speaking, the same type of machines has been in use for the last 20 or 30 years. There have, of course, been improvements, but they have been of a minor character. The rifling machines we use at Lithgow are the most up-to-date and best obtainable, but that type of rifle machine has been in use for a good many years. For immediate results, two shifts of eight hours would not be as good as the present twelve-hour shift, but for ultimate results the two eight-hour shifts might be better. In the course of time the output might be appreciably increased by the adoption of two eight-hour shifts instead of the one twelve-hour shift. The output of the factory is creeping up now, as the times of the work have been gradually accelerated. Special skill is required in making the more complicated tools. The *present staff might have to be increased to some* extent. The tools are of great variety, from very simple cutters, which can be made by comparatively unskilled men, up to expensive gauges, which can be made only by highly skilled men. Of course, the wear and tear is greater in the case *of the class of tools which can be made by com*paratively unskilled men. I do not think that the tool making would present any difficulty in the establishment of two shifts.

129. *To Mr. Laird Smith.*—A night shift is never as good as a day shift, and by working a night shift you would not necessarily double the output of the day shift. The men might be given turn and turn about at night and day shifts. In most places the best men work on the day shift. A difficulty is that a man who works on a night shift, though he is expected to sleep during the day, wakes up early in the day, and goes out for pleasure. He does not get all the sleep he requires, and it should not be forgotten that about 2 or 3 o'clock in the morning human vitality is always at its lowest. The breaking of tools occurs mostly during night shifts. I doubt if we could get hands for a double shift for the burnishing or browning of the rifle barrels. That work would be governed by the facilities for drying. The men would have difficulty in making up their ovens. Even at present the ovens are kept burning during the night, and certain of the furnaces are run on Sundays. The output of rifles is, of course, regulated by the capacity of the factory in that way; that is why I say it would be necessary, if the output is to be increased, to look after the weak points and strengthen them. There should be no difficulty in getting men to do the work of straightening the barrels. The man who does this work could do more than he is doing at the present time. He has his son working with him, and he is training him in the work. Within the last week or two another man has applied for work at the factory who has previously done a little of this work. It would not be difficult to strengthen that department. Piece-work is never so well done as day-work, unless there is very rigid inspection so throw out everything defective. There would be some difficulty in getting trained supervisors for a double shift, but I believe that it might be overcome.

130. *To Mr. Gregory.*—I am aware that there was a guarantee by Pratt and Whitney that the Small Arms Factory at Lithgow would turn out 15,000 rifles a year working eight hours per day. We are now working a shift of twelve hours without producing that quantity, but we are not working quite up to the capacity of the machinery. One very important reason for this, of which I took personal notice during the last month or two in going over the figures, is that the men do not attain the times in doing the quantity that was set down in the Pratt and Whitney estimate. Suppose, for instance, Pratt and Whitney's time for a certain piece was 100 in eight hours. A man *making 100 per day would be working for 20 days* to produce that batch; but when I took that time over a batch of 2,000, the records actually showed that the work was not up to that time. The first day only 40 might be made; the second day 50, and perhaps the third day the man made 100. *Something happened another day, and the speed* of the work dropped again, with the result that over the 2,000 pieces the average was very much less than the Pratt and Whitney time. I think that the men here are just as intelligent as are the American workmen, but they have not had a large experience with this *class of machinery*. In a large mechanical centre it is possible, of course, to obtain a supply of the labour of men who have done exactly the kind of work you want done. Pratt and Whitney, in demonstrating the capacity of the machinery, took the time over relatively small quantities. They could not put through 2,000 pieces in trying the machines. They could not be expected to provide the material to make 2,000 rifles merely for the testing of the machine. In all honesty, I think that they gave the machinery a fair test. Their estimate of times is based upon the operation of similar machines in use.

131. *To Mr. Finlayson.*—To put on highly skilled men for such a purpose would be an unfair test, but they gave the workmen the benefit of the doubt by putting on men who could not be called specially skilled. The men who made the machines might not be able to make such good time as men who had been working similar machines continuously for a considerable time.

132. *To Mr. Gregory.*—I doubt whether it would be possible to increase the output by the adoption of piece-work or the incentive of the bonus system. I do not think that our output at present is all that our machinery could give us. There is a great deal in habit and temperament. In my view, for instance, the reason why the telephone system in Australia is not good is due to the fact that the telephonists here are so easy-going.

133. *To Mr. Laird Smith.*—I have not been in a central telephone exchange here, and have not seen the telephonists at work.

134. *To Mr. Gregory.*—I said, in reply to Mr. Laird Smith, that it is not possible to get as good work from piece-work as from day labour. That was a general statement. Everything would depend upon the rigidity of the inspection in the case of piece-work. If you had a system of inspection which would absolutely refuse to pass work that was not up to the right standard, you would get as good work from that system as from day labour. If men did inferior work on the piece-work system they would, no doubt, be displaced

by other men if they were available, but the inspection is more rigid in a Government factory than in any private factory. I do not think that the work of any commercial concern would be as closely inspected as is the work done at the Lithgow Small Arms Factory. When you inform me that riflemen shooting for prizes prefer the Ely to the Government cartridge, I say that that might be so for match shooting. If a cartridge is defective the defect may be due to the manufacture of the cordite, to the packing of the cordite in the cartridge, or to the manufacture of the cartridge itself. Cartridges are manufactured in accordance with regulations based upon special tests. Before you could make an effective comparison between different makes of cartridges you would require to know the standard of measurements adopted for each. I have never heard of any special requests by local riflemen for other than our factory rifles. No one can doubt the quality of the rifle turned out at Lithgow. No direct provision has been made to see that there will be a sufficient number of skilled men available to act as overseers for the operation of additional plant, but we are working upon the general principle that we should train as many men as we can in order to be prepared for contingencies. The factory has now been in operation for three years, and I think it would be possible to take some of the skilled men to supervise a second shift. There are undoubtedly more skilled men there now than there were two or three years ago. Working as we are at present with one shift of twelve hours, I believe that, with the added efficiency of the men, the output will increase. There has been a good increase in the output during the last twelve months. That is due to the increased efficiency of the men, and as the organization is gradually perfected, and one department more completely co-operates with another, the output will certainly increase. I will not say definitely that working two shifts of eight hours each, the factory would for a time turn out less than is now turned out with a twelve-hour shift, but I will say that it is probable that would be the case. I think that something might be done in the direction of working the present twelve-hour shift with an additional eight-hour shift. We might gradually arrange for working two shifts by first of all having an additional shift for the manufacture of some of the simpler components, in order to get a stock of them in hand. That would relieve the machinery to some extent. We are short of some machines for increasing the output, but I think we could get enough to strengthen the weak points within six months. We have several operations on one machine, and it requires careful organization to get the full capacity of such machines. There are not any fires available to put on extra men in the blacksmith's shop at Lithgow, but we might be able to crowd in a man or two at different times if the steel is available. In the working of a double shift the keeping of a big supply of material on hand is one of the first essentials. The men are working now 68 hours per week. They start at 7 o'clock in the morning, and work until noon, and they work then from 1 o'clock until 5.30 o'clock, and again from 6 o'clock to 9 o'clock. On Saturday they work from 7 a.m. to 12.30 p.m. I have not noticed any marked injurious effect upon the men as the result of having to work a twelve-hour shift. Sometimes there are periods of sickness, and the applications for leave of absence are running high; but I will not say that they run much higher than they would on a shorter shift. I shall see what can be done to arrange for a double shift. I do not care to give snap judgments without a full consideration of all the facts.

135. *To Mr. Fenton.*—In the matter of raw material supplied we have now eight months' supply of wood, and we are pretty well supplied with steel. There are one or two small lines of special requirements, such as steel for springs, of which we are short, and we shall have to get these supplies as quickly as possible. The wood problem was a very serious one, but that difficulty has been overcome. In ordering steel it has to be remembered that the work of the factory involves the carrying of a large number of parts on the floor. Suppose that when the factory was started we said that we would order two years' supply of steel, we might fondly imagine that would last us for the two years, but some of the parts are what might be called long-winded parts, and, in consequence, eighteen months' supply of steel might be in the works at the same time, so that to have ordered two years' supply at the start would be giving us virtually only six months' supply in excess of current requirements. A very large amount of material is tied up on the floor of the factory, but once the factory is filled up with material the ordering of new supplies can go on at stated intervals. We have been hampered by orders for an increased number of rifles owing to the war. Lately we have received large shipments of material, and that has relieved the situation. I have read Mr. Swinburne's recommendation—

> "That the management should always have in view the possibility, in times of necessity, of having to work two or three shifts, and should aim at maintaining as many capable mechanics as possible at work in the factory as section hands and in the tool room."

I think that recommendation is fairly complied with at the Lithgow factory. I have known of some cases of hesitancy on the part of section hands in teaching others to become as efficient as themselves, from the narrow-minded idea that they may be educating men to push them out of their jobs. That fear would be dissipated to some extent if it were suggested that there would be an extension of the factory or the institution of two shifts, and in that way some assurance of permanent employment.

136. *To Mr. Finlayson.*—I have said that the factory should be twice as large as it is now. My reason for saying so is that it would make it easier of manipulation. It would be a different matter if one machine was confined to one operation, but the bulk of the operations may take no more than two hours a day on one machine's time. A plant might be laid down so that we might have one machine for each operation, but in that case it will be seen that the machinery would be used for only portion of the time, and the capital investment would be four times as large as it need be, and would be practically prohibitive. To get the greatest advantage from the machinery there must be several operations on the one machine, and that means getting particular work to a particular machine when that machine is ready for that work. That can only be done by a systematic dovetailing of the operations of the factory. If we multiplied the capacity of the factory from 50 a day to 200 a day, a machine that would be worked two hours a day in

an eight-hour shift to produce the 50, would have to be working all the time to produce the 200. In the larger factories it is possible to utilize the whole time of the machines where there is a separate machine for each portion of the work. If one machine has to undertake more than one portion of the work, the dovetailing of the times for different operations has to be carefully arranged. The cost of supervision depends on the nature of the articles being manufactured. Many rifles can be manufactured much more easily than the Enfield rifle. It is a most difficult rifle to manufacture because of the complicated nature of the parts. Take, for instance, the body, which is the main part of the rifle; there were some 200 operations necessary for it, but I think they have now been cut down to 165. That is nearly a day's work in itself, but it is passed through so many hands, that in order to keep the men working on there must be an immense amount of work on the floor. This requires a very great deal more of manipulation than would be necessary if the factory were of larger capacity. In the matter of the ordering of material, had not the war broken out, we should have been in a comparatively easy position with regard to the supply of wood. Two or three years' supply ordered from England was loaded on the ships, and was then commandeered by the British Government, and so cut away from us. We had a shortage of steel also. There was a difficulty in obtaining the steel we required; the earlier shipments were obtained from the British War Office, but they were not always up to the specification. Major Buckley, who was in London at the time, wrote a letter to the Defence Department on the subject of the supply of steel. It was explained that even the British factories had to be satisfied with less than the rigid requirements of the specification owing to the demand for steel brought about by the war. In the circumstances we had in earlier shipments to accept some percentage of defective material. There was at first some difficulty in obtaining capable workmen, but that is being overcome now. I am not prepared to say that we have a sufficient number of efficient men for the establishment of a double shift immediately, but we have a fair number of men who have been sufficiently instructed to be intrusted with the supervision of the larger machines. Speaking generally the character and capabilities of the men who have offered themselves for employment at the factory have been satisfactory. When you say that the cost of a good imported rifle is about £15, that would be a match rifle. We are turning out a rifle equal in quality to the best. It might not be so exact as a match rifle, but it is far better than the ordinary stock rifle. The present cost of turning out our rifles is higher than that of the ordinary imported rifle. The reason for this is the higher rate of wages paid here, and because, generally speaking, the men are not making the times which they should make with the machinery, as compared with the times made by men in small arms factories elsewhere. In order to meet the desire of the Government for an immediate increase in the output of rifles, we require more material, more men, and more machinery. Given these, I see no reason why the output should not be immediately increased.

137. *To Mr. Sampson.*—The additional machinery we should require would have to be imported, thought we are able to buy a machine in Sydney occasionally which we can use to advantage. The Enfield factory may have increased the number of their shifts, but there are disabilities here connected with the housing problem and the skilled labour market with which they are not confronted in England.

138. *To the Chairman.*—I do not think that the present factory is situated in an ideal locality for such a factory. I think that a better site could have been selected.

139. *To Mr. Gregory.*—The chief conditions necessary for an ideal site for such a factory would be a sufficient supply of water and coal, means of access, a good supply of labour, and a means of housing the labour employed. If we were to think of establishing the factory now, I should advocate that it should be located upon an extensive level area, because the expense goes up tremendously if the ground is not level. It should be near to a port, if possible, so as to reduce freights, and it should be within easy railway communication of the main ports. There should be a good water supply and a good gas supply for the furnaces. Freights would not be a considerable item. You might get actual figures as to the amount of freight involved. If you undertook the manufacture of machine guns and artillery, freights would be a more important factor. The factory should be established in a fair-sized town where you could rely on a good supply of mechanically-trained labour, and where the social conditions would be such as to keep the workmen contented. If we were starting the factory now, I should not advocate the selection of the present site. As the factory has been started, and has involved an expenditure of a considerable sum of money, I should be doubtful about the wisdom of removing it to another site unless I were satisfied that we should not be going out of the frying pan into the fire. I have serious doubt about the wisdom of removing the factory now to another site, because of the expense which would be incurred, but from the broader view of national requirements, it is possible that the removal would be justified.

140. *By Mr. Fenton.*—I should prefer to see the other sites suggested before I could express a definite opinion. I strongly advise weighing up all the expense and trouble involved in the removal of the factory before finally deciding to remove it.

141. *To Mr. Gregory.*—It is very necessary that such a factory should be established in a place where there would be a considerable choice of labour. It would be better, for instance, if such a factory were established near Sydney than at Lithgow.

142. *To Senator Keating.*—If it were decided to transfer the factory to another site, probably the best plan would be to install new machinery at the new site, and gradually proceed with the removal of the existing factory. But that answer requires to be qualified. There are some machines used in the factory which would not be duplicated. These are machines upon which different operations are performed, each of which does not occupy a great deal of time. They would have to remain at Lithgow until the final removal, and they would not be available at the new place.

143. *To Mr. Finlayson.*—An extension of the works at Lithgow could be carried out, but it would involve some little excavation.

144. *To Mr. Laird Smith.*—Electric furnaces are not as well adapted to our purpose as are gas furnaces. We use gas furnaces at Lithgow. We have a 3-in. pipe running up to the factory now, but it ought to be a 4-in. pipe.

Arthur Creed Wright, Manager, Small Arms Factory, Lithgow, recalled and further examined.

145. *To the Chairman.*—I have had an opportunity of inspecting a proposed site at Canberra for a small arms factory. I could see no objections to the site, which appeared to me to be eminently adapted for a very extensive manufacturing establishment. From the point of view of the configuration of the land it has advantages over Lithgow. From a climatic point of view I do not think there is any difference between them. It would cost quite a sum of money to remove the factory to Canberra, because the railroad communication to that place is in a very embryotic stage at present. If I were asked to shift the factory, I should advise doubling the area of the existing buildings. It would be wise to put on at the existing factory for instruction as many men as the number of machines would admit of in order that they might be given a certain amount of training. If the removal of the factory were decided upon there would be a partial stoppage of the output for some time.

146. *To Mr. Laird Smith.*—Looking to the future, I believe that the idea of concentrating factories in the Federal Territory is a good one; but under existing circumstances I do not think that it would be possible to make a move in the direction of the removal of the existing factory for two or three years. I question if the necessary buildings could be put up on the new site within that time. I have said that the idea of having all the factories together in the Federal Territory is a very good one. There are three factories which may be said to be co-related. The Cordite Factory, the Ammunition Factory, and the Rifle Factory should be in close communication with each other. The character of the country at Lithgow does not lend itself to the easy expansion of the existing factory. There are huge depressions and steep mountain sides at Lithgow, and the excavation necessary there to make that site as good as the Canberra site would cost an enormous sum. I understand that the grade at the Canberra site is about 1 in 100.

147. *To Mr. Finlayson.*—The Lithgow site is not a suitable site to carry out the idea of co-relating the Cordite, Ammunition, and Rifle Factories. Leaving the Canberra site out of consideration, I should say that these factories should be located on perfectly level land. That is necessary for the erection of the buildings alone. An ammunition factory is somewhat different from a cordite factory, and it should not be located too near a centre of population because of its dangerous character. These factories should be close to a community from which it would be possible to secure a sufficient number of employees. They should have good railway communication and a good water supply, and be in proximity to a coal supply, though that would not be a very serious item. Gas is a necessary requirement of a small arms factory, but there would be no difficulty in establishing an independent plant for the supply of gas to the factory. On general lines, the Canberra site meets the conditions I have suggested as necessary.

148. *To Mr. Sampson.*—When I am asked that presuming a small arms factory were established of twice the capacity of the factory at Lithgow, what employment would be necessary if we were to undertake the manufacture of field guns, as compared with the labour necessary for the manufacture of small arms, I would say that we know what small arms we are required to make, and we do not know what would be the requirement for field guns. It is possible that twice the number we have now would be required. I am assuming that you are referring to the manufacture of 18-pounders and rapid-fire guns. The labour required for the purpose would all depend upon the requirements of the military. I do not know what the estimated war strengths are. To double the capacity of the factory would theoretically involve the employment of twice as many men as are employed now, but we do not know what would be the requirements for field guns and machine guns. I have already stated that it would be economy to concentrate all these manufactures at one location. It is for the Government to declare their policy in the matter. I should advise getting them as close together as possible to secure economy of administration and manufacture. It is very difficult to say whether by the establishment of a factory at Canberra that would have twice the output of the existing factory at Lithgow, and which might undertake also the manufacture of artillery, it would be possible to save in economy of manufacture and administration an amount equivalent to the interest cost of the buildings at Lithgow. I can say that it would not require a very large increase of staff to run a small arms factory that would have three times the output of the existing factory. The managerial expenses would probably not be any larger, and working with larger quantities and increased facilities there might be a considerable reduction in the cost of manufacture. But to give a direct answer to your question, I should require to carefully weigh the possibilities on both sides. When I am asked whether the establishment of all these factories at Canberra, with three times the number of hands, would lead to a saving which would compensate for the abandonment of the present building at Lithgow, I may say that I think in course of time it would.

149. *To Mr. Gregory.*—I am quite satisfied with the configuration of the land proposed for the site of a small arms factory at Canberra. There is not at the present time, and under existing conditions, the same chance of getting the labour required at Canberra as at Lithgow. In the next three or four years it is possible that the opportunities for obtaining labour at Canberra would be equal to those at Lithgow. When I am asked whether, if working for a board of directors, I would recommend the transfer of the small arms factory from Lithgow to Canberra at the present time, I would say that everything depends upon what Canberra is going to be. I have said that it is in an embryotic stage at present. I do not think there is any member of the Committee who could state very clearly what Canberra will be in five or ten years from now. From a manufacturing point of view it is worse, rather than better, than Lithgow at the present time. It would be difficult under existing conditions to get skilled workmen to go there unless the Government made extraordinary efforts to take care of them when they got there. Under the present conditions of the Federal Capital there is not, of course, the same opportunity for the employment of boy labour, or of young men, as there would be if it were any nearer to a large centre of population.

150. *To Senator Keating.*—Gas is indispensable to a small arms factory. You could not dispense with it by the use of electricity, but it would not be difficult to establish an independent generating plant for the production of the gas required. Gas is extensively used in Lithgow, and a low price is quoted for the factory. I think

that it could be manufactured as cheaply at Canberra. I would use a different type of gas, which would not be produced in the same way as that used at Lithgow, though it would be generated from coal. It would be generated under a different process which would give a larger volume from the same quantity of coal, and so I think coal could be taken to Canberra and gas produced from it by an independent generating plant as cheaply as it is supplied by the municipality of Lithgow. The machinery of a small arms factory could be used to a large extent in the manufacture of rapid-fire guns. It is quite interchangeable, but when you come to the manufacture of 18-pounders it would be necessary to get larger machinery. The smaller portions of the guns might be made by the plant we have now. It would be a distinct saving to have the small arms and machine-gun factories associated, because it would keep the machines regularly employed.

Walter Whitworth Anderson, Agent for the Eagle and Globe Steel Company Limited, sworn and examined.

151. *To the Chairman.*—I represent a firm of manufacturers of steel in England. We are at present supplying steel for the manufacture of small arms to the Lithgow factory. We have been supplying the factory since the beginning of the war. We only got the contract then. Prior to the war, I understand that the steel used in the factory was sent out by the War Office. No one here had a contract for its supply. We have a contract up to the end of July, 1916. We are to supply 915 tons 17 cwt. That is the quantity we are called upon to supply under our contract for the manufacture of arms for three years. We are supposed to keep in stock one-sixth part of the total quantity to be supplied under the contract, on which the Government may call at any time. The contract was not signed until July last, when one year of the time had already expired. We are ahead of our time in regard to deliveries. The contract was signed in July last, but we did not get an order until 8th August. We delivered the first shipment in October. Since that time we have been keeping up supplies by practically weekly deliveries. It is outside my province to say how many rifles are manufactured from the steel we supply, but we are called upon to supply 915 tons to meet the requirements for three years. I could not say, without cabling to my firm, whether they have a sufficient stock of steel for this kind of work in hand to enable them to duplicate the quantities they are supplying under their existing contract. I have cabled to ask what they could supply, and I will communicate the reply to the Secretary of the Committee as soon as I receive it myself. My firm offered, about a month ago, to supply half as much again as they have contracted to supply, provided they got the increased price which they have themselves to pay now for the raw material owing to the outbreak of the war.

152. *To Mr. Gregory.*—If arrangements were made to double the output of the factory, I do not think we should have any difficulty in supplying all the steel necessary.

153. *To Mr. Finlayson.*—I do not know how much of the world's output of material is available, but I think that all that could possibly be used here could be supplied. There are other firms dealing in this particular class of steel, and we had to compete against them for the contract. I think there were five or six tenders put in. Ours is British-made steel. In some cases it is specified that the steel shall be made from Swedish ores.

154. *To Mr. Sampson.*—I do not think there would be a reasonable chance of doubling the supplies of steel within the next twelve months. I think the Small Arms Factory have as much as they can use now. They have nearly three years' supply. I think we have only about one-fourth of the total quantity of our contract yet to deliver. Three-fourths of the quantity has already been delivered or is on the way. Shipments are constantly arriving by the mail steamers. It is certain that the 915 tons will be delivered before the end of July, 1916, when our contract expires. This represents three years' supply for the present plant at Lithgow. The shipments come in from 20 to 50 ton lots. I have actually delivered 610 tons, and have 305 tons 17 cwt. yet to deliver. I am only advised from mail to mail of the shipments coming forward, but the deliveries are not less than monthly. We have been having two shipments a month regularly so far.

155. *To Senator Story.*—We supply almost the whole of the requirements in steel to the Lithgow factory. I could supply the Committee, if necessary, with the various items of our contract. There is a very small amount of steel not connected with the rifle itself supplied by other firms. Owing to the extraordinary activity in the manufacture of small arms in England and in America, the difficulty of getting necessary supplies of steel for Australia has been increased, but I do not think that it will last very much longer; perhaps not beyond the next six or nine months. That would not interfere with the Small Arms Factory at Lithgow, because they could not supply the machinery required for the increase of their output before then. If they decided to put on a double shift they would still have plenty of steel to go on with. It is true that it would be useless to supply steel for 99 parts of a rifle if you could not procure the steel for the remaining part, but I understand that within the last month there has been landed here a supply of the steel for the special parts referred to, to last the factory for twelve months.

156. *To Mr. Fenton.*—When we tendered for three years' supply of steel for the Lithgow factory, so far as I know it was for the manufacture of 15,000 rifles a year. If they wanted to produce 30,000 rifles a year our contract would, of course, last only half the time, but, in the circumstances I have explained, we are really delivering three years' supply in one and a half years. Increased prices would be asked for future contracts, owing to increased rates and the scarcity of material, which cannot now be obtained at the price for which it could be obtained before. Some of the components of the steel have to be imported from other countries, and the Swedish ores, for instance, which are the purest obtainable, have gone up to a very high price.

Albert Edward Cornwell, Assistant Tool-room Foreman, Small Arms Factory, Lithgow.

157. *To the Chairman.*—There are 34 or 35 men employed in the tool-room branch of the factory. There would not be the slightest trouble, so

far as the tool-room branch is concerned, in establishing double shifts at the factory. I say this, speaking for the tool-room branch, and I think I may say the same for the rest of the factory on the machinery side. I have been two years and a half in the factory. I did not learn my trade there. I served my time in England, at mechanical engineering. I had not the slightest trouble in picking up the business of the tool branch at the factory. When I first went to the factory I was engaged as tool fitter, and I was there for only two or three months, when I was given the position which I now occupy. The skill required in the tool-room is in advance of the skill required in other branches of the factory, but a man having a knowledge of engineering should have no trouble in picking up the work of the tool-room. A careful man, who thinks for himself, should not find it difficult to do whatever he may be asked to do in that branch. When men have been required for my branch I have been able to get them immediately. Our labour problem has not been difficult to solve. I speak with a limited knowledge of the other branches of the factory, but I happen to be president of the local branch of the Amalgamated Society of Engineers, and in that capacity I am in daily contact with the section hands. I have had their views expressed to me, and have reason to believe that they are correct when they say that they do not think there would be a great deal of trouble in starting a second shift. During the two and a half years in which I have been at the factory I have never seen any advertisements in the newspapers for help for the Small Arms Factory at Lithgow. The applications for employment have been from men who have heard of the existence of the factory, and have applied to be given a start there. I speak particularly of the tool-room, but I believe there is a file of applications in the factory to-day of men who at one time and another have applied for work there, and have not been employed. When I have asked for more men for the tool-room, Mr. Statton, my immediate superior, has gone along to the office and has recommended the men he has considered most suitable after going over the file of applications. Speaking as President of the local branch of the Amalgamated Engineers Society, I may be allowed to say that since the war started we have done our best to induce the Minister to start a second shift. We have approached the Minister of Defence for the purpose. We got our Melbourne branch to go into the matter and approach the Minister of Defence, with a view to starting a second shift. They failed in their endeavour. The second step was taken, to be precise, on the 9th December last. Mr. Pedersen, the secretary, of our branch, and myself were asked to go across to Melbourne to attend upon a personal deputation to the Minister of Defence. As a result of our interview, Senator Pearce said that he thought the time might be ripe for the starting of a second shift, but he left it to the manager of the factory to say if that were so. He promised to visit the factory early in 1915, and if a second shift were not started by that time he would call further evidence in the matter. The object of the deputation was to impress upon him the advisability of starting a second shift. At that time we had plenty of labour available, but I believe that since that time many of the men who would have then been employed have gone to their homes. I think that at present there is a sufficient supply of labour possessed of the necessary skill for the operation of the second shift. The last factory I was in in the Old Country manufactured the Straker Squire motor car, and we worked two shifts there. There were occasionally personal squabbles between men on the different shifts, but there were no general labour troubles as the result of working two shifts. Those personal difficulties would be decreased here, because the work there was a good deal more skilful than the work of a small arms factory. The element of personal skill was more in evidence there, but there was very little trouble. There is no objection on the part of the employees to work two shifts at the factory. The members of my own society do not want overtime, and they consider that the interests of the factory would be better served if a second shift were started. There is a lack of house accommodation at Lithgow. One of the difficulties of establishing a second shift would be to find housing accommodation for the extra men employed. I think that a second shift could be started with from 150 to 200 men. The number of employees at present in the factory is approximately 480. Of that number 140 are boys. With a nucleus of 150 to 200 men I think a second shift could be started. Some arrangement would have to be made for the housing of the additional men required. There are a number of boarding-houses at Lithgow, but I am not in a position to say whether, so far, their accommodation has been overtaxed.

158. *To Mr. Laird Smith.*—Our union has never at any time suggested that the men should restrict their output. I may answer the question in another way by giving you a concrete case. In the factory there are test times for operations. In the profiling department there are 28 machines, which are used, roughly speaking, for 115 operations. The length of time which should be taken on these operations was set by what Mr. Wright calls experts in America. I went over these times only a month ago, and out of the 115 operations I found that in the case of only six operations the employees of the factory had not exceeded or equalled the number of components machined in the same time by the experts in America. I have risen from a comparatively humble position to a more responsible one in the factory, and, so far as I know, none of the union officials made any objection to my promotion. Australians are quite equal to the men with whom I have worked in other parts of the world in learning the business of the factory. In the tool-room from 30 to 35 per cent. of the hands are Australian-born, and it is the highest skilled branch in the factory. On the question of increased pay for a night shift, I may say that when we first approached the Minister we said that we were willing to consider the working of that shift at normal rates, or at reduced overtime rates in order to assist the country as much as possible. I believe that such a proposal would be fairly discussed and considered. There would be no difficulty in finding supervisors to effectively carry on the work if two shifts were established. The section hands in the factory are Galbraith, Yates, Venman, and Gillies. The first and third came from Armstrong, Whitworth's in the Old Country, and were foremen in that establishment. In addition to them there were two other foremen there, Talbot and Ridley. At the present time these men are working at Cockatoo Island. They left the factory because of differences with the management. I do not think there would be any difficulty in finding supervising labour. Recently, Bouckley, the foreman of the barrel department, resigned, and there was in the tool-room at the time an Australian named Snowden, 26 years of age. The manager had no hesitation in taking him from the tool-room and putting him in charge of the barrel department with 48 or 50 machines to supervise. He is filling the position creditably, and has made alterations which have led to an increased output in that section.

159. *To Mr. Finlayson.*—I do not think that the tool-room is working up to its full capacity. A number of machines in that room are not fully employed. We have greater pressure sometimes than at others. We have milling machines and grinding machines. I have pointed out on several occasions that if we had more milling machines we could increase the output of the tool-room. As bearing on the question of a restriction of output, I may say that in the first six months of last year the tool-room turned out 4,500 tools, and during the last six months the output was roughly 10,500. There was clearly no restriction of output there. If it were decided to immediately increase the output of the factory, the tool-room branch would be capable of meeting the increased demand for tools. I do not anticipate that there would be any difficulty in securing the necessary additional labour for that section. We make tools for the machining of components, and we have also made fixtures and jigs for the machining of components. They were made for the purpose of accelerating the output. I do not know of one case where the tool-room has failed to be able to do the work asked of it. The skill required for the various operations of the factory varies. This will be seen when I mention that for some of the components we have machines that complete operations at the rate of seventy per day of eight hours, and for some others the machines turn out 1,200 per day of eight hours. At an inquiry held by Mr. George Swinburne, the Inter-State Commissioner, in January, 1914, into the running of the factory, he asked several of the section hands how long it took them to teach the operators to acquire the requisite skill to perform their work, and the men in one portion answered that it took from half a day to a day. Speaking to the Mayor of Lithgow he stated that he overheard Mr. Wright say during the course of an inspection when taking round the Imperial Trade Commissioners that he would guarantee to teach any operator in that factory any portion of the work in a fortnight. No one has yet served an apprenticeship at the Small Arms Factory. I do not think that the institution of the double shift would have any appreciable effect in reducing the output at first, and in a month or two the effect would probably be to increase the output by about 70 per cent. To establish a second shift it would be necessary to divide the supervisors, but that would not seriously interfere with the production of the factory. Speaking of the site of the existing factory, in view of the proposal to extend its operations in the production of rifles, and also the proposal to establish a factory for the manufacture of field guns, I consider it a good site. The value placed upon the land some time ago was considered a very low one. Owing to the shortage of house accommodation forty or fifty of the members of the A.S.E. employees at the factory took advantage of the subdivision of land there to purchase lots. I bought a piece of land with 85 feet frontage and 200 feet depth, and the price was, roughly speaking, at the rate of £220 an acre. The cost of living at Lithgow is not higher than it is in Sydney, but the surroundings are, perhaps, not all that is desirable. As a member of it, I may say that the Lithgow Municipal Council are doing their best to improve the conditions. They have got a move on lately, and are making an effort to grapple with the problem of providing better conditions for the people there.

160. *To Mr. Fenton.*—When I said that I would expect an increase of 70 per cent. in the output from the establishment of two shifts I was speaking of two shifts of the duration of the present shift, and not of two 8-hour shifts. I was speaking of a shift from 7 a.m to 7 p.m., and another from 7 p.m. to 7 a.m I have had in mind in giving my evidence the institution of two long shifts, practically working the round of the clock with a short break between the shifts. In the teaching of new hands there is sometimes a breakage of tools and a waste of material. That must be taken into consideration, because it undoubtedly does occur. But it would not affect the working of a second shift to any great degree. Care could be taken in arranging the shifts to put the less skilled men on the jobs requiring least skill. I have not heard of any, but if there has been any hesitation on the part of section hands in teaching those under them it has been due to the policy of the manager in supplying the section hands with unskilled helpers. There may have been some little diffidence on the part of a section hand in dealing with unskilled helpers. In some cases men have been put under them when it was not necessary, and there has been some feeling that the object is to provide a menace for the section hand. I know that where they have been shorthanded section hands have asked for skilled helpers, and the manager has been consistently against them. Mr. Swinburne was very emphatic about the necessity of keeping the factory well equipped with skilled men and good organizers. That has been our aim all the way through. If the necessity arises for a helper we have insisted that the interests of the factory are best conserved by the appointment of a skilled helper. There are no apprentices in the Small Arms Factory and the Amalgamated Society of Engineers have advocated the introduction of an apprenticeship scheme, and one has been provided for in the new award on the lines we suggested, but it is not in operation yet.

161. *To Senator Keating.*—All the employees of the Small Arms Factory are not members of the Amalgamated Society of Engineers. Some belong to no association, and some are members of the Small Arms Factory Association. It can scarcely be said that there has been industrial litigation between the two societies. There was some little industrial trouble which was due to the manager's apparent desire to break down trade union principles. Some time ago the manager wanted to put an unskilled man into the tool-room, and to pay him a rate of 30 or 40 per cent. lower than the other men in the room were getting. That man was a member of the Small Arms Factory Association. At the start of the war, when Senator Millen was Minister of Defence, we stated in a telegram to him that we were prepared to waive all controversial matters, and would continue to work under the then existing conditions for the duration of the war. We pledged ourselves to that, but in January of this year a conference was held between the manager of the factory and representatives of the Small Arms Factory Association, with the result that a log of wages and conditions was drawn up covering the whole of the employees of the factory. We naturally took exception to that, and the case came on for hearing before Mr. Justice Powers. We asked for leave to be heard in the case, and I am glad to be able to say that Mr. Justice Powers, when the facts were represented

to him, gave us leave to apply for a variation of the award. But for the fact that that agreement was drawn up between the manager and the Small Arms Factory Association there would have been no trouble or litigation over the rates of pay or conditions of employment during the continuance of the war. I have said that I am assistant foreman of the tool-room. During the absence of the foreman it would be my duty to take full control of the tool-room branch. I have no desire to cheapen my job in any way, but I could mention half-a-dozen men who without any very great trouble could take up the work I am doing now. In the event of it being decided to work two shifts my chief would probably take control of one shift, and I should probably be given control of the other. I have said that the men are prepared to work the round of the clock practically in two shifts. It is true that it might be somewhat distressing for the men in the forging and annealing shops to work a shift of 10 or 11 hours. But as the factory is at present constituted it would not be necessary for them to do so, even if two shifts were decided upon. The forge shop can do all that is required in 9½ hours for a shift of 12½ hours in the other branches of the factory. Naturally the same relative length of shift in the forge shop could be preserved if two shifts were decided upon. There would be no difficulty in getting men for this kind of work. Drop hammers are used in the Clyde Engineering Company, and the same kind of hammers as we use here are used in factories in Sydney. The engineering award provides a rate for drop forgers, and that proves the existence of such forgers. I believe that men to work the machines could be obtained by simply advertising for them. There would, of course, be a percentage of the applicants rejected, but the major portion of them could, I think, be engaged right away. In my experience in the Old Country the proportion of rejects is not more than 15 per cent. of the men who are given a start. On the question of men in one shift complaining of the condition in which the machines have been left by the men of the previous shift, I say that you have always that personal element to consider. I have known such complaints to be made, but my previous factory experience was hardly analogous to the experience of the Small Arms Factory. With the smaller machines it is sufficient to give a man about ten minutes to clean up. When it is suggested that it might be injurious to the machines to work them to the full twenty-four hours each day I say that you do not study the life of a machine. You can make running repairs. It is the duty of a section hand to see that his machines are in a condition to do their work effectively. With running repairs from time to time they can be kept in a state of efficiency. I have never had to worry over that. I have worked a machine while it is able to work, and when a machine is not able to do good work it is turned over to the tool-room for repairs. All that would be necessary should a double shift be established would be to give a man ten minutes or a quarter of an hour to clean up his machine before the new shift came along.

162. *To Mr. Sampson.*—We have advocated a second 12-hour shift at the factory, so that the machines might be kept running continuously. We have proposed that every man should get one Sunday off in four, so that we contemplated running the machines on Sundays as well as on week days. What we proposed with a reasonable break between the shifts would give twenty-one working hours per day for seven days in the week. I think that the staff could stand that, at all events, during the continuance of the war. This is the best time of the year for such a change, as the men could stand a greater strain during the winter months than they could during the heat of the summer. I think that an increase of 70 per cent. in the output of the factory might be expected within two or three months after the establishment of a second shift. The Amalgamated Society of Engineers is represented by from 30 to 34 per cent. of the adult workers in the factory. Our rules enable us to take in the whole of the workers, with the exception of labourers and some unskilled men. Our society includes every one of the section hands, and four out of the eight foremen. I could not say why the other foremen are not members of our society. They do not belong to any union. If the manager appointed as a section hand a member of the Small Arms Factory Association who had qualified himself for the position the Amalgamated Society of Engineers would take no exception to the appointment. We only took exception to the action of the manager when he put a man in the tool-room at a lower rate of wages than was being paid to the other men working in that branch. We could not, and would not object to the appointment of any member of the Small Arms Factory Association to any position so long as he was paid the same rate of wages as others occupying a similar position. No pressure would be brought to bear upon a member of the Small Arms Factory Association appointed to a position as a section hand to join our union. He might still continue to be a member of the Small Arms Factory Association. I could mention the case of a section hand who was a member of our society, and was given the sack, and though his place was immediately filled by a member of the Small Arms Factory Association we took no exception to that. If the manager shifts a man from one branch of the factory to another, so long as he is paid the recognised rate for the branch to which he is transferred we cannot object. Our society represents, with two or three exceptions, the whole of the skilled workers in the factory. I can give you the assurance that in the event of two shifts being worked the men would co-operate in every possible way in the training of new men to bring about the desired result of an increased output. Realizing the gravity of the present situation we are prepared to do all we possibly can to increase the output. I have not seen any of them on the subject, but I think that many of the residents of Lithgow would be prepared to help to secure that object indirectly by providing accommodation for the additional hands who would be required if it could not be otherwise provided.

163. *To Mr. Gregory.*—The removal of the Small Arms Factory from Lithgow to Canberra would involve financial loss upon a great many employees of the factory who have bought land for the purpose of building their homes at Lithgow. If it were decided to remove the factory, land values would drop 50 or 70 per cent., and as they bought at the values ruling some time ago, they would be bound to suffer a financial loss. There is not a large area to the immediate west of the factory at Lithgow that would be suitable for workers' homes, because the land there dips down into a hollow. There are a number of places in the neighbourhood of Lithgow that would be suitable. A large area suitable for the building of workers' homes could be resumed to the south-west of the factory, going back to the foothills. I can speak for my society when I say that if it were decided

to establish two shifts, the proposal would meet with the active co-operation of the employees. It would certainly be an inducement to the employees to give every consideration to the requirements of the Government at the present time, if it were made known that it was the intention to double the capacity of the existing factory, and to construct additional factories. I might say that at our deputation to Senator Pearce the matter was mentioned, and we were informed that the subject of further extension and development would be taken into consideration later on. I have personally no objection to either the bonus or the piece-work system, but the organization which I represent does not view either of these systems with satisfaction. I may say that they are endeavouring, with the co-operation of employers in the Old Country, to cut out those systems as far as possible there. It has been admitted that the men in many of the sections of the factory are working very well indeed. I have already said that, upon an investigation of the work of the profiling section, the times set by the American experts have been exceeded in 95 per cent. of the operations in that section. It is true that the plant is not turning out the output guaranteed, though we are working a shift of twelve hours instead of a shift of eight hours, and during the first two years the output was nothing near the guaranteed output. But there are other reasons to account for that, apart from the rate at which the men are working. I can give you the assurance that the men are loyally trying at the present time to give all the assistance they can. If the maximum guaranteed output has not been reached, the men are not responsible. Our society has not asked for any more wages for its members working in this factory than they would ask for from private firms. I might say, with regard to the rates of wages, that the new award provides for the forty-eight hour week, the same hours as are ruling outside, but the rates of wages are higher, because, in the tool-room particularly, a greater degree of skill is required, and to attain it, men purchase expensive kits of tools and obtain textbooks upon their work to give them a better grip of what they are required to do. I could mention the case of a man in the tool-room who has about £65 worth of tools which he bought for himself.

164. *To Mr. Fenton.*—Our rules provide for pay at the rate of time and a-half for a night shift, but we have said that we would use our influence with our members to get them to work at the normal rate during the currency of the war.

165. *To Mr. Finlayson.*—In the earlier stages of the factory it did not produce the guaranteed output, although, as I have stated, the men have been doing work up to the American standard tests. Lately the output has increased considerably. When I am asked what was wrong with the original conditions, and what has brought about the improvement in the output, I would say that the improvement has been brought about by a closer application of the system in vogue in the factory. The small output at first was due to the manner in which the system was applied by the management. In order to get the maximum output from such a factory, it is necessary to see that the components of the rifle are flowing consistently and steadily through. If there is a break in the steady flow of the components at any point, there is a corresponding drop in the output. In February, March, and April, 1914, the profiling section never touched the work on an essential component of the rifle for ten weeks. That was not due to the men, but to the defective application of the system. There are twenty-eight machines in the profiling section, and I was informed that in one week only three of the machines were working. If it were decided to increase the output, there are some sections in which the number of machines is sufficient for the purpose, and others in which the number of machines is not sufficient.

(Taken at Melbourne.)

TUESDAY, 1st JUNE, 1915.

Present:

Mr. Ribex, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.
Mr. Finlayson,	

Walter Burley Griffin, Federal Capital Director of Design and Contruction, sworn and examined.

166. *To the Chairman.*—The site suggested by the Home Affairs Department for the Small Arms Factory was brought under my notice on Friday last for the first time. I have had three days to consider the suggestion, but have had scarcely enough time to go thoroughly into the whole question. I can say, however, that the placing of the factory at the site suggested would interfere very materially with the Federal Capital scheme as a whole. It is difficult and dangerous to determine any of these individual questions without considering the scheme as a whole. In my original plan, drawn before I had received the surveys of the outlying territory, I had provided two alternative locations for industrial purposes. I think those are the only two available alternatives, so far as is shown by the meteorological data which I have been able to obtain. Before the Committee come to a determination on this point it will be necessary to consider, as one of the first elements, the prevailing winds. I have not been able to get from the Department their complete information on that subject, and I would be glad if the Committee could do so. The fundamental classification of the city recognises the industrial elements as one of the characteristic features, and makes provision for their being concentrated and correlated. Having regard to the whole plan of the city I can see great objections to the operation of a small arms factory at the spot suggested by the Department. My opinion is that the best location for the industrial centre is to the north of the city on the main line of railway, where the largest economically flat topography is available. A reference to the plan will show that that is the most economically developed portion of the city site for industrial purposes. That site would be about 5 miles from the power plant. Unfortunately, the power plant has been located on the plans without reference to the general scheme, and my objections to the site proposed by the Department for the Small Arms Factory apply largely to the site for the power plant.

167. *To Senator Story.*—We already know that the prevailing winds do not blow from the north, and that they would not carry any nuisance from

the northern site to the city. The Black Mountain converts the north-west wind to a westerly. The prevailing winds, according to the meteorological report, are south and west. The evening breezes, however, blow from the east.

167A. *To Mr. Finlayson.*—I have not experienced any "funnel" effect on the wind caused in the valley between Black Mountain and Mount Ainslie. These mountains do not protect the northern site from the wind.

168. *To the Chairman.*—I do not think the site would possess any disadvantages on account of soakage from the mountains; the valley gathers the water, and runs it into the Molonglo.

169. *To Mr. Fenton.*—I doubt whether the large water surface provided for in the plan would have any influence in diverting the winds. It has been claimed that large bodies of water have the effect of inducing precipitation, but that is a debated point.

170. *To Mr. Finlayson.*—I object to the departmental site for the reason that it occupies about 1½ miles of space which the general plan contemplates being converted into recreation grounds and lakes for the benefit of the community. The factory would intervene between the lakes and a residential suburb, the residents of which would be deprived of ready access to what was designed to be a means of recreation for them. The history of private industrial sites would be very well exemplified by the adoption of such a site as the Department has proposed. It has happened in America that large monopolies have taken the best sites for factory purposes, and the people have had to make their residences on the inferior sites.

171. *To Mr. Gregory.*—I should not care to incur the expense of building weirs and creating lakes if factories are to be so placed as to shut out the residential suburbs from access to the water. The city of Gary, U.S.A., is an example of a mistake of that kind. There a community of between 30,000 and 40,000 came into existence in four years, but the steel works occupied the lake shore, and the community was shut off in the background. The residents in the suburbs adjoining the proposed factory site will be cut off from recreational facilities in the same way.

172. *To Mr. Laird Smith.*—The unsightly appearance of factories erected in such a locality would be the least of my objections. I have not had an opportunity of studying how far three-story factory buildings erected there would interfere with the general beauty of the view from the city itself.

173. *To the Chairman.*—The first consideration in fixing a factory site at Canberra is the comfort and convenience of the inhabitants; the industry is a secondary consideration. The line of railway that is shown running through the plan is one of the first essentials to an industrial site. If a branch line were constructed as suggested to the factory a certain section of the country would be cut off from the other portions of the city, and the disadvantage would have to be overcome by incurring the expense of building bridges or subways. The present railway from Queanbeyan is thus available to the factory site suggested by the Department, but I would not have placed the railway there. I proposed that the railway should be brought further south, but it has been built across what I had laid out as a lake area. I wish to emphasize the point that details of construction cannot be considered independently: they must be dealt with in relation to the whole scheme.

174. *To Mr. Fenton.*—I do not know of any natural supplies of water near the site which I propose for the factory.

175. *To Mr. Sampson.*—No very great expense would be involved in conveying the electric power from the generating plant to the site to the north of the city. The current would probably be carried overhead. Unsightliness could be avoided by carrying the current along the railway line or round the back of the city. The site chosen for the power-house is also objectionable on the ground that it has been given a frontage to an ornamental water which is to be created for the enjoyment of the people. My proposal was to place the generating plant on the main line of railway on the northern side of the water.

176. *To Senator Story.*—A factory site beyond the Military College would involve the construction of another railway. The main railway must be the backbone of the city. Of course branch lines could be built, but it would be much better to make the railway system as simple in design as possible. The construction of branch lines would introduce further incongruities into the general plan. It must be remembered that a railway is not merely a line of track, but is in reality a railway track plus buildings, sidings, shunting yards, and other attributes. The main idea is to concentrate the railway into the smallest possible space in which it can effectively serve the community.

177. *To the Chairman.*—To place the factory site still further south-east than the point suggested by the Department would make it almost entirely tributary to Queanbeyan. There would be the competition of freehold land at Queanbeyan, which would be under no restrictions except those laid down by the State, and the State restrictions might not be in accord with those which the Federal authority would apply in the Federal Capital area; while the rental income would be lost to the Commonwealth. The Department's present recommended site is 6 miles from the centre of the Capital City, as against only 3 miles from Queanbeyan. The better idea is to keep all the habitations and industrial establishments at a site where they can be properly controlled by the Federal authority. My suggested site for the industries is very pleasantly situated from the point of view of the employees, and is entirely suitable for the development of a garden city. Indeed, on my plan it has been already so developed.

178. *To Mr. Laird Smith.*—The site I propose would be about 1½ miles from the civic centre.

179. *To the Chairman.*—The railway to that site would be the main line to Yass. The line from Canberra to Yass will be a very much easier and better railroad than that from Cooma to Goulburn.

180. *To Mr. Finlayson.*—I consider the extension of the railway from the Federal City to Yass an essential feature of my scheme. I do not anticipate any difficulty in carrying the line across the flats that are now coloured blue on the plan, and which will be covered by lakes later on. The railway will be carried across by earth banks. Earth banks will be quite sufficient for that purpose; in other parts of the world they have been built up hundreds of feet. I should provide for a bank 25 feet wide on the top, and with a slope of 2 feet in one. On the top level I would have a double line of railway, and on a lower level roads for pedestrians and vehicles. No bridge will be required at all. In my opinion it would be an advantage to the development of the civic centre of the city to have the industrial centre at the back of it. The city as a whole will have a centre of gravity, a place where most of the people will congregate. That centre of gravity is calculated not so much on the actual distribution of population as on the means of getting into the city. On my plan the centre of gravity is established at a spot to which there will be equal access from all portions of the city. I refer to the civic centre, which is further north than the present temporary administrative offices.

181. *To Mr. Sampson.*—I propose that the permanent administrative offices connected with the Federal Government shall be contiguous to Parliament House, and all related in the one continuous group of buildings. They will commence at a distance of 20 feet from the Houses of Parliament, and ultimately, when the city has reached its complete development, the remotest of the administrative offices will not be further from the Parliament Houses than is the General Post Office in Melbourne from Spring-street.

182. *To the Chairman.*—Access to the northern industrial site will be provided by the carrying through of the railway from Yass to Canberra. That would involve for the Commonwealth only an 8-mile continuation of the line that is at Canberra now. It would be sound economy to build the railway before establishing the factory. That would not necessarily mean proceeding at once with the creation of the lakes. The railway could be carried on a trestle temporarily, and the embankment across the lake could be built with its aid. The embankment could be built after the railway, but it would be better to do the whole job at once.

183. *To the Chairman.*—There would be no expediency in jeopardizing the serviceability of the city for the sake of any temporary constructional advantages. The first consideration is —what is Canberra to ultimately be. In my opinion the northern site is definitely preferable for industrial development. One important point to be borne in mind is that if the factories are to be located at the site advocated by the Department, that would not offer adequate possibilities for railway marshalling yards, which may ultimately develop to great size. Every objection to the site for factory purposes applies with equal strength as regards railway marshalling yards. The factories and the railway yards should be together as an industrial unit in the city, and to be economically handled they should be part of one scheme.

184. *To Mr. Finlayson.*—The present line of railway from Queanbeyan to the Federal Capital was originally proposed to be only temporary, but it has been laid down in very permanent form. I was told that it would be a temporary line, but when I came back from America I found that it had been constructed on a permanent basis. It is not at all necessary that the route of the present line should be followed for a permanent line. So far as regards contour, there are alternative routes that would be just as good. My original plan was that the line should go further south, where it would get even grades. Allowance must be made for alternative routes which may be required in order to give transport facilities to any other contiguous locality.

185. *To the Chairman.*—On the basis of the original meteorological information supplied to me, I assumed that the areas either north or south of the city would be available for industrial purposes, but not any of the country east or west, because the prevailing winds in the day-time are westerly, and at night easterly.

186. *To Mr. Finlayson.*—If the industrial centre were established at the point I propose there would be no difficulties in respect of either water supply, sewerage, or power. That area is slightly higher than the city, and the gravitation of the sewerage would be simple. There would be very little loss of power in transmission from the generating plant over the slightly greater distance to the northern site as compared with the eastern site. The cost of connexion with the main sewer would be less than the cost of connecting the site suggested by the Department. The water reticulation would present no difficulty. The reservoir on Red Hill would be high enough to allow of gravitation right across this area. It will be seen that the placing of the factory on the eastern site would involve the cutting off of some of the best available residential land in the locality.

187. *To Senator Story.*—A large proportion of the area in the vicinity of the northern site is laid out on my plan as a residential area, and the industrial traffic would be so provided for as not to interfere in any way with the ordinary traffic of the community.

188. *To the Chairman.*—There is a definite plan of the city, and I have done my best to proceed with its development. I came to Australia to carry out the plan with which I won the competition. All my work is based on that plan on which I am working at the present time. The modifications have been only in minor details. I can let the Committee have a map on which I have marked my proposals for the location of administrative buildings, workmen's dwellings, factories, railways, and the various other features of the city.

189. *To Mr. Fenton.*—The embankment which is to carry the railway across the basin will also serve in holding back the water, and there will be a discharge through the centre of the embankment. The contour of the plan of the lakes as shown on the map very closely coincides with the flood levels of the old valley.

190. *To Mr. Finlayson.*—My general scheme of which this plan is a portion has been accepted, and I consider that it would be fatal to the city to consider any element in it without having regard to the whole.

191. *To Mr. Sampson.*—I gave serious consideration to the possible establishment of factories in the Capital area, and I chose the northern site as the best suited for that purpose. One industrial centre ought to be sufficient for the development of the Capital City. The whole plan would be disturbed if there were to be more than one industrial centre.

192. *To Mr. Fenton.*—There have been no serious departures from my original plan. In my report explanatory of the preliminary general plan appeared this paragraph—

> The centre lying to the northward of the city was originally designated "manufactures," but conditions in the early growth, with the railroad facilities limited to the south of the Molonglo, may necessitate that such activities be concentrated in one of the southern suburbs. Furthermore, it is possible that the summer northerly winds may render the northern point less acceptable than a southern one for this purpose.

When I wrote that paragraph the southern suburbs were laid down directly south of the power-house site.

193. *To Mr. Sampson.*—That reference to the winds in relation to the northern suburbs was made because I had been told that the winds were northerly. I have never experienced a northerly wind in the city, but before taking any action it will be necessary to get all the meteorological data on that subject. We know that the prevailing wind is westerly, but we ought to know what are all the minor winds.

194. *To the Chairman.*—Whilst the prevailing wind is westerly, I believe the wind next in evidence is from the east, and if the factory were placed at the point suggested by the Department the smoke and smells would menace the city.

195. *To Mr. Fenton.*—There is no doubt that the prevailing wind would blow the smoke away from the city, but the effects of the secondary wind must also be considered. Adjacency of factories to a natural supply of water is not necessary in a city where the whole power is to be developed at some central point in one unit, and conveyed to various parts. The generation of power away from the central station is not contemplated. The scheme laid down provided for a central power unit for the whole area.

196. *To Mr. Gregory.*—I would not bring the factories within two miles of the civic centre. I anticipate the Federal Capital growing to a big city, but not industrially. I would keep the factories as far from Parliament House as possible, but we want the employees in the factories to have as much benefit of the accommodation in the centre of the city as they can reasonably get. They should be conveniently situated in relation to both their work and the facilities of the city. I was not consulted in regard to the Department's suggestion for a factory site. I heard nothing of the proposal until your secretary (Mr. Whiteford) asked me to see Colonel Owen on Friday last. The site on which the Department proposes to erect the factory is laid out as a suburban residential area on my plan. The site before the Committee was proposed by the departmental officers without my knowledge. I anticipate that a fairly large expenditure will be involved in constructing dams and weirs for the purpose of forming the ornamental lakes, but I do not think that such expenditure will be advisable if factories are to be placed along the edges of the lakes. There can be no great objection to the industrial centre being 1 or 2 miles further away from the power-generating plant than is proposed by the Department.

197. *To Senator Story.*—You say that there have been some suggestions that it would be a pity to submerge so much valuable land for the creation of artificial lakes, and that crops could be grown on that land for the next 50 years without interfering with the ultimate development of the city. If that consideration were to weigh with the authorities, and the making of the upper lake were not to be proceeded with, to what other ultimate use could the land be put? The land which I propose to utilize for lakes has been flooded, and is liable to be so again. Such an area would not be useful for residential or industrial purposes, and therefore if it is not utilized for lakes it must be utilized for parks. I am aware that the factory site which the Department has recommended is not on the land which might be suitable for cultivation, but it abuts on that land, and it lies between my proposed lakes and parks, and land that is habitable. The railway approaches to the industrial locality would also assist in shutting the people off from the recreation areas which my plan provides. The creation of an industrial centre there would entirely nullify the utility of that area as a park or a recreation reserve or for any other purpose for which it is adapted in ultimate development. I do not think that if my plan were modified to the extent of cutting out the upper lake the parks also would be struck out of the scheme. This must be regarded as a submerged area whether the lakes be abandoned or retained. The land has always been subject to inundation, even without any embankment being built across it. The original surveys clearly show that. As long as that blue area remains liable to occasional submersion it will be impossible to apply to it uses which will not bear such submersion. Therefore, if the area is not to be utilized for lakes, it must be utilized for parks, but the maintenance of parks costs money. Therefore, I think the lakes are the cheaper proposition. If the lake idea were abandoned altogether I still think that the site mentioned by the Department would be unsuitable for the Small Arms Factory, having regard to the plan on which we are working. Of course, with an entirely different city plan that site might be suitable for factory purposes. The trouble is we are working on a city plan with which the Department's proposal does not harmonize. Factories are an element in the design I have provided, and they cannot be placed at the point advocated by the Department unless an entirely different design is adopted.

198. *To Senator Keating.*—The larger scale plan accompanying my explanatory report does not show any particular area as having been set aside for factories, because the site for them is just outside the area embraced in that plan. I say finally that the proposal to put factories to the east of the city as suggested by the Department conflicts with my plan, and I do not think the site is suitable. My whole work has been entirely bound up with my conception of the city as revealed on the accepted plan, and I admit that I object to the eastern site mainly because it conflicts with my design, which has arisen out of the physical characteristics of the Territory. The adoption of the Department's site would compel me to modify my plan of the city. I have already informed the Committee how the placing of the factories there would run counter to my provision for concentrating the industries and railway yards together. If that site were adopted for industrial purposes and another industrial area were created to the north of the city extra engine service and haulage would be involved, and all the material would require to be drawn through the city. The mere fact of the Department's suggested site not going actually to the lake borders would not detract from my objection. I have not had any consultation with the departmental officers in regard to the site that they have proposed.

199. *To Mr. Finlayson.*—The railway distance from Sydney to Canberra *vid* Goulburn and Queanbeyan is 203 miles; from Albury to Canberra *vid* Yass 229 miles. From Albury to Canberra *vid* Yass is 243 miles, and *vid* Goulburn and Queanbeyan 323 miles. The plan of streets and avenues which I have shown to the Committee to-day is that which was approved by Mr. Kelly, late Assistant Minister for Home Affairs, although I have since been working on the plan and developing it. It has been extended in accordance with the surveys which were supplied to me. No work in accordance with this plan has yet been undertaken.

(Taken at Melbourne.)

THURSDAY, 3RD JUNE, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.
Mr. Finlayson,	

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

200. *To the Chairman.*—I have already given evidence to this Committee on this subject. This evidence is in continuation. I did not consult Mr. Griffin before I recommended the site I have suggested for the proposed Small Arms Factory at Canberra. I had in my possession a small plan, prepared by Mr. Griffin for his report explanatory of the general plan of the Federal Capital. That plan showed an area to the south-east of the city, which, I concluded, would not be used in connexion with the main proposition. There was no reason why I did not consult Mr. Griffin. There are other possible sites, but I think the one I have suggested is the best, and the area I have marked on the map represents about the area I thought would be required for the Ammunition Works, though it need not necessarily take that form. The factory, for instance, need not be erected on the border of the lake. The lake could remain as it is designed by Mr. Griffin at present. I only propose to take the buildings near the lake, so as to get water for manufacturing purposes at a low rate. As I said to the Committee before, I think it is desirable, with our present knowledge of factories, to have the factory as near water as possible. I know Mr. Griffin thinks the proposed factory site would cut off a certain portion of the lake frontage from the people to the south-west of it, and I dare say it would. I have, however, prepared a rough plan, which I would like to show the Committee, in order to give an idea of the length of water frontage there will be at Canberra, in order that the various factors, pro and con, may be adequately considered. I desired a plan which would bring home to everybody, as it has really brought home to me, what would be the length of frontage to the ornamental waters. I have plotted the area of the ornamental lakes on a map of Melbourne, so as to afford an opportunity of judging the size of those lakes when portrayed upon an area that we all know. When you see the size of the ornamental waters, and compare them, for instance, with the Albert Park lake, which is a fair large sheet of water, it seems to me that the amount of frontage which might be cut off by the factory site is not a matter of great importance in relation to the whole scheme. There is no reason why the corner suggested as the site should not conform to the boundary of the lake. I do not think the question of water frontage is a factor which, considered alongside the other advantages of the position, should seriously weigh against the placing of the factory on the site suggested. When I visited the site I had an idea that the prevailing winds would be from east-north-east, and north-north-east, and south-south-east. Yesterday I asked Mr. Hunt to give me a statement of the number of days that the wind had blown at Canberra from the various directions, and from that information I have made a graph. Mr. Hunt states that the isobaric conditions prevailing at Canberra are such that winds from the east will not be continuous. Easterly winds are of an intermittent character, the isobars precluding strong or continued winds from that direction. Probably Mr. Hunt would explain the matter better himself: but his information shows that during the year 1914 the wind blew from the east on 60 days, from the south-east on 45 days, from south-south-east on 40 days, from the north on 31 days, from the north-north-west on 25 days, from the north-west on 74 days, and from west-north-west on 181 days. So that, apparently, the last is the prevailing wind. I cannot give the Committee any idea of the relative strength or velocity of the winds prevailing at Canberra. Mr. Hunt has got the information, and I think he will be prepared to state what are the relative average velocities. The site of the proposed factory is between east-south-east and south-east.

200A. *To Mr. Sampson.*—The south wind only prevails during thirteen days in the year, and it is a very light wind. I think the mountains have an influence upon the lightness of the wind; but as I understand it the isobaric pressures preclude the easterly winds from being continuous. One point about this, I think, should be borne in mind. At Acton we have protection from the south-west wind. I discussed this question of wind with Mr. Wright in relation to the site of the proposed factory. He said the smoke and fumes might be disregarded; that he felt none where he lives, which is only a few hundred feet away from the factory. He told me that if the manufacture of field guns were carried on there might be an objection in the noise, but I question whether, with a town, say, of 15,000 people, this sound would carry over a distance of 2½ miles. I do not know whether the working of a big steam hammer would have any effect at all. I have worked at Morts Dock, Sydney, where there is an 80-ton hammer. It might have been heard a short distance away at Water View Bay, but never in Sydney. When I looked for a position at Canberra, I had also in view a site opposite to the Military College on the east of the ornamental water, where an easy gradient is shown on the contour plan. I do not put forward that site for two very strong reasons. One is that we might make an isolated community there, cut off from the city, and not likely to eventually form part of the city. The other reason is that it would entail a certain amount of extra railway construction. A period of eighteen months for construction of additions to the factory was immediately in view, and it would have lost time to construct a railway to the proposed factory site, time was a consideration quite apart from that of cost. Were such a separate suburb established, a difficulty might be set up which it would be hard to overcome in the course of time. My own view is that wherever this factory is established a proportion of the community will live near by, and on the site I suggest this population would, in course of time, be merged into the town generally, and there would be no isolated community. I do not know whether I am sound in that view, but I am strongly of the opinion that to make an absolutely isolated suburb, cut off from the rest of your city, would be a mistake both from the point of view of the city itself and also from the point of view of the people. Mr. Griffin has suggested a site between Black Mountain and Mount Ainslie, just on the border of the city. I know the locality generally. It is level country, but I did not consider the site suitable. It is

on the wrong side of the town. For one thing, it would be on the express railway approach to the town. I believe all the coal for power, and all the heavy goods required, will not come in through that portion of the town. The site I propose is on the market approach as distinct from the express approach. I do not think, when in course of time you will have five or six factories, that it will be a very desirable thing to approach with your express traffic and your visiting traffic through an arsenal. For one thing, the arsenal will be open only to those authorized to go there. The buildings themselves will have to be isolated. I look upon the work now proposed as the foundation of an arsenal of six or seven factories, comprising workshops, in which the actual munitions of war will be produced.

201. *To Mr. Sampson.*—One of the reasons given by Mr. Griffin for establishing the factory on the north side of the city was the convenience to the marshalling yards for railway transit. Mr. Griffin mentioned that to me, but the outgoing tonnage, and the incoming tonnage, will not be such as to warrant taking the factory or arsenal close to the marshalling yards. The amount of marshalling that will have to be done per annum or per week will be negligible. The statement that there will be a considerable amount of railway traffic from the factory, and that if it is located at the south-east as suggested by me, this traffic would have to be carried to the site of the proposed marshalling yards and back, a distance of about 18 miles, rather exaggerates the amount of goods traffic there will be. The number of carriages or trucks required to carry away a large output of rifles or field guns will not be many in the course of a year. The Small Arms Factory will not be such as where, for instance, cement is being turned out, entailing a large number of tons of material being both brought in and sent out. What will probably happen when other military factories are established is that a train load will be made up each week or each fortnight, and go right away, complete in itself, and not be marshalled up with other goods.

202. *To Mr. Laird Smith.*—I think coal will be brought in along the Queanbeyan route and not along the express line from Yass, especially as the distance is longer.

203. *To Mr. Finlayson.*—I think the passenger traffic will come in through Yass.

204. *To Mr. Fenton.*—The difference in the mileage of the two routes is about 40 miles. Passenger traffic is bound to come from Sydney, Brisbane, and the north, through Yass. There will always be a fast express between Sydney and Melbourne through Yass. The railway between Bungendore and Queanbeyan has some heavy gradients, which would stand in the way of fast express traffic. A proposal has been made that there should be a deviation from Bungendore to Canberra, which would come in from the north-east round the Military College. The railway to Jervis Bay would branch off near Bungendore.

205. *To Mr. Sampson.*—I think that, for many years, we should use the existing line; we shall not be justified, when we have got one railway, in building another just because there are some bad gradients. It would not shorten the distance much to run a separate line from Bungendore.

206. *To the Chairman.*—I see great difficulty in establishing the factory in the site suggested by Mr. Griffin, especially as the work is one which has to be done quickly. Its adoption means either greater expense in construction and in getting the materials there, or in carrying out a railway connexion with the existing railway straight away. The latter is an engineering work that can be accomplished, but presents difficulties. We put in shafts and bores along the line of the railway, and found the sub-stratum alluvial for the best part of half-a-mile. The line cannot be constructed under a year, and it will involve large expense, and to put the factory to the north of the city site is an almost impossible task if the work has to be accomplished in anything like eighteen months. I would not prevent the factory going there if it is the better site, but, personally, I do not consider that it is the better site.

207. *To Mr. Fenton.*—I do not know of any natural water supply to the site at the north. I do not know of any creeks there, and the catchment area is comparatively small. There is no stream there like the Molonglo.

208. *To Mr. Finlayson.*—The railway from Yass to Canberra is part of the Federal Capital scheme. The route has been located. I do not think it would be expedient to build a light line of railway to meet immediate requirements along what would ultimately be the permanent route. I do not think it would be expedient to construct any railway, except of a permanent character. Proceeding on the assumption that a factory site would be selected in the valley between Black Mountain and Mount Ainslie, I do not think it would pay to put down a temporary line in order to get material in *viâ* Yass, instead of continuing the line from Queanbeyan up to the Capital site, even in view of the fact that Yass has to be a railway connexion. I do not think the railway authorities would allow their rolling-stock to run over such a railway unless it were of permanent construction. If Mr. Griffin's plan be adopted in its entirety, the railway between Queanbeyan and Canberra will, in course of time, be deviated, but I think the existing line will go on for many years as it is. There is no doubt that the existing route will be capable of carrying all the traffic that is likely to come over it for many years to come. The line laid on the Queanbeyan connexion is a standard railway, with 60-lb. rails. Supposing we were to lay tracks with 40-lb. rails, the New South Wales Government would not allow their rolling-stock to go on it. There is no present objection except cost to building a railway line from Yass of the same class as the present extension from Queanbeyan to Canberra. That is practically a permanent line. If the site suggested on the north between Black Mountain and Mount Ainslie were approved, I think that the extension of the present line to that site, or the construction of a line from Yass, would not be of much use for building operations, because the time involved would be too great to admit of the erection of the new buildings for early utility. For running a factory on the site proposed by Mr. Griffin I would go on with the Yass connexion. In deciding as between the relative advantages of the two sites, I think it would be advantageous to build the extension to the Queanbeyan branch line if we decided upon the northern site, though it might cost more to do that work than to do the whole railway on the other side. The difference in mileage is about 40 miles. I would suggest the immediate construction of the Queanbeyan-Canberra connexion, if the authorities are not prepared to run their steel, &c., in, and their finished article out by motor traction. The passenger traffic

will come *viâ* Yass, and goods traffic will come *viâ* Queanbeyan. The chief articles to be carried to the factory will be oil, steel, and wood. Coal will go to the city power-house, from which power will be supplied to the factory. The actual tonnage to and from the Small Arms Factory will not be a heavy item, and it would not be a serious matter if, for the time being, materials and finished rifles had to be taken by road to the railway. There will be probably 60 tons a week in and 30 tons out if the output of the factory is doubled. I mentioned that there was danger, if the site we looked at beyond Duntroon were selected for the factory, of its being isolated from the city. The city I referred to was what Mr. Griffin has called the "initial city." I think once you start an independent town you will have great difficulty in stopping it. After six months shops will go up, and there you will have the "initial city." To put the factory on the north side of the city would be the thing to do if you desire to create the city there. But my argument is that if you do so, you will make an isolated community of the people who are employed at the factory. You may call it "North Canberra" or "Canberra No. 2," and you would commence with a condition which, in my opinion, would be wrong. There are to be three bridges crossing the Molonglo. If the population commences to settle in the north, they would be so far away from the "initial city" that they would stop there. A catering and attendant population will follow, and the settlement will become an initial city.

209. *To Mr. Laird Smith.*—The distance from the centre of the administrative group to the proposed factory in the north will be as far as the distance from the centre of Melbourne to Elsternwick. You will not get people to travel to and fro that distance. My contention is that, notwithstanding the position of the civic centre on the plan, the real civic centre will be made by the people.

210. *To Mr. Finlayson.*—In selecting definitely a site for the factory, I would approve that it should be a convenient distance from what will be the permanent centre of the city rather than a temporary centre. The initial city, although at first of a temporary character, will become permanent. I do not think it would be advantageous to select the factory site on the north, because, if we are going to establish a community of 5,000 people at the factory, a large business centre will be established there, a long distance away from the real centre of the city. The site suggested by me is quite satisfactory from the points of view of sewerage and water supply. Greater expense will be involved if the factory is established in the north, because the mains will have to be extended a considerable distance to the site.

211. *To the Chairman.*—Before I decided upon the position for the power plant, I weighed various considerations. At first consideration was given to a suggested hydro-electric scheme; it was turned down on the question of fixed charges. Then consideration was given to the relative merits of a Diesel plant and a steam plant; investigations disclosed that the steam proposition is the proper one. In order to get the highest efficiency for the engines at minimum cost, it was regarded as essential that the power-house should be put near to the water, which could be used for condenser purposes. Our consultant in the matter of electric supply was Mr. Clements, the engineer-in-chief and managing director of the Melbourne Electric Supply, the Geelong Supply, and the Adelaide Supply. The point of installation for a central station was discussed with him, and he agreed that it should be located near the Molonglo. Another reason for the location chosen was to be near the railway for coal: the three factors influencing the selection of site were water frontage, city location, and railway. If the power plant had been placed in the north of the city, where Mr. Griffin proposes to locate the shunting yards and the new factory, we would have had to take water there for condenser purposes from the city supply, and that would have added to the cost of the current. We would have had to construct a railway at once, and it was thought—and I still think—that Canberra will see no necessity for another railway to Yass for a good many years to come. Current could, without much difficulty, be carried from the present power plant to the proposed site in the north. No site has been selected in connexion with the manufacture of gas, but necessarily the works will have to be near a railway, because of the coal. The proposed power-house is about a mile from Parliament House. It will be seen from Parliament House, but there will be no danger of smoke from the chimney stack interfering, because of the type of the plant. With chain grate stokers and induced draught, there is practically no smoke. That is the reason why the chimney stack is only 40 feet high. I know of one plant at Port Kembla that has been using this style of plant for a number of years. It is practically smokeless,

212. *To Mr. Sampson.*—I have not based my suggestions as to site upon the position on the plan of the proposed lakes and dams. I am not assuming that the lake will be there, though, if the ornamental waters are constructed that will be a factor which will tend to prevent the population spreading to the other side. I do not assume that there will be no population to speak of on the north side, but that population there will be more of a residential character, and will be more scattered than in the busines centre to the south: suburban small businesses would grow up on the north side because the people there will require to be catered for in a small way. But I think we have only to look at any town in Australia through which a river runs in order to see that once population begins to settle on one side you cannot move its principal centre. Take, for instance, Brisbane, Sydney, Perth, and, in a smaller way, Hobart. I do not know any place where it has been possible to move the most important centre of population once it has settled on one side of a river. My opinion, based on these circumstances, is that the construction will begin on the southern side. I do not think we realize, when looking round Canberra, what a huge area of land we have to deal with as compared with the size of Melbourne. I certainly think there may be suburbs—residential suburbs—but there will only be one business centre. There will be only one Parliament House, and one set of administrative offices; warehouses, banks, and financial institutions will gather on the same side of the water. There may be small retail businesses elsewhere, but the principal business centre will be in the one locality. I am rather afraid, also, that the size of the proposed lakes at Canberra is not thoroughly understood. If there is to be a development of two city populations simultaneously, it will be largely helped by the separation of the city into two parts by the artificial lakes. I commenced my evidence this afternoon by stating an objection to the establishment of an independent community away from the rest of the city, and I

think, if you are going to attempt the establishment of two populous communities, one on each side of the water, the presence of the factory further north will have the effect of making a third centre. I believe there will be some houses in the north, but I think many years will elapse before anything like extensive close settlement takes place there. Having in mind the future development of the city with the sparse population which will probably go there at first, I think it is inevitable, if the factory is established in the north, that that would become a town or city centre. There is one matter which has not been touched upon yet in relation to this proposal, and, from this point of view, the construction of the factory on the north becomes a very different proposition from that to construction on the south. One of the essential factors was that we should start the construction within a few weeks, and in the estimates which I have prepared for the factory buildings I have relied upon getting the steel placed on the trucks at the point of supply and delivered by rail to the building site. Supposing the Commonwealth desires not only to manufacture small arms, but heavier guns and shells—and I know inquiries are being made about shells—Canberra is the place where we can make a start at once to build. One of the essentials in the scheme which I have put forward relates to the development that is likely to take place in several correlated manufactures. Time is an important factor.

213. *To the Chairman.*—I rather doubt the assertion that whether there is a lake there or not floods will occur. We hope to mitigate the possibility of flooding. My opinion is that the flooding of the Canberra plains can be reduced by constructing a by-pass through the spur running south from Black Mountain. When the dams are constructed on the Queanbeyan we may expect reduction in the flood levels.

214. *To Mr. Laird Smith.*—If you regard the land as agricultural land, I do not think floods will matter, because they are of infrequent occurrence, and they will be alleviated to some extent in the way I have said, by making a straight cut through the spur at Black Mountain. That would not be an expensive job.

215. *To Mr. Gregory.*—I did not consult with Mr. Griffin in this matter, one reason being that I had great difficulty in getting time to deal with this subject. I only put forward a site tentatively. Mr. Griffin occupies the position of Federal Capital Director of Design and Construction. His plan and tracing is with the Minister, not with me. It has never been referred to me. Officially I do not know anything about what is being done.

216. *To the Chairman.*—The levels the Minister is waiting for refer to inside the city area. Those are all he has asked for, and all that have, so far as I know, been under consideration.

217. *To Mr. Gregory.*—The site I suggest is about 4 miles from Queanbeyan. The distance from the suggested factory site to the centre of the initial portion of the city will be about 2¼ miles, and the distance from the site suggested by Mr. Griffin to the centre of the initial portion will be about 5½ miles. The adoption of the site suggested by me will induce settlement in the immediate vicinity and in the southern side of the town. I agree that alongside the frontages of the proposed ornamental lakes there will be admirable sites for dwellings, but I think the interference with the water frontages by the erection of this factory on the site I suggest will be negligible. There are high level frontages which I think will probably be used for residential purposes by the factory people. Any extension of the factory would, I think, be made in a north-westerly direction. A larger number of people will probably be employed at the factory in the future than is the case at Lithgow now; and, in my view, it would be a good plan to establish factories generally in the south-eastern portion of the outskirts of the city. There will be difficulties in the way of establishing factories in the north on account of the necessity for a railway for the purpose of supplying materials for construction. The excess cost of freight would be a negligible item compared with the cost of making the railway. The stone to be used for the building of Parliament House is to be brought in. If it comes from Tharwa, I am afraid it will have to come by road traction. To get a railway to Tharwa it will be necessary to cross the Murrumbidgee, and it would never pay to make a railway bridge there. Besides which, it would be difficult to get the trucks into the quarries at Tharwa. I do not think the same difficulties will be met with if we construct the factory on the south side as on the north. It will be cheaper on the south, though I cannot say how much. I will prepare an estimate if the Committee wish. The money that has already been expended at Lithgow will not, in my opinion, be lost if the transfer be made to Canberra. I think the Commonwealth will gain very materially by the transaction.

218. *To Mr. Laird Smith.*—Mr. Griffin has extended the plan so far as it relates to the environs (south-eastern) of the city since he arrived in Australia. If the factory is erected on the site I suggest, it might interfere with the extension plan, but I do not think it would be a very difficult proposition to alter the proposed lay-out of that extension.

219. *To Senator Story.*—Approximately, the extent of water frontage, assuming the whole scheme for the construction of ornamental lakes is carried out, will be 25 miles. The amount of frontage that will be subtended if the factory be built on the south will be about a mile, but even then it will not deprive the people of that water frontage. It would still be possible, for instance, to construct a carriage-drive around the lake. My reason for suggesting that the first settlement will take place about the south-east portion of the city is that the railway is there, the first works will be there, and other works will be there, and workmen will naturally also go there. Those are the people who are going to sustain the initial community. Other people—doctors, lawyers, shops, places of amusement—will come afterwards. Once you get 500, or 600, or 1,000 workmen in that locality you will get the catering population for them, and the initial town will be at once formed. The distance between this portion of the Territory, where I think the preliminary settlement will take place, and the proposed civic centre, as shown on Mr. Griffin's plan, is about 5½ miles. That is a rough estimate, but I think it covers the shortest route. My impression is that the same influences will obtain at Canberra as have obtained in other towns where settlement has taken place. In saying that, I am not aware that in the city of Adelaide, which was laid out some 75 years ago, the initial plans provided for two main centre streets that

were to be the main business streets of the city, and that the main street running east and west has not yet reached an advanced stage of development, in consequence of the people settling on the side of the town nearest to the water. I was not aware of that fact, but I can quite realize that it may be so. My own opinion is that the proposed civic centre, which will probably embrace the Town Hall and the Corporation offices, will not be established within the next 25 years on the north side, unless land is absolutely refused to people on the southern side. Supposing the Government decided to put the factory on the site suggested by Mr. Griffin, I do not think that it would induce the bulk of the population to settle there at once. It would undoubtedly induce a population dependent upon the factory itself—the workmen with their wives and families and the attendant population—to go there, but I do not think it would induce any population to go there with the idea of city development. My opinion is that if the factory were established on the site suggested by Mr. Griffin, there would be two separate settlements a considerable distance apart.

220. *To Senator Keating.*—The distance between the proposed administrative centre and the proposed civic centre is about one and five-eighth miles. The distance between Federal Parliament House and Spencer-street, Melbourne, is slightly over a mile. Between the administrative centre and the civic centre is proposed a basin which will have to be crossed. The diameter of that basin is about half-a-mile. The length of the base of the lake in front of the administration group is about a mile.

221. *To the Chairman.*—I have prepared a statement showing what it would cost to erect the additions that are suggested to the Small Arms Factory at Lithgow, and the cost of erecting a new factory at Canberra, capable of double the output of the present factory at Lithgow. In the statement I have prepared regarding both Lithgow and Canberra, I have allowed for an area of land for workmen amounting to 50 acres. I have also allowed for certain works common to both proposals, but I have not allowed for construction costs for further factory in which there will be economy at Canberra as compared with Lithgow. I have allowed 10 acres for factory extension at Lithgow. I have not taken any account of the 260 acres at Canberra as an asset compared to what it would cost to get a similar area at Lithgow. The cost of additions at Lithgow, including the buildings put forward by Mr. Wright—the power plant, the foundations for hammers, chequer plates for the forging floors, counter shaft timbers, installing new machinery, moving existing machinery, electric distribution, including the 10 acres of land for the factory and 100 acres of land for the workmen, amounts to £94,600. The estimate I have prepared for complete buildings at Canberra, which would include new three-story concrete workshops, wood store, wood kilns, rifle range, test house, water services, forge shop, hardening shop, installation of new machinery, moving of existing machinery, electric distribution, &c., and including similar areas of land, would amount to a total cost of £92,100. Some of these estimates are approximations; I have not had the advantage of being in touch with Mr. Wright. I have put down for the land on the factory at Lithgow 10 acres, at £300 per acre, and I have put down 100 acres at £250 an acre. I think you will find these areas work out at somewhere about £1 per foot frontage, on the basis of 40 feet frontage and 150 feet depth per house. The cost of the transfer I have put down at £2,000. I submit, first of all, that the proposition to obtain a factory containing plant double the size of that at Lithgow, without getting any more land, is one that cannot be accepted. I think it is absolutely essential that more land than I have estimated for shall be obtained at Lithgow. Field guns and machine guns are being talked about just now in connexion with the Lithgow factory, and I think you must look at their manufacture as a portion of a comprehensive scheme. Therefore, to double the size of the factory at Lithgow a good deal of additional land would be necessary. I have had the advantage of speaking to an Ordnance Officer and to Mr. Wright about the present Lithgow factory. Mr. Wright agreed with me that the Lithgow factory is well laid out for the manufacture of vehicles. The Ordnance Officer says it is admirably laid out for that purpose. The point I am making is this: By spending £92,000 at Canberra you will be getting two complete factories, a Small Arms Factory, capable of turning out double the output of the Lithgow factory, and a Vehicle Factory at Lithgow, equipped as a going concern. There is a contract covering a period of two years for 96 ammunition waggons and 26 gun carriages, five of which have been delivered. As well as making vehicles, it would be possible to manufacture at Lithgow, camp equipment, picketing pegs; they could stamp bits, stirrups, buckles, and do a good deal of other work. I am free to say that an Ordnance Inspector has told me that the manufacture of these things in the Commonwealth must come, so that when you look at this expenditure at Canberra, I suggest that you should look at it bearing in mind the possibility of the Commonwealth, in the early future, making for itself other equipment which is just as necessary as rifles. The factory at Lithgow is admirably equipped for the manufacture of vehicles, and, in addition to that, there are facilities for the storage and seasoning of timber. It is often difficult to obtain seasoned timber from any private establishment, and the use of timber that is not seasoned for the manufacture of such a thing as a gun wheel would be a murderous proceeding. The Commonwealth can, in a very few years, have everything prepared for the manufacture of its own military vehicles out of seasoned timber, and be in a position to supply most of the equipment for its military forces, and to meet any extra demand that the emergency of war might create.

222. *To Mr. Gregory.*—I have not read the returns showing the cost of each rifle manufactured at the Small Arms Factory recently submitted to Parliament. I have a fair idea of what the report would contain. A good many factories have probably found the cost of rifles heavy in the initial stages of their career.

223. *To Mr. Sampson.*—The cost of construction at Canberra is likely to be cheaper than at Lithgow, because of the better facilities we have for construction. I have not gone into the question of establishing a factory necessary for the manufacture of field guns. I have been making inquiries as to size, number of workmen, cost of the plant, and management, and I will make a further effort to obtain information on these points.

(Taken at Melbourne.)

TUESDAY, 8TH JUNE, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Samuel McKay, general manager for H. V. McKay, Sunshine Harvester Works, sworn and examined.

224. *To Senator Lynch.*—The works of which I am manager were removed from Ballarat to Sunshine. Primarily there were two reasons for the removal. The first was a lack of room at Ballarat. The business had developed to such an extent that the premises became too confined to permit of proper working. The second reason was that the freight upon raw material, and upon our manufactures, represented a considerable burden upon the business. We were very anxious to get nearer a port. Incidentally, we made many inquiries about suitable sites, and when the present site at Sunshine was offered, we tendered for it, and our tender was accepted. We made inquiries for sites at Geelong, and at other places near Melbourne. Had our tender for the site at Sunshine not been accepted, we should have shifted from Ballarat in any case to a suitable site nearer the coast. We purchased our present property about ten years ago, but we did not remove the whole of the factory from Ballarat for at least three years. Our present factory site was previously owned by the Braybrook Implement Company. They had a small foundry and a fair amount of machinery for turning out ploughs and other lines of agricultural implements. We carried that business on and extended the foundry. We shifted the foundry portion of the Ballarat business first, and when we had established that properly at Sunshine we removed the various departments of the Ballarat factory one after the other to Sunshine. The removal did not interfere with our output, as we were able to shift the lathes, forges, and tools generally as we required. The present site has fulfilled all our anticipations of the advantage to be derived from the removal. We have the necessary room at Sunshine, and we are comparatively close to the port. We experienced no difficulty in securing sufficient labour for our works at Ballarat. We were, perhaps, fortunately situated in this respect, because when we established our works there the Phœnix Foundry, Munro's, and other similar establishments were not prospering and were about to close up. We were able to absorb the labour employed in those establishments. Our business requires a good deal of skill in many departments. For the manufacture of tools and machine tools highly skilled labour is required. We make the tools we require, and a good deal of our plant also. Because of the lack of room at Ballarat we could not attempt the variety of work there that we have undertaken at Sunshine. We did not attempt, for example, to build machine tools. Now we do that work at Sunshine. So far as we could, we brought our old employees at Ballarat with us to Sunshine. Practically all the men who mattered followed us from Ballarat to Sunshine. We provided special facilities at Sunshine for the housing of our employees. That is one of the reasons why we occupied three years in making the shift. At the time we bought the property at Sunshine there were practically no houses there. There was a great deal of vacant land. We acquired the land, and then offered it to our employees, in the first instance, at a very low price—I think something under the cost price—in order to encourage them to settle near the works. In Ballarat there was plenty of accommodation for our employees provided by private land-owners, but at Sunshine the position was altogether different. It was a matter of great importance to us that at least a considerable number of the men should live near their work. We thought it good policy for the men and for ourselves to establish homes for them near the works. There was plenty of land available for the purpose at Sunshine. The minimum area of the blocks we set apart for house accommodation was 50 feet by 150 feet. Some of the blocks were very much larger. We found in actual experience that the men prefer not to have too large blocks. They would probably buy 40-feet blocks more readily than 50-feet, but we thought it better to avoid slum conditions by allowing plenty of room, as the land was comparatively cheap, and so we made blocks of 50-feet frontage the minimum. In our first subdivision of the land we provided for 60-feet frontages, but more recently we reduced the size to 50 feet. The minimum blocks now provided for give a little less than a quarter of an acre for each building site. We have had no complaints from our employees on the score of insufficiency of space. We have a very much larger number of persons employed now than we had at Ballarat. All our employees are not provided for at Sunshine. A number prefer to live at Footscray and other suburbs of Melbourne. We do not compel our employees to take the terms we offer in the matter of accommodation. The men have an absolutely free hand to do as they like in the matter. I should say that the proportion of our employees whom we have accommodated in the way I have explained would be at least 50 per cent. When I am asked whether we found it a paying proposition to make this provision for the accommodation of our employees, I would say that, from the point of view of land-selling and house-building, there has been no profit in it for us. We never looked for a profit in that way, but it has its advantages in enabling the men to become the possessors of homes of their own near to the works. That, indirectly, is of benefit to us in the working of the factory. We occasionally have reason to work overtime and night shifts. If the men are living right beside the works that is a great advantage in the working of a night shift. We do not require to consider the train service in working a night shift when we can call upon men living close to the works. Our factory at Ballarat was constructed partly of brick, but nearly all of galvanized iron. We disposed of it by auctioning part of it. We sold some of it privately, and we have some of it still. A portion of the factory at Sunshine is built of brick, but it is chiefly built of galvanized iron. I could furnish the secretary to the Committee with particulars of the cost of the removal of our works from Ballarat to Sunshine.

225. *To Mr. Laird Smith.*—When I am informed that it has been suggested to remove the Small Arms Factory at Lithgow a distance of about 200 miles to Canberra, I would say that a good many factors have to be taken into consideration in the removal of a factory. If, for instance, you have a lathe worth £200, the foundation for it may have cost £30. Upon removal the foundation is lost altogether. You have to put in a new foundation for the machine at the new site. You have then to consider not only breakage or injury which may occur in the removal of the machine, but also the cost of a new foundation for it. I have not seen any of the machinery at the Small Arms Factory, and so I am not in a position to say whether a large proportion of it could be manufactured in Australia. I think, however, that many classes of lathes or drilling machinery could be manufactured here. We have made lathes. It sometimes pays to make machinery, but sometimes it does not. If we required to install certain machinery quickly, it might not pay us to wait to manufacture it. But, speaking generally, machinery can be made as cheaply and as well here as imported machinery. On the understanding that it is intended to duplicate the Small Arms Factory in connexion with the proposed removal to a new site, I should certainly advise that a complete unit of the new factory should first be established on the new site, and the existing factory should be removed subsequently. I understand that the necessary power plant is already installed at the Federal Capital. There would be great advantage in having a larger area available at the new site. Our factory at Ballarat covered 4 acres. We have at Sunshine for our factory at the present time 27 acres. We have found the additional space of very great advantage. It cheapens production enormously to have plenty of room. The men consider it an advantage to live near the factory at Sunshine, and when they were put in the position to become the owners of their own homes they appreciated the change. It should be remembered that Sunshine is only 7½ miles from the city of Melbourne, and has a fairly good train service. If the men want to come into Melbourne from Sunshine they can do so very easily. They would not have similar advantages at Canberra. Unskilled labour may be obtained at almost any place, but skilled labour is different. It is a much more difficult matter to induce skilled labourers to be content to permanently reside at a place where there is not a variety of work or a variety of interests to occupy their attention.

226. *To Senator Story.*—I have found, as a general rule, that the employees take a pride in their homes, and go in for gardening on their allotments. I should say that 90 per cent. of the houses at Sunshine have gardens surrounding them. We have sold the land to the men, and they have built their own houses. If we built the houses ourselves and let them to our employees, I should say that for an ordinary four-roomed house we should expect a rental of from 11s. to 12s. 6d. per week. Several people who have built houses at Sunshine get those rents for them readily. I do not think there is very much difference between the rents paid for houses at Footscray and at Sunshine. The owners of houses at Sunshine have no difficulty in keeping them constantly occupied. According to the position of the site they have selected, our men have paid from 10s. to 30s. per foot for their land. They have paid from 20s. to 30s. for it recently. Land is dearer at Footscray than it is at Sunshine, and working men could not get a 50-feet frontage at Footscray. One of the advantages at Sunshine is that there is plenty of room, and men can secure their own homes on fair-sized allotments of land. The difference in freight upon material and manufactures between Ballarat and Sunshine represented a very considerable item to us in the year. Our manufactures are fairly heavy, and the freight is almost a profit in itself. The freight upon our manufactures between Sunshine and Adelaide would, of course, be greater than between Ballarat and Adelaide, but the biggest trade we have is export overseas and Inter-State trade by steamer. We save a great deal in freight on that trade. There are no hotels in Sunshine. It is not a prohibition settlement, but so far we have been able to keep hotels out of the place.

227. *To Mr. Fenton.*—In moving from Ballarat to Sunshine we found it possible to make considerable improvements in the lay-out of the factory. We had the experience of a good many years to go on, and if we were removing the factory again to-day we could make still further improvements. These improvements, of course, represent a saving in the handling of material and in other ways in connexion with the work of the factory. There are from 100 to 150 acres set apart for workmen's homes at Sunshine. About 350 houses have been erected by our workmen with our assistance on allotments we have sold to them, but there are still a number of blocks that have not been built upon. We manufacture farmers' requirements generally, ploughs, harrows, cultivators, as well as harvesters, and we also manufacture engines. The workmen engaged in our tool establishment must be expert, and the best we can get. Some came from Scotland, some have been engaged locally, and some are men of our own training. It takes a good many years to make a thorough fitter or turner. Tool-making requires very great accuracy. We have done a considerable amount of work recently for the Defence Department. We have experienced no great difficulty in taking men from one class of work and putting them to another. Australian workmen are most adaptable. They took to the new work without very much trouble.

228. *To Senator Keating.*—At the time we removed from Ballarat to Sunshine we were employing about 650 men. The removal actually took three years, but it need not have taken so long. It suited us to work the factory at Sunshine and transfer a good deal of the stuff to Ballarat to be finished. Being short of room at Ballarat, we used the foundry and other parts of the factory at Sunshine for the time, and sent the stuff to Ballarat for machining. The two places were connected by railway, and there was no difficulty in doing that. It would have taken between nine and twelve months to make the transfer without interfering with the output. Disregarding output altogether, the removal might have been accomplished in a much shorter space of time. I suppose we had 200 lathes, drilling machines, and so on, to be shipped, and by putting on a sufficient number of men we could have taken that machinery off the beds in a fortnight. We could probably have put it down in the beds at the new site in a month. Eliminating all consideration of output, we could have made the transfer in about six weeks.

229. *To Mr. Gregory.*—Ours may be considered a fairly large industrial establishment now. We are under our normal strength at the present time owing to the dry season, but I suppose we have over 1,000 hands employed. We do a fair

export trade. With some small exceptions ours is practically the only establishment of its kind doing an export trade. I have been to Lithgow, and know the place, and I have heard of Canberra. Assuming that there is a satisfactory water supply at Lithgow and at Canberra, that there is a gas supply at Lithgow, and a supply could be provided for at Canberra, that there is coal at Lithgow, and none at Canberra, and considering the labour available, in arriving at an opinion upon the proposed removal of the Small Arms Factory from Lithgow to Canberra my mind revolves around the labour problem. I have said before that in any part of the world it is difficult to regulate skilled labour in what might be called an isolated centre. In my view one of the difficulties you would have to face at Canberra would be to get sufficient skilled men to permanently settle in the place. You would have no difficulty with unskilled labour, but you require a high proportion of skilled labour for a small arms factory. For the first year or two that would be a difficulty, but as other industries were started at the Capital, that difficulty would be gradually overcome. On the other points, I would say that what matters most in connexion with the establishment of a manufacturing industry is to have plenty of room. The question of the water supply would not be so important. Coal would cost more at Canberra than at Lithgow, but the coal bill would not amount to very much. If it were decided to remove the existing factory, and I were asked whether I should prefer to remove it to Canberra or to a site a little distance out of Sydney or Melbourne, I should say that I would prefer to establish it a little distance out of Sydney or Melbourne. I would prefer that for the purpose of keeping the men more content. Men will not stay in the one works for over. They like to shift from one place to another.

230. *To the Chairman.*—It is true that with a small arms factory there would be the only one employer by whom the men could be employed, and I have said that with the establishment of other industries at Canberra, the difficulty of securing skilled labour for the Small Arms Factory there might be gradually overcome.

231. *To Mr. Gregory.*—If it is difficult to secure the class of labour required at Lithgow, the difficulty would be hardly less at Canberra. You could, of course, get a better supply of labour for such a factory if it were established close to a large city. I have seen in England attempts made to establish isolated manufacturing concerns which have not been successful. When we removed from Ballarat a few of our employees felt it to be a hardship to remove with us, as they were not able to dispose of their homes they had made at Ballarat at what they considered a fair price. Realizing the necessity of having contented workmen we made every effort at Sunshine to provide homes for our employees. We let them have the land in the first place at cost or less than cost price. As soon as an employee was able to find 10 per cent. of the total value of the land and building he required, he was able to put a building upon the land. If, for instance, a man wanted land worth £40, and a house worth £360, that would be a total of £400. If he could pay £40 we would get the house put up for him. If he could show that he had sufficient thrift to provide 10 per cent. of the total expenditure we were ready to finance him. The average cost of the houses that have been erected has been from £350 to £400. They have mostly been built of wood. Brick houses would cost a good deal more. We gave the men a freehold title to their blocks of land. We have given no leaseholds, and we were never asked for a lease. The men prefer freeholds, because they can do what they like with them later. In answer to Mr. Laird Smith I said that I would advise the establishment of a new unit complete upon the new site if it were proposed to duplicate and remove the existing factory. I had in mind that the output should be maintained all the time. We set ourselves at the beginning of the month to produce a certain output, and we like to see that accomplished. I have said also that if we were removing our factory again, we should unquestionably be able to make many alterations which would be of advantage to us. When asked whether the building constructed for the Small Arms Factory at Lithgow would be of use for the establishment of a factory for the construction of vehicles, I would say that much would depend on the room available. For the building of vehicles plenty of room is required, and there should be very few walls. You want an open shop. I do not know that the Government could manufacture vehicles as cheaply as private enterprise could. I know of no place where it has been done. In the establishment of a new industry a private firm will go to any expense in experimenting to bring about cheap production eventually. When we start building a new machine we might spend, in getting out the first machine, £600 or £700, but when we have got 50 or 60 machines made we can by improved methods very greatly reduce the cost. Private enterprise will expend capital for eventual results. We have an immense experimental shop, where everything new goes through first. When men have not to travel too far to their work, they are more inclined to continue working in the same factory. This is particularly the case if their homes belong to themselves, and they are able to improve them when opportunity offers. If you were changing at all I should recommend removal to a site near a large city where there would be a big supply of the necessary labour, rather than to a remote and unpopulated district. I am of opinion that you could increase your output more easily if you removed the factory near to some big centre than you can expect to do if it is established in an isolated part. Looking at the matter from a commercial point of view, I should, after spending £60,000 on the buildings of a factory, require strong arguments to show that the position would be improved before recommending its removal to Canberra.

232. *To Mr. Finlayson.*—Speaking from my experience, I should say that it is better to bring your factory to population in order to secure a sufficient supply of skilled labour than it is to try to bring population to the factory. With that qualification and other things being equal, there should be no great disadvantage in establishing a factory in a suitable locality and attracting the population you want to that locality. Presuming that it is the policy of the Government to establish as many factories as possible at Canberra, and that a start must be made with some factory, my objection to the transfer of the Small Arms Factory from Lithgow to Canberra would be to some extent discounted. It would make a difference if there were other factories at Canberra employing the same class of labour. Except that a small arms factory might be considered vital, and specially important, I see no reason why such a

factory should not be the first established at Canberra. I do not know Lithgow very well, but I never considered it a good manufacturing centre. We should never have gone to Lithgow ourselves. We had a site under offer before we bought our present site. We could have got the additional space we required for our factory at Ballarat, but there were too many streets in the way. Our factory was established almost in the centre of the town, and any sites that could have been secured adjacent to it would have been divided from it by streets. An area outside of the limits of the city could have been obtained, and had freight not been so important a consideration we should have preferred to stay in Ballarat. If a site at Canberra would be under no disadvantage compared with the Lithgow site in the matter of freight, the fact that there would be plenty of land there without cost, while the land required to duplicate the factory at Lithgow would cost a good deal, would weigh in favour of Canberra. I believe that the municipal by-laws in force at Sunshine would prevent the further subdivision of the minimum blocks of 50 feet by 150 feet which we have provided for our employees. I believe that smaller subdivisions would not be accepted by the engineer of the local council. There is no limit to the number of people who might reside on one of these lots. There would, therefore, still be a possibility of overcrowding, but there are no slums there yet, and there has been no overcrowding. We have made no provision of our own for the accommodation of employees. We have made arrangements by which they may become possessed of their own homes. If a workman does not accept our offer he is at liberty to provide accommodation for himself. But if a man wants a block on which to build it will be provided for him. We have no special arrangements in the way of barracks for the accommodation of single men. Our employees have full liberty to live elsewhere if they please. There is a very good State school at Sunshine, and also a technical school, which is of considerable advantage to the people. Every one of our apprentices is allowed half a day off in each week at our expense to attend the technical school. We have a system of bonuses which enable them to pay their fees. If they attend the technical school and behave themselves we pay their fees also. We provided the land and enough money to erect the building for the technical school, and the State Government staff it and maintain it. Most of our apprentices take advantage of the technical instruction given, and we recently made it compulsory for our new apprentices to attend the technical school. A certain proportion of apprentices to expert workmen is recognised in the factory. In some cases there has been hesitancy on the part of a workman to teach an apprentice, but speaking generally the journeymen are quite willing to teach the apprentices. We have had no trouble on that score. There is a hall at Sunshine and a picture show there three or four times a week. The hall was not provided by the firm, but by the people. They control it themselves. They have a committee who attend to the business, and control the character of the entertainments given there. There has been no reason to complain in any way of the character of the entertainments provided. The people are sociable, and co-operate heartily for the general amusement. They make their own arrangements for sports of every kind. The fact that they are to a certain extent isolated, though at a short distance from the city, has not prevented them from making the necessary arrangements for entertainments, amusement, and recreation in the way described. The population of the township is perhaps about 1,200. Our experience is that a settlement of about 1,000 people is able satisfactorily to provide for its own entertainment and recreation. But it should not be forgotten that many of the men, women, and children at Sunshine come into Melbourne occasionally. For ordinary purposes they may be considered a fairly self-contained community. I will not say that it is essential that the employees should be able to buy their land, and own the freehold of their properties, but I do say that it makes men more contented if they can buy their land and own their homes in the ordinary way. When I am informed that at Canberra the employees of a factory could obtain land practically rent free, and a satisfactory guarantee of tenure, I still say that they would want the freeholds of their properties as they might want to mortgage them. If a man puts up a house, and has paid half the cost, he may desire to raise money for some purpose, and he would want to be in a position to mortgage his property. In such circumstances he would appreciate having a freehold title to it. I do not see how a man could mortgage a house built on land belonging to some one else. I believe that if the men actually owned the land on which their homes were established it would induce them to settle there more permanently than they would otherwise do.

233. *To Mr. Sampson.*—There is a limit to the size of a factory which can be satisfactorily administered by one manager, and I should say that a factory employing 1,000 hands would be the maximum. A very great deal, of course, would depend on the nature of the article manufactured, and whether the factory was engaged in the manufacture of one article or of a variety of articles. If men are doing the same work day after day the supervision and management charges are naturally reduced very much. A small arms factory is engaged upon the one class of manufacture. Many factors have a bearing upon the question. For instance, the supply of the raw material is a most important factor. The character of the material is also important. You have to consider the question whether the factory is working with material entirely in a raw state, or with material partly manufactured. That would affect the issue. I take it that in a small arms factory the wood would be supplied in a raw state, and would be machined in the factory. The steel, on the other hand, would probably be supplied, tempered, and prepared ready for the first operation in the factory. If the manager of a factory were required to look after the supplies of material he would require a fairly strong assistant to see to that part of the business alone. It is quite enough work for one man to have to look after the purchase of material. In manufacturing a great deal depends upon the foreman. If rough work has to be done a foreman might have fifty or sixty men under him, but for particular work requiring minute inspection a foreman should not have more than thirty men to supervise, or the work of inspection will not be attended to thoroughly. Speaking roughly, a good manager who understood his work should be able to look after 1,000 men. You ask me to assume that at the Small Arms Factory at Lithgow there are 500 men engaged, some of whom have residences of their own, but the great majority of whom are living in boarding-houses or rented houses; the buildings alone for the factory cost £60,000; it is proposed to double the size of the building, and there is land available at Lithgow for the purpose, but not for providing house accommodation for their employees; it is

proposed to remove the machinery at Lithgow to Canberra, and to build there a factory twice the size of the factory at Lithgow; the cost of erecting the factory at Canberra and of removing the machinery from Lithgow would amount to £24,000; and, assuming other conditions to be equal, you ask me what course I should recommend. In the circumstances you have asked me to assume I say that, from a business and commercial point of view, I would not make the change. So far as I can see, on the facts as stated, you would be throwing away £28,000.

234. *To the Chairman.*—When our firm started at Ballarat, land was not cheap there. The land we purchased at Sunshine was very much cheaper. That was not the inducement for the change, but it was one of the factors considered. If the Government offered me the position of manager of the Small Arms Factory, and told me it was their desire to double the present output; that they intended to embark largely upon the manufacture of the munitions of war; that they had 900 square miles of land at Canberra; that land for the expansion of the factory could be obtained for £4 10s. per acre, whereas at Lithgow £50, £60, or £100 per acre would have to be paid for land required for future expansion, Canberra would appeal to me under those conditions. The removal of our factory from Ballarat to Sunshine considerably enhanced the value of the land we purchased at the latter place. As business men we would, of course, take that into account. The loss of £28,000 shown on the facts submitted to me in Mr. Sampson's question would have to be modified to some extent in view of the enhanced value given to the land at Canberra by the establishment of the Small Arms Factory there. That increase of value, due to the establishment of the factory, is a factor which ought to be considered. When we decided to make provision for workmen's homes at Sunshine, we subdivided a certain area, and formed the roads, or at least the footpaths, before we sold the land. Many of the men who bought land only had 10s. to pay, and 5 per cent. interest was charged on the balance of the purchase money. When the men were prepared to start building, several methods were provided to enable them to do so. Some men were able to find more than the 10 per cent. of the value of land and building; some were able to find 20 per cent. Where they could do so, we raised for them a private loan, of which they took, perhaps, two-thirds, and we loaned the balance ourselves. They then paid off the whole lot at so much a year. Where men could provide from 20 per cent. to 25 per cent. of the total cost of land and building they got the balance of the money at from 4½ per cent. to 5 per cent. Where men were unable to find from 20 per cent. to 25 per cent. of the cost we raised the money for them through a building society on a special scale. We were thus able to save them the cost of survey fees, commission, and so on, and they had a certain amount to pay on building society rates at a reduced scale. The men have to submit the plans of their houses to us for approval before they start to build. We manufactured 550 vehicles for the Commonwealth in six weeks. We manufactured as many as 30 a day for a time. We completed one contract for waggons last week. These vehicles were made of Australian timbers. They were transport waggons chiefly. We built some water carts, designed at Sunshine, for the Expeditionary Forces. We built ambulance waggons, and carts of various kinds required. For the manufacture of waggons and vehicles generally a factory should be on one floor, and, if possible, in one room. We put down 30 waggons at once, which means 120 wheels. You want plenty of room for waggon-building; the factory should be on one floor, and should have plenty of light. The power we use at Sunshine is electricity. We find it an advantage to use electricity because we can put our machines where we require them. We generate the power with our own plant. We have not a proper sewerage system at Sunshine yet. I understand that that is to be taken in hand by the local council. If they do not take it in hand, we propose to put in a septic tank system. At present we are under the Braybrook Shire Council, and they collect the rates.

235. *To Senator Story.*—Assuming that the Government took over Mr. H. V. McKay's business, and appointed me general manager at my present or a higher rate of salary, and gave me a perfectly free hand to employ and discharge whom I pleased, also full control as at present, I do not see why the work done there could not be turned out as cheaply as at present. But the creation of a line of business has to be considered. You do not start the manufacture of an implement without a great deal of preliminary experimental work. You must perfect a machine before you begin its manufacture. That is where close management and supervision are required. I do not think that there is enough elasticity under Government control. You have to consider initiative, and there should be bonuses provided to encourage the suggestion of good ideas of manufacture. We have found it an advantage at our works to encourage men to develop an idea. If, as manager, I had the same freedom to do that under Government ownership, there is no reason why I should not do as good work, provided the men were controlled as they are to-day.

236. *To Mr. Laird Smith.*—If a man has charge of a factory employing 1,000 men he should have a storekeeper, but the storekeeper should be under the manager. He should, above all things, have a good buyer to relieve him of all worry in connexion with the supply of the raw materials required by the factory. If the supply of raw materials is as nearly as possible automatic, a great deal of the worries of the manager will be overcome.

237. *To Senator Keating.*—I have said that under private enterprise there is better scope for initiative and experiment than under Government control. The cost of experiment is debited to the individual line concerned. To give an illustration: Supposing we are developing a disc harrow, we make certain tools, and a certain plant in developing it, and whether the result is successful or not the cost of the experimenting is debited to that particular line.

238. *To Mr. Fenton.*—We have adopted schemes for encouraging the initiative and inventive genius of our workmen. I should favour, in connexion with industries carried on by a public department, the inauguration of schemes to encourage the employees, from the office boy up to the manager, to make suggestions. We have a suggestion box at Sunshine. Any employee has the right to put a suggestion in the box, and it goes to the heads. Every suggestion is considered on its merits, and if it is proved to be valuable we recognise it.

239. *To Senator Lynch.*—We shifted our factory a distance of about 80 miles, but we would have removed it if the distance had been 200 miles, because we felt we were compelled to get nearer to the port. The best mechanics are not necessarily the sons of mechanics or men trained in industrial centres. I do not think that the industrial occupations of the parents have much influence upon the children. A number of our skilled men are the children of parents who were not engaged in similar industries. In looking for apprentices we like to get lads who have had a good education, who know how to behave themselves, and who have some natural faculty for mechanical work. We do not look for anything else. The boys come into the works for a certain period on probation before their indentures are signed. Skill in this kind of work may be altogether disassociated from parentage or locality. The McKays are all farmers' sons. Certain men seem to be part and parcel of our business. Men in the fitters', turners', and blacksmiths' shops have been with us ever since we started business. A number of members of the same families are employed at our works. I would not say that changes have been greater in the skilled than in the unskilled sections of the factory. We see more of the skilled men than of the unskilled men, and would notice a change amongst them more readily. There is no striking difference in this respect. Compared with the factory at Ballarat, we have started many additional departments at Sunshine. The best men we can get are the men we train ourselves. The fact that we have instituted additional departments has not, I think, given us any advantage in securing the necessary supply of skilled labour. The great secret of success seems to be not to develop a new thing too quickly. Men have to be trained to a new class of work, and it is some time before a satisfactory output is achieved. I have said that experiments with new machines have cost us as much as £600 or £700, and I will say that to develop any implement properly, and make the necessary tools, would cost that amount of money. As the manufacture of a new machine goes on the cost of production is reduced. The first cost, therefore, is not a criterion of the subsequent average cost. If we were building 500 machines a year of a certain type I would say that the cost of the last 300 would be between 5 per cent. and 10 per cent. less than the cost of the first 200. Everything depends upon having men and machines ready for the job in hand. We recently started a new branch of manufacturing in the motor business. We found no great difficulty in training men for that work. We are manufacturing engines, and we started their manufacture at the rate of one per week. We gradually increased that output until it has now reached very decent dimensions. We did not attempt to manufacture a large number of engines from the start. If we had done so I believe we should have blundered. You have first to get your men acquainted with the class of work they are called upon to do. The engines we are manufacturing are stationary engines used for ordinary industrial purposes.

240. *To Mr. Gregory.*—Looking at plans of the buildings at Lithgow, I should say that the present buildings, though not ideal for the purpose there, would be suitable for the manufacture of waggons.

(*Taken at Melbourne.*)

WEDNESDAY, 9TH JUNE, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Henry Ambrose Hunt, Commonwealth Meteorologist, sworn and examined.

241. *To the Chairman.*—I have visited the Federal Territory, and have prepared the following notes on wind direction at Canberra:—

The data consist of three observations per day—May-December, 1913; January-December, 1914; and January, 1915.

The observations were summed and averaged for the respective months. February, March, and April are based on one year only. The other nine months have two records each.

The dominant winds are as follows:—

Month.	Observations per Month.			
January	W. ... 22	East ... 16		
	W.N.W. 16			
February	...	East ... 23		
March	...	East ... 18		
	...	E.S.E. ... 18		
April	W.N.W. 39			
	W. ... 17			
	N.W. ... 11			
May	W.N.W. 22	E.S.E. ... 11		
	N.W. ... 13			
June	W.N.W. 29	S.S.E. ... 15		
	N.W. ... 14			
July	W.N.W. 27			
	N.W. ... 17			
	W. ... 12			
August	W.N.W. 21			
	N.W. ... 16			
	W. ... 13			
September	W.N.W. 29			
	N.W. ... 13			
October	W.N.W. 20	East ... 12		
	W. ... 19			
November	W. ... 19	East ... 13		
	W.N.W. 17			
December	W. ... 17	East ... 16		
	W.N.W. 15			

Summarizing, west-north-west winds predominate from April to October; west winds are slightly in excess during November, December, and January; while east winds are noticeable from October to March, and are the most important winds in February and March.

DAILY WIND CHANGE.

The figures for the evening observations have been taken out separately. There is a close resemblance, of course, to the total wind direction.

In general, the easterly component is stronger in the evening, as is shown in the following table. Here one-third of the total number of daily observations is compared with the recorded evening observations. Thus, in January, one would expect six east winds at 9 p.m., and twelve are recorded, &c.:—

Month.	Number of Evening Observations.	One-third of Daily Number.
January	12 E.	6 E.
February	17 E.	8 E.
March	12 E.	6 E.
April	Normal	13 W.N.W.
	13 W.N.W.	
May	Normal	
June	Normal	
July	Normal	
August	Normal	
September	6 E.	2 E.
October	6 E.	4 E.
November	9 E.	4 E.
December	10 E.	5 E.

WIND FORCE VARIATION.

The maximum mileage appears to occur in November (133 miles per day) and January (134 miles); December is 127. The mileage run per day decreases to a minimum quite regularly in midwinter.

The above information will guide the Committee on the question of whether the winds are likely to blow smoke, dust, or fumes towards the city from the proposed factory sites. The amount of wind with a north or south component is very slight, according to those records. The two critical directions are west and east. The easterly prevails during the day-time only in February and March. During those two months the winds would drive smoke and fumes across the southern portion of the proposed city area from the suggested location of the factories to the south-east of the city. The velocity would not be very strong at that time of the year—from about 100 to 120 miles in the twenty-four hours. If the factories were located to the north of the city area there would be practically no smoke or fumes blown over; in fact, when the northerly wind comes, if it comes at all, it is generally accompanied by rain, and the mountains on the north would deflect the winds from the city, but our records show so far no appreciable northerly or southerly winds at all. What northerly winds do blow have a good deal of westerly tendency in them, so that they would blow away from the city area. The predominance of easterly winds is almost wholly produced by the physiography of the place. Winds are prone to follow lower levels, such as the bed of a river. The larger surfaces of water produced by the proposed artificial lakes might accentuate the velocity of the winds a little in the winter and lower it in the summer. I do not think the city would be subject to severe wind storms any more than any other part of the country. Unfortunately, it has been denuded of vegetable surface, but once that is restored the area should not suffer more than any other. I do not think the proposed factory site at the south-east corner would be likely to be more exposed to cold winds than the area to the north of the city.

242. *To Mr. Laird Smith.*—Mr. Griffin, in his report, states—

> The centre lying to the northward of the city was originally designated "manufactures," but conditions in the early growth, with the railroad facilities limited to the south of the Molonglo, may necessitate that such activities be concentrated in one of the southern suburbs. Furthermore, it is possible that the summer northerly winds may render the northern portion less acceptable than a southern one for this purpose.

My answer to that is that there is not much northerly wind in the summer, the prevailing wind being a strong westerly with a slight northerly component. I think the Committee can take it that the northerly wind does not exist there.

243. *To the Chairman.*—The figures I have given may be taken as a fair criterion of the direction of the wind. Last year was abnormal, and possibly the strong easterly evidence of wind may be due to the abnormality of the season. It was exceptionally dry, and the easterly winds are mostly due to mountain and valley causes, the cool air from the ranges in the east flowing down to the lower levels.

244. *To Senator Lynch.*—I do not think there would be very much variation from year to year, but I fancy the easterly component would be modified, last year's predominance being largely due to the droughty condition of the country, with consequent extreme radiation. The most favorable direction from the city to establish factories is either south or north, if you want to avoid gases passing across. The least favorable direction would be the west. The site indicated to the north, being low land between the hills, would be inclined to be very cold at night, and foggy on still nights. On other nights the easterly wind would be strongly in evidence. The only trouble about the suggested site to the south-east is the east-south-east wind which predominates in February and March only. Fumes and smoke blown by that wind might pass over Red Hill. The least objectionable site would be due south, then north, then east.

245. *To Mr. Fenton.*—The area indicated to the east, where there is a creek or river, would not be so good as the one to the south-east.

246. *To Mr. Sampson.*—I would regard Canberra as a better climate, from a general health point of view, than Lithgow, which is wetter and almost as cold. Of course, cold is not naturally unhealthy. At Lithgow, which is right at the foot of a mountain, the heat in summer would be felt much more. From the amount of snow that falls in the Lithgow district, as compared with Canberra, there is no question that Lithgow is much more uncomfortable. It is a cold, wet snow, not a hard, dry snow. I can supply the Committee with the temperatures of the two places, and with my opinion as to whether, from a workman's stand-point and from a health stand-point, Lithgow shows any serious disadvantages compared with Canberra. I know that there have been interruptions of communication with Lithgow for twenty-four hours or more owing to falls of snow. I could not say whether the death rate would be any indication. I have never heard that Lithgow was an unhealthy place, but I should certainly think that, from a climatic point of view, Canberra was better. I have long records from Lithgow and Queanbeyan, and these can be supplied. Canberra would have a much drier temperature than Lithgow; in fact, it is one of the driest spots in eastern Australia, and very free from fog. Observations have been purposely carried out on Stromlo to define the atmospherics there, and fogs are very rare indeed, being intercepted by the surrounding mountains, whereas Lithgow is likely to get fogs from the west. Besides the one at Stromlo, I have a station at Canberra itself, one at Queanbeyan, and another at Duntroon. The temperature records have been very carefully taken.

247. *To Mr. Finlayson.*—With the level of the site in the south-east at 1,935 feet, and the level of the site in the north at 1,910 feet, there would not be much difference in the climatic conditions, except that the lower level to the north would be more liable to fog, especially in the winter time. With the water in the lakes the tendency to fogs would increase. Even though the south-eastern site is right on the very edge of the lake system, there would not be a greater tendency to fog there, because the wind there is from the east. There would not be much variation in temperature between the two sites, but the northern site would be colder at night, and warmer in the day. On a still night between the hills in the north there would be a great tendency to fog. Under favorable conditions in the winter time you could see the fog run down the mountains like water. The easterly winds shown by the records for 1914 were a surprise to me. I did not expect to find anything like that predominance, and can only put it down to the abnormal conditions of last year, because the pressure control is such as almost to eliminate the easterly wind. The barometric pressure is normally higher to the north of Canberra than to the south, and the circulation in the southern parts of anticyclones is westerly. I think it will be found, with growing records, that the west-north-west winds will show a greater predominance, and the east will gradually be reduced. The north and south winds would remain practically as stated. The most beneficial rain comes from the north, and June is the wettest month. Some rain would be got from the south-west. It is a very dry place, as the rains are intercepted by the mountains on both sides. Residential areas would be better on the higher levels, because they get the cool nights during the summer, which they would not always get in the valleys. If it became an economic necessity to put the industrial centres on the flats, there would be an advantage in putting the residences on the higher levels.

248. *To Senator Keating.*—The wind gauge from which the observations were taken is immediately in front of the Commonwealth offices at Acton. I think it is completely exposed. We have another at the school near the church, another at Duntroon, and another at Stromlo, and they are all in agreement. I have not heard it suggested that the gauge at Acton is protected by trees from some of the winds. The building may deflect the winds slightly, but the main direction as indicated would be true. The results of the several gauges are collated and compared.

249. *To Senator Story.*—The daily wind from the east would be of comparatively low velocity, being largely due to convectional action. The wind at night would be stronger. If factories situated to the south-east, about a couple of miles away from the Houses of Parliament, were working at night, there might be a slight condensation of fumes and gases in the direction of Parliament House; but I do not think it would be noticed in the day-time because the gases, being at a high temperature, would rise over the city. At night the cold would have a tendency to condense the fumes, and they would possibly be noticed. If the factories were established on the northern area there would be no danger of this at all, because there is practically no northerly wind. What northerly wind there is has a strong westerly component, and would drive the smoke and fumes to the eastward away from the city. There is no easterly component in the north wind there.

250. *To Mr. Fenton.*—The distance to which smoke can be carried by a wind depends on the volume of the smoke. We have records of smoke from bush fires being carried hundreds of miles.

251. *To Mr. Laird Smith.*—I believe the fumes at Queenstown, Tasmania, carry about 16 miles.

252. *To Mr. Sampson.*—I will give the Committee details regarding my evidence as to frost, snow, and heat at Canberra and Lithgow respectively, as commented on by Colonel Owen in the evidence he gave to the Committee on 6th May.

Colonel John Stanley, Quartermaster-General, Commonwealth Military Forces, sworn and examined.

253. *To the Chairman.*—My duty is the provision, maintenance, and upkeep of all equipment and clothing that a soldier wants and fights with. I have to forecast the requirements in waggons and other vehicles, equipment, clothing, &c., and make a demand for it upon the Contract Department, with dates of delivery. I cannot give the Committee an exact idea of the future requirements of the Australian Army for guns, gun-carriages, and waggons. Guns and gun-carriages come under the Chief of Ordnance. Artillery requirements are so technical that only an artillery officer is qualified to deal with them. I happen to be an artillery officer, but it is very rarely that the quartermaster-general is an artillery officer. I can, however, tell the Committee what is wanted in that direction. The artillery has been singularly fortunate, in that its requirements have been fulfilled on a very liberal scale, and, unofficially, I may say I have knowledge that the artillery of the Commonwealth is exceptionally well provided for. The full numbers of Australian troops will reach their culminating point in 1919-20, but the actual units will be nearly completed next year. That is to say, although all the men will not be there, nearly all the actual units will be provided for next year. The artillery has been very largely provided with gun-carriages. I think there will be only two more years in which we shall want gun-carriages. It will mean each year for the next three years 16 limbers (carriage); 48 limbers (waggon); 48 waggons (ammunition); and 4 waggons (telephone). After that, all that will be required is maintenance, because these munitions of war are made on English pattern, which is a tremendous factor. Every other army in the world has its equipment calculated on the supposition that it will never be more than a day or so distant from a forge or engineering works. The British army equipment has been calculated on lines which enable it to fight in the desert miles away from anywhere, and is, therefore, made of the best possible material of the most lasting quality. Our artillery equipment is made on those lines also, and the question of maintenance ought to be very small indeed. Ours is purely a defence force, for the defence of an island continent, and, therefore, a great many of our transport vehicles may be simply requisitioned for on the spot. Transport vehicles are divided into two classes—general service transport, for which practically almost anything, such as farmers' waggons, will do; and, secondly, technical vehicles. The technical vehicles are principally limbered waggons used for the conveyance of small arms ammunition. We can always get these here, and they are the biggest quantity. We would want about 250 of these per year for the next two years. Then there are the medical or ambulance waggons, and transport waggons. We require 60 ambulance and 35 transport. After that, all that is required is maintenance. Another small item is engineers' technical waggons, of which twelve tool carts and five waggons for cables are required. These figures are for the whole Commonwealth. Of course, the despatch of the Expeditionary Forces has entirely altered the outlook. We have equipped them with an enormous number of vehicles of every kind.

254. *To Senator Keating.*—The figures I have given indicate the requirements under normal conditions. We hope that a lot we have sent away will come back, because there is not a very large wastage of these things in war.

255. *To the Chairman.*—I have not with me the figures to show how many rifles will be required to be manufactured each year. It is a

very complicated question. Up to the present we have been largely helped from Home. The actual local output is only about 1,500 a month. A rifle lasts a long while, given fair usage, and the only other factor is a change in the pattern of the rifle. We have now roughly about 50,000 men under training, and we have to reach 80,000 in 1919-20. Apart from that, there are about 70,000 rifles away with the Expeditionary Forces. Rifle clubs are not fully equipped at present, but they are a good deal more than partially equipped. Every rifle club has, I think, 50 per cent. of rifles to its members.

256. *To Mr. Finlayson.*—If a club in Brisbane formed three months ago has not yet got a rifle, all I can say is that the instructions issued from my Department are that every rifle club is to have 50 per cent. of rifles for its members. You will possibly find that some one has neglected to carry out the order of the State Commandant, who has probably been rushed in getting away the Expeditionary Forces.

257. *To the Chairman.*—I would not like to commit myself to a statement as to the average annual requirements of rifles in ordinary normal circumstances. We have to consider what number of rifles may come back from the war. It would take some time to make up the information from the figures available at my office. I should say that the present output from the factory is not sufficient to supply our normal requirements.

258. *To Senator Lynch.*—That is on the basis of an output of 18,000 rifles a year, but it should be remembered that in four years' time the numbers of our troops cease to expand under Lord Kitchener's scheme.

259. *To the Chairman.*—I have nothing to do with the question of making field pieces locally; but unofficially I have heard that inquiries have been set on foot in that direction. I believe inquiries are also on foot in regard to the local manufacture of explosives and shells, but that also is not in my Department. I do not know whether there is any intention to begin the local manufacture of machine guns. Colonel Dangar, Chief of Ordnance, should be applied to on that subject.

260. *To Mr. Fenton.*—The waggons required are made all over the Commonwealth. The majority have been extremely satisfactory. There have been cases where the work has not been entirely satisfactory, but the defects have been located in most cases before the waggons were sent away. Others were located in Egypt.

261. *To Mr. Sampson.*—It would require a very complicated return to show what the normal requirements of the Commonwealth for rifles will be. The whole thing depends on what we get back from the war. The normal demand must naturally increase each year until 1919-20. Speaking only approximately, the normal increase would be about 10,000 a year. Other branches of the Department calculate their requirements, and instruct me to make provision accordingly. If it be decided as a matter of policy that trainees passing into the reserves shall put in a certain amount of practice at rifle shooting, an additional number of rifles will be required, but I do not suppose the Government would issue each man a rifle for that purpose. A certain number of rifles would be supplied for the purpose to each unit, and that would be quite sufficient. Trainees who have done their service are not allowed to retain or purchase their rifles. Individual members of rifle clubs are allowed under normal conditions to purchase their rifles, but that privilege may be temporarily withheld. The actual life of a rifle, so far as its mechanism is concerned, unless it is badly used, is practically unlimited. We have plenty of barrels in stock to replace worn-out barrels. Next year all the units will be provided with vehicles. I hardly think these will have to be replaced by motor vehicles, unless a distinct departure is made from the policy of the country, which is purely a defence policy. The system of motor transport will, of course, become more applicable, as the whole trend of commercial traffic is in that direction, but the motor has its limitations for our purposes, because it cannot go over the same rough country as a horse-drawn vehicle. I do not think there is any great possibility that the vehicles we are supplying will get out of date very rapidly.

262. *To Mr. Gregory.*—I could not tell you how many rifles the Department has received to date from the Lithgow factory. I could tell you from the records in my office. I can send you the information. The majority of the rifles supplied by the factory have been of good quality. A report came from Egypt recently in which a very good account was given of the rifles. From all I can gather, they are of quite good quality in every respect. In time of war in Australia we shall be able to obtain locally all the vehicles that we require, except the technical vehicles, which are provided.

263. *To Senator Lynch.*—In 1919-20 we shall have 80,000 effective men in the Citizen Forces, and there are supposed to be another 20,000 recruits available then who have not completed their training. It is a long while to look ahead to say whether we shall then have many spare rifles over and above those required for those 100,000 men. It will depend on what the output of the factory will be in the future and what we get back from the war. Rifles are not very easily damaged, and we may get back a large proportion of those we have sent away. If we do we shall be in quite a strong position in regard to our requirements. We are also owed some. As to the question whether if this country were attacked we should want more than 80,000 men in effective service, it is impossible to make any definite forecast of the position in 1919. It is quite possible that the output of the factory may be so increased as to overtake all requirements without any outside consideration. The development of rifle clubs in future must be considerable, because as men pass through their period of training they will be allotted to rifle clubs. Men who have put in seven or eight years' training, and have become accustomed to the use of the rifle, will naturally take an interest in rifle shooting, and I should say that the future of the rifle clubs should be a very live one. That would necessarily increase the demand for rifles. I could not say definitely how many rifles have been served out to rifle clubs. Approximately the number might be 60,000 in all.

264. *To Mr. Fenton.*—A rifle is not easily damaged, and there is always an armourer handy to attend to defects in springs, and so on. Neglect is much worse than rough usage.

265. *To the Chairman.*—I could not say how many revolvers have been issued to the Expeditionary Forces. It is not a big item, possibly 1,000. They are manufactured in England.

(Taken at Melbourne.)

TUESDAY, 15TH JUNE, 1915.

Members present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson.
Mr. Fenton,	

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

266. *To the Chairman.*—In a letter received from the secretary to the Committee, I have been asked to state whether the item in schedule 3 for additional houses, 50 acres, £12,500, is the same as the item in schedule 4, land for workmen, 15,000 people, £12,500 (*vide* Appendix). These are not the same items. My view is that for the projected extension of the factory at Lithgow we would want first 50 acres, and that in the case of other factories being started we would require a further area of 50 acres. That only brings the area proposed at Lithgow to 100 acres in comparison with the area of over 300 acres suggested at Canberra. The secretary also asked me to furnish a statement showing the cost of construction at the area suggested by me at Canberra, as compared with the area suggested by Mr. Griffin to the north of the city area, of buildings, machinery power, water sewerage, &c. To give the comparison I would like to add to the statement which I put in, and which has not been altered in any particular for the estimated cost at Lithgow and Canberra. I desire to add a column as to Canberra for half size, that is, a factory for an output equal to that of the existing factory at Lithgow. Without taking the land into consideration, except 50 acres at Canberra, for the buildings, the cost at Canberra, half size, would be £60,385, as against the cost at Lithgow, to add half size, £66,000, that is, without purchasing any land at Lithgow. In round numbers the difference in cost is £6,000 in favour of Canberra, that is assuming that we build within the existing site at Lithgow without purchasing any additional land there for workmen's cottages. The secretary also informed me that the Committee would like to have an estimate of the value of the machinery which would be left at Lithgow, and available for the suggested vehicle factory in the event of the transfer of the operations of the Small Arms Factory to Canberra. I find some difficulty in answering the question, because, although I know that there are forge shop plant and machine tools at Lithgow, it is difficult to state exactly what would be left there in the absence of detailed knowledge of the manufactory. I telegraphed to Mr. Wright, and he replied that, including the motors forge shop, £7,000, wood shop, £6,000, and I estimate that in the forge shop £5,000 worth of forge shop machinery would remain there (meaning that £2,000 worth would go away), and in the wood shop £4,000 worth would remain. I was asked by the Committee when I last gave evidence why the power-house was located where it is, close to the ornamental water at Canberra. I stated in a broad way why it was so located, but I think I may be allowed to state fuller reasons. Hand in hand with the central station power proposition we must consider the future necessity of installing mixed-pressure turbines. For mixed-pressure turbines it is a *sine qua non* that there shall be cool circulating water. The loss of 1 inch of vacuum might mean a 7 or 8 per cent. loss of efficiency in the prime movers, which would be a very serious matter. I have reduced to figures what the annual loss would be to put the power-house on the north site proposed by Mr. Griffin. The estimated additional cost per annum would be from £4,000 to £6,000. The Committee can accept these figures, that between £4,000 and £6,000 a year on the estimated load of 2,800 kilowatts worked on a 60 per cent. load factor would be the loss sustained by the community in placing the power-house at the northern site.

267. *To Senator Lynch.*—The original capital charge of central power station would be increased, because there would be the cost of cooling towers estimated at from £5,000 to £6,000. I am, however, dealing now with only the annual outlay, not with the capital outlay. The latter would have been greater, but the actual fixed and operative charges would have been from £4,000 to £6,000 a year. There is another important point which had to be considered from a practical point of view, and that is that if you use water containing any salts in solution, the effect of the circulating and constant evaporation will be to concentrate the solution of those salts, with the result that you will get a furriness on the condenser tubes eventually necessitating the boring out of the tubes, and a disability in the power plant. There is no doubt that if we had pumped circulating water from the Molonglo River for use in the cooling tower, we would have had condenser trouble. Before leaving the point I wish to lay special stress on its bearing on the suggested location of this arsenal on the Molonglo, and to point out that there will come the stage when the authorities at the arsenal will generate their own motive power; to preclude the use of turbines by erecting prime movers at an unsuitable site to the north of the city, such as suggested by Mr. Griffin, would be a great mistake. Such a location is never accepted in modern practice if it can possibly be avoided.

268. *To Mr. Sampson.*—That means that they require to be put close to cooling water. I think I was asked at the last meeting to state what would be the extra cost of installing the works at a site 2 miles to the north of the city boundary, in comparison with the cost of constructing the works at a point 1 mile to the east of the city boundary near the Queanbeyan-Canberra railway. I find that the extra cost of construction at the northern site would be £8,588.

269. *To the Chairman.*—To build would cost that much extra. The additional cost would comprise 10,960 tons of road transport, including two handlings, £3,288, and for foundations, £2,000. As regards electrical supply there is an additional length of transmission line for only one factory. We really would need to have two feeders, but I have made the estimate conservative, namely, £1,200. I put down the cost of water during construction—it is low for pumping—at £450. I have allowed an extra £250 for sewage disposal, and for transporting factory machinery from the railway siding to the site £300. You cannot go 5 miles further afield without having incidental and overhead charges for buggies, carting, and odds and ends. I have

allowed £500 for these charges, though probably a contractor would allow more than that sum. There is a capital outlay of £1,800 on a temporary water service, and for depreciation, taking up and moving, I have allowed £600. We would have to take the water up there temporarily. There would be no hope of getting the city water from the main to carry on construction. In point of time the south-eastern site would undoubtedly lend itself to speedy erection, because we have the railway practically there. It would facilitate the work all through instead of having to transport materials, &c., by road tractors. I have no hesitation in saying that we could build more quickly at the south-eastern site. I have received from Mr. Oxenham, the secretary to the Postmaster-General's Department, a memorandum in which he states that the total number of horse-drawn vehicles and hand-carts in use in the Department at present is 665. That, of course, does not include motor lorries. I did not ask Mr. Oxenham how long the vehicles lasted, or what increased number may be required from year to year as the postal works develop. The present factory buildings at Lithgow cover, roughly, an area of 5¾ acres. The area of unoccupied ground which might be covered with factory buildings, although the construction cost would begin to mount up because of the slopes of the ground, would be 7½ acres. That is the area still available, running down to the front fence. It is Government property. After the buildings proposed to the Committee were erected, I should say that, roughly, about 4 acres of land would be left, that is in front of the existing buildings. I do not know why such a large general area at Lithgow was required. I had nothing to do with the matter. Out of a total area of 122 acres 3 roods 15 perches, the area suitable for factory buildings is 13¼ acres.

270. *To Mr. Gregory.*—Not very much of that land would be suitable for workmen's houses, as it is low-lying. The portion of the site at its north-west corner would be suitable. There are some houses on it already, but after the projected factory extensions go up I do not think there will be much more suitable land for other buildings. There is an area at the back, up the valley, on which, if it did not interfere with the use of the rifle range, cottages could be built, but I do not know whether you would get families to live there.

271. *To the Chairman.*—I do not think that this land at the back of the factory is used for anything now. There is a rifle range along the western side. The people of Lithgow are giving to the Commonwealth an area of 15 acres 3 roods 32 perches, but so far as I can gather it is on the top of the hill at the back of the gully. I believe that the object of the gift is to provide for the safety of the rifle range. It would not be suitable for cottage building. You could not build behind the rifle range. My original estimate of land which should be set aside at Canberra was that there should be room for about six factories the size of the complete Small Arms Factory. Some consideration is being given to the advisability of erecting a shell factory. Part of the original scheme submitted by me is that all these co-related factories shall be brought together.

272. *To Mr. Gregory.*—I think that the manufacture of shells just now is a matter of urgency. I cannot anticipate any works being erected at the Capital to turn out shells within eighteen months. I do not think that we could produce any shells there for the present war, but time is an important factor I consider in establishing such a Commonwealth manufacture. The sooner it is started the better. I think that both the manufacture of small arms and munitions of war and the erection of new factories at Canberra ought to be carried on. It is really an ordnance question. I do not like to give an opinion on a matter which comes within the province of the quartermaster-general and the adjutant-general, but as one of the community I think it is more important to get an immediate output of small arms and munitions of war than to erect new buildings. To double the size of the Small Arms Factory at Lithgow, and to give more room, 50 acres of land are required. If I led the Committee to understand that the total included 10 acres of land for the factory and 50 acres of land for the workmen, bringing the total capital outlay up to £94,600, I made a mistake. What I intended to convey was that 50 acres will be required for duplicating the existing Small Arms Factory. My deliberate contention was that if you are going to have several factories you must have 100 acres of land. As regards Canberra, I think that men would want to live between the town and the factory. I have not the slightest idea of the value of the land on the north-west side of the existing site at Lithgow. So far as I know there has been no valuation of that area. A plan has been prepared in regard to the proposed buildings at Canberra. I think that we would not be able to get at Lithgow all the steel which would be required for stanchions and joists.

273. *To the Chairman.*—The supply of the stanchions and joists would be a matter for tenders. If they could be made at Lithgow they would be obtained there more cheaply. They would have to be cut to lengths, drilled and riveted. We have no power at Lithgow to do that, but we have the power at Canberra. It could not be done in the factory at Lithgow. Mr. Wright uses his full limit of power in the factory, and he wants more power. He has told me that he could spare no electrical current at all. I do not think that any structional steel work is done by Mr. Hoskins. It would never pay to send the material to Sydney to have it framed, but it could be done there. I have prepared a scheme for a system, and having our own power we could do the work economically at Canberra. At Lithgow, however, we would not have the plant or the power. If we were doing it at Canberra the machines would become part of our work-shop stock for further steel work, and we would be justified in laying down the plant. The other great point in getting the steel direct by rail is that it would be put on the waggons at the place of manufacture, and under the zone system go right through to Canberra at a comparatively low freight. In my opinion we will be able to get all the stanchions and joists cheaper at Canberra than at Lithgow. I said that I did not think that Mr. Hoskins could roll them, and if we cannot get them rolled at Lithgow, then we can do the work more cheaply at Canberra. I went very carefully into the cost of the preparation of steel framing. My estimate is £14 13s. 6½d. a ton, but in order not to be cutting the thing too finely I allowed £15 a ton, and added to it afterwards a percentage to cover unforeseen incidentals. From a contractor making steel work at Melbourne or Sydney we would never get a price approaching that figure. The reason why I can keep down the cost is that under the zone system for railway transport, and by using our own machinery, I can get the steel work done more cheaply at Canberra. I can use the work-shop appliances, which can be afterwards added to the working plant. We have quite a large proposition for cheap steel work, assuming that I have power for machinery. I do not think that we would have any trouble to get the machinery for preparing the steel framing. The machinery for this particular part is not very extensive. I am informed by Mr. Hill that we have actually got machinery under offer.

274. *To Mr. Gregory.*—It is a fair proposition to put down £10,000 for fresh power at Lithgow, and nothing for power at Canberra. I have included the cost of the transmission line at Canberra. We would charge per unit for the current, covering all the fixed charges on the existing buildings. If we start to build these factories at Canberra, it will be necessary to increase the size of the power plant or to install a local plant. The power plant may not directly pay working expenses and interest during initial city construction; it will be a tool of construction, and indirectly pay for itself many times over. Of course, that power plant is laid down for the population of initial occupation. The power plant is a little ahead of its time. If the Commonwealth starts a vehicle factory at Lithgow the advantage will be that the Commonwealth Government will have the control. I believe that it would make the vehicles more cheaply than they are made at present. We have control at present of the Small Arms Factory. It is quite beyond my province to say whether I am satisfied in regard to the output, but I can make a general statement. Most men who have thought over military matters have come to the conclusion that the Crown should control, so far as it possibly can, the manufacture of its munitions of war. In face of the fact that, according to the manager of the factory, each rifle costs £9 13s. 4d., I do consider that the Commonwealth should start to manufacture its vehicles. I do not think that that is his last price for the manufacture of rifles. I consider it is an initial price.

275. *To Mr. Finlayson.*—Apart from the 5¾ acres which are now occupied by factory buildings, and the 7½ acres which are available for the extension of the factory, the balance of the land is not useless for any other purpose. The manager's quarters and the cooling pond for the circulating water are on part of the land, and then the rifle range occupies a portion of it. You could build cottages up the gully, but I doubt whether people would care to go and live there. There are, however, some sites on which you could build. Even with all that land available I hold that a large purchase of land is necessary in connexion with the duplication of the factory and the erection of workmen's homes. When I said this morning that the cost of an additional half size of the factory would be in round figures £60,000 at Canberra and £66,000 at Lithgow, inclusive of land, I was referring to the proposed extension at Lithgow as planned when the matter came before the Committee, and a factory at Canberra with the output of the present factory at Lithgow. The first proposal submitted by me in regard to Canberra was a factory with double the output of the existing factory at Lithgow; whereas the estimate submitted to-day is for a factory half that size, or an output equal to that of the existing factory at Lithgow. It would not be necessary to duplicate the whole of the buildings in order to double the output at Canberra; practically you would only need to put up a half-sized building. The proposed addition at Lithgow consists in duplicating the workshop portion of the factory and increased power plant. According to Mr. Wright, the value of the machinery shops and wood shop at Lithgow is about £13,000, and I estimate that £9,000 worth could be advantageously left at Lithgow for the manufacture of vehicles. It represents machinery which, if a Small Arms Factory be erected at Canberra, will be required there, but which is also useful for making vehicles at Lithgow, so that if it be left behind the expense of removal will be saved. It is very difficult to get a detailed estimate of the cost of the machinery. I agree that for economic reasons it would be wise to concentrate, as far as possible, the various factories at Canberra. As regards the best site for an industrial centre in the Capital area, I hold a view with which many persons may not agree, namely, that it is inadvisable to create an independent and isolated centre, whether it be for millionaires, for any particular section of the community, or for the poor. One ought to avoid the creation of such centres. I think that a wise thing would be to let the population at this factory gradually merge into the city. All factories and industries ought to be established adjoining the city. It is possible that there is in the Federal area a site other than the one I have suggested, but from the stand-point of easy transport and economical working the locality where an industrial location could be best established is quite clear. We would have railway communication straight away, and we must establish the industries near that railway unless we are prepared to postpone the establishment of industries for several years, until a railway goes right through to Yass. I think that industries will spring up close to the existing railway. I suggest as a site the south-eastern portion of Mr. Griffin's extension plan. After a railway extension to Yass will have been completed that arrangement would not need to be modified at all, partly because of the objections to the isolation of an industrial centre from the rest of the city. With an industrial centre established on the north side there would be a tendency for a distinct community to spring up; that would be a disadvantage. At the present time the population would be attracted to a certain extent to Queanbeyan, but in five years' time it would not be attracted in that direction. It would then be attracted by the progress at Canberra, and in twenty years' time people would forget that such a place as Queanbeyan existed. In the south-east corner there is room for five co-related factories beside the Small Arms Factory. As regards an opportunity to establish other factories, such as boot and clothing factories, I think that further space might be got in that vicinity. I allowed what I thought was a very large factory area for the future requirements of the Commonwealth. If the manufacturing industry extended beyond six factories of the size of the Small Arms Factory we would have to seek another site. I expect to have to spend more for foundations on the hill than down in the flats, because we can reasonably anticipate finding harder ground close to the surface on the hills than on the plains. Two thousand pounds is not, however, a very large sum to put down. I did not include an item for sewerage. We

would never dream of taking the main sewer all over the city environs, hence we would dispose of the sewage locally by means of septic tanks. I allowed £250 for that purpose, because I considered that we would have to take the sewage across the road. The item of £450 for water is not for laying an extra length of line, but to meet the cost of pumping during construction. It would be a very heavy expense to lay a 6-inch water main from Red Hill. I think it is a cheaper proposition to pump the water during construction, and to charge up the permanent water main against the community. It would be much cheaper to lay down a water main from Red Hill to the south-east side than from Red Hill to the north side.

276. *To Mr. Fenton.*—As regards the direction of the prevailing winds, I would not put my view against that of Mr. Hunt. I understand that the winds from the east and south-east do not blow during the night. Normally, the factories would not be working at night, but, of course, in the case of war they would work three shifts, and if there were any smoke the city might get it. On the other hand, Mr. Wright tells me that he lives within a couple of hundred yards of the Lithgow factory, but he has not noticed any smoke. Indeed, there is very little smoke from a factory like the Small Arms Factory; there might be smoke from other factories. With normal working conditions, and with slight winds at night, even if they prevailed for a fair number of days in the year, I do not think that there would be any great trouble from smoke, because the winds would occur at a time when the factory was not working. There would be no steam-engine plant there unless the circumstances warranted it, but even with such a plant we anticipate that we would not have any smoke troubles; with a very large factory development hydro-electric power might be warranted. In connexion with the Small Arms Factory there would not be any chimney stacks which would emit smoke. I do not know about the other factories. Concerning the cost of steel girders, joists, and other iron work, it is a fact that sometimes contractors at a distance from a place have quoted lower prices than have contractors who were established near by. An allotment at Lithgow measuring 40 feet by 150 feet does not amount to a quarter of an acre of land for each resident. I think it is undesirable where cheap land is available to put up a workman's residence on a less area than a quarter of an acre, but I put down what I thought would be the absolute minimum for Lithgow, because I was working on a conservative basis. I would never think of doing that at Canberra. At Lithgow it would cost considerably more for land. In my opinion more than 300 families will need to be housed in connexion with the Small Arms Factory, though I believe that a certain number will always want to live in the town. You will get a large number of persons all wanting to live close to the city. What the percentage may be will depend upon the number of factories. I should hope to see that take place at Canberra, and not to have a sharp line drawn between sections of the community. At Canberra I allowed for 260 acres as a garden suburb for the works. I should say that it will be necessary to provide for the housing of 200 or 300 families close to the factory.

277. *To Senator Keating.*—The third sentence in paragraph 221 of my evidence has no reference to anything in the statement mentioned in the two preceding sentences. Suppose that field or machine guns—something quite outside what is proposed now—were made there that would mean a further extension of works, land, and everything else which has not been dealt with in my evidence. The third sentence has no reference to the item of £12,500 appearing in the statement I supplied. On schedule 3 I put down "Lands for additional factory buildings, £3,000, 10 acres; for additional houses, 50 acres." Then on schedule 4 I put down another area of 50 acres. The replies I gave to Mr. Fenton made the position quite clear. If you are going to have extensive factories, for instance, a shell factory, in addition to a Small Arms Factory, you must allow for at least another 50 acres of land. I could have put down 150 acres for Lithgow, but the Committee might have considered that it was an exaggerated estimate. The significance of the third sentence in paragraph 221 of my evidence is that I was thinking of field guns. If we go beyond the proposed duplication of the Lithgow factory we will require more land than 50 acres. The area required might get up to 300 acres. That is what I intended to convey in my previous evidence.

278. *To Senator Lynch.*—In my statement the existing factory at Lithgow is taken into comparison in this way: that after adding to the existing factory under my estimate there would be just the same output of rifles as there would be at Canberra under the estimated cost of the whole factory. We would be adding as much to Lithgow as would compare with a complete factory at Canberra of double output. My estimates do not touch the machinery employed in rifle making. In other words, a preliminary estimate is given by me for a factory built at Canberra, which would equal the output of the factory at Lithgow with the proposed extension. I make the difference in favour of Canberra to be £2,500. I have put down £3,500 for a railway branch. I have not debited the Lithgow factory with the perennial cost of carriage; I do not believe it is very high. The railway branch included in my estimate is required first for construction, and secondly for taking away the rifles already packed. The importance of the railway would not be so great for a Small Arms Factory alone, as it would be where there are several co-related factories together. Part of the £3,500 would serve an additional or co-related factory later on. It would be a scheme which would develop from year to year. My general idea is that each factory should be on its own railway siding, so as to keep the through line clear for the whole factory site. To a great extent the £3,500 should properly be spread over the other co-related works set down later on. About a fourth of that sum would be a special charge against the present proposal, while three-fourths of the sum would be available for useful factories in the future. I was on the conservative side in debiting the Small Arms Factory at Canberra with the whole of that amount. Schedule 3 contains an item, "Lands at Lithgow, 10 acres for additional factory buildings," and also the item "for additional houses, 50 acres." I may explain this matter. What is contained in schedule 4 is what should be first considered—that is to say, "land for workmen, 1,500 people"; that item came after the item "residences for manager and staff." The Committee will realize that I was relating them. I put in schedule 4 what will be the first requirement—that is, land for workmen, 1,500 people. Schedule 3 was common to immediate requirements and additional factories. That is how the 10 acres came in for additional factories, and 50 acres more land. It is not a duplication. To get any comparison at all one should take straight away at Lithgow 50 acres of land for residences for 1,500 workmen, and allow for more land at Lithgow for future factories to the extent of 10 acres, and at least another 50 acres for workmen, and then you have a rough comparison between the two sites. The 1,500 people referred to in schedule 4 will represent a population (men, women), and not individual employees at the factory. At the power-station in Canberra we have a large margin of power at present. Mr. Christie tells me that the units we have installed (1,350 kilowatts) would meet the demand from a Small Arms Factory without further additions to the power-house. I have not gone in detail into the comparative cost of power at Canberra and Lithgow. I have, however, made inquiries into the matter, and consider that there is not the slightest doubt that without the same engine efficiency or the economical handling of fuel the price per unit must be higher at Lithgow than at Canberra. We anticipate generating the power at a half-penny per unit.

279. *To Senator Keating.*—The proposed site for the Small Arms Factory at Canberra is about 4¼ miles from Queanbeyan Post Office.

280. *To Mr. Sampson.*—I should say that the first business site on the southern side of the lake would be to the east of the junction of the Narrabundah and Urriara roads. In other words the business site would be somewhere between the proposed factory and Parliament House. If it be decided only to double the size of the present factory at Lithgow it will not be necessary to purchase more land for factory purposes, because land is available there for such purposes. Eliminating the item of land, the proposed additions to the factory at Lithgow would cost £66,600, whereas the sum of £92,000 would provide for building at Canberra a Small Arms Factory double the size of the present factory at Lithgow. Its capacity would be double the present output; but in addition to that we would have two complete factories for the outlay of £92,000 instead of one for a further outlay of £66,600. In the case of building workmen's homes at Canberra it would be necessary to assess the rent on a certain ground value. I do not know what scheme of valuation the Government would adopt. The land question is entirely outside my province; I have never dealt with it. I am afraid that I cannot give a forecast in regard to land values. If the existing factory at Lithgow be duplicated, and about 1,000 men be employed, it will form a single unit. It is difficult to say in pounds, shillings, and pence what saving there would be in administration if we had an output twice the size of the present one, and employed 2,000 hands in two distinct factories. But there must be savings in regard to general stores, tool-rooms, laboratories, and accountancy, if you have several co-related manufactures brought under one general control you must effect economy on the whole.

(*Taken at Melbourne.*)

WEDNESDAY, 16TH JUNE, 1915.

Members present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Lieutenant-Colonel Horace William Dangar, Acting Chief of Ordnance, Department of Defence, sworn and examined.

281. *To the Chairman.*—In my official capacity I have chiefly to do with our fixed defences and field artillery, so far as their equipment and training are concerned. Various other matters principally relating to the *personnel* of the artillery units come under my control. I have nothing whatever to do with rifles. The secretary of the Committee, however, asked me if I would obtain for the Committee information as to the number of rifles required in the Commonwealth. I find that the estimated average number necessary to meet normal requirements is 15,000 per annum. That is the number required to equip the trainees who annually enter our Citizen Forces. At the present time rifle clubs are not supplied with the pattern of rifle that is manufactured at the Small Arms Factory. But the average requirements of these clubs during normal years is approximately 3,000 rifles. The 15,000 rifles to which I have already referred represent the average normal output that is required to keep pace with the trainees who require to be equipped year after year.

282. *To Senator Lynch.*—That number of rifles will be required annually until the maximum number of trainees has been reached. After a certain period some of the trainees will begin to pass out of the ranks of our Citizen Forces. I think that Colonel Stanley has already told the Committee that we expect to reach that maximum number in about three more years. But I presume that even when that period has arrived we shall continue to produce 15,000 rifles annually in order to build up a reserve of these weapons. I do not think it will ever be necessary to decrease the number. It must be remembered that rifles will always be required to replace those which become worn out. It remains to be seen what that number will be.

283. *To Mr. Fenton.*—The trainees who pass out of our Citizen Forces do not take their rifles with them. The rifles never become their property. The estimated average number of revolvers required per annum is 150.

284. *To the Chairman.*—A considerable amount of work has been done by the Department in the way of prosecuting inquiries in regard to the manufacture of shells. I suppose that the members of the Committee have seen the statement dealing with this matter which the Minister recently made to the press. That statement is practically a *précis* of what has been done up to date. I think it may be accepted as a fact that the Department has determined that the manufacture of shells shall be undertaken in the Commonwealth. We have gone a considerable distance in that direction—we have obtained estimates of the cost of the requisite machinery. Unfortunately, the pressure upon manufacturing firms all over the world since the outbreak of the

war has prevented us from obtaining more than one offer in this connexion, and that has come from an American firm. That offer is for machinery without power, without the necessary shafting in the buildings, and without the buildings themselves. In normal times we increase our artillery each year by about four batteries—that is by sixteen guns. In 1916-17 we expect to expend 12,800 rounds; in 1917-18, 14,400 rounds; in 1918-19, 16,000 rounds; in 1919-20, 17,600 rounds, and in 1920-21, when we will reach our maximum, 20,000 rounds. These figures relate to the ammunition for eighteen-pounders.

285. *To Mr. Laird Smith.*—From my point of view there is no absolute necessity to have the shell factory established in a position adjacent to the Small Arms Factory. I do not think any immediate advantage would accrue from having it so situated, except that possibly by having all our factories centred in one spot they might run better together. But from what I have seen of the Small Arms Factory and of the manufacture of shells there is not much in common between the two things. I do not think that any of the machinery of the Small Arms Factory could be used in the manufacture of shells. Of course, a small thing like a tube in a shrapnel shell could be turned out by a machine in the Small Arms Factory. But that is about the only machine I can think of in that establishment which could be used for shell-making purposes. I think that it would be necessary to have supervisors.

286 *To Mr. Sampson.*—Inclusive of the fuse and the charge, the value of an eighteen-pounder shell is about 44s. That is the cost to us landed in Australia. The price f.o.b. in England is less. We usually allow 20 per cent. increase upon the price in Great Britain on account of freight and insurance, so that landed here the cost of a round fired by an eighteen-pounder is 44s. It will be seen, therefore, that 20,000 rounds represent an expenditure of £55,000.

287. *To the Chairman.*—At the present time a certain number of our guns and ammunition waggons are abroad. Whether they will come back to this country and be useful in the future it is difficult to say. But the policy which has hitherto been adopted has been to increase the existing number of batteries by four each year until we reach the number that we intend to maintain, namely, fifty field batteries and six howitzer batteries. Each year we require sixteen guns, carriages, and limbers, and forty-eight waggons and limbers. The price of a carriage limber is £112 f.o.b. in England, and the price of it landed here is about £135. The cost of these carriage limbers, locally manufactured under existing contracts, is £200.

288. *To Mr. Sampson.*—The quality is absolutely the same in both the imported and the locally-manufactured vehicle. The latter is made according to English specifications. It is equally as good as the vehicle of British manufacture, and its workmanship is splendid. The waggon limber of British manufacture costs £120, and the waggon itself £126, or £246 for the two vehicles. That is the price f.o.b. in England, and the cost landed here is £295. The price that we are paying for the same article locally produced is £426.

289. *To the Chairman.*—My own idea is that the cheaper we can get an article manufactured the better. If the Government undertook the manufacture of these waggon limbers and waggons it would not look for a profit, with the result that we should get them cheaper than we do now.

290. *To Mr. Gregory.*—Surely if the Government manufactured them—seeing that it would not be looking for a profit—we would get them cheaper than would otherwise be the case. The private contractor has naturally to make a profit.

291. *To the Chairman.*—I certainly think there would be a saving effected if the Government embarked upon their manufacture. At the present time we are placed in a difficult position by reason of the fact that changes take place during the manufacture of these vehicles almost from month to month. The result is that after we have accepted a tender for their manufacture and during the process of manufacture some portion of the vehicle undergoes a change. If we wish that change to be effected in the vehicles comprised within a contract, we are penalized, and obviously it is very desirable that when an article is manufactured it should be made as up-to-date as possible.

292. *To Mr. Gregory.*—It is really surprising how frequently alterations are introduced into this type of vehicle during the currency of a contract. The fact that we are penalized in getting those alterations effected is not due to any laxity on the part of the Department in its preparation of specifications. The specifications are all right. The position is that every month a pamphlet is issued on the changes which take place in war materiel. If a change is notified in that pamphlet we cannot get that change effected in vehicles for which a contract has been let without being penalized by the contractor. The fact that we desire to introduce it affords him a loop-hole through which he can secure an extension of his contract or some other concession. In order to get the change effected we have to break our contract. We cannot avoid it.

293. *To the Chairman.*—We have in the Department the cost of the different sized guns, and I could supply the Committee with that information confidentially if it is desired. The advisableness of manufacturing field guns and quick-firing guns has occupied the attention of the Department. The waggons to which I have already referred are not the waggons which are required for transport purposes. They are technical waggons which require to be specially manufactured. They cannot be turned out in the same way as can transport waggons. They are ammunition waggons that are used in connexion with a battery, and they really form portion of a battery. For a division of troops we would require about 700 general-service waggons to carry stores, &c. It may be quite possible to substitute vehicles for those used in carrying stores, but artillery people consider that it will never be possible to substitute vehicles for those used in carrying ammunition. We provide ammunition columns which carry not only artillery ammunition, but small arms ammunition. When we reach our full establishment we shall require 438 general-service waggons for gun and small arm ammunition, and 122 limbered waggons. These represent the ultimate requirements of the ammunition columns. They have nothing whatever to do with the transport waggons, which are used for carrying baggage, &c. In the evidence which he gave to the Committee, Colonel Stanley did not include any ammunition columns. The ammunition waggon is an armoured vehicle, which is made of bullet-proof steel, whereas the other vehicles which are found in ammunition columns carry the ammunition in boxes, from which it is transferred into waggons which go up the firing line. In regard to the manufacture of field guns the Department is making inquiries through the London office, and, so far, has made fair progress. Owing to the war we have pretty well arrived at a standstill, and it looks as if it would be impossible to get the requisite machinery at the present time. However, inquiries are being made, and I think that the policy in the future will be to manufacture our own field artillery. It is manifest, however, that our requirements will not be very great. If the outbreak of war had been deferred until 1920 we would have completed our equipment by that time. When our equipment has been completed our annual requirements will not be easy to estimate. They will depend entirely upon the life of a gun. When once our army has been equipped there will be very little wastage in the gun. The life of a gun is dependent upon the number of rounds fired from it. Our requirements would not justify the establishment of a gun factory at present. The information which has been supplied to me by Colonel Stanley is that the manufacture of machine guns has received consideration. A machine gun of the latest pattern is due to arrive in Australia this month. It is then intended to consider the question of local manufacture. It is proposed to recommend that 500 guns be ordered. These will suffice to meet our requirements up to full war establishment—that is the establishment which has been laid down for a force of 80,000 men.

294. *To Senator Lynch.*—The supply of 15,000 rifles annually to trainees is based upon the scheme of Lord Kitchener, which had been adopted by the Government. I cannot say whether it provides for a sufficient reserve of rifles in case of emergency. That would depend upon one's opinion as to what ought to constitute such a reserve. The 15,000 rifles represent the estimated average number of trainees who will require to be equipped each year. It is estimated that 12,685 trainees out of every 15,000 who enter our Citizen Forces will pass out of them on the completion of their training. The difference represents the wastage which will take place in the interim. It is obvious that the same number of men who enter upon their training will not complete it, owing to deaths and other contingencies. Thus there will be a certain number of rifles accumulating as a reserve. I have not had much experience of rifle clubs, and consequently cannot say whether any forward movement in their development is probable.

295. *To Mr. Sampson.*—I will endeavour to obtain information as to how many additional rifles would be required if a scheme were adopted under which trainees upon completion of their course in our Citizen Forces were allowed to continue their rifle practice as members of rifle clubs.

296. *To Mr. Gregory.*—I am afraid that I cannot say what reserve of rifles we should have in Australia, or whether a reserve of 50,000 would be sufficient. That is purely a matter of opinion—really it is one of policy. I am informed that the annual requirements of trainees represent 15,000 rifles, and I presume that the Defence Department considers that the Small Arms Factory should be able to turn out that number. I cannot say what reserve would be ample for military necessities. Of course, in a contract for the delivery of, say, 550 transport waggons within a period of six weeks, there would not be much chance of alterations occurring in those vehicles. But transport waggons are very different from ammunition waggons or gun carriages. A transport waggon can be purchased for £30, whereas a waggon limber and the waggon itself, if manufactured locally, cost £426. The difference in price speaks for itself. Our contracts for the supply of ammunition waggons cover much longer periods than do our contracts for the supply of general-service waggons, which are principally composed of wood. We have not had any experience of Government manufacture of these vehicles. I cannot speak of the results achieved by the Small Arms Factory, because I have only paid a flying visit to it for a particular purpose I have not given much consideration to the question of whether it would be wise to establish a factory for the manufacture of shells some distance inland, instead of having it located close to the sea-board. In connexion with factories of this description we ought certainly to consider the question of safety as well as the supply of raw material. That is to say, we ought to have regard to the most convenient means of obtaining the raw material. I understand that plenty of power will be available at Canberra, and consequently the question resolves itself into one of convenience in getting the material there. The carriage of shells by rail is considerably safer than is the carriage of dynamite. It must also be remembered that, although shells might be manufactured at Canberra, they might not be filled there. But even if they were filled there the storage conditions which would apply to them would not apply to dynamite.

297. *To Senator Story.*—I have not had a large experience with contractors. In our Department there is a contracts branch. I would probably be called upon to state our requirements, and to provide specifications, but the contract branch would deal with all contracts. I do not say that if an alteration has to be made in a contract after it has been let, the contractor will in most cases take advantage of it. I think that contractors generally have acted very reasonably, and that they have met the Department in every way. What I intended to convey by my previous statement in connexion with this matter was, that if a contractor had undertaken to supply a certain number of waggons within a prescribed time, and the Department stepped in and said that it wanted an alteration made in those waggons, its action practically dispensed with the time limit, so that it was at the mercy of the contractor. I did not mean to imply that the contractor took advantage of the Department, but I did mean that he was in a position to do so. In the circumstances I have outlined we have practically to agree to any price that he may name for an alteration being made in the vehicles. We have no option, because the work is not then open to competition. I do not think that contractors have ever taken advantage of the Department in that way, although the breaking of contracts has necessarily altered the time within which those contracts had to be completed. My own idea is that in England there are certain firms which are recognised by the War Office. They are contractors to the War Office, and they supply these vehicles at certain prices. I presume that there is an understanding between the War Office and these firms under which, when alterations have to be made in vehicles, those alterations are effected without any special change being made in the conditions of the contract. I know that when we used to order goods from England some of them used to come from one firm and some from another, whilst others used to come from the arsenal itself. But even when our guns are manufactured, say, by Messrs. Armstrong Whitworth or Vickers, Maxim and Company we deal only with the War Office. The munitions of war required by Great Britain are also supplied by contractors. Shells are made by the firms I have mentioned, and many others. I have no knowledge of the method adopted by Germany in this connexion. From reading

recent cables in the newspapers I do not think that the British Government have yet taken control of the means of supplying munitions of war. Only last night or this morning I saw that it was suggested that they should do so. I may mention that the War Office regularly issues what we term "The priced vocabulary of stores." The prices in that publication vary from time to time. It is that circumstance which leads me to suppose that there must be an understanding between the Imperial Government and certain firms of contractors, because when we order munitions in the Old Country we do so on the prices laid down in that vocabulary. The prices which I have quoted this morning were taken from that publication, and consequently it is evident that there must be some kind of continuous understanding between those firms and the British Government. They must have a sort of standing contract with the Government.

298. *To Senator Keating.*—The average requirements of rifle clubs during normal times is approximately 3,000 rifles annually. I cannot say whether the requirements of these clubs are fully met by the supply to them of 3,000 rifles each year. I know that owing to pressure upon supplies, Colonel Stanley had recently to reduce the allowance made to rifle clubs in the form of rifles by 50 per cent. It is a fact that the requirements of these clubs cannot be fully met under the present circumstances. It must be recollected that the membership of these organizations has increased to an extraordinary degree since the outbreak of war, in addition to which the rifle requirements of the Commonwealth outside of rifle club organizations have increased. It stands to reason, therefore, that at present these clubs cannot be fully supplied with rifles. At the present time no rifles are being imported to my knowledge. I cannot say how long it is since their importation by the Department ceased. I should think that it ceased as soon as the Small Arms Factory began to turn out rifles in any considerable quantity. I will endeavour to ascertain when importation actually did cease, as well as what number of rifles was imported during the three years prior to the establishment of the Small Arms Factory and the number which has been imported annually since its establishment.

(Taken at Melbourne.)

THURSDAY, 17TH JUNE, 1915.

Present:

Mr. RILEY, Chairman;

Senator Keating,	Mr. Finlayson,
Senator Lynch,	Mr. Gregory,
Senator Story,	Mr. Sampson,
Mr. Fenton,	Mr. Laird Smith.

Norris Garrett Bell, Engineer-in-Chief and Acting Commissioner, Commonwealth Railways, sworn and examined.

299. *To the Chairman.*—In my capacity as Engineer-in-Chief and Acting Commissioner, the question of the Yass-Canberra railway has come under my notice. I have no instructions as to the construction of the railway in the near future, but a trial survey from Canberra to the northern boundary of the Federal Territory has been completed. As to any further action before a final survey, I shall require to get further instructions from the Minister; and, so far, I have received none. The country is comparatively easy; and it would not take long—perhaps a matter of six months—to make a working survey. The proposed factories' site would not in any way hamper the railway, which is supposed to eventually cross the lakes. I have not considered the matter of marshalling yards as yet; but I think it will be many years before such yards are required, seeing that they are necessary only in large distributing centres. The line from Yass to Queanbeyan will go through the northern site for factories. I could give you an estimate of the cost of a railway from the present Queanbeyan line up to that point, in a few days, and also indicate the time necessary for its completion. Without looking at the plan in order to see what earthworks will be required, it is difficult to say how long it would take to construct a railway from the Canberra terminus to that point; but I can let you have that information along with my estimates of cost. I think it would be best to make that railway part of the general scheme—a permanent line.

300. *To Senator Story.*—I could also give an estimate of the time which it will take to construct a railway from Yass to the Capital site, if the line were started immediately. The New South Wales Government undertook to build that section.

301. *To the Chairman.*—There are 11 miles of railway to be constructed in the Federal Territory, and 33 miles from the border to Yass on the New South Wales side.

302. *To Mr. Finlayson.*—The 11 miles of railway terminate on the northern border towards Yass. The best route for the railway from Yass to Canberra is the route that has been surveyed. The traffic from Melbourne will naturally come through Yass, and the traffic from Sydney through Queanbeyan. I think that the Queanbeyan route is more advantageous for passenger traffic from Sydney than the Yass route. From Melbourne it is considerably shorter *viâ* Yass to Canberra than round by Queanbeyan. I believe it is part of the scheme to connect the line right through from Yass to Queanbeyan. Without having a further look at the plans and sections to see what earthworks and bridges are required, I could not say how long it would be before there would be a working survey completed and the railway in working order; I will let you know that later, in the report I have already promised. As to whether it would be better to build a light line across the flats to the northern site to carry goods and material, or to lay down a permanent line, I think the latter would be the better course, because you must build the line sufficiently strong to carry the rolling-stock. The trial survey has been taken right through to the present terminus at Canberra. I am not quite sure whether the line follows the marks on the map across the artificial lakes just at the point indicated; the scale is too small to show; but I think it crosses a little further down. In the departmental trial survey, I paid no attention to the artificial lake system suggested in Mr. Griffin's design, because the line might have to be diverted. In my absence, a report was submitted by Mr. Hobler on the railway suggestions regarding the Capital site. That report was given to Mr. Archibald, the Minister for Home Affairs, about six weeks ago; but I do not know what has become of it. When the trial survey was carried out it was not based on Mr. Griffin's design for the lay-out of the city, but was surveyed from a railway point of view; that is, the best route for the line was selected. The existing line from Queanbeyan to Canberra was surveyed by the Home Affairs Department, and constructed by the New South Wales Government for the Commonwealth; and it will form part of the permanent line running through from Yass to Queanbeyan. I am not aware that Mr. Griffin states that the present line from Queanbeyan to Canberra interferes with the general lay-out of the city. In fact, Mr. Griffin's design has not entered into our calculations at all.

Major William Henry Osborne, Director of Rifle Associations and Clubs, and Acting Secretary to the Military Board, sworn and examined.

303. *To the Chairman.*—At present, the approximate strength of the rifle clubs is 70,000 members, about 20,000 of whom require rifles. If the whole of the clubs were called out to-morrow, 20,000 of the members would be without arms. Of the total number of members, there are approximately 20,000 who own their own rifles; this means that there are 55,000, or thereabouts, who do not own rifles, but are dependent on loan rifles from the Government, or have no rifles at all. We can supply all but 20,000 of the 55,000 with rifles; that is, with loan rifles on issue from what there is in stock. We would require 70,000 rifles to supply all, including those who have no rifles now; that is, to arm every man with an up-to-date Government-pattern rifle. The rifles they have are quite good, many of them being match rifles, for which the members have paid £8 each. A rifleman's rifle is generally in a better condition than the rifle of any other man. The long-barrelled magazine rifles at present in use by the clubs are quite serviceable, and just as efficient for service as the War Office pattern. They were Government-pattern rifles until quite recently.

304. *To Senator Story.*—There are two sorts of rifles supplied to those who do not own rifles of their own. The supply of rifles of the magazine pattern has been exhausted. There is a magazine pattern and a single-loader pattern, both of the same bore; but there was a disinclination to use the single-loader on account of alleged defective sighting; and, no doubt, there was some ground for complaint.

305. *To Mr. Laird Smith.*—The single-loader rifles were made in England and imported by the Victorian Government when the .303 bore rifle first came out. They are good rifles, with a splendid barrel; but, as I say, the sighting was complained of. To help the Department out of the difficulty, I conferred with some private manufacturers of sights, and they fitted to the single-loader an aperture sight which overcame the difficulty; and the clubs are now purchasing those sights for their single-loaders. Up to about 900 yards, the single-loader is a very effective weapon with this aperture sight.

306. *To the Chairman.*—The rifle-club movement is extending. On the 30th June last, there were, approximately, 48,000 members; and on the 31st May last, this has increased to 78,000.

307. *To Mr. Laird Smith.*—In some cases, it would be an inducement to men to join, if rifles were made available more easily, because the obligation to purchase rifles is a hardship on the poorer men in the community. But I have a disinclination to give arms indiscriminately to people, because no man values a rifle, or, indeed, anything else, so much as when he has purchased it. The man who owns a rifle always takes care of it. If the Government decide to give every member a rifle, I suggest that, in order to insure that the rifle is kept in order, they should be inspected once a year. The best way to meet the difficulty would be to equip a travelling motor workshop, with an armourer, who could go round the various centres and inspect the rifles once a year. I am against indiscriminately issuing rifles without any check as to the ultimate fate of the rifle.

308. *To the Chairman.*—If the Government provided every member with a rifle, it would, to some extent, be an incentive to men to join the club, and would lead in some cases to more practice. However, it is hard to say, in abnormal times such as these, what would take place later.

309. *To Senator Keating.*—The rifles are sold to members at £3 5s. on a deferred-payment system. The men pay £1 down, and if they are effective in the last year, the Government waive the final payment of 10s. In addition to the rifles that are sold, there are loan rifles issued on a guarantee from the club, or from individuals, that any damage will be made good. There are requests for rifles from clubs which are not yet supplied. At present, we do not give a club on loan more than fifty rifles, no matter what the membership may be. Applications are dealt with in the order in which they are made. If a club applied for forty rifles, it would depend entirely on the work in the Ordnance Department when the application was complied with. Military procedure is to give first treatment to the first-line units, and rifle clubs are the second line, or the reserve. I cannot give concrete instances of delay in the supply of rifles, because that is a matter with which I do not deal; it is only when complaints reach the Minister that it comes within my purview. It is possible that six months may have elapsed; but I do not remember any specific instances. I have known of cases where several months have elapsed, but that was a long time ago. The normal supply of rifles of 3,000 per annum would not anything like meet the development indicated by my figures; but, of course, if every member were given a rifle, that 3,000 per annum would not then be required. The expansion in the membership of clubs between June of last year and May of this year was to the extent of 30,000 throughout the Commonwealth, and is abnormal, and there must necessarily be a large number of men not supplied with rifles; and, further, a number of clubs now awaiting gazettal are not included. I have to deal with the gazettal of the clubs, and any delay before a club is officially recognised depends on the speed with which land can be obtained for rifle ranges. It is not until a club is officially recognised and gazetted that rifles are supplied. A club in a metropolitan area is in a much better position than is a country club, because a start can always be made at a metropolitan range. Of course, when you meet private land-holders who desire to get all they can for their land, some time is necessarily lost. In this respect, the conditions in Western Australia are the best I have met. There the Government, when marking out a new township, set apart a rifle range, which,

of course, is always available when settlement springs up. With regard to rifle clubs in country towns throughout the States generally, it often happens that Crown land is required for rifle ranges; and we get it without any difficulty, at a nominal rental. The State Governments charge a uniform rate of about £1 per annum, which covers the cost of the licence for the whole area.

310. *To Mr. Gregory.*—I regard the increase in the membership as abnormal, and take it that there will not be the same demand in the future under altered conditions.

311. *To Senator Lynch.*—The shortage of 20,000 rifles is due to the abnormal increase in the membership, and this, in turn, is due to the war. We have also to consider the demand by the Department for equipment for troops abroad; otherwise, a large number of rifles could have been released for the use of rifle clubs. It is really the war conditions that have caused the shortage. I have not made any calculation as to the eligible balance of the male population who ought to be in rifle clubs; but I have thought much about the matter. The Defence Act provides that every man between the ages of eighteen and sixty is available for service in time of war; but, of course, if a man has had no previous experience of either shooting or drilling, I do not see what value he is from a defence point of view. My idea is that there ought to be a census, or something of the kind, so that we might have an idea of the value of the men available. As I have said, I have not gone into the question of what that available balance of the male population amounts to. I have opinions about compulsory enrolment in rifle clubs; and I certainly would not exempt lads in the present exempt areas, but should insist on these joining rifle clubs. In the areas not exempt, the lads are, of course, being drilled. The men above the age present a problem requiring much thought. I apprehend, as I have said, that there should be some sort of registration, and some method adopted to induce such men to take up miniature-range shooting, where time is not available to go to the Service ranges. I am now speaking of men who are up in years. An acquaintance with a rifle in any form makes a man much more serviceable and useful than if he has no knowledge whatever of a gun. It is here where the miniature rifle ranges would come in—miniature rifle clubs which at present do not form any portion of the Defence Forces. In the United States, 500,000 service rifles have been distributed free to private individuals, along with a supply of ammunition, in order to enable them to practise shooting; and any ten individuals can form a club. I have not seen the American regulations; but the fact that the rifle is made a free gift shows that they are more liberal there in that respect than we are here. In Australia, thirty members are required to form a club, as against ten in America. In Switzerland, rifle shooting takes the place of cricket and football with us, and it is considered a slur on a man not to be able to shoot. In Switzerland, as we know, every man is called to the service; but, after he has passed his term in the "Elite" or "Landwehr," he can join a rifle club, thus keeping up his connexion with the Forces in a national Landsturm, which does no further military service except in the event of war. I am not certain whether this latter service is compulsory or voluntary; but I believe a certain period of service is compulsory. I would like to place before the Committee the following information in regard to Swiss Rifle Clubs. This information I found on page 628 of the March-April, 1915, issue of the *United States Infantry Journal*:—

Rifle Clubs.

Rifle shooting is the great national pastime in Switzerland. Rifle clubs are volunteer organizations. They are organized among boys from eleven to twenty. The smaller boys have a serviceable light gun; the larger ones the regulation rifle. In 1914, about 38,000 boys were members of these clubs. Rifle clubs for adults are under Federal control and encouragement. Of this class, in 1904, there were 3,656, with a membership of 213,000. Assistance to these clubs is given as follows:—

> Each commune by law is required to maintain a target range of not less than 300 meters. Each club that completed the prescribed course is given a gratuity of 4 francs per member per annum. Soldiers may shoot *their prescribed practice on these ranges at* their homes. The results are entered in their register books, and they are excused from summons to a military range, in the *alternate years, when the Elite and Land*wehr are not training in the repetition courses. As the Swiss soldier has his rifle, at all times, in his personal possession, the facilities for target practice are apparent, and, considering the spirit of the people, inherited from their earliest ancestors, it is plain why rifle practice has become the national pastime.
>
> Each club makes its annual return of practice through the cantonal committee to the chief of infantry.
>
> Among the boys' clubs, nothing can exceed the joy and enthusiasm of its members. It is counted a mark of inferiority not to be an expert shot, as well as not to be able to serve in the army.

The population of Australia is 5,000,000. Switzerland, 4,000,000. Membership of clubs in Australia, about 78,000; in Switzerland, as above, 213,000. I do not know the conditions in South Africa. In New Zealand, men are not exempt from service, but are compelled to join rifle clubs; and that is what I would suggest here in exempt areas. *This, of course, would mean a supply of rifles on a* population basis; and I have not gone into the figures.

311A. *To Mr. Sampson.*—If the members of the rifle clubs were called upon for service, the rifles they have would be quite suitable. I do not know as to the stock of bayonets; but I believe there are plenty for the whole of the pattern rifles issued; at any rate, all the rifles would be suitable for the bayonet. The rifles now used by the rifle clubs could, if necessary, be utilized at the front. I am speaking of the .303, for every one of which there is a bayonet in stock. These rifles are not of the same pattern as those being turned out at the Small Arms Factory, and they would not come within the service regulations at the Front, though they could be utilized at a pinch. They would not be liked at the Front; but they would be all right for defence purposes in Australia. There would have to be fresh rifles manufactured if all the rifle clubs were equipped with the same weapons as are the other branches of the Forces. I understand from what you say that, some time ago, a motion was submitted in the House of Representatives to the following effect:—

> That in order to increase the shooting efficiency of members of our trained Citizen Forces, after having passed through their period of compulsory training, shooting for certain periods of the year be made compulsory in connexion with our rifle club system; and *that the Defence Department be instructed by this House* to give effect to this policy, and to provide the necessary rifle ranges and shooting facilities for the purpose.

I understand, further, from what you say, that the Assistant Minister of Defence, on that occasion, said that he thought it would be better to leave the matter to be considered on its merits at a future date, and that he had consulted with the Minister of Defence, who offered no opposition to the policy; but he suggested that the motion should be withdrawn, promising that at some future date it would receive, he hoped, favorable consideration from the Government. I put a suggestion of the kind forward last November, in a separate proposition to the Government. I suggested that Part XII., section 125, sub-paragraph (*d*) of the Defence Act should be amended to read:—

> (*d*) From twenty-five to thirty years of age in a Rifle Club.
>
> *Provided that, except in time of imminent danger of* war, service under paragraph (*d*) shall be limited to firing a musketry course of such number of rounds, and under such conditions, as may be prescribed, but the Governor-General may at any time suspend, reduce, or vary *the operation of the said paragraph.*

In my opinion it is a great pity, after the Commonwealth has gone to the trouble and expense of training, say, 15,000 men for six years, to have these men drop out and be lost sight of. If in any way we could retain a hold on these men, even if only in a perfunctory fashion, it would be most useful, in the event of any sudden outbreak of hostilities, to know where we could lay our hands on them. The great trouble is for a man to keep in shooting practice. When we consider the time and money spent on the ranges, the wear and tear on the barrel of the rifle, the cost of ammunition, and so forth, it will be realized what it costs to train a man Shooting, like swimming, is never forgotten, but to keep himself effective a man must have practice at regular intervals; and that practice, I suggest, should not be less than fifty rounds per annum, in shoots of ten rounds, every two months. That is as little as any man can do if he has any national spirit in him. Such a scheme as this would mean that about 13,000 men in 1920 would go automatically into rifle clubs instead of disappearing from our lists; and if they were permitted to take rifles with them, it would mean about 13,000 out of stock, representing about £60,000. It would mean 13,000 rifles every year from 1920 onwards, until we reached our maximum strength.

312. *To the Chairman.*—It requires 3,000 rifles per annum to meet the increase in the rifle club membership under present conditions. I mean *the conditions under which men are allowed to* buy rifles, or have them loaned to them. If they were all given rifles, of course, a larger number of rifles would be required.

313. *To Senator Story.*—The ammunition is issued to members of rifle clubs at a reduced rate. For 70,000 members we require about 14,000,000 rounds per annum. The quantity issued to each club is limited. When a new member joins now he gets 150 rounds during the year; and, if he makes himself effective with that 150 rounds, he is given 200 rounds the next year. If the whole of the 70,000 members were equipped with rifles, we might have to consider a reduced distribution of ammunition to the clubs, or, of course, increase the stock of ammunition.

APPENDIX "A."

SMALL ARMS FACTORY—PROPOSED CONSTRUCTION.—PRELIMINARY ESTIMATE.

Item.	At Canberra, Half Size.	Estimated Costs.				Remarks.
		Additions at Lithgow.	New, at Canberra.		Engines and Miscellaneous, Canberra.	
			Concrete Buildings.	Wood and Iron Buildings.		
SCHEDULE I.	£	£	£	£	£	
Extensions to Lithgow Factory—Main buildings, wings, steel store, boiler house	..	44,750*	..	..	..	*Includes £300 office partitions and £200 luncheon-room
Electric light, water, gas, moving luncheon-room, roads, contingencies	..					
New three-floor, main factory building, containing store-rooms, offices, luncheon-rooms, including 10 per cent. contingencies	29,000	..	48,000	..	..	
Wood store building	320	..	1,580	..	..	
Wood kilns	1,800	1,000	3,200	..	..	
Rifle range and test house	1,800	3,500	3,200	..	..	
Water services outside	150	..	200	..	..	
Power plant—Engines, generator, boilers, piping, boiler settings, flues, steam pipes, circulating pipes, and accessories 600 h.p.	..	10,000	..	..	..	
	33,610	59,250	56,180	..	..	
SCHEDULE II.						
Forge shop	2,100	..	..	3,800	..	
Hammer foundations, plates, &c.	600	600	..	..	1,000	
Hardening shop	1,400	..	..	2,520	..	
Chequer plates	400	400	..	..	800	
Wood shops exhaust piping	500	500	..	..	800	
Weighbridge	..	..	..	..	200	
Countershaft timbers	350	250	..	..	600	
Heating system (water) boiler and piping	1,500	..	..	..	2,500	
Gas plant	300	..	..	..	400	Size and type not yet determined
Pathways, trees, &c.	150	..	..	..	250	
Fencing	300	..	..	..	500	
Installing machinery—						
New	2,000	2,000	..	..	2,000	
Moving existing	..	200	..	..	2,000	
Electric distribution*	800	500	..	..	1,000	*Not including motors
Oil tank, excavations, &c.	50	..	..	..	100	
Derricks	125	..	..	..	250	
	10,575	4,450	..	6,320	12,400	
SCHEDULE III.						
Common to present proposals and immediate requirements for additional factories—						
Lands—						
For additional factory building, 10 acres	50	3,000*	..	..	50	*£300 per acre
For additional houses, 50 acres	..	12,500†	..	..	250	†£250 per acre
Roads, 1 mile	500	800	..	..	500	
Water main	2,500	..	..	..	2,500	
Railway branch	3,500	‡	..	..	3,500	‡Practically impossible to existing site, Lithgow
Electric power main	700	..	..	..	700	
Transformer station	1,500	..	..	..	1,500	
Sewage (factory)	800	..	..	..	800	
	9,550	16,300	..	..	9,800	
SCHEDULE IV.						
Fittings and furnishings—						
Benches	500	500	..	..	900	
Foremen's offices	150	..	..	..	200	
Residences—Manager and staff	6,000	..	5,000	..	..	
Land for workmen—1,500 people	..	12,500*	..	..	250	*50 acres, at £250 per acre, for further manufactures
†Road making, kerbing, &c.	1,000	1,600	..	..	1,000 50	†2 miles
	6,650	14,600	5,000	..	2,400	

SMALL ARMS FACTORY—PROPOSED CONSTRUCTION.—PRELIMINARY ESTIMATE—*continued.*

Item.	At Canberra, Half Size.	Estimated Costs.				Remarks.
		Additions at Lithgow.	New, at Canberra.		Engines and Miscellaneous, Canberra.	
			Concrete Buildings.	Wood and Iron Buildings.		
SUMMARY.						
	£	£	£	£	£	
Schedule I.	33,610	59,250	56,180	..	..	
" II.	10,575	14,600	5,000	..	2,400	
" III.	9,550	4,450	..	6,320	12,400	
" IV.	6,650	16,300	..	9,800	..	
	60,385	94,600	61,180	16,120	14,800	
				92,100		
Cost at Lithgow, half size (without additional land), deduct	..	28,000				
		66,600				

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