

WASC 1881

Extracts from  
'The Royal Arsenal'  
OUP

re Wm Congreve  
Royal Laboratory  
W/ARM

OOD

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3, p. 163.

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17 December 1787.

## THE WARREN 1776-1800

Mrs Catherine Hallifax, coal merchant, signified on 27 May 1788 that she was willing to rent the wharf, late in the possession of Mr Knap, for £20 per annum and the tenement adjoining for £8 per annum. She agreed to have the house and wharf repaired for £23. 6s. 2d. and rent the premises.<sup>178</sup> Danger of fire, however, still exercised the mind of authority, so on 5 January 1789 the Master-General approved of the five old houses adjacent to the wharf rented by Mrs Hallifax being razed to the ground and the space they covered being added to that of the wharf. He considered, however, that Mrs Hallifax should pay more rent than she proposed, i.e. the rent for only two houses.<sup>179</sup> Mrs Hallifax was conciliatory and proposed that she could pay £31 per annum rent for the old houses scheduled for destruction, a proposition which was accepted.<sup>180</sup> Regarding the houses in Warren Lane, which being close to the Royal Laboratory constituted a serious fire risk, the Master-General intended that they should be demolished and the boundary wall of the Warren made good in their place as soon as they became Ordnance property and the tenants could be evicted; and that such houses as could not for the moment be pulled down should remain empty. The Master-General understood that one of the houses in question which had been built some time previously by the Office of Ordnance, was inhabited by Mrs Sumpter, the widow of one who had been employed in the Warren. This woman being addicted to liquor had on several occasions created an alarm of fire, and as she was thought to be insane she was considered to be a most improper person to inhabit a dwelling so close to the Royal Laboratory. The Master-General therefore desired the Board to give orders for her removal and at the same time to instruct the storekeeper to bribe her with two or three guineas to leave the house quietly and consent to being transferred to the workhouse, where her friends wanted her to be placed.<sup>181</sup> Apparently the storekeeper was successful in his delicate mission. The Respective Officers reported on 20 February 1789 that Mrs Sumpter had left the premises in Warren Lane, having accepted the storekeeper's three guineas.<sup>182</sup>

On 27 May 1789, Major William Congreve was appointed Comptroller, Royal Laboratory vice Colonel Thomas Jones resigned.<sup>183</sup> Besides being in charge at the Warren his appointment gave him certain jurisdiction over the powder factories at Waltham Abbey and Faversham.

After a period of three years during which no master founder was appointed, the Board suppressed the post with effect from 1 January

<sup>178</sup> Ordnance Journal Book, PRO/WO/47/111, p. 817.

<sup>179</sup> Ordnance Journal Book, PRO/WO/47/113, p. 19.

<sup>180</sup> Ordnance Journal Book, PRO/WO/47/113, p. 89, 16 January 1789.

<sup>181</sup> Ordnance Journal Book, PRO/WO/47/113, p. 19, 5 January 1789.

<sup>182</sup> Ordnance Journal Book, PRO/WO/47/113, p. 373.

<sup>183</sup> Ordnance Journal Book, PRO/WO/47/113, p. 826.

1789 by their order dated 11 January 1789. John King being placed in charge in the capacity of foreman. His younger brother Henry wanted to receive the same emoluments as his elder brother but was told by the Board that they could not both be put on the same footing as one man alone could be in charge. To soften the blow he was granted an additional shilling a day.<sup>184</sup>

'Be civil to all' wrote Benjamin Franklin in 1756 and this advice certainly paid Mr Samuel Harden, farmer at Woolwich. It is the prerogative of farmers to grumble but not so the worthy Samuel. He had his land damaged when the Royal Regiment of Artillery was reviewed on it. Did he clamour for justice? No. He refused all compensation, and as on several occasions he had shown civility, he was given by the Board a piece of plate worth £20.<sup>185</sup>

There was a project in the air towards the end of the eighteenth century for rebuilding the gunwharf at the Warren in masonry. The initial expense would have been high but the maintenance charges would have been considerably lessened. Two estimates with plans were forwarded to the Master-General on 30 June 1788. The first of £2,567. 3s. 8d. was planned by Lieut.-Colonel D'Aubant and the second designed by Lieut.-Colonel Morse came out at £2,905. 15s. 5d.<sup>186</sup> No action, however, was taken and further proposals were submitted in 1789 and 1801. Several of these designs are to be found among the War Office records at Stanmore,<sup>187</sup> but it is doubtful whether the complete set is in their possession. The new wharf was not built till the following century. Curiously enough on the same day as the estimates for the wharf were forwarded to the Master-General, Isaac Ashton was paid £461. 19s. 1½d. for building the guardhouse at Woolwich according to the M.G.O.'s order dated 14 January 1788.<sup>188</sup> This was the Main Guard, the estimate for which was included in the Ordnance Estimates for 1788. It has a handsome portico and was formerly used as a B.W.D. office.

Only a few items of minor interest remain to be told before the century closes. No further building schemes matured till the nineteenth century opened and the only works carried out were those connected with maintenance or repair. This does not mean that

<sup>184</sup> Ordnance Journal Book, PRO/WO/47/116, p. 692, 26 November 1790.

<sup>185</sup> Ordnance Journal Book, PRO/WO/47/113, p. 221, 2 February 1789.

<sup>186</sup> Engineer Papers, 1788-1810, PRO/WO/55/756.

<sup>187</sup> Map No. 16. Woolwich Wharf Project for reconstructing the wall in masonry, 28 June 1788.

Map No. 18. Project for rebuilding part of the wharf in wood, 1789.

Map No. 17. Section of the proposed gun-wharf at Woolwich, 1789.

Map No. 15. Plan of a wharf proposed to be erected in Woolwich Warren, 1801.

Map No. 14. Project for a new wharf proposed to be built at Woolwich, 1801.

Map No. 13. Method of laying the masonry for the new wharf, Woolwich, 1801.

Map No. 12. General section of masonry for the new wharf, Woolwich, 1801.

Map No. 9. Progress plan of new wharf and buildings, Woolwich, 29 March 1803 to 9 June 1807.

<sup>188</sup> Ordnance Bill Book, Series III, PRO/WO/52/35, p. 75.

little took place in the activity. The imprests over the years and by £10,000 per year.

On 3 July 1789 a building was ordered to be built at a site occupied by William King in 1784,<sup>190</sup> was ordered and its demolition did not obviate the risk of fire to the unoccupied.<sup>191</sup> There were no officials were 'privileged' in official quarters in the Warren in November 1789 when the Warren Branch, including Main Guard, was available for poor rate, church repairs.

The following repairs were made:

31 December 1789. At Warren Lane, let by the Master-General, did not exceed £112. 12s. 11½d.

2 June 1790. The Main Guard in the Warren should be supplied.<sup>194</sup>

1 November 1790. The Main Guard repaired at a cost not exceeding £100.

5 November 1790. Minor repairs to the Main Guard.

23 December 1790. Minor repairs to the Main Guard.

Although not a repair, a shed was erected in the Main Guard boxes.<sup>198</sup>

On 12 April 1791, the rules governing the occupation of the Warren to avoid misconception. The expense for quarters was not to exceed £100 in any circumstances.<sup>199</sup>

<sup>189</sup> Ordnance Journal Book

<sup>190</sup> See note 148.

<sup>191</sup> Ordnance Journal Book

<sup>192</sup> Ordnance Journal Book

<sup>193</sup> Ordnance Journal Book

<sup>194</sup> Ordnance Journal Book

<sup>195</sup> Ordnance Journal Book

<sup>196</sup> Ordnance Journal Book

<sup>197</sup> Ordnance Journal Book

<sup>198</sup> Ordnance Journal Book

<sup>199</sup> Ordnance Journal Book

throne of France. The first Peace of Paris was signed 30 May 1814. All these joyous happenings had a profound effect upon the government and people at home, and the Royal Arsenal did not escape its repercussions. The engines of employment went into reverse, heavy discharges took place and money for the appurtenances of war shrank. Expansion was out and retrenchment was in. The discharges from the Royal Arsenal are given in Appendix VIII, and the tide rapidly receded from the peak figure of 5,000. Nevertheless, in spite of the shrinking economy, the life of the departments had to go on. The individuals still employed had to work and live and the future had to be safeguarded.

The Peace of Paris was celebrated by a firework display in St James's Park for which the Royal Laboratory under the Office of Ordnance was responsible. On 3 June 1814, two London artists—Mr Sadler Crumpton and Mr Monkham—were engaged at £100 each to assist in the preparation of the fireworks. Sir William Congreve, 2nd Bart., who had succeeded to the Comptrollership of the Royal Laboratory on 1 July 1814 after the death of his father on 30 April 1814,<sup>226</sup> having advanced money to these two gentlemen, had it refunded by the authorities.<sup>227</sup> Arrangements were made on 10 June 1814 to select special artificers and labourers to unload the fireworks in London, to take care of them and to assist in fixing them for the exhibition. They received the usual extra pay while so employed.<sup>228</sup> Captain By, R.E., the C.R.E. at Waltham Abbey, was asked to lend certain articles on 22 June 1814, to aid the erections in St James's Park and to give all the assistance he could in supervising such erections.<sup>229</sup> The display under the direction of Sir William Congreve took place on 1 August 1814, the day being chosen to mark the centenary of the accession of the House of Hanover to the English throne.

The bill for the officers and men of the Royal Artillery employed in the park during this national fete, amounting to £92. 19s. 6d., was paid by the paymaster. It was made up as follows:

Officers and men, R.A.	£66. 1s. 9d.
Corps of R.A. Drivers	£26. 17s. 9d. <sup>230</sup>

There was one fatality in connection with this celebration. John Taylor, a carpenter in the R.L., lost his life in the fire which broke out in the pagoda set up in St James's Park for that occasion. On 26 September 1814, the paymaster was ordered to pay his funeral expenses.<sup>231</sup>

<sup>226</sup> Extracts of Minutes, Series II, PRO/WO/47/2,630, pp. 1,971 and 1,794.

<sup>227</sup> Extracts of Minutes, Series II, PRO/WO/47/2,636, p. 2,297.

<sup>228</sup> Extracts of Minutes, Series II, PRO/WO/47/2,636, p. 2,403.

<sup>229</sup> Extracts of Minutes, Series II, PRO/WO/47/2,636, p. 2,575.

<sup>230</sup> Extracts of Minutes, Series II, PRO/WO/47/2,637, p. 3,375.

<sup>231</sup> Extracts of Minutes, Series II, PRO/WO/47/2,637, p. 4,000.

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(2) Building a wall from  
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<sup>232</sup> Extracts of Minutes, Series

<sup>233</sup> Extracts of Minutes, Series

<sup>234</sup> Works Estimates, 1813, PR

<sup>235</sup> Extracts of Minutes, Series

<sup>236</sup> Works Estimates, 1813, PR

## THE ROYAL ARSENAL DURING NAPOLEONIC TIMES

signed 30 May 1814. The effect upon the government did not escape its impact into reverse, heavy expenditures of war were in. The discharges of 1814, and the tide of the Revolution. Nevertheless, in spite of the circumstances, the departments had to go on, and live and the future

firework display in St. Mary's Church under the Office of the two London artists—were engaged at £100 for fireworks. Sir William Pulteney, Comptroller of the Ordnance, died of his father on 10 June 1814, and these two gentlemen, Messrs. Pulteney and Pulteney, were engaged to unload the powder from the gun to assist in fixing them at Waltham Abbey, on 10 June 1814, to aid the work of the gun. The assistance he could give under the direction of the Ordnance, the day being 10 June 1814, the day being the day of the House of

of Artillery employed in 1814, to £92. 19s. 6d., as follows:

£1. 9d.  
£1. 9d.<sup>230</sup>

On this celebration, John Pulteney, the fire which broke out for that occasion. On 10 June 1814, he was ordered to pay his funeral

£1,971 and 1,794.  
£2,297.  
£2,403.  
£2,575.  
£3,375.  
£4,000.

There were further functions to mark the signature of peace. On 14 June 1814, H.R.H. the Prince Regent visited the Royal Arsenal. Normal work proceeded except that certain overseers and men were detailed to show and explain the various pieces of machinery to the royal visitor, and to act as guides round the several departments. Officers were instructed to attend their own establishments and were held responsible for all persons employed on the day in question. Employees who for any reason were prevented from working received a day's pay.<sup>232</sup> Four days after this visit a civic banquet for the allied sovereigns was held at Guildhall. One more gala occasion brightened the year. There was a grand jubilee held on 25 October 1814 to celebrate the fifty-fourth year of King George's reign. The Royal Laboratory as usual were concerned in the arrangements, and for the expenses incurred the paymaster was on 16 November 1814 authorized to pay the sum of £23. 1s. 0d.<sup>233</sup>

The authorities were still much exercised in their minds about the problem of security. To modern ideas the Royal Arsenal was very poorly protected at the beginning of the nineteenth century. True, there were several guardhouses, such as the main guard near the Entrance Gate, the guard by the western water front and the guard by the eastern marshes, but until these were reinforced by some kind of continuous barrier, it was impossible, especially during the hours of darkness, to prevent undesirable persons from trespassing. During 1813/1814 therefore determined steps were taken to remedy this defect. They were three in number or rather three separate parts of one whole scheme.

(1) Raising the wall from the Entrance Gate to the cadet barracks at a cost of £2,527. 6s. 9d. This part of the boundary was far from satisfactory particularly owing to the shocking condition of the old and dilapidated buildings connected with it. This work, long under consideration, had been postponed while services of a more pressing nature had been given priority.<sup>234</sup> During this operation, the quarter allotted to John Guest, a clerk in the storekeeper's department, became temporarily untenable, he was therefore granted house rent allowance in lieu on 3 January 1814.<sup>235</sup>

(2) Building a wall from the wood-yard adjacent to and behind, the dwelling of the clerk of the survey, to the storekeeper's house and the Plumstead stables to join up with a similar wall. This would form a complete enclosure to the Royal Arsenal when connected to the canal on the eastern boundary. Estimated cost £2,169. 14s. 5¼d.<sup>236</sup>

<sup>232</sup> Extracts of Minutes, Series II, PRO/WO/47/2,636, p. 2,425.

<sup>233</sup> Extracts of Minutes, Series II, PRO/WO/47/2,638, p. 4,645.

<sup>234</sup> Works Estimates, 1813, PRO/WO/49/128.

<sup>235</sup> Extracts of Minutes, Series II, PRO/WO/47/2,635, p. 7.

<sup>236</sup> Works Estimates, 1813, PRO/WO/49/128.

to be paid to the separation of *groups* as defined in *Magazine Regulations*. That loading and unloading at the proof-butts was to be under the supervision of the Proof Officer who would be responsible that the work was properly carried out according to *Magazine Regulations*. That work performed by men of the Ordnance Store Department or Naval Ordnance Department should be done under the supervision of a uniformed guard of the Royal Arsenal Railway. That only red-painted vans, designed for the carriage of gunpowder, were to be used for the conveyance of explosives on the Royal Arsenal Railway. That the conductor would see that each van used for conveying explosives was 'clean' and free from grit. That small arms ammunition was exempt from the above rules. That the establishment of conductors should be charged against the Commissary General of Ordnance and the Naval Ordnance Store Officer in proportion to the services rendered.<sup>80</sup>

Another principle, not strictly relevant to the Ordnance Factories, was adopted in the Royal Arsenal in 1894. This was the inspection of naval warlike stores by the War Department. The file<sup>81</sup> dealing with this matter states that the Naval Ordnance Department commenced to function on 1 October 1891. On 29 June 1894 the Admiralty in a letter numbered 'Enclosure to G 5,550/7,224' stated that they accepted the inspection of naval warlike stores by the Inspection Departments under the Director of Artillery, i.e. the Chief Inspector, Woolwich, as their agent though they accepted the responsibility for such inspection to the same extent as though it had been conducted by their own officers. On 8 May 1894 the Principal Medical Officer, Woolwich Garrison, replaced an officer of the Ordnance Store Department as a member of the Woolwich Board of Health.<sup>82</sup>

After an explosion at Waltham Abbey on 7 May 1894, when the Quinton Hill nitro-glycerine plant in that part of the Royal Gunpowder Factory bounded by the Swardstone Road literally 'went up in smoke', causing an appreciable number of casualties, a Committee was set up under the chairmanship of Lord Sandhurst to consider the Danger Buildings at Waltham and Woolwich in general and the Waltham Abbey explosion in particular.<sup>83</sup> Besides the chairman, who was Parliamentary Under-Secretary of State for War, the members were: Sir Fredrick Abel, War Department Chemist; Colonel V. D. Majendie, H.M. Chief Inspector of Explosives; and Colonel M. T. Sale, Superintendent, Building Works, Royal Arsenal. The Committee submitted two reports and the

<sup>80</sup> PRO/WO/32/512: 57/Woolwich 271.

<sup>81</sup> PRO/WO/32/513: 57/2/7,095.

<sup>82</sup> PRO/WO/32/723: Woolwich/2/8,786.

<sup>83</sup> C/7,370: 74/Gen. No./3,677: 85/Gen. No./3,497.

second, B. 349, deals January 1895.

The Committee drew

(1) The question of m a number of operations not, has already been n going observations whic Composition Buildings. I this point, and to suggest 'non-danger' operations tions as far as may be a appear generally speaki

- (a) It tends to necess and precautions ( costly character, necessity can reall
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(2) The Committee enquiry some, and even regard to the storage ar believe that such irregula to the difficulties in the a and military stores resp and also in some degre sub-division is likely to i this is a question of cons they would be imperfect recommend that the sub adoption of measures to o uniformity of practice in

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THE CLOSING YEARS OF THE NINETEENTH CENTURY

second, B. 349, deals exclusively with Woolwich. It was dated 21 January 1895.

The Committee drew attention to four points:

(1) The question of mixing up together in one part of an Establishment a number of operations, of which some are dangerous and others are not, has already been noticed incidentally in those portions of our foregoing observations which relate to No. 3 Cartridge Factory and to the Composition Buildings. But the Committee think it desirable to emphasize this point, and to suggest that care should in all cases be taken to prevent 'non-danger' operations being brought into the scope of 'danger' operations as far as may be available. The main objections to such a practice appear generally speaking to be as follows:

- (a) It tends to necessitate the application of a number of regulations and precautions (structural and otherwise), necessarily often of a costly character, to buildings and operations where no such necessity can really be shown to exist.
- (b) It tends, also, to weaken the belief in the value or necessity for danger precautions, and thus, to some extent, to interfere with their strict observance even in necessary cases.
- (c) It may often happen that by this arrangement a number of work-people are brought within a risk which, if they were employed elsewhere, would not affect them.

(2) The Committee could not fail to notice in the course of their enquiry some, and even serious, irregularities or diversities of practice in regard to the storage and handling of explosives. They are disposed to believe that such irregularities and diversities may be due in some measure to the difficulties in the appropriation of the accommodation for the naval and military stores respectively, which is one result of their separation, and also in some degree to the want of unity of control which such a sub-division is likely to involve. The Committee are alive to the fact that this is a question of considerable importance and difficulty, but they feel they would be imperfectly discharging their duty if they did not earnestly recommend that the subject be carefully considered with a view to the adoption of measures to ensure, if not unity of control, at any rate greater uniformity of practice in dealing with similar classes of stores.

(3) The existing arrangements for the shipment of gunpowder and other explosive stores are not, in the opinion of the Committee, adequate either to the requirements of the public service or to the minimizing of risks associated with operations of this character. Even the adoption of a code of carefully considered regulations which have been recently framed with the object of removing some of the graver and more obvious risks, will not in itself suffice to place this part of the Arsenal service on a safe and proper footing. To that end, it appears to the Committee to be essential that a pier of suitable construction and dimensions should, without delay, be erected at some convenient but isolated spot, thus avoiding the necessity which at present exists of conveying large quantities of explosives through crowded parts of the Arsenal, and for shipping and

APPENDIX IV

call before them such merchants and others who were known to be able to supply the goods required and to select the best offer. Articles when received and passed by the Surveyor-General were to be placed in store for future issue. Departmental wants were to be drawn from store and not from the open market in order to prevent a possible price ring against the government.

The Board in this respect carried out the duties which at its demise devolved upon the Director of Army Contracts, some of which in turn were transferred to the Director of Contracts, Ministry of Supply, when that Ministry was formed in 1939. These have now reverted to the Director of Army Contracts.

*Manufacturing Departments*

Since the Board was responsible for the provision of munitions, stores bought under contract had to be supplemented by those made by direct manufacture. The Board therefore had charge of the government factories. These were originally eight in number, situated in six localities; the powder mills at Faversham, Ballingcollig and Waltham Abbey; the small arm establishments at Lewisham and Enfield Lock; and the manufacturing factories at Woolwich. Early in the nineteenth century Faversham, Ballingcollig and Lewisham were abandoned, leaving only five factories to be administered by the Board during the last twenty odd years of its existence. These five were in 1855 handed over to the War Department and became known ultimately as the Royal Ordnance Factories. They were the Royal Gunpowder Factory, Waltham Abbey; the Royal Small Arms Factory, Enfield Lock; and the Royal Laboratory, the Royal Gun Factory and the Royal Carriage Department in the Royal Arsenal. It is the latter three which form the subject of this book.

The Ordnance did not manufacture gunpowder till 1759. Prior to that date supplies were obtained from the East India Company. On 11 May 1759, a warrant was issued<sup>20</sup> for purchasing the powder mills at Faversham from Mr Benjamin Price for the sum of £5,682. 1s. 7d. and the deed of conveyance for the factory was dated 16 May 1759.<sup>21</sup> A few months later another warrant under date 17 November 1759, set up the establishment at the Faversham Powder Mills. It was a very modest affair, the annual expenditure being only £398. 5s. od.<sup>22</sup>

Its details were as follows:

Storekeeper	£100 p.a.
Master Worker	£ 90 p.a.
Clerk of the Cheque	£ 54. 15s. od. p.a.
Extra Clerk	£ 36. 10s. od. p.a.
2 Carpenters (12s. p.w. each)	£ 62. 8s. od. p.a.
Hoy Master (12s. p.w.)	£ 31. 4s. od. p.a.
Hoy Master's Mate (9s. p.w.)	£ 23. 8s. od. p.a.

The powder mills at Faversham were sold in 1825, as on Friday 25 November of that year 'the Royal Powder Mills and Ordnance Lands and Premises at Faversham' came under the hammer at the Ship Hotel,

<sup>20</sup> P.R.O/WO/55/359. Warrants and Orders in Council.

<sup>21</sup> P.R.O/WO/55/360. Warrants and Orders in Council.

<sup>22</sup> P.R.O/WO/55/360. Warrants and Orders in Council.



Faversham, Messrs Stevens and Brenchley of 36 Old Jewry, London, being the auctioneers. The property, divided into 15 lots, was purchased by Messrs John Hall and Sons, who carried on the works for eighty years. They were then absorbed by Messrs Curtis and Harvey Ltd., who gave way to Nobels Ltd. and eventually to Imperial Chemical Industries Ltd.<sup>23</sup> Apparently, a certain portion of the Ordnance lands at Faversham, known as the 'Quarsh Works' comprising 86 acres, 3 roods and 4 perches, remained unsold, and this property was leased to Messrs John Hall and Sons in 1834.<sup>24</sup> Eventually, with Treasury approval, all the remaining lands belonging to the Board of Ordnance at Faversham, were sold to Messrs John Hall and Sons, the arrangements for the sale being concluded by 9 June 1854.<sup>25</sup>

Ballingcollig was sold in 1834.

Powder mills had existed at Waltham Abbey since the sixteenth century, and these were purchased by the Crown from Mr Walton on 18 October 1787 for the sum of £10,000. In the past they had had their ups and downs, their periods of calm and disaster. Thomas Fuller, who was connected with the living in 1641, says:<sup>26</sup>

'It is questionable whether the making of gunpowder be more profitable or more dangerous; the mills in my parish have been five times blown up in these seven years, but blessed be God, without the loss of anyone man's life.'

and from the Waltham Abbey parish register it appears that Thomas Gutridge and Edward Simons were 'killed with a powder mill' on 4 October 1665, and that Peter Bennet met his death by an explosion on 27 November 1720. Farmer<sup>27</sup> gives a view of the factory in 1735, then the property of John Walton, showing 22 buildings among which are certain stamping and horse mills. There were, in addition, a saltpetre refinery, a charging house, a composition house, a corning and glazing engine and several drying stoves. The horse mill was probably akin to the modern incorporating mill. Although horses continued to be used to help the labours and exertions of man, they were not the only form of motive power; water, in addition, was employed to drive the antiquated machinery, and in 1814 this prime mover eventually superseded the horse. When Government purchased the property it must have been in a shocking state of repair, as a further sum of £7,988. 18s. 8¼d. had to be spent in putting the buildings in a serviceable condition. This necessitated the presence of builders and workmen for 18 months and completely prevented manufacture from proceeding during that period. The following letter shows production to have commenced in February 1789:

'Royal Powder Mills.  
6 Feb. 1789.

Sir,

We have (by a Messenger) received your directions to set the Mills to work, we beg leave to acquaint you that we mean to begin on Monday

<sup>23</sup> *Archaeologia Cantiana*, vol. LX, 1947, p. 66.

<sup>24</sup> P.R.O./WO/47/1663, p. 10,207.

<sup>25</sup> *Engineer Papers*, P.R.O./WO/55/764.

<sup>26</sup> *Worthies of England* 1662, vol. 1, p. 338, Thomas Fuller.

<sup>27</sup> *History of Waltham Abbey*, 1735, J. F. Farmer.

morning as it will take all day to set the composition and various things to adjust before we begin.

We beg to inform you that we have set the Mode of Working; but you will be the keeper wherein the manner of working we beg to acquaint you that we have intimated would be sent for your perusal.

We have no mode of drying the powder not set in the Proof House, but in the fixed, therefore the Master will be charged until the samples of the powder may be drawn on working.

Major Congreve'

Misfortune dogged the mills and the mills blew up.

They were also not free from accidents in the second letter:

My Lord Duke and Rt Honble the Duke and Honble Gent<sup>m</sup>.

We beg to report that I am obliged to quit these works as I am a servant to the Clerk of the Works of the Houses and there cruelly treated.

We beg to represent that because the labourer you have employed of David Bonner will be spoiled by the powder is ordered to be melted.

My Lord  
Y

His Grace the Master General

The land on which the works were set in 1795 as in September 1795 Congreve—Comptroller, General, Richmond, Master-General of Ordnance, best of Mr Walton's works and servants. When the Board of Ordnance was sold to the Crown, the establishment

APPENDIX IV

morning as it will take all day tomorrow to provide the horses for grinding the composition and various other small matters which will be necessary to adjust before we begin.

We beg to inform you that we have your directions of 8 July on the Mode of Working; but you took back the paper which you gave the store-keeper wherein the manner of marking the barrels was inserted. We likewise beg to acquaint you that we have no cooper which Mr. Forman intimated would be sent from the Laboratory.

We have no mode of drying mill samples at present as the Cylinder is not set in the Proof House, neither does Mr Sutton know how it is to be fixed, therefore the Master Worker thinks to work 35 and 32 pound charges until the samples can be tried and proved that some conclusion may be drawn on working 38 pound charges.

We are, Sir,  
Your most obedient servants,  
Jas Wright      Jno Clowdesley

Major Congreve'

Misfortune dogged the management's footsteps as six days later one of the mills blew up.

They were also not free from disciplinary troubles as witnessed by this second letter:

'Royal Powder Mills,  
Waltham Abbey.  
22 June 1789.

My Lord Duke and Rt Honble  
and Honble Gent<sup>m</sup>.

We beg to report that Donald M'Lean a Warder at this place has been obliged to quit these works on account of the treatment of a young woman servant to the Clerk of the Cheque, by forcing her into one of the Watch Houses and there cruelly treating and injuring her.

We beg to represent that it is not necessary to enter another labourer because the labourer you was pleased to order to be entered in the room of David Bonner will be spared from the Refining House until the saltpetre is ordered to be melted.

We are,  
My Lord Duke and Rt. Honble and Hoble gent<sup>m</sup>  
Your Most Obedient and Humble Servants,  
Jas Wright      Jno Clowdesley

His Grace the Master General and Board'

The land on which the factory stood, however, was not bought till 1795 as in September of that year Major (afterwards Sir William) Congreve—Comptroller, Royal Laboratory—was directed by the Duke of Richmond, Master-General of the Ordnance, to engage 14 or 15 of the best of Mr Walton's workmen to continue in the factory as government servants. When the Board of Ordnance acquired the mills on behalf of the Crown, the establishment of officials with their rates of pay considered

APPENDIX IV

necessary to run the factory was laid down on 16 February 1789 as follows:

Respective Officers (storekeeper)	1 at £150 p.a.	
(clerk of the check)	1 at £90 p.a.	
	1 at £70 p.a.	
Clerks	1 at £60 p.a.	
Master Worker	1 at £90 p.a.	
Surgeon	1 at £54. 15s. p.a.	
Mixing House Man	1 at 21s. p.w.	
Labourers for the Mixing House	3 at 10s. 6d. p.w.	
Millwright	1 at 21s. p.w.	
Carpenter	1 at 17s. 6d. p.w.	
Cooper	1 at 17s. 6d. p.w.	
Storehouse man	1 at 14s. p.w.	
Storeman	2 at 10s. p.w.	
Millman	12 at 12s. p.w.	
Labourers for Corning House and Glazing Engine	11 at 10s. 6d. p.w.	
Saltpetre Mill Men	2 at 10s. 6d. p.w.	
Charcoal and Sulphur Mill Men	2 at 10s. 6d. p.w.	
Dusting House Men	2 at 10s. 6d. p.w.	
Office Keeper	1 at 12s. p.w.	
Barge Man	1 at 10s. 6d. p.w.	
Barge Man	1 at 9s. p.w.	
Labourers {	To make Powder Barrels	1 at 10s. 6d. p.w.
	To set and draw, stoves, weigh powder, &c.	3 at 10s. 6d. p.w.
	To assist the Bargeman to cut weeds	3 at 10s. 6d. p.w.
Charcoal Burners	2 at 10s. 6d. p.w.	
Warders	3 at 10s. 6d. p.w.	
Watchmen	6 at 1s. per night	
Horsekeeper (to be found by the Contractor)		
Horses for Charcoal, Sulphur and Saltpetre Mills and a Corning Engine	1 at 8s. p.w.	
Refiner	1 at 17s. 6d. p.w.	
Labourers to refine Saltpetre	6 at 10s. 6d. p.w.	

APPRENTICES

To the Master Worker	1 at 7s. p.w.
To the refiner of Saltpetre	1 at 7s. p.w.
To the Mixing House Man	1 at 7s. p.w.
To the Millwrights	1 at 7s. p.w.
To the Carpenter	1 at 7s. p.w.

EXTRA ALLOWANCE TO OFFICERS, &C

Storekeeper, for House rent, Coals and Candles	£25 p.a.
Clerk of the Cheque, for House rent, Coals and Candles	£20 p.a.

Clerks, for House rent, Master Worker. In lieu Refiner of Saltpetre Extra pay to the Stover Extra pay to the Millm Extra pay to the Barger employed in the Barge and from the Mills

Extra pay to Charcoal when in the Country char

In 1791 double horse n have been sent regularly 1 house exploded killing 9 were erected on Horse M the Royal Mills were in tons of powder per annum of Ordnance asked a Cor report upon the possibili caused by walking or rol use of silk covered dusting that no danger could aris explosion occurred in a p in the Lower Island Wor This led to a recommend of reconstruction that Bra powder and that a machi gradually. This no doubt by Sir William Congreve tion in the Lower Island house was built, though Middle Ages; also, as bei that of the horse as a dri

In 1829 three officers, ( Sir Hugh S. Frazer, K.C Royal Engineers, were fo Works at Waltham Abbe ments necessary to give t efficiency. The following quent report:

'The water power vest purposes of manufacturi miles of the original cha of the stream of the King below the town.

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on 16 February 1789 as

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3 at 10s. 6d. p.w.  
6 at 1s. per night

1 at 8s. p.w.  
1 at 17s. 6d. p.w.  
6 at 10s. 6d. p.w.

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CERS, &C

£25 p.a.

£20 p.a.

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Clerks, for House rent, Coals and Candles	£15 p.a.
Master Worker. In lieu of Coals and Candles	£5. 5s. p.a.
Refiner of Saltpetre	£4. 4s. p.a.
Extra pay to the Stovemen for night work	2 at 6d. per night
Extra pay to the Millmen for night work	12 at 3d. per night
Extra pay to the Bargemen when employed in the Barge and absent from the Mills	} 2 at 1s. 6d. p.d.
Extra pay to Charcoal Burners when in the Country charring wood	} Foreman 1s. 6d. p.d. Assistant 1s. p.d.

In 1791 double horse mills are mentioned; in 1796 powder appears to have been sent regularly to Purfleet for proof; in 1801 the horse corning house exploded killing 9 men and 4 horses; and in 1804 six horse mills were erected on Horse Mill Island. Notwithstanding these vicissitudes the Royal Mills were in 1804 turning out 20,000 barrels, i.e. about 800 tons of powder per annum. As a sequel to the explosion of 1801 the Board of Ordnance asked a Committee of the Royal Society to investigate and report upon the possibility of danger arising from electrical excitation caused by walking or rolling barrels on leather covered floors or by the use of silk covered dusting reels. The Committee reported on 23 July 1801 that no danger could arise from such causes. In 1811, another disastrous explosion occurred in a presshouse, corning house and reel house situated in the Lower Island Works which caused much loss of life and property. This led to a recommendation by the engineers entrusted with the work of reconstruction that Bramah presses should in future be used for pressing powder and that a machine be devised for breaking the pressed cake more gradually. This no doubt led to the invention of the granulating machine by Sir William Congreve, as in 1816 one of these machines was in operation in the Lower Island Works. In 1816 too, the present saltpetre refining house was built, though to the casual eye it looks like a relic from the Middle Ages; also, as before mentioned, water power completely eclipsed that of the horse as a driving force for the mills.

In 1829 three officers, Colonel J. Jones, C.B., Royal Engineers, Colonel Sir Hugh S. Frazer, K.C.B., Royal Artillery and Major Thomas Moody, Royal Engineers, were formed into a committee to report on the Ordnance Works at Waltham Abbey and to propose any improvements and arrangements necessary to give the Royal Manufactory of Gunpowder its utmost efficiency. The following are some extracts from the Committee's subsequent report:

'The water power vested in the Board of Ordnance, and allotted to the purposes of manufacturing gunpowder consists of rather more than four miles of the original channels of the River Lea commencing at the fall of the stream of the King's Weir fall above, and extending to Black Ditch below the town.

The three falls of water are:

Paynes Island averaging about 1 ft. 6 ins. in depth.

One at Upper Mill Head averaging about 6 ft. in depth.

One at Lower Mill Head ,, ,, 2 ft. 10 ins. in depth.

APPENDIX IV

The two latter falls only being available for the purposes of the manufactory.

This body of water is often insufficient to work the whole of the machinery (owing to frost or drought), so that on an average full working days should not be taken at more than 280 in a year. Adopting the conventional term used among mechanics of a *Horsepower* for the standard of composition it is calculated that when the manufactory was at its greatest height of efficiency in 1814, the stream did actually operate to the power of 79 horses, viz:

- On 15 gunpowder mills equal to 60 horses power.
- On 3 corning houses equal to 12 horses power.
- On 1 glazing mill equal to 5 horses power.
- On 1 dusting mill equal to 2 horses power.

The above mentioned machinery worked by water was in 1814 aided by five composition mills and seven mills for working the dust drawn by the animal labour of 50 horses on an average. These two powers united being made to work night and day, Sundays included, and very extraordinary exertions being used by the workmen, the produce of the manufactory was that year raised to 25,000 barrels. The animal labour being deducted from this calculation, it would appear to be equal to the manufacture of more than 15,000 barrels annually.

At the conclusion of the late war, two water mills deemed unserviceable were taken down, as were also nine mills and two corning houses worked by horse power, and the material was sold. None of the five horse composition mills still existing is in a state to be set to work. Further since peace the limited expenditure authorized by the Board for repairs has very prudently and judiciously been applied by the executive officer to keeping the more serviceable machinery of each nature of operation so far efficient as to ensure some power of reviving the manufacture whenever the demands of the Service shall require it, and at this period the only machinery in a condition to work consists of:

- 5 gunpowder mills in a state to do the work of 4 efficient mills.
- 1 gunpowder mill fitted up as a composition mill.
- Half a gunpowder mill fitted up to break mill cake.
- 3 corning houses.
- 1 glazing mill.
- 1 dusting mill.

The gunpowder mills, however, are all much worn and very unstable and some of them are erected on very defective principles. The establishment of workmen is altogether unequal to the full employment of the machinery so that the extreme annual produce to be obtained from the manufactory in its present state cannot be calculated higher than 3,500 barrels.

A new mill head is recommended to be excavated in Queen's Mead.

Since no arrangement for charring wood exists at Waltham Abbey, and, as this is very important, it is recommended that the cylinders at Faversham should be removed to Waltham Abbey.

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The Committee recom

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#### APPENDIX IV

Storehouses on Horse Mill Island (originally a stable) must be considered a crippled building owing to its having been injudiciously loaded with sulphur.

The Committee recommended that:

1. All mills newly erected should be placed angularly and not opposite to each other on their respective banks of the Mill Head.
2. Water wheels and shafts should be made of cast iron instead of wood.
3. Powder should be glazed in barrels instead of reels.
4. Self-registering thermometers should be introduced into the drying room to indicate to the Superintendent on each inspection the greatest and lowest degree of heat that has been applied to dry the powder.
5. Steam stoves rather than Gloner stoves should be approved.
6. As the duties of the several persons employed in responsible situations have never been defined on any general principle of subordination or mutual co-operation, and at this time the chief of each division or branch of the manufactory regulates his practice on partial instructions or established usage and the Service has not the benefit of perfect unit and accord, some person under the title of Superintendent and living on the spot should have such a general control over all the working departments of the Manufactory as to be able to continue and direct their efforts at all times and under all circumstances to the advancement of the public interests, provided each Master Worker or Refiner by means of instructions from the Board specifying his responsibility and charge over his particular department, be protected from all possibility of wanton innovation or vexatious interference on the part of the Superintendent.

In 1843 a further terrible explosion in two corning houses, a press house and a reel house shook the factory and caused the loss of seven lives. It originated in a building where one of the old corning machines with shaking frames was at work. No machine of this description has been used at Waltham since, and soon after the accident, Professor Faraday and Colonel Cockburn, Director of the Royal Laboratory, visited the factory to report on various matters connected with the safety of the buildings. Twelve years afterwards the factory was transferred to the War Department.

Faversham, Ballingcollig and Waltham Abbey were under the control of an artillery officer styled in 1811 the *Inspector of the Manufactory*.

As has already been stated, the connection of the Ordnance with the small arms trade dates from June 1631. This trade, originally carried out in London, moved to Birmingham in the eighteenth century or rather then commenced there *de novo*. As a result, the Office of Ordnance established a proof-house in that town to facilitate supplies. The business of the small arms department at the Tower was carried on by civilians deputed by the Surveyor-General and the Principal Storekeeper, assisted as necessary by the master furbisher. They received their orders, either directly from the Master-General and the Board, or through the Principal Storekeeper. Such means of supply were totally inadequate for the country's requirements and, therefore, by the end of the eighteenth century armed forces of the Crown depended for their complement of arms primarily upon the trade. When such a source proved insufficient, recourse

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had to be had to purchases from abroad. Mr J. Colegate, an officer of the Ordnance, was sent to Liege in 1779 to supervise the setting-up of 40,000 stands of arms for the British Government, while Major-General Miller was ordered to Liege and Hamburg on similar errands in 1794-95 and 1800. By the beginning of the nineteenth century, therefore, the position in regards to small arms in this country had reached an extremely low ebb. In fact, in 1802, a public statement was made to the effect that the art of making military fire-arms in England had wellnigh vanished. Such a state of affairs was gravely disturbing in view of the European situation, and the government of the day felt, not unnaturally, that some steps were imperative. A Royal Warrant, dated 1 April 1804, was therefore issued, by which the small arms department, so far as provision, inspection and maintenance were concerned, was committed to the care of a new official, entitled the *Inspector of Small Arms* stationed at Birmingham. He was given a staff of one Assistant Inspector at £300 p.a. (his own salary being £400 p.a.), and several subordinate officers, the whole to be defrayed out of public funds at an annual cost of £1,170. The first holder of this appointment was Major James Miller, R.A.,<sup>28</sup> the Assistant Inspector being a civilian. In the same year, the manufacture of small arms under another Assistant Inspector, Thomas Alsop, was commenced at the Tower, part of the work being carried out at the premises of Mr Fullard, a gunsmith, in Allen Street. Production was at first confined to rough stocking and assembly from parts supplied by Birmingham, but accommodation proving insufficient when quantities increased, the old Armoury Mill at Lewisham, which had become semi-derelict, was pressed into service in 1807 to form a manufactory for the supply of locks and barrels under the superintendence of Mr J. Colegate. This was a major undertaking as it virtually meant setting up an entirely new factory at a considerable cost. The enterprise entailed a large building programme including, besides workshops, storehouses, grinding mills, roads, a proofhouse and a bridge, the erection of two houses for foremen and six cottages. Before commencing operations, the Board of Ordnance purchased the old mill machinery and fittings for £186, and the order to go ahead was given on 27 May 1807.<sup>29</sup> Captain Mulcaster, R.E., was put in charge of the constructional work and Mr Bordwine, senior clerk of works, Mr Creed, overseer of works and Mr Barnes, foreman of bricklayers, all from the Royal Powder Mills at Faversham, were ordered to assist him.

Staff now began to be recruited and the following appointments were made:

James Pearson to be temporary clerk at 3s. a day on 17 June 1807.

Thomas Marshall to be storekeeper at £200 p.a. on 21 August 1807.

Christopher Walker to be established clerk at £70 p.a. on 25 January 1808.

Thomas Stokes to be viewer of barrels at 7s. a day on 31 January 1808.

Ralph Deane to be porter and messenger at 4s. a day on 8 July 1808.

H. Selwyn to be clerk of the cheque on 1 August 1808, replaced after his death by George Gaskoin on 1 January 1814.

<sup>28</sup> Afterwards a Major-General. Died at Charlton 24 March 1825.

<sup>29</sup> P.R.O/WO/47/2596, p. 1,293.

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#### APPENDIX IV

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Building was got quickly under way and production commenced in March 1808. The original intention was to manufacture 100,000 sets of materials annually for fire-arms, a figure afterwards lowered to 50,000 sets. Mills were therefore erected and machinery installed to grind 50,000 barrels a year. Power was supplied by water and steam, the former by means of sluice gates and water-wheels set up in the Ravensbourne, and the latter by an engine furnished by Messrs Lloyd and Ostell at a cost of £2,400. In addition, 50,000 locks, rammers and bayonets were to be provided. Later on, as the outcome of an accident, it was decided to confine the grinding of barrels to those of the new Land Service musket and Sea Service pistol, while the remainder of the manufactory concentrated on turning out regular India pattern locks required for the setting up of barrels already in store.

On 24 April 1809, the majority of the building work being completed, Captain Mulcaster handed over his responsibilities to Mr Tull, the principal clerk of works at the Tower of London, and returned to his normal duties at Faversham. Edward Bevan was, thereupon appointed Clerk of the Works at Lewisham at 7s. a day on 8 May 1809. Mr Colegate moved into one of the cottages when it was ready for occupation, having till then, like most of the officials, resided in lodgings in the neighbourhood. The small arms factory at Lewisham never had its own hospital, Mr Harris, a local surgeon, being engaged on 16 April 1810 to tend the sick for £60 a year, an allowance afterwards reduced to £40 p.a. when the number of workers decreased.

An old cash-book of 1810 gives the wages paid to the employees at the *Royal Manufactory of the Office of Ordnance*, Lewisham, from August to December of that year. Three foremen and viewers were employed at 7s. a day; 24 artificers at 3s. to 4s. 6d. per day; and, in addition, there were 82 lock filers; 4 barrel filers; 4 barrel borers; 7 barrel grinders; 10 barrel forgers—who incidentally had to pay for the fuel they consumed; 13 other workers and 9 labourers earning from 2s. to 2s. 6d. a day. In all, the establishment consisted of 156 persons and the wages bill amounted to £360 a week. One curious recurring item in the book shows the bother and expense involved in the Superintendent visiting his immediate chiefs in London. This item is '£2 for chair-hire to the Tower of London'. Such journeys were not only expensive, they must have been tedious in the extreme notwithstanding the countryside through which the conveyance would have passed. How different from modern conditions of travel!

Under stress of war, work increased and on 22 February 1811 it was decided to move the Tower workshops for small arms to Lewisham, and £20,000 to cover this transfer was included in the Ordnance estimates for that year. This comprised the assembling of Brown Bess muskets. In 1812, additional lathes were installed at the Lewisham factory to increase output.

Suddenly, as a result of Waterloo, the engines of policy were reversed. Economy became the order of the day. In July 1815 output at Lewisham was reduced to 25,000 muskets and barrels annually. In 1816, 77 artificers and 30 boys were discharged from the Royal Armoury Mills, thereby saving £9,600 a year, and, principally owing to transport difficulties and



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the insufficiency of water-power at Lewisham, it was decided to transfer the barrel branch to the recently erected *Royal Small Arms Factory* at Enfield Lock. Mr Colegate also moved over and became the first Superintendent at the new factory, his place at Lewisham being taken by Mr Noble. The 'Locks' and 'Finishing' Sections soon followed the Barrel Branch to Enfield, and thereafter Lewisham merely became a repair depot. After two years of shrinking activity, an order was promulgated on 24 January 1818 that all workmen at Lewisham were to be discharged except one foreman and a few selected men whose wages were not to exceed £3,531. 8s. od. a year. This was really a caretaker contingent to supervise the transfer of machinery and stores to Enfield. The end came on 23 October 1818.<sup>30</sup> On that day directions were issued that Lewisham was to be abandoned as an Ordnance station, and that the whole process of small arm manufacture and repair was to be concentrated at Enfield. Thereafter the factory on the Ravensbourne was closed down and the site sold in the spring of the following year.

Utilization of the waters of the river Lea as a source of power was the primary object in establishing a factory at Enfield Lock, and, to this end, the Board of Ordnance purchased in 1811 the site together with an additional 25 acres of land surrounding it. The actual building of the establishment was commenced in February 1814 under the supervision of Major By, R.E., who commanded the Royal Engineers at Waltham Abbey, an officer who afterwards constructed the Rideau Canal in Canada and founded there the small village of Bytown which later developed into Ottawa, the present capital of the Dominion. Enfield was a much more ambitious project than the Lewisham mills, being conceived on more generous lines and costing about £100,000. For instance, it had 4 foreman's houses and 60 cottages. When ready for operations and after Mr Colegate's installation as Superintendent, Mr G. Lovell, clerk of the cheque at North Yarmouth, was appointed storekeeper on 1 April 1816 on a salary of £200 p.a.

The defeat of Napoleon, however, curtailed the original Enfield scheme to a considerable degree. Work became confined to assembling the Brown Bess, repairing arms generally and manufacturing a limited number of swords and lances. On 21 January 1818, the whole factory was placed on a reduced basis and all workmen were discharged, except a foreman and certain selected employees whose wages were not to amount to more than £2,072. 6s. 8d. a year.<sup>31</sup> It was indeed a sorry outcome of the builders' hopes.

By 1823, the factory, then known as the *Royal Armoury Mills*, the buildings of which and its enclosure covering some 7 acres, had a staff of only six foremen, two viewers, one mill-wright, twenty-eight artificers, one warder, three labourers and an odd man, figures which prove that at that date the Crown's production of small arms had, indeed, reached a very low ebb. Matters became worse in 1841 when the Small Arms Department at the Tower, together with its stock of flint-locks was completely destroyed by fire. During these somewhat depressing years of

<sup>30</sup> P.R.O/WO/47/2,658, p. 3,446.

<sup>31</sup> P.R.O/WO/47/2,655, p. 286.

English small arms history  
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1857. The school contin  
handed on to the Board o  
of which was the Revd J  
Highway, at a stipend of

On 7 October 1853, M  
Machinery, Royal Arsen  
capabilities of that establi  
by machinery. A further  
nance recommending th  
to give a daily output of  
a more extensive field  
questions apparently the  
Enfield to undertake by  
the Home Government  
Opposition to this latter  
Government in March  
Commons under the cha  
into the matter, and to c  
efficient manner of prov  
Committee consisted of:

Mr Walpo  
Colonel M  
Mr Muntz  
Colonel B  
Mr Newde  
Mr Monse  
Lord Page

APPENDIX IV

was decided to transfer  
*Small Arms Factory* at  
 became the first Super-  
 wisham being taken by  
 soon followed the Barrel  
 nerely became a repair  
 order was promulgated  
 m were to be discharged  
 hose wages were not to  
 a caretaker contingent  
 o Enfield. The end came  
 re issued that Lewisham  
 d that the whole process  
 concentrated at Enfield.  
 as closed down and the

source of power was the  
 d Lock, and, to this end,  
 e site together with an  
 e actual building of the  
 4 under the supervision  
 l Engineers at Waltham  
 Rideau Canal in Canada  
 hich later developed into  
 nfield was a much more  
 eing conceived on more  
 instance, it had 4 fore-  
 operations and after Mr  
 G. Lovell, clerk of the  
 ekeeper on 1 April 1816

e original Enfield scheme  
 to assembling the Brown  
 ng a limited number of  
 le factory was placed on  
 d, except a foreman and  
 to amount to more than  
 outcome of the builders'

*Royal Armoury Mills*, the  
 ne 7 acres, had a staff of  
 , twenty-eight artificers,  
 figures which prove that  
 s had, indeed, reached a  
 when the Small Arms  
 k of flint-locks was com-  
 hat depressing years of

English small arms history, however, genius had been busy, and the discovery in 1807 by the Reverend Alexander Forsyth of ignition by the percussion of fulminate of mercury, followed eleven years later by the percussion-cap, revolutionized the gun makers' outlook. Eventually a percussion musket was evolved in 1842 and on its introduction matters at Enfield Lock improved to a certain extent. A small number of these weapons were made there, but even then not in their entirety. Output commenced at about 7,000 per annum, in addition to 1,500 swords. These figures gradually increased until 1853 when the annual capacity of the factory reached 50,000 muskets and 5,000 swords—the maximum number of arms ever produced in a single year prior to 1857/8. It appears that a goodly proportion of this produce was actually manufactured for export, the remainder being appropriated for government use. Between the years 1816 and 1853 two water-wheels of 46 H.P. had been installed for shop driving purposes. They were 18 feet in diameter by 14 feet and 9 feet wide, being of the head wheel pattern made of cast iron. These power-units had no governors and were very irregular in output. In addition, workshops, offices and storehouses for gunstocks were erected, and houses for 64 families built. The factory property in 1853 was estimated at £120,000. Owing to the isolated position of the factory a school for the children of employees was opened in 1846 and a chapel was built on the premises in 1857. The school continued to grow and flourish till it was eventually handed on to the Board of Education, and the chapel, the first incumbent of which was the Revd J. Harman, Vicar of St James's Church, Enfield Highway, at a stipend of £120 a year, was demolished in 1928.

On 7 October 1853, Mr (afterwards Sir) John Anderson, Inspector of Machinery, Royal Arsenal, was sent to Enfield Lock to report on the capabilities of that establishment in regard to the manufacture of bayonets by machinery. A further report was also furnished to the Board of Ordnance recommending the erection of an additional factory at Woolwich to give a daily output of 500 muskets, Woolwich being selected as offering a more extensive field for the supply of suitable labour. These two questions apparently then became merged in the larger one of expanding Enfield to undertake by machinery the manufacture of muskets both for the Home Government and the Honourable East India Company. Opposition to this latter proposal being encountered in Parliament, the Government in March 1854 set up a Select Committee of the House of Commons under the chairmanship of Sir William Molesworth to enquire into the matter, and to consider the cheapest, most expeditious and most efficient manner of providing small-arms for her Majesty's Service. The Committee consisted of:

Mr Walpole	Colonel Dunne
Colonel Maule	Mr George Dundas
Mr Muntz	Mr Peach
Colonel Bolders	Viscount Jocelyn
Mr Newdegate	Colonel Lindsay
Mr Monsell	Lord Seymour
Lord Paget	The Judge Advocate

APPENDIX VIII

Thomas Parry appointed Labourer in the Storekeeper's Department vice James Burke, deceased.

(PRO/WO/47/2,703, p. 1,669)

28 December 1831. Two military collar-makers to be loaned to the Civil Officers for a month or 6 weeks.

(PRO/WO/47/2,703, p. 1,785)

20 January 1832. Benjamin Kane appointed Assistant Clerk in the Storekeeper's Department.

(PRO/WO/47/1,561, p. 539)

11 May 1832. William Allender's appointment as Foreman of Carpenters, Engineer Department, dated 2 May 1831, is confirmed.

(PRO/WO/47/1,573, p. 4,081)

13 August 1832. Henry Wain appointed Storehouseman in the Engineer Department vice Thomas Murrell, superannuated.

(PRO/WO/47/1,582, p. 6,950)

5 October 1832. Owing to the new arrangements in force at Waltham Abbey and Faversham, the post of *Inspector of Gunpowder Manufactories* is to be abolished. Major William Eyles Maling, R.A., the Inspector, to be so informed. As both these powder factories are under the general supervision of the Director R.L., that office will in future discharge the duties hitherto performed by Major Maling.

(PRO/WO/47/1,587, p. 8,512)

28 December 1832. Thomas P. Weaver, Clerk of the Works in the Engineer Department, to be superannuated on a pension of £200 p.a., *w.e.f.* 1 January 1833.

(PRO/WO/47/1,595, p. 11,307)

28 December 1832. Changes in the Engineer Department consequent on the retirement of Thomas P. Weaver, Clerk of the Works, will take place on 1 January 1833. Thomas Durnford to be superannuated in due course.

(PRO/WO/47/1,595, p. 11,308)

7 January 1833. Thomas Durnford, Clerk of the Works, in the Engineer Department, to be superannuated on a pension of £105 p.a., *w.e.f.* 1 January 1833.

(PRO/WO/47/1,596, p. 186)

7 January 1833. Samuel Rose, Plasterer in the Engineer Department, to be superannuated on a pension of £20 p.a.

(PRO/WO/47/1,596, p. 148)

9 January 1833. John Green, Bricklayer in the Engineer Department, to be superannuated on a pension of £24 p.a.

(PRO/WO/47/1,596, p. 247)

16 January 1833. As the number of artificers and labourers who suffer from ague had in the last 2 or 3 years been greatly reduced, it was decided to withdraw the indulgence that men out sick with ague should receive half-pay.

(PRO/WO/47/1,597, p. 449)

25 January 1833. It was decided that a reduction in the Storekeeper's establishment could be effected without affecting its efficiency. This reduction to amount to £697. 8s. 9d. per year. Owing to the ages and

services of the labourer should be given them as in readiness to be re-£500 credit was to be tal in the same way. When would be filled by Assis be recruited. Should it ev could be given from the

Saving in the esti over that of 18

Painter—William  
Foreman—Thom  
Wharfinger—Step  
1 N.C.O. of drive  
4 drivers of horse

Name	Service
A. M'Donald	2
H. Guernsey	3
A. Hammond	1
Richard Odden	3
William Hall	2
Peter Herriott	2
Richard Lewis	2
Jarvis Wharrin	2
Thomas Couch	1

Total

(PRO/WO/47/1, 12 April 1833. Jarvis

keeper's Department, di  
(PRO/WO/47/1, 24 June 1833. The B  
Deputy Storekeeper R.L. a  
consequent upon the ab

(PRO/WO/47/1, 16 September 1833. L

C.R.E. Woolwich Distr  
Sir John T. Jones, R.E.

(PRO/WO/47/1, 21 October 1833. Tho

Engineer Department, c  
(PRO/WO/47/1, 21 October 1833. On t

the Engineer Departmen

James Barling, John Mc  
William Wickham, Jam  
William Winter and He

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services of the labourers to be discharged, it was agreed that £10 p.a. should be given them as half-pay if they would agree to hold themselves in readiness to be re-employed should the Board consider it necessary. £500 credit was to be taken for this service. Clerks were also to be reduced in the same way. When vacancies occur among permanent clerks they would be filled by Assistant Clerks, and no more Assistant Clerks would be recruited. Should it ever become necessary temporary clerical assistance could be given from the Tower.

*The savings to be effected*

Saving in the estimate of 1833 } over that of 1832	£ 76. 11s. 2d.
Painter—William Crookes—	£ 54. 15s. 6d.
Foreman—Thomas Moore—	£ 63. 18s. 1d.
Wharfinger—Stephen Emptage—	£100. 7s. 6d.
1 N.C.O. of drivers	£ 15. 13s. 0d.
4 drivers of horses	£ 47. 2s. 0d.

Name	Labourers		at £33. 18s. 2d. p.a. each	£339. 1s. 8d.
	Service (years)	Age (years)		
A. M'Donald	28	84	}	}
H. Guernsey	37	66		
A. Hammond	19	59		
Richard Odden	31	57		
William Hall	24	51		
Peter Herriott	22	53		
Richard Lewis	26	36		
Jarvis Wharrin	20	66		
Thomas Couch	13	70		

Total Savings £697. 8s. 11d.

(PRO/WO/47/1,598, p. 707)

12 April 1833. Jarvis Wharrin, a pensioned labourer from the Storekeeper's Department, died 9 April 1833.

(PRO/WO/47/1,606, p. 3,116)

24 June 1833. The Board do not agree to the creation of a post of Deputy Storekeeper R.L. and to the upgrading of the 2nd and 3rd Clerks, consequent upon the abolition of the post of Clerk of the Survey.

(PRO/WO/47/1,613, p. 5,438)

16 September 1833. Lieut.-Colonel George Harding, R.E., appointed C.R.E. Woolwich District, w.e.f. 11 September 1833 vice Lieut.-Colonel Sir John T. Jones, R.E.

(PRO/WO/47/1,621, p. 8,007)

21 October 1833. Thomas P. Weaver, late Clerk of the Works in the Engineer Department, died 1 October 1833.

(PRO/WO/47/1,624, p. 9,054)

21 October 1833. On the Sappers and Miners taking over the work in the Engineer Department, the following are to be discharged:

James Barling, John McArthur } William Wickham, James Larkin } William Winter and Henry Wain : Labourers }	Foremen } Labourers }	To be recommended for superannuation
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power of expansion in time of war, and to enquire what change, if any, is desirable in the present distribution throughout the country of such manufacture and workshops.<sup>9</sup>

The first finding of the Committee was that the localities wherein the Ordnance Factories were situated appeared to be generally suitable.

There was some ground for believing that the Government might well follow the example of private enterprise and seek some more favourable area of production nearer the sources of the supply of coal and iron, where the burden of local rates was less and the prevailing standard of wages lower. It was evident, however, that a very considerable saving would have to be assured to counteract the enormous expenditure which would be entailed in acquiring a new site and providing new machinery, buildings and housing. The Committee decided that to transplant the Royal Arsenal as a whole seemed impracticable, and to move part of it would be useless in view of the interdependence of the several factories. They also felt that any such transfer might defeat its own object, since the sudden concentration of a large industrial population on the outskirts of an industrial town would go far to create a similar state of affairs from which it was hoped to escape, while the selection of a site in a remote area, which would favour security, would present housing difficulties and offer no reserve of labour to draw on in case of an emergency. The proximity of Woolwich to Shoeburyness was also a strong argument in favour of retaining the Ordnance Factories at Woolwich since it was essential to have them near the proving ground, and Shoeburyness had unique advantages in this respect.

Hence the recommendation of the Committee was that no move be made.

Five years later, the vulnerability of the Royal Arsenal and other Ordnance Factories again came under discussion.<sup>93</sup> The general feeling was that, in case of attack, Woolwich was in a slightly different position from Waltham and Enfield Lock, because as well as containing factories, it had large storage depots within the Royal Arsenal for the use of the Land and Naval Services.

It was realized that to minimize the danger, either Woolwich must be made impregnable, which was not practicable, or its contents must be decentralized. The problem was put to the *Home Ports Defence Committee* and that body on 5 July 1912 reported on *The decentralization of stores and manufacturing plant at Woolwich and in its vicinity*.

Its conclusion was:

(1) That the damage which could be inflicted by any probable form of attack on the stores of war material and the plant for manufacturing such stores at, and in the vicinity of Woolwich, would not be serious enough to warrant decentralization.

The Committee recommended however:

(a) That steps should be taken to diminish the stock of explosives at Purfleet, the extent of which is not consistent with safety.

(b) That when the Royal Flying Corps has been sufficiently developed

<sup>93</sup> PRO/WO/32/1,303, 79/Eastern/169.

and trained to enable it to be used as a military centre, the aerial force would be in the vicinity.

The Committee were of opinion that railway facilities might be used for the despatch of the stores to meet the needs of any factory in a sufficient margin for the time of war or emergency. The modified form of decentralization proposed in M.G.O's War Reserve, Reserve Schedule, mobilization plan, was not to be adopted.

The question of the best site for the Mackinnon Wood Co. was discussed in Chapter 23. They cited the following as a government factory:

- (1) The distance from the river
  - (2) The distance from the forgings and materials
  - (3) The site is peculiarly suited
  - (4) The river frontage is large
  - (5) Labour conditions are good
  - (6) Its bad layout makes it difficult to manage but did not consider them modern methods, most of which were adopted
- The Committee, therefore, recommended that Woolwich because:

- (1) There existed already a large number of facilities for practically all the work
- (2) No other individual factory was so well situated
- (3) Its proximity to Shoeburyness which was a great advantage
- (4) The trained personnel were available

A supplementary report was prepared for further consideration of the question, or, alternatively, a committee was appointed to consider whether new works should be built near the Royal Arsenal in time of war, so that it was saved once again.

Next, an inter-departmental committee under the chairmanship of Sir John French, of the War Department proposed that the cost of transferring the stores to new sites making provision in new sites for the facts brought to light t

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and trained to enable it to co-operate in the defence of important naval and military centres, the Admiralty and War Office should decide what aerial force would be required for the protection of Woolwich and its vicinity.

The Committee were also of the opinion that although the local railway facilities might be adequate under peace conditions to deal with the despatch of the stores and supplies accumulated at Woolwich, to meet the needs of any future Expeditionary Force, they did not allow a sufficient margin for the dislocation of traffic which might occur in time of war or emergency. The Committee, therefore, did recommend a modified form of decentralization. The stores concerned consisted of the M.G.O's War Reserve, Schedules (B) and (D) of the Q.M.G's War Reserve Schedule, mobilization equipment and 3,400 tons of compressed hay.

The question of the best site for the Royal Arsenal also came before the Mackinnon Wood Committee whose report has been summarized in Chapter 23. They cited various arguments against its present location as a government factory:

- (1) The distance from the coal-fields increases the cost of production
- (2) The distance from the steel centres increases railway transport for forgings and materials
- (3) The site is peculiarly prone to aerial attack
- (4) The river frontage is valuable for commercial purposes
- (5) Labour conditions at Woolwich have a hampering effect on management and send up costs of production
- (6) Its bad layout makes economical production more or less impossible but did not consider them to be insuperable, as with developments and modern methods, most of them would tend to disappear.

The Committee, therefore, decided that the Royal Arsenal should remain at Woolwich because:

- (1) There existed already manufacturing capacity and experimental facilities for practically all classes of war material.
- (2) No other individual national factory possessed those facilities.
- (3) Its proximity to government departments in London, and to Shoeburyness which was unique as an experimental establishment.
- (4) The trained personnel resident in the neighbourhood.

A supplementary report, drawn up by Lord Marchamley, recommended further consideration of the transfer of the Royal Arsenal from Woolwich, or, alternatively, a conference with trades union representatives to consider whether new work could be found to maintain employment at the Royal Arsenal in time of peace. This was not accepted and Woolwich was saved once again.

Next, an inter-departmental committee was appointed in 1922 under the chairmanship of Sir James Stevenson, Bart., to consider the future of War Department property at Woolwich. The Committee investigated the cost of transferring the Royal Arsenal activities to other sites or of making provision in new factories to absorb Woolwich functions, but on the facts brought to light the Committee was dissolved without formulating

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any recommendations, the Cabinet having decided that no precipitate action involving such expense and dislocation of industry should be taken at that time.<sup>94</sup>

Woolwich employees breathed again.

In 1934 the Hacking Committee was convened under the chairmanship of the Right Honourable Douglas Hacking, O.B.E. M.P. It was appointed in July 1934 and reported on 22 December 1934.<sup>95</sup>

Its terms of reference were as follows:

In view of the vulnerability of Woolwich to air attack

(1) To enquire into and report upon the removal of the activities now carried on in the Royal Ordnance Factories at Woolwich, Enfield, Waltham etc. to a more suitable site or sites and the consequential financial effects.

(2) To advise on the suitability of localities and the grouping of functions thereat.

(3) In assessing the suitability of any new locality for an establishment which on grounds of vulnerability it is considered should be removed from Woolwich etc., to have regard to the necessity of maintaining or increasing or reducing its present reserve of productive power and capacity for expansion.

(4) To indicate the period during which a removal should be effected.

(5) To consider the effect on other departments at Woolwich, Shobury etc.

The following is a resume of the Committee's report.

The Royal Arsenal occupies an area of 1,308 acres with a river frontage of  $3\frac{1}{8}$  miles.

Department	Numbers employed		War
	Peace	Annual cost (a)	
R.G. and C.F.	2,000	£751,000	8,000 (b)
R.A.F.	2,600	£601,000	17,000 (b)
R.F.F.	700	£413,000	19,000 (b)
Ancillary Services	2,200	£[349,000] (d)	10,000 (b)
Total for R.O.F.	7,500	£2,114,000	54,000 (b)
C.I.A.	1,600	£375,000	25,000 (c)
A.O.D.	1,000	...	7,000 (c)
Naval Establishments	1,000	...	2,000 (c)
Research Department	600	£25,000	1,000 (c)

(a) Including cost of materials

(b) Estimated requirements for war

(c) Numbers at the Armistice 1918

(d) The cost of ancillary services in the main is taken up in the costs shown against the three productive factories; the figure in square brackets represents certain remaining charges arising in the Woolwich factories generally

<sup>94</sup> 70/Gen. No/5,274.

<sup>95</sup> A/3,918, 70/Gen./8,189.

There are also smaller establishments at Shoebury (£55,000); W.I. departments in the Royal Arsenal.

The Mackinnon Wood Committee in 1918 recommended that peace should be continued and the number of national factories should be maintained.

As regards the danger of air attack

'The Arsenal situated at Woolwich is assumed to be more open to attack. Looking ahead, in a few years the parts of the country will be more densely populated. Moreover, Woolwich will be a more important arsenal and at the outbreak of war a larger percentage of the total requirements will be met there.'

They went on to say:

'Had, however, the Royal Arsenal been located elsewhere than at Woolwich, of such size as we consider necessary, that Woolwich is the most suitable site for an arsenal.'

They then gave their conclusions.

The question of transferring the Arsenal was considered in 1922 by the Royal Commission on the factors since 1918, such as the change in manufacturing conditions and the fact that national factories still left to be considered.

The Stevenson Committee in 1924 were prepared for the Commission to report respectively on the air and the ground. The Committee of Imperial Defence in 1925 reported:

(I) That the unimportance of the Arsenal in the event of war is the first essential consideration. The Staff that the Royal Arsenal performs any useful function on the ground is a dependence on Woolwich is a military point of view.

(II) That the danger of air attack at the distance of Woolwich is a consideration for precipitate action involving the relocation of the industry.

(III) That in view of the fact that it is a general principle to avoid the concentration of an arsenal.

In view of these conclusions the Stevenson Commission recommended that the Stevenson Commission should be set up to consider the possibility of transferring the Arsenal to a more suitable site.

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There are also smaller Establishments at Woolwich; Ordnance Committee (£55,000); W.D. Chemist (£27,000) etc. The Experimental Establishment at Shoeburyness (£121,000) is closely linked to the departments in the Royal Arsenal.

The Mackinnon Wood Committee in their 2nd report dated 22 November 1918 recommended that the location of the government arsenal in peace should be continued at Woolwich, though there were a large number of national factories in being.

As regards the danger of air attack they said:

'The Arsenal situated in the south and east of the country is generally assumed to be more open to aerial attack than in the north and west; but, looking ahead, in a few years as the radius of bombing machines grow, all parts of the country will be almost equally open to foreign aerial attack. Moreover, Woolwich must be looked upon mainly as a peace producing arsenal and at the outside only capable of producing a very small percentage of the total requirements for a serious war.'

They went on to say:

'Had, however, the retention of a large arsenal been contemplated in all probability we should have recommended a considerable section being located elsewhere than at Woolwich, but in the case of an Establishment of such size as we consider will be required, we have come to the conclusion that Woolwich is the natural and most convenient place for such an arsenal.'

They then gave their reasons, already stated, for retaining Woolwich.

The question of transferring the Royal Arsenal elsewhere was again considered in 1922 by the Stevenson Committee having regard to new factors since 1918, such as liability to attack from the air, alterations in manufacturing conditions in industry, and the existence of a number of national factories still left unsold at that date.

The Stevenson Committee made no formal report. Two memoranda were prepared for the committee by the General Staff and the Air Staff respectively on the air danger. These memoranda were referred to the Committee of Imperial Defence, whose conclusions were as follows:

(I) That the uninterrupted supply of munitions upon the outbreak of war is the first essential. In view of the considered opinion of the Air Staff that the Royal Arsenal, if retained at Woolwich, will cease to fulfil any useful function on the outbreak of war with a continental power, dependence on Woolwich for essential supplies is dangerous from a military point of view.

(II) That the danger of war with a continental power within striking distance of Woolwich Arsenal is not sufficiently imminent to justify precipitate action involving immediate expense and dislocation of industry.

(III) That in view of the increasing range of aircraft it is desirable as a general principle to avoid dependence on any single and concentrated arsenal.

In view of these conclusions, the Secretary of State for War decided that the Stevenson Committee should be dissolved.

ided that no precipitate industry should be taken

l under the chairmanship E. M.P. It was appointed p.<sup>95</sup>

ir attack

oval of the activities now at Woolwich, Enfield, and the consequential

s and the grouping of

lity for an establishment red should be removed ibility of maintaining or productive power and

oval should be effected. ents at Woolwich, Shoe-

report.

res with a river frontage

War

ost (a)	
oo	8,000 (b)
oo	17,000 (b)
oo	19,000 (b)
oo] (d)	10,000 (b)
oo	54,000 (b)
oo	25,000 (c)
	7,000 (c)
	2,000 (c)
oo	1,000 (c)

is taken up in the costs figure in square brackets the Woolwich factories



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As the terms of reference to the Hacking Committee indicated that the Royal Arsenal at Woolwich must be considered vulnerable, they sought advice from the General Staff and Air Staff as to what areas in Britain could be assumed to be reasonable safe from air attack. As a result of such advice, the Committee accepted the position that the only areas which could be considered suitable and comparatively safe were those in south-west Scotland (including Renfrewshire), the west of Cumberland, Westmoreland and Wales, excluding its more southerly parts. In view of the probable increasing range of aircraft, no guarantee of safety from damage could be given for any area should it be singled out for a determined attack. In this connection, the Committee recognized that in the main the industrial activities of the country lay in an area not regarded as reasonably safe in the sense above, and it would be on those activities that the country would largely depend for its munition supply in time of war.

Dispersal into smaller units of the activities congregated in the Royal Arsenal would obviously diminish the risk of damage from aerial attack, but other important factors must be considered. The cost of moving, the increased difficulties and higher cost of administration in peace time of a number of isolated factories, the difficulties of labour supply and its necessary transport in non-industrial sites, and a certain loss of efficiency in the development of new types of munitions or new methods of manufacture which might follow if the present centralized organization at Woolwich were to be broken up.

It was obvious that the removal of the Royal Arsenal as a whole to a single new site could not be seriously entertained. It would still present an attractive target to raiding bombers, and the finding of a large enough site within the limited 'safe' areas would be insuperable, especially when a large number of employees would have to be found rapidly in an emergency. The Committee, therefore, considered a scheme of dispersal.

They were of the opinion that the Ordnance Factories at Woolwich could be broken down into six units as under:

<i>Unit</i>	<i>Numbers in Peace</i>	<i>Numbers in an emergency</i>
R.G.F.	660	3,330
R.C.D.	2,065	7,330
S.A.A. and Q.F. } Cartridge Factory }	930 (a)	8,655 (a)
Fuze Factory	1,400	6,265
Projectile and } Bomb Factory }	1,130	5,065
R.F.F.	1,200	23,500

(a) includes the filling of small arm ammunition

In considering the possibilities of dispersing these activities, the committee bore in mind four main considerations.

(1) The damage which might be expected to arise from the nature and location of each factory as the result of an attack, and the effects of raids

and warning of raids or interruptions of work.

(2) the extent to which output of each factory in

(3) the extent to which with those of other facto

(4) the cost of remova

They did not attempt would be affected by re would enable savings to not, arise in wages and the other hand, increase tion of staff and plant, compared to the cost of

The recommendations

*Factory*

R.F.F.

R.G.F.

R.A.F.

R.C.D.

(a) As the Committee the Royal Ammunition since they were of low p Filling Factories should removal would take three as under the degree of Royal Arsenal which wo Factories from Woolwich

Ordnance Committe

Research Departme

W.D. Chemist

Inspection Departm

The recommendation principle, and an inter-c of Sir Arthur Robinson out of their recommenda reported in February 19

(i) A part of the Filling at Chorley, and should

(ii) On removal from be established at Bishop

The question of the consequent upon the ac

<sup>96</sup> 70/Gen./8,341.

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and warning of raids on the output of the factory consequent on the interruptions of work.

(2) the extent to which reliance was placed by the Services on the output of each factory in the first 12 months of war.

(3) the extent to which any one factory's activities were interlocked with those of other factories and departments in the Arsenal area.

(4) the cost of removal to a safer site.

They did not attempt to estimate how the cost of peace administration would be affected by removal. A new factory designed on modern lines would enable savings to be made, and further savings might, or might not, arise in wages and materials depending on local circumstances. On the other hand, increased cost would arise from the unavoidable duplication of staff and plant, but any such variations would be negligible compared to the cost of removal.

The recommendations of the Committee were as follows:

<i>Factory</i>	<i>Locality recommended</i>	<i>Cost of removal</i>
R.F.F.	Oswestry	£2,100,000
R.G.F.	Glasgow District	£2,600,000
R.A.F.	(a)	(a)
R.C.D.	(a)	(a)

(a) As the Committee were pressed for time, they did not deal with the Royal Ammunition Factory and the Royal Carriage Department, since they were of low priority. The Committee stressed that the Royal Filling Factories should be removed as early as possible, since such a removal would take three years to complete. The Committee also indicated as under the degree of disturbance of the following departments in the Royal Arsenal which would arise as the result of moving the Ordnance Factories from Woolwich.

Ordnance Committee	...	No disturbance
Research Department	...	Some rearrangement of the department would be necessary
W.D. Chemist	...	No material change
Inspection Department	...	Would have to follow manufacture

The recommendations of the Hacking Committee were approved in principle, and an inter-departmental committee under the chairmanship of Sir Arthur Robinson was set up to consider certain questions arising out of their recommendations.<sup>96</sup> It was appointed in September 1935 and reported in February 1936. The Robinson Committee recommended that:

(i) A part of the Filling Factory should be established elsewhere than at Chorley, and should be located at Bridgend in South Wales.

(ii) On removal from Waltham, the Royal Gunpowder Factory should be established at Bishopton, near Glasgow.

The question of the transfer of labour and housing of employees consequent upon the acceptance of these proposals was examined by the

<sup>96</sup> 70/Gen./8,341.

Committee, but no specific action was considered necessary until the date of transfer were definitely known.

Ministerial approval was given to these recommendations, and they were implemented in due course.

Though the Royal Arsenal itself remained almost unaffected as a result of these changes—the filling factories at Woolwich had to reopen during the Second World War—they were the forerunner of a process of sharing the load. Later on many other Ordnance Factories for the manufacture of various types of warlike stores opened up in different parts of the country. No longer was the Royal Arsenal the prime manufactory. She might now well be compared to a mother Ordnance Factory in a Commonwealth of Ordnance Factories. Her importance in war has therefore diminished and, as the worst fears of the Mackinnon Wood Committee in regard to air attack have now been realized, the question of security after 150 years had tended to become academic rather than practical, particularly in view of the special present day activities of the Royal Ordnance Factory, Woolwich.

WATER,

When the Crown purchased with a piped supply from a source of water available on property, including the one in Collick Lane,<sup>1</sup> one of the streams was opened up to obtain a more ample supply of water. There were more streams and water available from the house whence it was distributed to the Warren by means of new pipes at great expense. This was not structurally sound. In 1715,<sup>2</sup> and had eventually on a warrant dated 19

Supplies of water in the early days they were upon rainfall and were insufficient to satisfy the exigencies of the situation and the risk of fire. On frequent occurrence, on 1715, a sum of £1000 was paid for 'searching' Certain wells, afterwards called 'widow's mite', but the supplies of the eighteenth century advanced to meet the purposes and the increased demands for supplies, and complaints were made of the fluid. The foundry used large amounts and the general consumption quantities, particularly in the early days, were crying bawling the absence of water. A warrant was raised on 26 July 1778,<sup>5</sup> and was ordered to survey the four pumps set up for

This unsatisfactory situation led to a stroke to widen the source of supply. The pressing when the new works were completed, was planned to be a Pond. This area of water was the Royal Military Repository. The Royal Military Regulations passed on 14 July 1804,

<sup>1</sup> Also called 'Cholick Lane'. It is now part of Woolwich.

<sup>2</sup> Ordnance Bill Book, Series 1, p. 10.

<sup>3</sup> Ordnance Bill Book, Series 1, p. 10.

<sup>4</sup> Ordnance Bill Book, Series 1, p. 10.

<sup>5</sup> Ordnance Journal Book, p. 10.

<sup>6</sup> Ordnance Journal Book, p. 10.

<sup>7</sup> 44. Geo III, C. 79.