

After the war ended, the Small-Arms Factory continued upon the wartime scale for a while, which of course had already become reduced substantially through industrial troubles, considering that in January 1918 the employment had amounted to 1,517 persons. The figures for the following months read: February 551, March 589, April 735, and then by October 1918 they had moved up to 1,312. The number then remained thereabouts until March 1919 when instructions were issued to reduce output, the result being that there was a drop to 1,077 persons by June 1919 - with a reversion to day-shift working - and 789 by June 1920. After this, the conditions remained stable for a while; in fact, the employment increased slightly. When 1921 opened the programme was still at the rate of 20,000 rifles a year, and the manufacture of "Long Barrels" for sale for civilian rifle-shooting purposes was undertaken. The acceptance of orders from commercial trading sources also contributed to maintenance of a good pay-roll so that, on 30th June, 1919, there were still 829 employees. However, there had been warnings about this time of a substantial reduction in the Votes usually drawn upon by the Services for their purchases of munitions. On 25th July 1919 instructions were received that the annual expenditure upon the Small-Arms Factory was to be reduced to £280,000, which meant inevitably that further retrenchment was at hand. Nevertheless, the conditions in relation to the employees as a body were not all to their disadvantage. A commencement was made in August 1919 with the erection of 100 homes for employees - the project became known as "Littleton Village" in recognition of the Minister for Works and Railways (Hon. Littleton Groom,

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M.P.)<sup>10</sup> The first cottage was completed and occupied on 4th September 1920, and 21 more were occupied that month. By 30th June 1921, 82 cottages had been tenanted and the remainder were soon to follow. It was thought at the time that an acute problem of some years standing had been solved but other difficulties arose some years later.

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Other matters of interest to be noted during the three-year period 1918-1921 included the purchase of a strip of land, 140 feet frontage by 1,060 feet long, on the west side of the factory proper with an eye to future extensions, and a survey was made for possible railway connection with the main Western line. The Power-plant was strengthened by installation of an additional 150 kw. steam engine with generator, and two standard boilers, but after that, although there was necessity, no further extensions were authorised pending decision as to whether a large public electricity generating station would be erected in the district. There were additions also to the manufacturing plant. Apart from a few purchases of imported machines 74 were built in the Toolroom and 38 more were in hand when the period closed. [The developments in materials supply were important. It is customary to regard the steel used in mass-production factories as the preserve of specialist manufacturers of high-grade steel and consequently the Small-Arms Factory had to rely upon imports for its requirements. It became very difficult, as the war progressed, to obtain any steel from overseas, and in desperation the Factory manager appealed to the local manufacturer in Lithgow, G. & C. Hoskins Limited. The Directors responded and spared no effort to produce steel to the rigid specifications demanded in the manufacture of rifles,

with the result that ultimately 79 per cent. by weight of the steel required was being manufactured at Lithgow. There were difficulties, too, with the timber used in making the rifle stocks; The approved native timber was Queensland Maple (Flindersia Chatawaiana) but there had been heavy demands upon the resources of Queensland in that respect, and Factory investigations indicated that Coachwood (Ceratopetalum Apetalum) a product of the rain forests of New South Wales would be suitable. The important requirements <sup>were</sup> being that it should shape cleanly under automatic machining; be equal in weight to Italian Walnut; and withstand hard usage in warfare - later under exhaustive tests in the field the latter was proved. Incidentally, the point about Italian Walnut is that it is more or less a world standard, and rifles are usually designed about that timber because even a small variation in weight would affect the balance of the rifle and its accuracy. Australia therefore is fortunate in having both Queensland Maple and Coachwood as substitutes for Italian Walnut in the manufacture of rifle stocks.

Meanwhile, Mr. A.E. Leighton's General Report of 27th May 1919, in its relation to the Government factories, was being studied and debated in Departmental circles and within the Services in an atmosphere of acceptance and support, but there was not much for a time in the way of finance and action. However, matters came to a head in early 1922, as shown in Chapter 7, when the Munitions Development Programme was approved by the Government and launched as a six-year programme of factory expansion - it became known as "the 1922 programme". For myself I had been busy in England for the two years of 1919-1921 acquiring great quantities of munitions plant, as shown in.

Chapter 6, the installation of this obviously being an essential part of the 1922 programme, and consequently, notwithstanding the very much reduced activities of the manufacturing plants in the Government factories, the Munitions Supply Administration had before it a satisfying task in implementing the Government's policy for self-containment in Australia in respect of munitions production. Mr. Leighton's proposals for the Small-Arms Factory contemplated an output of rifles well in advance of the potential already established in the existing factory, and additional installations of plant for production of Lewis Machine-guns, Pistols of the revolver type and Signal Pistols, all of which was first discussed with the Service Boards of Administration and their agreement obtained. It is inadvisable at any time to state officially the output capacity to be attained but the objective was a layout of plant for line production to a capacity adjudged to be adequate for the maximum of fighting men that Australia could put in the field, inclusive of the losses of equipment in any battle that Australians could be expected to face. Also included in the plan was the General Machine shop for production of machine tools, and another unit to be separately equipped was a plant supplementary to the Toolroom for bulk manufacture of small engineering tools such as milling cutters, drills, taps and dies, and the like, of which quantities are expended in operating mass-production factories. Additional plant for electricity generation, steam heating, lighting, and stores handling also had to be considered, and as regards the requirements of buildings and floor space no difficulty was anticipated in accommodating that upon land available already in the Lithgow factory area. Approximate costs were given by Mr. Leighton, but these were revised for the 1922 programme as

	£.
Buildings and Works	88,750
Manufacturing Plant	59,250
Tools and Gauges	97,000
Power, Heat and Lighting Plant	<u>45,000</u>
	<u>£290,000</u>

hap.6 To this total there should be added £42,800 on account of expenditure already incurred, mainly as part of the British Munitions plant.

It will be opportune to mention here that a practical step towards self-containment had been taken even before the end of the war in commencement at the Small-Arms Factory of the manufacture of Machine Tools, and Before I left Australia in 1918 we had been talking in the Department about widening its scope. On 7th June, the Minister for Defence approved a memorandum by our Acting Chief Engineer, Professor A.J. Gibson, as a determination of policy -

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Under existing circumstances there is going to be great difficulty in obtaining the machine tools necessary for the various Arsenal activities. With a view to producing results at the earliest possible date it is proposed to erect and equip a shop for the manufacture of machine tools. This will be a purely temporary factory for the sole purpose of obtaining the machines for Arsenal equipment, and as soon as the Arsenal scheme is sufficiently advanced it will be transferred to the Arsenal site and used as part of the General Machine Shop for the Arsenal. It probably would be most convenient to erect this adjacent to the Small-Arms Factory at Lithgow in order that full advantage may be taken of the facilities that already exist there with regard to power and tools.

A letter from Mr. Leighton in London dated 24th June indicated that he too had been thinking about machine tools and he asked for authority to purchase surplus English plant, but it was not until Senator Pearce arrived in England during early 1919 that anything in that direction could be done. Progress nevertheless

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was being made in Australia. Soon after my arrival in New York, I received a cablegram from Melbourne dated 1st August instructing the purchase of six high-grade machine tools for the proposed Machine-tool Factory, and eleven more of similar quantity and in various types were being purchased from local importers. By the time I left New York, in November 1918, all the machines ordered were ready for shipment, and it can be said that, together with the machines already purchased in Australia, they were to form a very fine nucleus for a Machine-tool Factory.

#### Machine-Gun Production

In December 1921, the Hon. Walter Massy Greene took office as Minister for Defence, and it was noticeable that from the outset he was taking an interest in the spending sections of the Department, including the Government Factories. It was evident in the light of events subsequently that that was a preliminary to preparation of the Government's Defence Policy, and he expressed a wish to visit the Small-Arms Factory. It was arranged he should be there on 16th February and I was sent to Lithgow to escort him over the Factory. I had various official contacts with him in later life and this, the first, was the most innocuous of them. Also in January 1922, there was a drastic revision of the Estimates for Financial Year 1921-1922 in the provision for munitions production; £49,000 had been included for development of Machine Gun and Pistol manufacture but the amount was reduced to £5,000, to be applied to purchase of plant or alternatively for production of tools and gauges to enable a commencement of manufacture of the machine gun. The latter was approved and on 6th February the Munitions Supply Board allocated £3,000 as a

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first instalment for preparation of the drawings of the tools required for manufacture of the Machine-Gun barrel. Thus was inaugurated the first practical step towards self-containment in Australia in the production of weapons of offence heavier than the rifle; it was a modest beginning and it was most encouraging to all of us to see something come out of our work in England after the Armistice. Who could have imagined the operations upon a grand scale that became our lot only three months later? Mr. A.S. Ford was the Engineer-in-Charge of the Machine-Gun project, and Mr. R.H. Doyle, in his capacity as Assistant Engineer, was his representative at Lithgow in the Drawing Office there. It will be convenient to record here the qualifications of these gentlemen -

Mr. Ford served his time in the engineering trade with Messrs Vickers Son and Maxim at their machine-gun factory, Erith, England, and he emigrated to Australia in 1912. After his arrival he applied for a position as Draftsman at the Small-Arms Factory and was engaged on 3rd February 1913. For the greater part of 1917 he was in England, in company with the Manager of the Small-Arms Factory (Mr. F.R. Ratcliffe), on investigational duty relative to machine-gun manufacture, and was appointed on his return to be Chief Draftsman of the Small-Arms Factory. In July 1918 he was again despatched to England for a detailed study of all phases of manufacture of small-arms and machine-guns; a duty which is fully dealt with in Chapter 6. On 1st May 1918 he was appointed an Assistant Engineer on the staff of the proposed Arsenal and he returned to Australia in October 1920. On 3rd March 1921 he became Engineer-in-Charge of Machine-Gun and Pistol development.

Mr. Doyle was a Draftsman at the Small-Arms Factory when he enlisted in the Australian Imperial Force for active service abroad. He experienced a serious accident in England before the War ended and when I arrived there in November 1918 soon after the Armistice he was still in hospital, convalescent, but not yet fit for duty. I arranged however, with the A.I.F. Administrative Headquarters that as soon as he could be released for light duty he would be discharged from the A.I.F. and join my staff as assistant to Mr. Ford, in a detailed study of the manufacturing processes employed in production of small-arms and machine-guns, including rifles, according to the techniques developed out of the experience gained during the War as described in Chapter 6. On his return to Australia in October 1920 he was appointed as Assistant Engineer on the Arsenal Staff from 1st April 1921 to be

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Bren Light Machine Gun

In May 1935, Mr. A.E. Leighton reported to the Munitions Supply Board that he had received confidential information from Colonel H.B.L. Gipps, Chief Inspector, at the time in England, speaking highly of the Z.G.B. Gun, that he considered it would be adopted as the light machine-gun for the British Army. Extracts from a further letter from Colonel Gipps, dated 8th July 1935, were as follows -

ZGB MACHINE GUN

There have been definite alterations to the ZGB Machine-Gun since 1933. It will be adopted as the light Army Service machine-gun and manufacture should commence in a few months time.

Discussions have been taking place about contracts, royalties, etc. hence final approval has been held up. I discussed the position with the Superintendent, R.S.A.F. on Friday last.

He proposes to manufacture the gun on the No.IV Mark I (Mark VI) Rifle plant. Our Vickers machine-gun layout and plant will, with the addition of a few special machines for the piston and other allied parts, be quite suitable for the production of the ZGB.

I also ascertained that the agreement between the ZGB people and the British Government grants a licence to the latter to manufacture in Great Britain only. Therefore it would appear that, before we can commence to manufacture in Australia, we shall have to enter into further negotiations.

On 13th September, the Military Board wrote to the Secretary, Munitions Supply Board, that it was considering the adoption of the Z.G.B. Gun, now known as the "Bren Gun", as a replacement for the Hotchkiss and Lewis Guns at <sup>that time</sup> ~~present~~ the established light machine-guns for the Australian Cavalry and Infantry, and requesting that the possibilities of its manufacture at the Small-Arms Factory should be investigated. The Military Board also mentioned the question of obtaining a licence to manufacture the gun in Australia. Incidentally, it was learned later that the cognomen "BREN" was built up by the British War Office from

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the initial letters "BR" from Brno, the town in Czecho-Slovakia where the Z.G.B. gun was designed, and "EN" from Enfield, the town in which the Royal Small-Arms Factory of England was situated. The Military Board stated 1,080 Bren Guns as the initial requirement, and that about half that quantity would be the war wastage. Another letter from Colonel Gipps, dated 18th September, arrived in October, in which he advised that the licence with the British Government permitted manufacture throughout the Empire and that Australia would be included in the licence and pay the same royalties as the United Kingdom. He said that there were over 60,000 drawings of components, tools, gauges, jigs, fixtures, now being checked at Enfield; that changes would have to be made to these before the Z.G.B. gun became a Bren gun; ~~and~~ that dimension figures would have to be changed from metric to inches; <sup>and</sup> there would be changes also in screw threads and other items. He said that the drawings being made at Enfield would cost about £30,000 and that we probably would be asked to bear some of that; ~~and~~ that probably it would take nine months to prepare the British drawings; <sup>and</sup> that the British gun would probably be in production in September 1937. This information was duly passed to the Military Board and it was asked that, in the event of some guns being ordered as samples, one should be reserved for the Small-Arms Factory as a pattern for guidance. On 10th October a wireless message was received from Colonel Gipps advising that there would be nothing useful for an Australian expert to see before September 1937 and that the royalty would be £3 per gun, plus extra for drawings. The Manager of the Small-Arms Factory, Mr. A.S. Ford, discussed the information received from Colonel Gipps with Mr. Leighton and myself on 22nd October, when the

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possibilities were gone over in the light of our experience in producing the Vickers Machine Gun (the only factory in the British Empire <sup>producing this gun</sup> during World War II was at Lithgow) and the conclusion reached was summarised by Mr. Ford in his memorandum of that date -

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The important necessity for the near future is to gain the exact knowledge referred to. In my opinion it will not be necessary for the Small-Arms Factory to await full details of manufacturing processes. The Lithgow methods of manufacture are quite different from those obtaining at the English factories and whatever happens, it will be necessary for Lithgow to work up its own methods of manufacture and the requisite tools and gauges. It was done in the case of the Vickers Guns, both land and air patterns, and the success achieved is well known. All that the factory requires would be drawings of the gun and a general idea of the plant required to produce it. If any special difficulties have been experienced in particular features, the information would be useful. With such knowledge our draftsmen and toolmakers could be quickly set to work on the design and manufacture of tools and gauges suited to our methods of manufacture. In my opinion all the information we require should be obtainable during a comparatively quick survey of the conditions obtaining in England and Czecho-Slovakia. An absence of about nine months from Australia should be ample time. If this visit could be taken about the middle of 1936 matters should be sufficiently advanced to gain the best possible information and the return to Australia would coincide with the date when the factory would be prepared to commence operations.

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A letter from Colonel Gipps dated 9th October is next to be recorded. He confirmed the wireless message noted above and disclosed that it was the SKODA Company which had produced the ZGB gun and that a copy of the agreement was being obtained. He suggested that -

The best course would be for the S.A.F. Lithgow to buy two or three guns through the War Office, strip them down and treat them as unsealed samples or patterns. The Manager could then decide what machines, jigs, fixtures, etc. he requires, prepare his layout plans, and process schedules, and even do a certain amount of tooling up. This would place him in a position to proceed to manufacture fairly soon after receipt of the drawings.

A procedure, it will be observed, which is what Mr. Ford had proposed in his memorandum above. Colonel Gipps also mentioned that the Z.G.B. guns proposed to be purchased from SKODA would cost about £129 each, but that -

Enfield, under mass production conditions, expects to make them for about £25 each (which it was understood was for the gun alone without equipment).

On 4th November, the above information was conveyed to the Military Board and the request for a sample gun was reiterated. In replying to this the Military Board said that two guns would be allotted to the Small-Arms Factory when the six ordered were received. On 19th December we cabled for copies of the original Z.G.B. drawings but the reply dated 16th January 1936 said they were not available; it will be obvious that our efforts to proceed were frustrated.

On 2nd March 1936 the Chief Inspector, having returned from England, presented a report saying that the new machine-gun was to be manufactured at the Royal Small-Arms Factory, Enfield, and that for the next few months a considerable amount of preliminary work would be undertaken: conversion of the drawings from Czecho-Slovakian to British measurements, selection of machines, determination of layout of plant, preparation of operation schedules, formulae for heat treatment of metals, etc., and that if the gun <sup>was</sup> to be manufactured in Australia, it would be advisable for an engineer of the Small-Arms Factory to arrive in England by the time these preliminaries were approaching completion so that he could watch the development of production. The beginning of September 1936 was suggested. A copy of this report was sent to the Military Board with an intimation that the Munitions Supply Board would be prepared to recommend the visit "provided Military Board policy regarding the Bren gun

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supports that stage", ~~and~~ That Board replied on 11th March.

"that the early production of the Bren gun in Australia is regarded as a matter of great importance. The proposal that a representative should visit England at an early date in order that production here may be hastened is, in the opinion of the Military Board, most desirable". Meanwhile the Minister for Defence (Hon. A. Parkhill) had enquired of Mr. Leighton the current position in regard to the Bren gun and he was suitably advised with reference particularly to the proposal to send a technical officer, ~~and~~ Mr. Parkhill approved of that action on 5th March. At the meeting of the Munitions Supply Board on 19th March 1936, the Chief Inspector's report was read, and the Chairman advised that Mr. A.S. Ford, Manager of the Small-Arms Factory should be detailed for the visit to England, that the proposal was duly approved by the Minister for Defence, and that Mr. Ford should leave Australia about the middle of July and return during July 1937. A further decision by the Munitions Supply Board, relative to the main question, was that during Mr. Ford's absence, the Acting Manager would be Mr. J.D. Statton, formerly Assistant Manager there and present Sub-Manager of the Ordnance Factory; that Mr. R.H. Doyle would be loaned from the Small-Arms Factory to be Assistant Manager at the Ordnance Factory; and Mr. J. Finlay, senior Assistant Manager at Lithgow, would carry on under his former leader: Mr. Statton. At a meeting on 18th June 1936, the arrangements for Mr. Ford's mission were approved by the Munitions Supply Board with the intention that he would sail on 7th July and arrive in London on 20th August 1936. His instructions included enquiry as to the practicability of importation of some Bren guns from England pending Australian manufacture; all possible information regarding manufacture in

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Australia and provision of materials; estimates of costs of installations; production; etc. ~~and~~ In addition he was asked to obtain information and advice according to questionnaires upon a variety of matters which had been compiled by establishments of the Munitions Supply Board.

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Reports began to come in from Mr. Ford soon after his arrival in England. The first to arrive was a personal letter, dated 28th September, to myself. It was marked confidential because it dwelt mostly upon the difficulties being experienced in the War Office establishments in getting the Z.G.B. design adapted to British design and manufacturing technique. There was no suggestion that the hindrances were insurmountable. He said, for example: "I have no doubt, however, that the programme will go through successfully, even if it is not up to time." But there was warning that we must not expect results too quickly; that probably delays would have to be faced. The official report was dated 1st October. It was an informative survey of the position in England and the effects that would have upon the requirements of Australia; that it was unlikely, for example, that quantity supplies of the guns <sup>now ordered</sup> ~~were not likely to be~~ available for Australia before 1941, ~~and~~ He expressed the opinion that routine production in England could not be expected before late 1937. Other interesting advices were -

They have a number of guns at Enfield, but not one which embodies all the improvements which will be incorporated in the final design. Slight changes are still taking place.

The Gun presents more manufacturing difficulties than I anticipated but I have no doubt, <sup>production of the Gun at</sup> ~~production of the Gun at~~ Lithgow, if the means of doing so are provided.

A considerable amount of the production was being "farmed out"; Tools and Gauges as well as important components.

The rifle-manufacturing plant at Enfield was being largely employed upon Bren Gun production.

As to manufacture in Australia, it would not be safe to assume that we could start producing in quantity within three to three and one-half years from the time the work is definitely started.

In January 1937, sufficient information had been received from Mr. Ford to enable me to prepare a statement for the Munitions Supply Board upon which the Minister for Defence could determine policy in respect of adoption or otherwise of the Bren Light Machine-Gun. We had been advised that the immediate requirement was -

7,590 Guns and Mountings  
13,992 Spare barrels

and that the Factory should be equipped to produce up to 2,500 guns and mountings annually plus a spare barrel for each gun produced. It was explained that there was no provision in the design of the gun for cooling the barrel under continuous firing; a spare barrel was included in the gun equipment so that when barrel No.1 became too heated it was removed from firing and thus cooled down, and No.2 barrel took its place. It was expected that a complete gun equipment manufactured in England would cost about £36 including royalty to produce and it was considered, judging by our success in manufacturing the Vickers Machine-Gun, that it should not cost any more in Australia, say £50 in Australian currency. On that price it was estimated that the requirement stated above, including the war wastage for one year, would cost £600,000. The estimated cost of a factory to produce at the rate of 2,500 equipments annually was -

	<u>£.</u>	<u>£.</u>
A three-storey factory building		75,000
Machine Tools	80,000	
Tools & manufacturing gauges	60,000	
Installation & accessory	<u>25,000</u>	165,000
Inspection Gauges - to be obtained from England		10,000

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The estimated annual maintenance  
of such factory would be -

	<u>£.</u>	<u>£.</u>
Out-of-pocket expenditure	10,000	
Interest & Depreciation	<u>29,000</u>	<u>39,000</u>

It was proposed that the capital expenditure should be spread over four years: 1937-38 to 1940-41, in approximately equal amounts, and that finished guns would appear in 1941 or earlier. In saying this it must be explained that the intention was to draw upon the existing resources of the Factory and not wait until the works contemplated under "capital expenditure" were completed. After reading the foregoing Report, the Minister referred it, as was customary, to the Defence Committee for consideration and recommendation. The views of the Military Board were sought by the Committee and I was asked also to comment upon considerations raised by the Military Board in regard to new figures of Army requirements. On 1st June I explained that our plans of 28th January 1937 were wide enough to include the further estimates of requirements, and on 3rd June the Defence Committee advised the Minister -

The Committee considered that the manufacture of the Bren Gun in Australia was a matter of great importance, and endorsed the estimate of Army requirements furnished by the Military Board as a basis upon which planning for production should be undertaken by the Munitions Supply Board.

In regard to the priority of expenditure for this purpose in relation to other Defence needs, the Committee was of the opinion that this aspect should be considered in conjunction with the proposals for further development under the new Defence Programme and the review of policy after the Imperial Conference.

The scheme was duly approved as part of the £750,000 included in the new Defence Development Programme as a contribution to local and Empire Defence in accordance with principles adopted by the Imperial Conference, and provision for a commencement

was made in the Votes for 1937-1938.

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During the remainder of his time in England Mr. Ford spent much of it in organising a steady flow to Australia of the drawings and specifications - 14,000 separate drawings were to be supplied, and it was arranged that one of each would be despatched direct to the Small-Arms Factory, and duplicates were to be sent to the Inspection Branch at Maribyrnong, Victoria. A typical report by Mr. Ford, dated 19th March 1937, indicates this was not so simple a matter as the bare statement suggests -

The question of spare parts and appurtenances for the Bren Gun has been taken up with the Chief Inspector of Small-Arms a great many times. The whole position with regard to these has been in a state of flux, but it now appears to be more or less stable.

The lists of the spare parts etc., it is hoped, will be available about 1st April 1937, and whilst the drawings of some may be available, it will be some time before the drawings of the remainder are ready.

It is understood that one spare barrel will be issued with each gun, but the maintenance issue would be another two barrels per gun. This will make a total of four barrels, complete with carrying handles, per gun.

I am informed that during the early stages of manufacture, Enfield will only supply the one spare barrel per gun.

A number of the appurtenances will be purchased from the Trade, and it is hoped that these can be indicated when the lists are sent to you.

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A letter dated 25th March, addressed to myself, contained his comments upon my memorandum of 28th January 1937, a copy of which I sent to him, after it was approved by the Munitions Supply Board as shown in the preceding paragraph of this narrative. He said -

I have gone carefully through the Minute (Agendum 1937/163) and must say you have covered the ground extremely well.



During the past few days I have been endeavouring to obtain the latest estimated cost of the Gun, Mounting and Appurtenances. They have promised me some figures for next week, but they, the Factory, will not be able to give me a complete statement, as they have not yet got the lists of the full equipment.

However he was able to give the following figures that were of interest to me; the bare Gun with one barrel was quoted at £31 sterling against my £50 Australian currency, and spare barrels were £3 sterling each. The Tripod Mounting, which I had not estimated was quoted at £10-10-0 sterling, but I did include the small Bipod mounting attached to the gun in my estimate without thinking of it as a separate item of equipment. He said that he thought the spare Barrel to be under-estimated and was making further enquiries about that but a revision could scarcely affect our costs. At the end of April a letter was received advising that Mr. Ford had secured a passage to Australia to arrive in Melbourne on 30th August, and that he hoped the majority of the drawings would be despatched before he left on 28th July.

In May 1937, a further letter from Mr. Ford dated 23rd April required consideration by the Munitions Supply Board. He reported that the Bren gun was coming into production there and he advised that a working Foreman should be sent to Enfield to obtain a practical knowledge of the processes as they were being tried out. Mr. Leighton considered that our most competent authority on tool and gauge production should also be sent, obviously he meant the Assistant Manager, Mr. J. Finlay. This was agreed, and that Mr. Finlay should be accompanied by Mr. W.J. Cargill, ~~at present~~ Foreman of the Toolroom, who was to be the Working Foreman requested by Mr. Ford <sup>to</sup> and train the skilled employees and operatives to actually manufacture the Gun.

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Action on this proposal was deferred pending a decision by the Government as to manufacture of the Bren Gun and its inclusion in the Expanded Development Programme and this was duly forthcoming as shown above. Thereupon the arrangements for Messrs Finlay and Cargill were formally approved in October 1937 and they sailed soon afterwards. In November Mr. Ford resumed duty at the Small-Arms Factory and Mr. Statton returned to the Ordnance Factory; This allowed of Mr. Doyle being relieved from duty there and his return to take Mr. Finlay's place at Lithgow. In September 1937 a Works Requisition for a three-storey building, estimated to cost £78,000, was considered by the Munitions Supply Board and recommended for Ministerial approval. It was explained to the Board that the proposed building would be an extension to the Machine-Gun building, and that nominally it would be applied to accommodation of the Toolroom plant now located in temporary structures built during World War I. ~~But that~~ there was a possibility, in the event of the Bren Gun scheme being approved, of a general re-arrangement of the Factory floor space, and that this particular building might then be used for accommodation of the Bren production plant. This latter of course is what actually took place, and provision was made later for the accommodation of the valuable Toolroom equipment.

During April-May 1938, we received letters from Mr. Finlay in England which resulted in a radical change in our proposals of January 1937 for the development of Bren Gun production. It had been intended that the Tools and Gauges, other than the Gauges for the Inspection Branch to be purchased in England, would be wholly made in Australia, mostly at the Small-Arms Factory, at a cost of £60,000. The primary consideration from the outset was that production of the gun would be attained in 1940 or there-

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abouts and with this in mind Mr. Finlay had been consulting the British authorities, notably the Superintendent of the Royal Small-Arms Factory and the Birmingham Small-Arms Factory. They were ~~made~~ fully informed as to the resources of our Small-Arms Factory and Australian manufacturing conditions generally, and there was the fact that Mr. Finlay personally was optimistic always as to what he could do with the men and machines in the Lithgow Toolroom. The conclusion was reached that it would be impracticable to achieve the objective unless a substantial portion of the Tools and Gauges were purchased in England and suggestions to that end were made. The matter was discussed fully with the Manager of the Small-Arms Factory (Mr. Ford), by the Controller-General of Munitions Supply (Mr. Brodrigg) and myself, having regard to a general desire on the part of all of us to have as much as possible done in Australia, and it was agreed -

- (a) The gauges for manufacturing, i.e.: one set each of working, examination, and factory inspection gauges to be ordered from England.
- (b) The English contractors for manufacture of Bren Gun components for the War Office to be asked to quote and supply duplicates of the tools, gauges and fixtures, they were using in their own factories.
- (c) Certain Machine Tools which are to be ordered from England are to be tooled up for performance of operations upon Bren components before they leave England.

These proposals would still leave a substantial amount of Tool and Gauge production to be undertaken in Australia, but nevertheless they should contribute materially to acceleration of manufacture of the complete weapon. It was noted in passing that upon present indications the Tool and Gauge equipment was now likely to cost £75,000 but the estimate for Machine Tools might be reduced. The foregoing proposals were accepted by the Board

and recommended to the Minister.

During October 1938, acting on advices received from Mr. Finlay, the Manager, Small-Arms Factory, submitted Indents Nos. 133 and 134 for Tools and Gauges to cost in all £122,890 which meant that the quotations being received in England were much in excess of local estimates for Australian manufacture. In view of the time factor they had to be accepted and more were to follow but personally I was not satisfied with the position: the quotation for Item (c) above amounted to £17,591 and it seemed to me too much having regard to my knowledge of the market price of the machine tools when supplied not tooled-up. In December my misgivings were intensified by the receipt from England of a tender for 574 Fixtures at £31,847 sterling, an average of £56 per fixture, which appeared to me to be excessive. A Fixture may be described as -

a portable construction of steel to be attached to machines for holding components whilst being shaped by a Milling Cutter on the machine. The Fixture is shaped internally so that the component may be held rigidly, always in the same place, and always so that the same exact cut is made in the component.

As the measurements of the component have to be accurate within perhaps one-thousandth of an inch, the Fixtures have to be built with the same accuracy by skilled tool-makers according to drawings supplied by the technical staff.

About 1,300 Fixtures were included in the Bren Gun manufacturing equipment, and the original intention was that about 100 could be undertaken by the Small-Arms Factory Toolroom, and the remainder would have to be brought from England owing to the lack of precision tool-making plants in Australia. Of the total, tenders were to be invited in England from firms specialising in the production of mass-production equipment, and one tender had already been accepted for 467 fixtures to cost £16,500 sterling, an

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average of £35 sterling each. Having regard to the exchange, and to my experience of manufacture of fixtures at the Small-Arms Factory, I considered the price to be rather high but the only course practicable was to accept the tender as recommended by the Manager of the Factory. This second tender, however, averaging £56 sterling per fixture, appeared to me to be excessive, notwithstanding that I was well aware that some fixtures could run into £A200 or £A300 each, but I felt the majority should be well below that; I thought £A50 would be a fair average. I discussed my thoughts on the matter with the Manager of the Small-Arms Factory (Mr. Ford) and found him somewhat in agreement with me as to excessive costs but hesitant in doing anything that might delay getting the gun into production. He was willing to strain the resources of the Factory Toolroom to the utmost, but he was doubtful where else in Australia fixtures of the kind could be made with the precision required. I was not sure either, but I was insistent that we should try and just then an extraordinarily opportune letter, dated December 6th, 1938, came into the Department. It was from Holden's Motor Body Builders of Woodville, South Australia, and signed by the Sales Manager, Mr. J.H. Horn -

We have read several press notices lately regarding the Defence Department's intention to manufacture the Bren Light Machine-Gun in Australia, and we feel that in this direction we may be able to help you. You have seen the equipment in our Engineering Department and have the knowledge of what we are able to do. This Department will be fairly slack from January to June next, and if we can help you in the manufacture of any tools for this Machine-Gun now would be the ideal time to tackle the job.

We gather from what we have read in the Press that the tooling for this job is one of the causes for the delay in getting under way with its manufacture, and, whilst there are probably tools that we could not produce, there must be quite a number of parts that would suit our equipment and general facilities.