

Chapter 2 - Establishment of Munitions Factories.

The Cordite Factory.

The last mention in this narrative of the possibility of manufacture of Cordite was in connection with a proposal jointly by the Colonial Ammunition Company and Nobel's Explosives Company, but it happened that this coincided with discussions proceeding departmentally with regard to a change of pattern in the Cordite, and consequently the latter Company was informed on 24th August 1903 "it was not proposed to enter into an agreement at present". However, Mr. C.M. Hake was requested on 12th February 1904 to furnish reports -

footnote  
see p 46  
MSB

Def 03/2217

How the stock of Cordite could be supplemented in the event of difficulty in obtaining supplies from England.

Def 04/1041  
04/2456

Upon the possibility of joint action with the Imperial Government in the manufacture of Cordite in Australia which could be supplied to the Royal Navy for its stations in Australia and the Far East.

and on 23rd March, Mr. Hake was further asked to report - as to the possibility of arrangements being made with the Australian Explosives and Chemical Company for supply of Cordite in the event of an emergency arising.

/1742  
04/2608  
/2609

Mr. Hake submitted comprehensive reports on these questions on 16th March and 5th May, the conclusions being that -

- (1) As the total requirements of the Commonwealth and New Zealand were only 80,000 lbs annually the economic aspects would not justify an Australian factory and it would have to be ascertained whether the Imperial Government would also place orders.
- (2) The existing resources of the Nobel Company's Deer Park factory could be adapted and extended for production of cordite if required under pressure of emergency, and probably it could be done with three months notice, but it would be an expensive business and he advised that it would be preferable to establish reserve stocks of imported cordite "sufficient to cover a reasonable period of isolation".

Def 04/2949  
/4003

The Explosives Company followed up (2) on 19th May 1904 with a detailed statement of the financial conditions upon which it was prepared to manufacture cordite according to the information supplied by Mr. Hake, but the departmental

decision conveyed to the Company was that "the Minister does not see his way to entertain a scheme involving such expenditure as proposed". With regard to (1), the Naval Commander-in-Chief of the Australian station was invited through the Governor-General to express an opinion as to whether there could be collaboration with the Royal Navy in regard to obtaining its requirements of cordite from an Australian factory, but while sympathy was indicated the matter had to be referred to the Admiralty, and also it was shown that there were practical difficulties in the way of working up the cordite into cartridges for Naval guns. Ultimately the enquiry came before the Imperial Colonial Defence Committee and it was there decided that even supposing the Royal Navy obtained all their requirements from an Australian factory, it would be only one-quarter of the minimum production of an economic unit.

Def 04/4332

On 10th January 1906, a name destined to be significant in the development of Defence policy in Australia appears in the papers for the first time: Thomas Baring, then a private member but soon to be Minister for Defence. In response to an enquiry regarding the manufacture of military explosives in Australia, Captain Collins advised him:

Def 06/379

Cordite is at present the whole question. As regards local manufacture - this has been gone into on several occasions .... It has never yet been shown that Cordite could be manufactured locally with our present consumption at less than double the cost at which we import. We can keep a large stock of cordite as it doesn't deteriorate.

This adequately epitomises the position at the time and there was little more to record for 1906 except that New Zealand was approached once more but without result; the Melbourne firm of Cuming Smith Pty. Ltd. offered to supply Nitric and Sulphuric Acids "in large quantities at a price cheaper than it would cost you to make" and also Acetone; and the Australian Explosives and Chemical Company continued to make offers. There were also consultations with Mr. Hake, and at the end of 1906 the Acting Secretary of the Department of Defence, Mr. S.A. Pethebridge,

Def 06/2641

Def 1872/2/7

Def 1872/1/3

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summarised the position to the effect that the Explosives Company had offered to enter into a contract for ten years to supply 25-30 tons Cordite at 3/4d per lb. (against the landed cost of imported cordite 2/8d per lb.). The cost of building a factory had been ascertained, £73,000, but Commonwealth requirements could be supplied by such a factory with two months working only in a year and thus the skilled staff would be idle for the remainder of the time. The attitude of New Zealand was that the six tons required annually could be obtained from England at a cheaper price. At the end of 1906, 1872/2/13 Captain Collins was in England, and he sent out further 1872/2/19 representations on behalf of the Nobel Explosives Company, and the National Explosives Company also wrote but it was merely additional propaganda.

1872/2/17 There was some more correspondence with the Australian Explosives and Chemical Company in February 1907, one item being protestations regarding an article in a Melbourne newspaper whereby the impression given could have been that the Nobel Dynamite Trust Company was foreign controlled. However, the newspaper in question afforded the Company opportunities of presenting the facts, and these were made available also to the Minister. It was shown that although there were foreign associations and these had representation on the Board of the Trust, the financial control was actually in the hands of the Nobel Explosives Company of Glasgow, which in fact also owned the controlling interest in the Australian Explosives and Chemical Company. Actually, according to an article in the London "Financial News", it would appear that the German shareholders were resentful of the English control in that large profits were in the hands of the continental affiliates but were being withheld from distribution by the English Directors and placed in Reserves. It is well-known of course that Imperial Chemical Industries Limited are the present owners of the former Nobel Explosives Company and its subsidiaries.

In January 1907, the Hon. Mrs. Ewing, became Minister for Defence, and under his administration there was a general forward move in Defence Policy; the institution of compulsory military training was being discussed, and there was a revival of interest in the local production of rifles and their ammunition; the ultimate result being the establishment of a Defence Laboratory, and the establishment of Cordite and Rifle factories. Mr. Ewing was an experienced politician, I cannot recollect any member of Parliament who attended more assiduously to the affairs of his constituent, and he proved also to be an able administrator, gifted with initiative, and quick in acquiring knowledge and making decisions. The Commonwealth was fortunate also in the departmental Head: Mr. S.A. Pethebridge, who had succeeded to the position on the transfer of Captain Collins to be Official Secretary of the Commonwealth representation in London. Mr. Pethebridge too was favoured to a high degree with administrative ability, and in addition he had a capacity for leadership, not so much made manifest by his own actions, but proved notwithstanding by the trust placed in him by the very able Minister, and by the readiness with which it was accepted by the Chiefs of the Naval and Military Services - a marked contrast to the conditions obtaining previously.

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In February of 1907, Mr. Pethebridge prepared a review of the proposals of the A.S.C. Coy, as set out in their letters of 7th July 1906 and 14th February 1907, for the information of the Minister, no doubt in view of the interest he had taken in the matter some twelve months previously, and Mr. Hake was asked to favour the Minister with his remarks generally and more particularly on the points: (1) Practicality; (2) Price and (3) Whether there was any other factory in Australia capable of making Cordite. Mr. Hake exhaustively examined the economics of the proposal with particular reference

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to the current market prices of the constituent materials and the trend of their fluctuations, and his advice was unfavourable; without going into too much detail, one paragraph of his memorandum read -

I cannot suggest any advantages which would appear to compensate for this excess of expenditure. The Company propose in their offer that, at ruling prices, the Government should enable them to pocket from £9,000 to £10,000 per annum profit, they on their part undertaking to supply the Government with 40 tons of Cordite per annum, 37 per cent of the composition of which (Gun Cotton) is to be imported from Great Britain by the Company.

1872/4/-  
S.A.F. File

Engineer-Commander Clarkson, R.A.M., who was frequently consulted by the Minister in regard to technical matters, also presented a memorandum (9th February) relative to the proposed Cordite factory, but he dealt mainly with the question of availability of raw materials, a mention that raw cotton was being grown in Queensland is the only item of interest here, but the following paragraph has some originality -

If cordite can only be manufactured satisfactorily in certain definite minimum quantities, and if the minimum quantity is more than is required for defence purposes, then I am of opinion that it would be better, and probably cheaper, to manufacture this minimum quantity and destroy the surplus, than not to manufacture at all and import the requirements.

1872/2/21  
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The Minister then prepared a Minute, on 4th March, probably for submission to Cabinet, stating that in case of emergency it would be essential that Cordite should be made or stored in Australia, and that questions had arisen -

1. At present the cost of manufacture by a private firm appears for financial reasons to be expensive and probably unsatisfactory.
2. There have been two explosions - one in India and one at Woolwich in connection with Cordite - and this raises a doubt as to the wisdom of storing large quantities.
3. It is not absolutely sure that there will not be a substitution of some other explosive for Cordite.

and he recommended that Mr. Hake should visit England and enquire into them.

1872/2/22  
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with the concurrence of the State Government, Mr. Hake sailed for England on 23rd April 1907; his instructions being to obtain all information possible relative to the manufacture of cordite, including capital expenditure and

operating costs, the provision of constituent materials, the question of retention of cordite as a Service explosive, and problems of storage and reliability. He was asked also to enquire into other matters which are referred to elsewhere as being transferred to Engineer-Commander Clarkson.

footnote

Soon after his arrival in England, Mr. Hake sent out preliminary advices that there was no intention of Cordite being superseded, but investigations had shown it has a liability to decompose in hot climates, such as India, a subject which is dealt with in a subsequent paragraph. He also advised that he was making progress in the details of Cordite manufacture the planning of which would be designed for 50 tons per annum. In this he had the assistance of Mr. Marcus Bell, a chemist who was visiting England at his own expense to gain experience that would qualify him for appointment ultimately as an explosives expert. On 17th August, Mr. Hake cabled that the cost of a factory would be £65,000, and the cost of production, including 7½ per cent for depreciation, of 50 tons annually of Mark 1 Cordite (the existing type) would be 37d per lb. and of the new 4D type 39d per lb. Meanwhile the Senior Ordnance Officer advised that the most recent landed cost was 2½d per lb. for Mark 1 cordite, and a recently arrived letter from Kynoch's Limited of England contained an offer to set up a factory and supply Mark 1 type at 33d per lb.

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1872/2/46

On 18th October 1907, on his return from England, Mr. Hake submitted his report. It was said that Cordite was not likely to be displaced within the next 8 or 10 years, and that if another explosive were developed there would be practically no difference in the machinery required for manufacture. The cost of a complete factory capable of making 50 tons annually on one shift would be £65,000, and the cost of production would be 37d per lb. for 50 tons annually and 29d per lb for 100 tons annually. The present Australian requirement was 38 tons annually. It was contemplated that all the constituent parts would be manufactured in the factory; it was considered to be

unwise any portion should be purchased from another manufacturer; that there should be no division of responsibility and that there would be no advantage in price. There was a choice practically of only two methods for manufacture of gun-cotton and nitro-glycerine respectively: (i) the older method still in use in many private factories in Britain and the Continent, and (ii) the process invented at and introduced into the Royal Gunpowder factory at Waltham Abbey under the superintendence of Sir Frederick Nathan (this meant that the most modern method of the time was being instituted at Maribyrnong). The supervision and control, and the safety measures were very much superior at Waltham Abbey as compared with private concerns. A site for the factory that would be convenient to the Ammunition factory was recommended and it was estimated that the buildings would cost about £25,000; an extensive range of buildings being necessary owing to subdivision of the various processes of manufacture. The required area of land would be 22 acres but 50 acres would be desirable to allow of possible expansion. As to management, Mr. Make at first had in mind a graduate of Melbourne University at the time working in England in explosives production, but unfortunately this gentleman had suffered injuries in an explosion, and now he was considering a Mr. A. E. Leighton, C.M.G., F.R.I.C., F.I.A.C.I., M.I. Chem. E.; Officer of the Department of Military Supply, Government of India 1903-1909; was Assistant Manager, Government Cordite Factory, Arivankadu, India, on resignation 1909; invited accept appointment as Manager, Government Cordite Factory, Australia, 1909-1916; General Manager, Australian Arsenal 1916-1922; Controller-General of Munitions Supply, Australia, 1922-1937; retired 1937 but invited resume the position May 1938-June 1939; Consultant on Explosives, Ministry of Munitions 1940-1946; Consultative Member, Board of Factory Administration 1946-1950. Also held appointments: Technical Adviser on Explosives Supply in British Ministry of

who was in England during his own visit, for consultation in connection with investigations into spontaneous explosions of Cordite in India. The authorities in England had been favourably impressed by Mr. Leighton, and after several meetings with him, Mr. Hake had formed the same opinion. On his return to Australia he had sought the Minister's approval to sound Mr. Leighton as to the Australian appointment, with the result that the Minister marked the papers "Leave choice to Mr. Hake - Govt. to approve".

Acquisition of Site.

On 20th February 1908, Mr. Rwing issued a memorandum in his own handwriting -

Site for manufacture of Cordite.

Location:	Fronting Saltwater River, Maribyrnong.	
Area:	256 acres	
Costs:	by valuation obtained by £20 to £30 per acre Sec. Home Affairs	
Costs:	say	£6,380
	Mr. Hake - Military Board -	Inspector-General
	Director Naval Forces	Approve.

(sgd) Th. E.  
20/2/1908

It is not known whether this was after consultation in Cabinet; in those days, according to the time-honoured practice there were no records of the proceedings of Cabinet, but it is most likely that such a decision would have been agreed to in Cabinet.

On 27th February, Mr. Pethebridge submitted another Minute to the Minister setting out first the salient points of Mr. Hake's October report and then he went on to say that "since Mr. Hake's return a much more favourable proposal has been received from the Australian Explosives Company for the manufacture of cordite" and then giving the details of a proposal dated 13th January 1908 addressed to Mr. Hake. Mr. Hake went through this proposal in detail without strongly expressing opinions one way or the other, except that he wound up by saying -



whatever difference of opinion there may be as to cost of erection of a factory (and in the absence of any details it is impossible to express an opinion on the Company's estimates) there is no doubt that the cost of production by Government would be less than the cost of production by the Company, plus profits.

Mr. Pethebridge traversed the Company's proposal and Mr. Hake's comments upon it, and then went on to suggest that the land selected should be secured at once; also that the plant and machinery should be ordered immediately. He further proposed that Mr. Hake should be appointed as a Commonwealth officer to supervise the establishment of the factory and to be Inspector of Cordite as previously suggested; and further that Mr. Marcus Bell should be his assistant, with the intention that ultimately he in turn would be appointed as Inspector of Cordite. Continuing, his comments upon Mr. Hake's report, Mr. Pethebridge said -

Appoint a Manager of Factory at once. Mr. Hake considers the most eligible candidate is a Mr. Leighton, at present assistant manager of the Government Cordite Factory in India. .... If appointed Mr. Leighton would proceed to Melbourne from India to consult with Mr. Hake and then go to England to assist in connection with general arrangements of Factory and selection of Machinery in consultation with the War Office authorities.

By "War Office Authorities", Mr. Hake had in mind Sir Frederick Nathan, Superintendent of the Royal Gunpowder Factory at Waltham Abbey. This gentleman had been of great assistance to Mr. Hake during the visit of 1907; in fact some of his own manufacturing processes (for which he had been recompensed by the British and Australian Governments) were to be used in the Australian factory, and Mr. Leighton was to consult with him in that connection.

With the passing by Parliament of the Appropriation Act 1907-1908 in which provision had been made for acquisition of land and purchase of plant and machinery for the Cordite Factory, a memorandum was issued on 12th June 1908, over the Minister's signature, that -

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(1) As soon as he could be released by the State Government of Victoria, Mr. Hake would be appointed to the Commonwealth Service at salary of 1800 per annum. His duties were to include the initiation supervision of the establishment of the Cordite Factory and that he would also be responsible for the inspection and testing of cordite and for advice on its preservation, supply and storage throughout the Commonwealth.

(2) Mr. Marcus Bell would be appointed as assistant to Mr. Hake with the understanding that ultimately he would succeed him in the capacity of Inspector of Cordite. Salary to be £200 while assistant, £450 as Inspector of Cordite and to receive increments to a maximum of £800 per annum.

(3) Mr. Leighton to be appointed as Manager of the Cordite Factory on a five years engagement with option of renewal. Salary to be £1000 per annum plus residence rent free. Mr. Leighton to come to Australia, as soon as he could obtain his release from the Indian Government as Assistant Manager of the Aruvankadu Cordite Factory, for consultation with Mr. Hake and then go to England to work in conjunction with the War Office authorities on design, etc.

1872/2/114

Immediate steps were taken to give effect to these instructions: during the same month, negotiations were opened for acquisition of the selected land at Maribyrnong, and on 20th June the Department of Home Affairs advised that 137½ acres belonging to the State Government had been purchased at £30 per acre; that the owners of the remaining 127½ acres - the area known as the Maribyrnong Racecourse - were asking the sum of £10,000, but the valuations did not support that price and compulsory acquisition was being considered. The Minister for Defence concurred in this and subsequently it was notified in the Commonwealth Gazette that the Governor-General in Council had approved of the acquisition - 255 acres 2 roods in all - to date from 4th July 1908.

1872/2/117

The staff appointments involved the transfer of Messrs Hake and Bell from the Victorian State Service to the Department of Defence: Mr. Hake as Chemical Adviser, and Mr. Bell as Assistant to the Chemical Adviser; and Mr. A. L. Leighton signed an agreement, in India, dated 4th August 1908, for a five years engagement as Manager of the Commonwealth Cordite Factory. This was confirmed by notification in the Commonwealth Gazette of 29th May 1909 of an Order signed by the Governor-General in Council. It will be convenient to mention here also that Mr. W. K. S. Brodrigg, C.B.E., F.F.I.C., A.F.A.C.I., Chemist, Victorian Government Laboratories 1903-1909; Chemist, Commonwealth Government Cordite Factory 1909-1912, Assistant Manager 1912-1915; Manager 1915-1918; Chief Chemical Engineer, Department of Defence,

1910-1937; Controller-General of Ordnance 1937-1940. He also held appointments: Inspector-General of Ordnance 1938-1939; Assistant Director-General of Ordnance 1940-1944; Chairman, Principal Supply Officers Committee 1937-1940; Chairman, Munitions Supply Board and its successors: Board of Factory Administration 1937-1950; Chairman, Board of Aircraft Factory Administration 1946-1950; Chairman Australian Shipbuilding Board 1943-1945; Chairman Australian Aluminium Production Commission 1953. Chief Chemical Assistant in the office of the Chief Inspector of Explosives, Victoria, was appointed on 4th October, 1909, to be Chemist in the Corio Factory.

1872/2/186

1872/2/171

Mr. Leighton took up duty in Melbourne on 17th February 1909 and the early months were employed in preparation of a contour plan of the land and study of its possibilities for layout of the various buildings and works necessary in an explosives factory, particularly having regard to its proximity to a suburban area, partly settled then but now thickly populated. The configuration of the land contributed materially to the satisfactory layout from the aspect of safety, and the fact that at this time of writing, nearly fifty years later, despite the spread of the population in the district, it is still a "safe" area, is a tribute to the original planning. The buildings and works had then to be designed in conjunction with the architects of the Commonwealth Works branch; Mr. Leighton having meanwhile drawn up a system of manufacture, based upon the pre-determined output and the staff to be employed, upon which the chemical processes and plant were worked up. Lists of manufacturing plant were also prepared; water supply and power, heating and lifting services had to be provided for; and investigations were made as to procurement in Australia of raw materials and the supplies for factory maintenance.

1872/2/205

Everything thus being set in train for local construction of the buildings and works, it was decided in December 1909 that Mr. Leighton should visit England to check up there on the latest processes in manufacturing and storage

1872/2/221

of cordite, and to arrange for the purchases thereof of the machinery and plant. He was also instructed to visit the Indian Cordite Factory en route for check of the climatic conditions there in relation to manufacture and storage of cordite seeing that they would be more comparable with Australian conditions than would be the case with the English factories. He was also to place orders through the High Commissioner's office for the raw materials and supplies which had to be obtained from abroad, particularly Cotton Waste, Mineral Jelly, Glycerine and Acetone; it was expected that the last two would be obtainable ultimately in Australia but it was considered desirable that for the initial operations all the raw materials should be imported. Mr. Leighton was also to engage a Foreman experienced in all the details of Cordite manufacture, and it can be said here that while the

1872/6/16

selection of Mr. E.G. Monk, of the Waltham Abbey factory, for the position, contributed greatly to the success of the Australian factory, it also had far reaching importance for this country; his then ten year old son is now Mr. Albert Monk, Chairman of the Australian Congress of Trades Unions.

1872/2/225

Mr. Leighton embarked upon his tour on 1st February 1910, and he was followed in March by Mr. H.K.S. Brodrigg with instructions to undertake a complete course of training in the processes of manufacture of cordite.

1872/6/22

1872/2/25\*

A matter of minor importance which should be recorded can be interpolated here. In January 1910, in response to enquiries, the Premier of Victoria was advised that the Commonwealth would have no objection to giving an easement over a strip of the factory land to enable the Municipality of Braybrook to construct a public road (now known as Commonwealth Avenue) provided that the proposed road would be to plans approved by the Commonwealth, and that the Municipality would maintain it for all time to the satisfaction of the Commonwealth.

1872/2/308a

Subsequently, following upon further representations by the

State Government, it was agreed that a strip of land 50 feet wide would be transferred to the State permanently, and that another strip of land 16 feet wide would be made available for purposes of a road but the ownership of that would be retained by the Commonwealth, subject to a further reservation by the Commonwealth that a short strip of the roadway thus provided, at the bridge over the Maribyrnong River, would remain the property of the Commonwealth but would be available to the State for the purposes of the road, by way of an easement. Another question which arose in respect of the property was in February 1912; the Army was granted a loan of the stable buildings standing on the Cordite Factory land at the Eastern boundary on conditions whereby the factory could resume possession at any time.

1872/2/599

During 1910 the construction of the factory was carried on actively under the supervision of Mr. Hake by the Department of Home Affairs, Works branch, and when Mr. Leighton arrived back in Australia during November 1910, he found the works well advanced and in position to receive the Machinery now coming to hand. On 23rd December 1910, Mr. Hake presented a memorandum to the Minister (Senator G.F. Pearce) -

1872/2/18

As the Government Cordite Factory is now within a few months of being completed and in view of my early retirement from the Service I would ask to be relieved of my charge in connection with the installation of the factory.

Actually, there was a little more to the matter than might appear from the wording of Mr. Hake's memorandum. Without intending in any way to minimize the great services rendered over the years by Mr. Hake, the facts are that whereas Mr. Leighton was an experienced Chemical Engineer and Factory Manager, Mr. Hake, although a notable figure in the Chemistry profession, did not have Mr. Leighton's practical experience, and once the latter had returned from England, there was no field for two "Captains" to be in charge of the construction of the factory. Mr. Hake therefore gracefully relinquished his responsibilities in connection with the factory and left the field solely to Mr. Leighton. The Minister minted the paper.

1872/2/418

In receiving this memo I desire to place on record my appreciation of the exceedingly valuable assistance that Mr. Hake has rendered from time to time in connection with the cordite factory and the thoroughness of his work.

Mr. Leighton to be informed of Mr. Hake's memo. and to carry on.

The second paragraph obviously is significant.

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On 31st January 1911, Mr. Hake presented another memorandum to the Minister -

Referring to the agreement under which I was appointed to the Permanent Staff (Memo dated 13th June 1908) I would submit that the Special duties I undertook to perform under this agreement have now been fulfilled and would ask that my resignation be accepted as from the 31st of March next.

This also was suitably acknowledged by Senator Pearce and thus ended an association between Mr. Hake and the Department of Defence which extended back to 1896. During these 15 years, Mr. Hake rendered notable service as adviser on a variety of technical matters, of which outstanding was his work in bringing to maturity the plan for manufacture of Cordite in Australia. When he retired he had already relinquished to Mr. A.B. Leighton the direction of construction of the Cordite factory, and now Mr. Marcus Bell succeeded him in the position of Chemical Adviser to the Department of Defence.

#### Commencement of Factory Operations.

For the next twelve months or so Mr. Leighton's time was fully employed in carrying through the buildings and works to completion, in the installation of machinery and plant, and in arranging for an inflow of raw materials and supplies, in which he was ably assisted by his second in charges Mr. M.K.S. Brodribb, until there came an auspicious day 24th May 1912;

1872/2/600

Mr. Leighton addressed the Secretary of the Department -

I am prepared to receive an order to manufacture Cordite, and would suggest that the first order be "Cordite, Mark 1, size 3 1/2, for Cordite Factory experimental and proof work - 1 ton.

If I receive the order to manufacture by the 27th instant, Cordite can be made during the week ending June 15th.

The order was duly issued and next the records show that

Head of Cordite Section.

Thu. 30th May	Start drying guncotton.
3rd June	Keep stove on two shifts daily until, say 3rd June.
5th June	M.G. First charge. (Nitro-Glycerine).
6th June	Incorporation of Paste.
7th June	Cordite.

The last date meant of course that the mixture was to be pressed into cords and reeled on to the drums; it became Cordite, Mark I, size 3 $\frac{1}{4}$ . On 4th June, Mr. Leighton issued another factory memorandum -

I.e. Cordite Factory will operate under full danger conditions from the morning of 4th June 1912.

This meant that the prescribed safety measures would be strictly enforced throughout the factory from the date stated. The following telegram, dated 7th June 1912, was addressed to Mr. Pethbridge in Sydney, from the Defence Department -

Leighton reports actual Cordite turned out this morning. Everything satisfactory.

872/2/605

872/2/1612

Next came the question of proof, and on 19th June Mr. Leighton drew attention to this and suggested a procedure somewhat similar to the arrangements for the Indian Cordite Factory. This was referred by the Minister to a departmental committee consisting of the Secretary of the Department, the Chief of Ordnance (head of the Army branch concerned), the Manager of the Cordite Factory, and the Chemical Adviser (Mr. Bell). On 8th August the Manager reported that the first two lots of Cordite, about 2 $\frac{1}{2}$  tons, were ready for proof, and on 30th August he supplied the results of specification tests and firing proofs upon which they were accepted for manufacture into small arms ammunition. A point interesting to the lay reader in this connection will be that one item of the firing proof test prescribes that cartridges made up from a new lot of cordite must be fired in comparison with "standard" cartridges specially selected for the purpose, with particular attention given to

1872/2/643

1872/2/648

The

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branch and some were made available for study of the new batches of cordite. Meanwhile the departmental committee having duly reported upon the procedure to be observed for proof of cordite, the Minister approved on 10th September 1912. It only remains to add that for the third quarter of 1912 the delivery of cordite from the factory was 10,123 lbs. and for the fourth quarter 30,059 lbs. evidence that the designed productive capacity had been attained. As a consequence of this the factory management had to be strengthened by the appointment of an Assistant Manager. Mr. W.K.S. Brodrigg was promoted to the position after consideration of the qualifications of ten other applicants; it was an auspicious occasion for Australian Defence having regard to the part he took subsequently in the development of Munitions Production in Australia. Mr. Brodrigg was succeeded in the duties of Chemist to the Cordite Factory by Mr. A.A. Topp, O.B.E., Assoc. W.M.C. (Met.); A.R.I.C.; F.R.A.C.I.; A.M. Aust. I.M.M.; Chemist with Mt. Lyell Mining Co., Victoria, and Chillagoe Mining & Railway Co. of Queensland, 1906-1908; Analyst, Victorian Mines Dept. 1908-1910; Assayer, Cassilis Gold Mining Co., Victoria 1910-1911; Chemist, Government Cordite Australia, 1911, promoted Assistant Manager 1915; Works Manager, Government Explosives Factory 1926; Assistant Director of Explosives Supply, Ministry of Munitions 1940-1944; Director of Explosives Supply 1944; General Manager of all Government Explosives factories 1947. Retired 1951. Also had appointments: Investigation of High Explosives manufacture and Gun Ammunition production in England 1916-1918 and had charge building factories for same; Member of Board of Administration of Government Factories; Deputy Member Australian Aluminium Production Commission; Chairman various Departmental Technical Committees who had joined the factory staff in 1911; he also rendered notable service in explosives production, and to the Chemical industry of Australia up to the time of his retirement in 1951.

1872/6/206  
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1877/6/246

The Manager's first annual Report, as of 30th June

1912 recorded that the works construction had been completed



branch and some were made available for study of the new batches of cordite. Meanwhile the departmental committee having duly reported upon the procedure to be observed for proof of cordite, the Minister approved on 10th September 1912. It only remains to add that for the third quarter of 1912 the delivery of cordite from the factory was 10,123 lbs. and for the fourth quarter 30,059 lbs. evidence that the designed productive capacity had

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Having a further to the fact that the production of cordite is a process which involves the use of a large number of machines and the employment of a large number of skilled workmen.

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according to schedule and that the first sample of Cordite was pressed on 7th June 1912; that the plant was operating satisfactorily, and that he expected it to quickly reach its rated out-turn. 256 acres of land had been acquired, the site of the former Maribyrnong racecourse, at cost of £6,932. 9. 7.; a large area being necessary always in the case of an explosive factory for provision of a safety zone. The suitability of this particular site was enhanced extraordinarily by the fact that on three sides it is bounded by the Maribyrnong River and on the fourth side by a large area occupied by the Government Ordnance Factory. The Manager reported that he had arranged with the Army Authorities that their adjacent Remount Depot would utilise some 200 acres of the safety area for grazing horses so that not even that land was being left idle. The expenditure to date upon factory buildings, machinery and plant, and services amounted £75,606. 2. 4d. and altogether £112,561.17. 0. had been made available by the Treasury to the factory. The employees of 30th June 1912 numbered 47, and in this connection an interesting feature was the appointment of a medical officer in 1911 to be continuously associated with the factory on a retaining fee with right of private practice. It was an innovation according to the commercial practice of those days, but in explosives factories there is always a liability to accident and provision for prompt medical attention and advice are a mark of good management. Applications were invited from medical practitioners residing within reasonable distance from the factory and the terms offered were -

- (a) a fee of 21/- for each visit to the factory with provision that should there be more than one case requiring medical attention, a further 10/6 would be paid for each such case;

The medical officer would be required also to -

- (b) medically examine applicants for employment in the factory;
- (c) medically examine staff and employees as required;
- (d) report on sanitary matters as required;
- (e) conduct an annual course of first aid instruction.

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the applicants were asked to state the retainer fee required inclusive of the services indicated as (b), (c), (d) and (e) above. Ten applications were received, and after consultation by the Manager with the Director-General of Army Medical Services (Surgeon-General W.D.C. Williams) Dr. H.J. Cahill of Flemington was invited to accept the appointment as from 1st August 1911; the retainer fee suggested being £52 per annum. It was a satisfactory arrangement and Dr. Cahill became an effective member of the managerial organisation; he served capably until 1st September 1932, after which the service was taken over by the Commonwealth Medical Officer.

In his Report for the ensuing twelve months - which incidentally was delivered on 1st July 1913, the day after the year 1912-1913 expired; an achievement which I had never known to happen previously by any organisation - the Manager disclosed that the tonnage per forty-eight hour per week, for which the factory had been designed, had been exceeded, and that of all the Cordite submitted for proof only 49 lbs. had been rejected. Ballistics of course, the science of projectiles, calls for exactitude to the uttermost degree, and therefore the chemical processes involved in the manufacture of cordite require laboratory control in every step taken, in the quality of the materials employed and in the tests applied to the several constituents during their manufacture; it will be of interest therefore to note that during the twelve months, the laboratory staff carried out 1307 separate analyses and tests. Another absolute necessity in carrying on the manufacture of explosives arises from the fact that unless precautionary measures are taken right from the outset - when the factories are being designed - it can be a dangerous occupation for anybody to follow, and there can be serious damage to property not only in the works concerned but also to buildings in the vicinity. The experts in explosives manufacture have acquired by experience the knowledge whereby accidents may be avoided and from the

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in promoting "operational safety", step by step as the operations of manufacture were taken in hand he issued memoranda describing every move to be taken by the operators and by the chemists and foremen supervising them, and what they were to do too when the operation was finished by way of cleaning up; they were also told what to do should something unforeseen happen. The result was that accidents involving danger or serious damage were practically unknown over many years, and if an odd "blow" did take place it was confined to a very limited area with small effect upon worker or property. Another impressive feature of this success in obtaining safety in working was the confidence it engendered in all the people employed in the explosives factories; there was never any difficulty in labour supply and never any reluctance on the part of individuals in taking up an allotted duty. In April of 1913, by which time manufacture generally had become established, all the memoranda and instructions upon specific matters and procedures which had been issued from time to time were consolidated into a book of General Rules and approved by the Minister of Defence; this had the effect in law of making them as binding as the Regulations under the Defence Act and recognisable by the Courts. It was also mentioned in the Report of 30th June 1913 that a Committee appointed by the Minister for Defence during the year had considered and reported upon questions relating to the manufacture of the Cordite used in field artillery and fortress guns, a matter which I shall refer to in a later chapter.

footnote

For 1913-1914, the factory continued to give good results; as a result of minor additions and rounding off of plant the production was increased by nearly 60 per cent over 1912-1913 notwithstanding that on 30th June 1914 the employees numbered 84 persons against the 78 of 30th June 1913, both excluding the eight of managerial and office staff. Incidentally the average weekly wage of adult employees on 30th June 1914 was £2.19.9d. This excellent increase of out-turn was reflected in the costs

of production, which dropped from 5/2d per lb. in 1913 to 3/8d in 1914 - no great increase upon the costs of landing cordite from England. The factory was now a going concern, regularly and unevenly producing the required output, apart from the tidying up of loose ends and the smoothing out of rough edges to be expected in all new enterprises. One of these was to arrange for regular supplies of the chemical products necessary for the designed production, the annual requirement of which happened to be: 600 tons Sulphuric Acid, 176 tons of Nitrate of Soda, 2 tons Soda Ash, 24 tons Glycerine, and 21 tons Acetone. Glycerine of Australian manufacture had been arranged some time previously, but Acetone was always a problem according to the report under reference; Mr. Leighton said -

Strong representations have been made to London in favour of Canadian acetone and shipment in British ships. Hitherto this essential store has been shipped in German bottoms.

An Australian concern was offering locally produced Acetone at the time but the price was £162 per ton, against 180 per ton landed for the imported chemical, and this made the position very difficult having regard to the effects of a high price for the Australian acetone upon the costs of production. However it will be shown later that the problem of Acetone was duly solved, and meanwhile it will be obvious that the Cordite Factory was in good condition to meet the shock of war, all unknown as the possibility was on 30th June 1914 although it was facing us only five weeks later. An episode of considerable interest in the light of these after events was that on 12th March 1914 General Sir Ian Hamilton visited the factory; who could have imagined that only 13½ months later, the cordite being made at that factory would be fired on Gallipoli under the command of the distinguished visitor.