

## **The National Factory Scheme**

In August 1914 the state-owned ordnance factories were providing the Army with about a third of its weapons and at this time there were only sixteen firms tendering for War Office munitions contracts:

- WG Armstrong Whitworth & Co. Ltd.
- Harper Sons & Bean Ltd.
- William Beardmore & Company
- Head Wrightson & Co.
- Cammell Laird & Company
- Kings Norton Metal Co.
- Coventry Ordnance Works
- The Projectile Co. (1902) Ltd.
- Dick Kerr & Company
- Rees Roturbo Manufacturing Co.
- The Electric & Ordnance Accessories Co.
- Vickers Ltd.
- T Firth & Sons
- J & P Hill
- Hadfields Ltd.
- Watson Laidlaw & Co.

The first few months of the Ministry's existence saw the establishment of an imposing group of national factories so that by the end of December 1915, there were 73 new sites. These were in addition to the Royal Factories conceded from the War Office at Enfield Lock, Farnborough, Waltham Abbey and Woolwich. By the end of the war, this array of national factories had increased, both in number and in the variety of the products. Over 218 new or adapted factories were in operation and covered not only every kind of munitions, from cannon and aeroplanes to small-arms ammunition, but also centres for the production of ball-bearings and concrete slabs.

Along with the Ministries of Food and Shipping, the Ministry of Munitions came to an end on 31 March 1921.

## **National Shell Factories**

As a means of increasing output of small ammunition shells, various local Munitions Committees organised themselves throughout the country. They represented the smaller engineering firms, many of which had acted as sub-contractors to the armament companies. The first group to be set up were the National Shell Factories established in the Leeds area, where a number of engineering firms co-operated with the production of light shells. Each National Shell Factory was run by a local board of management that represented the main engineering companies in the area. The urgency of the situation demanded that factories were to be established in existing buildings such as railway workshops, textile mills and tramway depots.

## **National Projectile Factories**

The armament firms were strongly opposed to the Ministry setting up new independent production centres for heavy shell and, instead agreed to set up their own new factories as an extension to their existing works. The new factories would be Government property and the armament firms were responsible for the design, construction and to provide managers to run them as agents for the Ministry. One example, the firm of Cammell Laird refused to take any commission for the erection and management of the factory they set up in Nottingham. All new factory designs had to be submitted to the Ministry for approval and their erection was supervised by the Office of Works. But progress was so slow, that in October 1915, John Hunter of Sir William Arrol & Co. Ltd. was appointed as Director of Factory Construction.

The National Projectile Factory at Birtley was built adjacent to an existing works of Sir WG Armstrong Whitworth & Company and was taken over by the Belgian Government for munitions work. To house the workforce, a model village d Elizabethville, (after the Belgian Queen) was constructed from September 1915 by Belgian labour. Single-storey accommodation was provided for 1,600 workers and included 325, three bedroom, 342 two bedroom cottages, 22 timber huts, 24 hostels for single workers and two large dining halls. The village was run on military lines with its own local government, cemetery, church and hospital but, opposition against the administration culminated in a serious riot in December 1916. The result was that Belgian Gendarmes were withdrawn and substituted by British Police and army discipline was relaxed. The workforce were repatriated to Belgium from 7 December 1918 and the houses were then transferred to the Ministry of Labour.

## **HM Explosive Factories**

The factories discussed above, ensured a provision of empty shell, but it was also necessary to provide explosives to fill and propel them. The need to secure outside sources of supply for high explosives had been realised early in the war by the War Office. Only one day after the Defence of the Realm Act became law, the Government commandeered the Rainham Chemical Works for the purification of crude TNT. Before this date there was practically no factory capacity for military TNT other than that produced at the Royal Gunpowder Factory at Waltham Abbey (the manufacture of high explosives was never a function of the ordnance factories). The first new national factory in January 1915 for the manufacture of TNT at Oldbury, was managed by a firm of acid manufacturers, Chance and Hunt. In July 1915, four more National Explosives Factories were established by the Ministry, including a huge example at Gretna for the production of cordite. This site was so large that it had to be divided up into a number of 'Areas'. These consisted of Dornoch Area (1,203 acres) and contained the nitrocellulose and nitro-glycerine sections making a cordite paste which was transported eastward to the Mossband Area (1,381 acres). Here there were eight 'ranges' where the paste was made into cordite. The finished cordite was then sent to the magazines situated in the Longtoun Area (258 acres). Other Areas included the Central Electric Power Station Area at Rigg (10 acres) and Reservoirs and Filters Area (14 acres). Townships for 19,772 workers were built at Gretna (431 acres) and Eastriggs (173 acres).

## **The Manufacture of High Explosive**

Trinitrotoluene (TNT) is a coal extract that eventually replaced lyddite (which was expensive to manufacture and used imported materials) as the bursting charge of high-explosive shell. An adequate supply of explosive was achieved by economising the TNT by mixing it with nitrate of ammonia. The approved method of filling a shell was to melt the explosive and pour it in through the opening at the nose where the fuse would eventually be screwed on. But when ammonium nitrate is mixed with the hot melted TNT, the mixture will not pour very well, so that with 40% nitrate the mixture will not pour at all. A method had to be found of mixing the two ingredients dry and to fill shells with powder. This problem was given to Lord Chetwynd who went over to France in October 1915 to study French methods of shell-filling, he discovered that, their method of filling powdered explosives, by pressing it in through the nose of the shell could be adapted for amatol. On another visit, this time to Woolwich where the practice was to fill with the ratio of 80:20 amatol, was to compress the powder into cakes and insert these into the shell. This idea was eventually abandoned as being too complicated. Meanwhile, Lord Chetwynd in his new purpose built factory at Chilwell near Nottingham, designed experimental plant to show that the mixture of 80:20 in powder form could be used for filling shell. This work proved successful and he went ahead to design larger plant for the mass production of HE. His idea was to use existing equipment found in peacetime industry so that machines normally used for coal crushing, stone pulverising, sugar drying, paint making and sugar-sifting were all adapted to suit his purposes. The TNT for example, was ground between the rollers of a flour mill and a bread-making plant did the mixing.

## **National Filling Factories**

Woolwich could not provide anything like the facilities for shell filling demanded by the number of shells on order, so in July 1915 the first National Filling Factories were started at Aintree and Coventry. By the end of the war, eighteen factories were engaged in filling shells. The Principle Architect to HM Office of Works, Mr. Frank Baines became responsible for all new NFF building designs.

The actual filling was a simple process but very dangerous work and was mainly done by unskilled women workers. One of the problems was that of toxic jaundice resulting from TNT poisoning which, apart from many fatalities resulting from this condition, turned their faces a bright yellow colour. This earned them the nick name "canaries". The factory at Hayes therefore, employed women to fill gaines. A gaine is a tube filled with explosive, attached under the nose-cap of a high-explosive shell and connected with the TNT filling. Its purpose is to ensure that the detonation of the fuse in the nose-cap successfully detonates the contents of the shell.

In 1915 the frequency of premature explosions led to the discovery that a large stock of gaines sent from America had a left-hand screw thread instead of a right-hand thread, and tended to come unscrewed in the shell as it rotated in flight. To prevent this from happening, the screwed-in gaines had to be stabbed in two places with a cold chisel and hammer to break the thread to prevent them from unscrewing in flight. The women workers at Hayes undertook this risky work, for if a trace of the fulminate were ignited by the blow, the gaine would explode.

## **Acetone Production**

Acetone is an essential element in the process of manufacturing cordite and was normally produced by the destructive distillation of wood. Before the war there was a small factory in the Forest of Dean set up by the Office of Woods and Forests to utilise cordwood. In May 1915, the same office opened two more factories at Bideford and Dundee. All three factories were transferred to the Ministry in October and meanwhile, the company of Kynoch had set up a factory in the Forest of Dean which was nationalised in 1917.

The supplies of wood alcohol for the manufacture of acetone was, in 1916, insufficient to meet the increasing demands and without the acetone there would be no cordite. Professor Weizmann discovered a culture capable of transforming the starch of cereals, particularly of maize, (maize contains about two-thirds of its weight as starch) into a mixture of acetone butyl alcohol.

In King's Lynn, an oil-cake factory had been converted in 1912 to make acetone from the starch content of potatoes. As the company was unstable it was nationalised in March 1916 and by June, was producing acetone from maize by the Weizmann process. The shipping shortage in 1917 resulted in the autumn, of a national collection of horse chestnuts for the purpose of using their starch content as a substitute for maize. The King's Lynn factory produced acetone from horse chestnuts using the Weizmann process up until it closed at the end of 1918.

### **The Stokes Gun**

In January 1915, Mr. Wilfred Stokes, an agricultural machinery manufacturer, submitted to the War Office, a drawing for a trench mortar of simple design. It consisted of a steel tube into which a bomb could be dropped with a cartridge fitted to its base, which would explode on hitting a striker at the base of the tube and propel the bomb. But the War Office did not approve of the type of fuse fitted to the bomb, and promptly turned down the invention. On 30 June 1915, Lloyd George witnessed a demonstration at RNAS Wormwood Scrubs and was impressed with its performance. Despite the gun's rejection by the War Office, Lloyd George with a donation of £20,000 from an Indian Maharajah, gave instructions for 1,000 of them to be made. Meanwhile, after a further successful demonstration at Shoeburyness with a new fuse based on that used on the Mills hand-granade, he immediately ordered 100,000 bombs. The Battle of Loos saw the first use in action of the Stokes gun and by the end of the war 11,500 guns of this type had been produced.

### **Anti-Aircraft Air-to-Air Ammunition**

When Germany introduced a practice of bombing undefended towns from Zeppelins, it became desirable to consider ammunition which had a destructive effect on enemy aircraft. In the early part of the war the Special Brock Zeppelin BIK and later, the Pomeroy PSA .303-in. incendiary bullets were being used by both the RFC and RNAS for anti-Zeppelin work over the North Sea. The PSA bullet was developed from 12 August 1916 to replace the BIK as an anti-aircraft round, but when put into production it was found that it would not detonate on a fabric containing rubber such as that used on Zeppelins. The Munition Invention Department re-designed it and the improved version became known as the Explosive Anti-Zeppelin Cartridge, Pomeroy PSA Mk.II.

JF Buckingham of Coventry offered to the Admiralty a .303-inch round with a combined incendiary and a smoke trace which was soon adopted by the RNAS. With the introduction of this round, Sir Richard Threlfall produced the RTS round and although his original version proved difficult to manufacture, a new model known as the RTS Mk.III proved satisfactory. It had both explosive and incendiary characteristics, but it was only used for a short while against Gotha aircraft due to the Armistice.

### **Aircraft Production, Acceptance and Repair**

With airships being transferred to the Navy at the end of 1913, the Royal Aircraft Factory (RAF) from that time was devoted to research and invention of heavier than air aircraft for the Royal Flying Corps. The Navy had pinned its faith to the civilian aircraft industry, with Admiralty contracts being awarded to Messrs A V Roe, Short Brothers and Sopwith. Furthermore, on the outbreak of war, Rolls Royce were also encouraged to build high horsepower aero-engines. This marked the beginning of a long line of Rolls Royce engines for use in aircraft and it was thought essential that their s should have generic continuity. The s of birds of prey were thought suitable with the first RR military aero-engined "Eagle".

The Royal Aircraft Factory existed as a technical department for both services, but the Admiralty made comparatively little use of its services and developed an independent technical branch. Thus, on the outbreak of war, the Royal Aircraft Factory was entirely under the control of the Director-General of Military Aeronautics.

For the first two years of war much pioneer work in design, both of aeroplanes and engines was carried out at the factory. A certain amount of manufacture was also done, including repair and the provision of spares for both aeroplanes and aero-engines.

As a result of accidents involving Deperdussin, Cody biplanes and Bristol monoplanes during 1913, the Army Orders issued on 2 January 1914, announced the formation of the Aeronautical Inspection Department of the Military Wing, RFC. New aeroplanes and engines for acceptance by the AID, were to be delivered by road to Farnborough for erection and flight test. Furthermore, a vital factor involving the department was in assuring increased security in the air. Standards of safety were laid down by the AID, which were soon to be adopted by private industry and greatly reduced the number of casualties amongst pilots.

In January 1915, a scheme of co-operative aircraft construction was established in Scotland with G & J Weir as the central firm. This system utilised a number of small sub-contractors for the manufacture of aeroplane parts in conjunction with final assembly of the component parts in their own works. By the summer of 1915, similar centres to that operating in Scotland had been set up in Coventry, Manchester and London.

From March 1915, demand and output of new aircraft and engines increased, contractors were now required to deliver new machines for acceptance by the RFC either to aerodromes built adjacent to their own works, or to the nearest specified aerodrome. This was instead of the previous method of supplying new aircraft to Farnborough for acceptance. Under the new system, aeroplanes were erected by the firm's own staff and handed over for flight test by the pilots of the Aeronautical Inspection Department. This eventually led to the establishment of a number of Aeroplane Acceptance Parks (AAPs).

By late 1918, 27 AAPs were either in operation, or under construction. Also a number of Aircraft Repair Depots (ARDs) were established geographically to carry out major repairs to military aircraft. Good road and rail communication and proximity to industrial centres were all essential for the operation of the ARDs. Construction commenced from 1917 on new sites that were established close to an existing railway network and from this extensive railway sidings were created serving large salvage and store sheds. A network of Decauville narrow gauge railways was also built inside the camp serving the interior of salvage, workshops and stores

### **National Aircraft Factories**

In the middle of 1917, the sudden expansion of the aircraft programme, led to a change from the previous policy of distributing work among a large number of small producers, to concentrate instead on large production centres.

Sir William Weir (the Director of Munitions in Scotland) originally proposed the transfer to the Ministry of Munitions, of the responsibility in supplying aircraft to the Army and Navy in May 1916. On 8 September 1916 Mr. Montagu (Minister of Munitions) laid Weir's proposal before the War Committee, that great skill was required to manufacture aircraft components and the production of aircraft should therefore be controlled by the Ministry - the War Committee accepted. Meanwhile a change of Government took place and the scheme was accepted by Lloyd George's War Cabinet in January 1917. Weir was then appointed as Controller of Aeronautical Supplies, and his duties were to re-organise the existing Army and Navy supply sections into a single Supply Department. Weir was given a seat on the Air Board and an office in the Hotel Cecil, where the Board had its headquarters. Percy Martin became Controller of Petrol Engine Supply. On 21 February 1917, Weir's achievement as Controller of Aeronautical Supplies was awarded with a knighthood.

With the new Minister's backing (Christopher Addison), Weir curtailed the designing of aircraft and aero-engines by the State at the Royal Aircraft Factory. Weir's main policy was to get new aircraft into the air while producing fewer aircraft types produced in larger factories. On the 1 March 1917, there were 55 types of aircraft in production and 33 types of engine. One year later, the number of aircraft types in production had come down to 30 and of engines, to 25. At the same time the Department had been trying to develop large production facilities rather than to spread the work among a large number of contractors.

Sanction was therefore obtained in September 1917 to fund the setting up at Government expense, of three new factories, to be operated under the control of the Department of Aircraft Production. Sites were selected at Croydon, Liverpool and Kingston, and arrangements were made for their management by Holland, Hannen and Cubitt (Croydon), the Cunard Steamship Company (Liverpool) and the Sopwith Aviation Company Ltd. It was eventually decided that the Sopwith Aviation Company should adapt the new building at Kingston (built by Dick Kerr) as an assembly shop to their adjacent factory and not as a national factory. A factory under construction in the autumn of 1917 belonging to the Crossley Motors Ltd Company, was selected instead as the third National Aircraft Factory.

### **NAF 1**

In September 1917, Holland, Hannen & Cubitt undertook the management of their factory at Waddon. The site consisted of 198 acres of flat land, but progress on construction was delayed by the bad weather and the shortage of steelwork. By 18 January 1918, the office staff was installed and by the middle of March, part of the factory was sufficiently equipped for manufacture to begin. All building work being completed by 13 July 1918.

The factory was laid out to produce a weekly output of forty, DH 9 aircraft plus spare parts, and 600 CC interrupter gears. The first complete aircraft was delivered during the first week of April and the total production by 31 March 1919, was 241 aircraft and 3,000 CC gears.

### **NAF 2**

Matthews & Sons started construction of the NAF at Heaton Chapel and its adjacent landing ground, on 9 October 1917 on a site covering 22 acres, but was delayed by extensive excavation required on the site. Matthews also experienced delays in the supply of steelwork and other building materials and it was not until December, that the company were granted first-class priority for building supplies. In July 1918, the factory was extended for the manufacture of Dragonfly engines. Manufacture began in April of DH 9 and DH 10 aeroplanes and the total output before 31 March 1919, was 326 aeroplanes - making it the most successful National Aircraft Factory.

### **NAF 3**

About 70 acres of land next to Aintree racecourse was requisitioned under DORA and construction on the new factory began on 4 October 1917. The racecourse itself was used as a flying ground. About 3,000 men were engaged in construction work, many were Irish labourers who in March 1918 left the country owing to the new Registration Act. By this time, the buildings had been sufficiently built to accommodate the office staff and production of Bristol Fighter aircraft commenced several weeks later. By 1 October 1918, only 36 aircraft had been delivered and twelve of these were without engines. Manufacture continued after the Armistice, with the total output at the end of March 1919, being 126 aircraft.

## **Oldham**

In June 1917, an Aircraft Production Board had been set up in America and the Bolling Commission sailed for Europe to gain information for an American aircraft programme. The mission had recommended in July, for the production of Caproni bombers and later, that consideration should also be given to the Handley-Page bomber. In London, the Chief of Air Staff, Hugh Trenchard, devised a plan in January 1918, for incorporating American crews as well as British, thus creating an inter-Allied bombing force using Handley Page O/400 bombers. Contracts were therefore awarded to the Standard Aircraft Company for 500 HP bombers, most of these were to be shipped over for final assembly in Britain. The metal fittings for 1,000 sets of aircraft were to be manufactured by the Grand Rapids Airplane Company. Later the order was increased to 2,000, O/400 bombers and in September, the first American-built O/400 was delivered to the American Air Service.

A site for the final assembly of American-built aircraft, was found in Oldham, where there was a large female workforce normally engaged in the Lancashire cotton industry. On grounds of cost, and the labour question, it was decided to requisition the Gorse Mill (No. 2), Hollinwood, and the Lilac Mill at Shaw. It was also decided to erect a number of buildings for aircraft assembly and to provide an Aircraft Acceptance Park. The work of construction began in February, and the Alliance Aeroplane Company (Waring and Gillow Ltd.) were appointed as managers.

Progress of construction was slow and it was not until July 1918 that the first floor of Gorse Mill was occupied. The first shipments of parts arrived on 20 August and by the November Armistice, only 10 aircraft had been partially assembled.

## **Airframe Components**

The production of large bomber aircraft towards the middle of 1917 raised a serious problem in the supply of radiators as this type of aircraft required water-cooled engines requiring radiators of special construction.

The factory of the Motor Radiator Manufacturing Company at Greet, near Birmingham, offered several advantages for this purpose. It was already laid out for the production of tube honeycomb radiators and had the necessary plant equipment. After negotiations to transfer the company, which belonged to a Norwegian, to an English firm, it was taken over by the Ministry under DORA.

Perhaps the most significant war-time contribution made by this company was in February 1918, when the new SE 5 aircraft then under trial had a serious reduction in top speed. This was due to the fitting of a similar radiator to that used on the DH. 9 but when fitted to the SE 5, it produced too much drag. Within two days a new design was despatched to Farnborough which proved successful. As this aircraft type was urgently required at the Front, a number of courier air mechanics personally delivered the new radiators to service aircraft in France.

The demand for aircraft timber in September 1917, resulted in the provision of facilities for kiln-drying British ash timber. Two new kilns were constructed at the works of the Great Western Railway Company at Swindon and those of the London Brighton and South Coast Railway at Lancing. Both companies took over the kilns for their own purposes on 31 March 1919.

## **Aero-Engine Components**

During August 1917, heavy demands for Rolls Royce aero-engines were received by the Controller of Aeronautical Supplies, special steps therefore, had to be taken to increase production. Because of their experience in repairing French aero-engines, the firm of Clement Talbot at Ladbroke Grove was selected by the Government for repair and producing spares for Rolls Royce engines. The works were taken over by the Ministry on 1 January 1918 and dealt with the repair of RR engines returned from aerodromes within the counties around London. The total output of repaired engines during the period of the works running as a national factory was 608. The works returned to Clement Talbot on 28 February 1919.

During January 1917, in order to undertake a large contract for the supply of aero-engine parts, the Government authorised Mitchell, Shaw and Company, to purchase the Goss Printing Works at Hayes, Middlesex. The Ministry of Munitions decided in October 1917, to take over the management of the factory, as the output was unsatisfactory. After the change in management, the organisation improved and production increased. The factory was sold in September 1919 to the Cosmos Consolidated Company.

## **Kite Balloons**

By the end of 1917 there was under the Home Defence Scheme, a demand for kite balloons for the anti-submarine programme. The decision was taken therefore, to establish a National Balloon factory and a site was found in Finchley, North London, the property of Bohemia Ltd. The premises were taken over under the Defence of the Realm Act and managed jointly by the Sidney Davidson Balloon Company and Davidson Aviation Company, but owing to some delay in setting this up, the factory was taken over in July 1918 by the Controller of National Aircraft Factories. Production of Caquot and Nurse type balloons began in April 1918, and the total number of balloons up to 8 February 1919 (when the factory closed), was 118. A large proportion of the workforce were women, and at the Armistice out of a total of 297 employees, 270 were female. The factory was sold around June 1919 to the Kiwi Polish Company.

## **Gazetteer of National Factories 1915 - 1919**

### **His Majesty's Explosive Factories**

#### **1. HMEF Avonmouth**

*Construction started:* August 1916.

*Opened:* early 1917.

*Area:* 249 acres

*Management:* Explosives Supply Department.

*Munitions:* mustard gas, sulphuric acid and picric acid (production of picric acid later abandoned).

*Notes:* built on a bank of the River Severn 1.5 miles from NFF Chittening, and close to the site of the National Spelter Company factory under construction in August 1916.

#### **2. HMEF Bradley (Deighton)**

*Construction started:* January 1917.

*Opened:* 1 July 1918.

*Area:* 26 acres, land part owned by the Midland Railway Company.

*Management:* Major Holliday.

*Munitions:* picric acid (lyddite).

*Notes:* built adjacent to Major Holliday's works but separated by a railway embankment (for safety).

#### **3. HMEF Colnbrook (Middlesex)**

*Construction started:* June 1916.

*Management:* direct control.

*Munitions:* guncotton.

#### **4. HMEF Craigleith - Edinburgh**

*Construction started:* April 1916.

*Contractor:* designed and built by the Lothian Chemical Company.

*Opened:* February 1917.

*Management:* Lothian Chemical Company.

*Munitions:* TNT.

*Notes:* this was the last WW1 factory erected for the production of TNT.

#### **5. HMEF Ellesmere Port**

*Construction started:* March 1916 - February 1917.

*Opened:* May 1917 (production started).

*Area:* 5 acres, land owned by the Portland Cement Company. Factory area 410,601 sq ft.

*Management:* Explosives Supply Department.

*Munitions:* synthetic phenol and arsenic compounds.

#### **6. HMEF Gadbrook (Northwich)**

*Construction started:* 19 July 1915.

*Contractor:* Brunner Mond & Company Ltd.

*Opened:* February 1916.

*Area:* 59 acres.

*Management:* Brunner Mond & Company Ltd.

*Munitions:* TNT purification.

#### **7. HMEF Greetland (Halifax)**

*Construction started:* January 1917.

*Contractor:* Sharp and Mallett.

*Opened:* August 1917.

*Area:* 15 acres, land part owned by the Halifax Corporation and the Lancashire & Yorkshire Railway Company.

*Management:* Sharpe and Mallett.

*Munitions:* picric acid.

*Notes:* built close to Greetland railway station.

#### 8. HMEF Greenford

*Construction started:* August 1916 - February 1917

*Opened:* January 1917

*Area:* land leased from Purax Company

*Management:* Chemical Section of Trench Warfare Department

*Munitions:* chemical shell.

*Notes:* satellite of Walthamstow to become the Chemical Shell Assembling Station.

#### 9. HMEF Gretna

*Construction started:* July 1915.

*Contractor:* Pearson & Son Ltd.

*Opened:* June 1916.

*Area:* 9,000 acres.

*Management:* Factory Branch of Explosives Supply Department.

*Munitions:* cordite.

*Notes:* built on the Solway Estuary.

#### 10. HMEF Hackney Wick - Phoenix Chemical Works (Wallis Road)

*Construction started:* 1915.

*Contractor:* works originally owned by Mr. Bragley.

*Opened:* unknown.

*Area:* 9,174 sq yds.

*Management:* Factory Branch of Explosives Supply Department.

*Munitions:* raw TNT.

*Notes:* factory located near to White Post Lane.

#### 11. HMEF Hammersmith (Distillery)

*Original function:* distillery.

*Opened:* 1915.

*Munitions:* phosphorus charging station for 4in Stokes bombs.

#### 12. HMEF Irvine

*Construction started:* January 1917.

*Contractor:* Noble's Explosives Company.

*Opened:* February 1918.

*Area:* 222 acres, land owned by the Duke of Portland.

*Management:* Noble's Explosives Company.

*Munitions:* nitro-cellulose powder production to reduce overseas purchases.

#### 13. HMEF Langwith (Mansfield)

*Construction started:* November 1915.

*Opened:* October 1916 (Electrolytic Section) and June 1917 (Chemical Section).

*Area:* 10 acres, land owned by Langwith By-Product Company Ltd.

*Management:* Langwith By-Product Company Ltd.

*Munitions:* ammonium perchlorate.

*Notes:* built so that Britain could be independent from Sweden for ammonium perchlorate.

#### 14. HMEF Litherland (Liverpool)

*Construction started:* November 1914, factory nationalised in March 1916.

*Opened:* November 1914.

*Area:* 11 acres.

*Management:* Botherton & Company Ltd.

*Munitions:* TNT for small shells.

*Notes:* built adjacent to existing works of Botherton & Company Ltd (tar distillers).

#### 15. HMEF Lytham

*Construction started:* January 1917.

*Opened:* July 1917.

*Area:* 21 acres.

*Management:* Mr. Lance Blythe and later Factories Branch of Explosives Supply Department.

*Munitions:* picric acid.

*Notes:* closed March 1918.

16. HMEF Oldbury - Tat Bank

*Construction started:* December 1914.

*Contractor:* Cape Explosives Company/ Chance and Hunt Ltd.

*Opened:* May 1915.

*Area:* 18 acres.

*Management:* Chance and Hunt Ltd.

*Munitions:* TNT.

*Notes:* i) this was the first new national factory for manufacture of TNT. ii) built as two sites adjacent to existing works of Chance and Hunt Ltd. iii) one site close to Oldbury goods station and the other adjacent to Langley Green station.

17. HMEF Pembrey

*Construction started:* existing factory nationalised in June 1917.

*Opened:* July 1915.

*Area:* 760 acres.

*Management:* Noble's Explosives Ltd.

*Munitions:* TNT, tetryl and propellants.

*Notes:* i) built at Pembrey Sand Burrows. ii) over 400 buildings constructed at this site.

18. HMEF Penrhyn Deudrath (N. Wales)

*Construction started:* existing factory nationalised in July 1915.

*Contractor:* Ergite & Company Ltd.

*Opened:* re-opened January 1916.

*Area:* 11 acres.

*Management:* Factories Branch of Explosives Supply Department.

*Munitions:* TNT.

*Notes:* factory destroyed by explosion in June 1915 but later rebuilt.

19. HMEF Queensferry with Sandycroft

*Construction started:* factory adapted from existing building in July 1915.

*Opened:* December 1915.

*Area:* 298 acres.

*Management:* Asiatic Petroleum Company Ltd at Sandycroft and Factories Branch of Explosives Supply Department at Queensferry. Note: originally two separate sites, later Sandycroft became a part of Queensferry.

*Munitions:* TNT, MNT and guncotton.

*Notes:* existing factory buildings were former engineering workshops of Williams & Robinson & Queens Ltd and used from the beginning of the war as a prisoner-of-war camp.

20. HMEF Rainham - 'Rainham Chemical Works'

*Construction started:* November 1914.

*Opened:* January 1915.

*Area:* unknown.

*Management:* Synthetic Products Company Ltd./ Coley & Wilbraham Ltd.

*Munitions:* purifying crude TNT.

*Notes:* factory completely destroyed in an explosion on 13 February 1918.

21. HMEF Sandycroft - Chester

*Construction:* existing factory nationalised in June 1918.

*Opened:* 1918.

*Management:* Asiatic Petroleum Company Ltd. and Factories Branch of Explosives Supply Department.

*Munitions:* MNT.

*Notes:* factory became part of the HMEF Queensferry complex.

22. HMEF Stratford

*Management:* operated by a detachment of RNVR.

*Munitions:* prussic acid.

23. HMEF Sutton Oak (St. Helens)

*Construction started:* existing factory nationalised in January 1916.

*Opened:* November 1915.

*Area:* 16 acres, factory area 82,811 sq ft.

*Management:* United Kingdom Chemical Products Company Ltd. and later, the Factories Branch of Explosives Supply Department.

*Munitions:* phenol and arsenic compounds.



24. HMEF Swindon 'Stratton Works'

*Construction started:* Early 1917.  
*Opened:* October 1917.  
*Area:* 67 acres, factory area 340,087 sq ft.  
*Management:* Factories Branch of Explosives Supply Department.  
*Munitions:* ammonium nitrate.

25. HMEF Trafford Park (Manchester)

*Construction started:* October 1915.  
*Contractor:* Hardman and Holden Ltd.  
*Opened:* July 1916.  
*Area:* land owned by Trafford Park Estates, factory area 8,400 sq yds.  
*Management:* Hardman and Holden Ltd.  
*Munitions:* toluol production.

26. HMEF Victoria - Northwich

*Construction started:* February 1916.  
*Contractor:* Brunner Mond & Company Ltd.  
*Opened:* August 1916.  
*Area:* 50 acres, factory area 461,802 sq ft.  
*Management:* Salt Union Ltd. and Factories Branch of Explosives Department.  
*Munitions:* ammonium nitrate and calcium nitrate tetrahydrate.  
*Notes:* originally known as the 'Victoria Salt Works'.

27. HMEF Walthamstow (Black Horse Lane)

*Construction started:* factory built July - August 1915 and nationalised in June 1916.  
*Contractor:* Baird & Tatlock.  
*Opened:* August 1915.  
*Management:* Baird & Tatlock until 1 November 1917, then taken over by the Trench Warfare Supply Department.  
*Munitions:* charging station for chemical shells (mustard gas).  
*Notes:* i) built next to Baird & Tatlock's 'Duroglass' Works (manufacturers of glass containers for chemicals.) ii) became NTWFF for charging lachymatory shell.

28. HMEF Watford

*Construction started:* August 1915.  
*Contractor:* James Gordon & Company Ltd.  
*Opened:* December 1915.  
*Area:* 61 acres.  
*Management:* Roburite & Ammonal Ltd.  
*Munitions:* amatol production until the price of aluminium became very expensive and then switched to producing amatol.

29. HMEF West Gorton (Manchester)

*Construction started:* existing factory of MN Morris & Company Ltd, nationalised in October 1915.  
*Opened:* late 1914.  
*Area:* 8 acres.  
*Management:* MN Morris & Company Ltd. of Gorton Brook.  
*Munitions:* synthetic phenol production.

**His Majesty's Explosive Factories (Acetate & Acetone Production)**

30. HMEF Bideford

*Construction started:* May 1915.  
*Opened:* nationalised in October 1915.  
*Management:* Office of Woods and Forests, and direct control.  
*Products:* acetate of lime by wood distillation.

31. HMEF Coleford

*Construction started:* existing factory constructed in 1913.  
*Opened:* 1913, nationalised in October 1915.  
*Management:* Office of Woods and Forests, and direct control.  
*Products:* acetate of lime by wood and maize distillation.

32. HMEF Dundee (Graham Street)

*Construction started:* May 1915.

*Opened:* nationalised in October 1915.

*Management:* Office of Woods and Forests, and direct control.

*Products:* acetate of lime by wood and maize distillation.

33. HMEF King's Lynn

*Construction started:* existing factory belonging to Synthetic Products Company Ltd and nationalised in March 1916.

*Management:* Propellants Branch of Explosives Supply Department.

*Products:* acetone.

34. HMEF Longparish (Andover)

*Construction started:* existing factory of Kynoch Ltd, nationalised early 1917.

*Products:* acetate of lime by wood distillation.

35. HMEF Ludlow

*Construction started:* spring 1918.

*Management:* direct control.

*Products:* intended for acetate of lime production.

36. HMEF Mid-Lavant (Chichester)

*Construction started:* spring 1918.

*Management:* direct control.

*Product:* intended to produce acetate of lime.

**National Filling Factories**

1. No.11 NFF Abbey Wood

*Construction started:* 23 September 1915.

*Contractor:* Kings Norton Metal Company.

*Opened:* January 1916.

*Management:* Kings Norton Metal Company.

*Munitions:* assembling and filling shell, fuses, detonators and gaines.

*Notes:* built adjacent to KNMC works at Abbey Wood.

2. No. 9 NFF Banbury

*Construction started:* 28 January 1916.

*Contractor:* Holland, Hannan & Cubitts?

*Opened:* 25 April 1916.

*Area:* 142 acres.

*Munitions:* lyditte filling factory - H2 mines, 18-pdr., 6-pdr. and 60-pdr. HE.

3. No. 12 NFF Cardonald - Glasgow

*Construction started:* 18 October 1915.

*Contractor:* Alfred McAlpine & Sons Ltd.

*Opened:* January 1916.

*Management:* Noble's Explosives Ltd.

*Munitions:* detonators, gaines and primers.

*Notes:* built close to Cardonald railway station.

4. No. 6 NFF Chilwell - Long Eaton

*Construction started:* 5 September 1915.

*Contractor:* Holland & Hannan & Cubitts Ltd.

*Opened:* January 1916.

*Area:* 208 acres.

*Munitions:* TNT and ammonium nitrate mills filling 4.5in to 15in shell.

*Notes:* i) two factories built here known as 'North' and 'South'. ii) on 1 July 1918, a serious explosion in the amatol mixing house resulted in the deaths of 134 employees.

5. No. 23 NFF Chitterning

*Construction started:* November 1917 - January 1918.  
*Contractor:* Thorburn Ltd.  
*Opened:* June 1918.  
*Area:* 200 acres.  
*Management:* Noble's Explosives Ltd.  
*Munitions:* filling 6in shell with mustard gas.

6. No. 10 or 21 NFF Coventry - Foleshill

*Construction started:* 12 September 1915.  
*Contractor:* White & Poppe Ltd.  
*Opened:* September 1916.  
*Area:* 109 acres, land owned by White & Poppe Ltd.  
*Management:* White & Poppe Ltd.  
*Munitions:* filling detonators, fuses and gaines.

7. No. 22 NFF Gainsborough

*Construction started:* 24 November 1917.  
*Opened:* 14 February 1918.  
*Area:* 143 acres.  
*Management:* local board of management.  
*Munitions:* for filling sinkers with TNT, and naval work including H2 mines.

8. No. 4 NFF Georgetown - Erskine (Paisley)

*Construction started:* 25 September 1915.  
*Contractor:* Alfred McAlpine & Sons Ltd.  
*Opened:* January 1916.  
*Area:* 250 acres, agricultural land.  
*Munitions:* filling 4.5in and 18-pdr HE, 12in HE and trench mortar bombs.

9. No. 5 NFF Gloucester - Quedgeley

*Construction started:* 20 October 1915.  
*Contractor:* The Gloucester Constructionists Ltd.  
*Opened:* March 1916.  
*Area:* 308 acres, agricultural land.  
*Management:* local board of management.  
*Munitions:* filling 18-pdr. cartridge, 4.5in and 60-pdr. shell, cartridges and primers.

10. No. 7 NFF Haynes

*Construction started:* 8 September 1915.  
*Contractor:* Higgs and Hill Ltd.  
*Opened:* 30 October 1915.  
*Area:* 200 acres  
*Munitions:* detonators, gaines, 18-pdr., 4.5in, 6in howitzer HE and smoke.  
*Notes:* also known as Emergency Factory No. 2

11. No. 14 NFF Hereford

*Construction started:* June 1916.  
*Opened:* November 1916 and April 1918.  
*Area:* 519 acres.  
*Munitions:* 18-pdr., chemical, 60-pdr. HE and 6in howitzer HE.  
*Notes:* closed in April 1918 and put on stand-by, reopened due to explosion at Chilwell.

12. No. 1 NFF Leeds - Barnbow (Manston)

*Construction started:* 13 September 1915.  
*Contractor:* W Irwin & Company Ltd.  
*Opened:* March 1916.  
*Area:* 296 acres.  
*Munitions:* filling 18-pdr. to 6in shell and QF, BL type cartridges.  
*Notes:* an explosion occurred in December 1916 which resulted in the deaths of 34 women.

13 No. 2 NFF Liverpool - Bland Park Farm - Sefton

*Construction started:* 18 October 1915.  
*Contractor:* Bullen Brothers Ltd.  
*Opened:* January 1916.  
*Area:* 175 acres.  
*Munitions:* 6in HE howitzer, 18-pdr. incendiary and 60-pdr. HE shell.  
*Notes:* built close to Aintree railway station.

14 No. 13 NFF Morecambe - White Lund

*Construction started:* 23 November 1915.  
*Contractor:* Mitchell Brothers Ltd.  
*Opened:* July 1916.  
*Area:* 250 acres.  
*Management:* Vickers Ltd.  
*Munitions:* filling 6in howitzer, 8in HE and 60-pdr. HE.  
*Notes:* the following buildings were constructed here: 16 bonded stores, paint shop, shell store, magazines, power station and six 'danger' huts.

15. No. 18 NFF Pembrey - Burry Port

*Opened:* 2 July 1915 and nationalised in June 1917.  
*Management:* Explosives Loading Company.  
*Munitions:* filling 4.5in, 6in, 8in shell and breaking down of defective shell and amatol recovery.  
*Notes:* built adjacent to HMEF Pembrey.

16 No. 3 NFF Perivale, London (Willesden Lane)

*Construction started:* 26 August 1915.  
*Contractor:* Alfred McAlpine & Sons Ltd.  
*Opened:* 1 December 1915.  
*Area:* 120 acres.  
*Munitions:* detonators, gaines and primers.

17. No. 8 NFF Southwark, London (Sumner Street)

*Construction started:* existing building with new extensions added late summer 1915.  
*Contractor:* John Gray Ltd.  
*Opened:* 12 September 1915.  
*Area:* 60,000 sq yds.  
*Munitions:* for filling gaines, Nos. 100 - 103 type fuses, and inspecting protective clothing.  
*Notes:* this site was known as Emergency Factory No. 1.

**National Component Factory**

18. NCF Tipton

*Original function:* unknown.  
*Opened:* early 1917.  
*Management:* Bean & Son Ltd.  
*Munitions:* fuzes, HE shell heads and nose bushes.

**National Fuse Filling Factories**

19. NFFF Leeds (Armley Road)

*Original function:* spindle factory of Jonathan Hattersley & Son Ltd.  
*Opened:* Early 1916.  
*Management:* Leeds Munitions Committee.  
*Munitions:* No.106 type fuse.  
*Notes:* the Leeds Munitions Committee acquired the rights to manufacture the No. 106 fuse from the Leeds Munition Company Ltd. This factory became National Ordnance Factory No. 4.

20. NFFF Leeds (Sweet Street)

*Original function:* unknown.  
*Opened:* early 1916.  
*Management:* Leeds Munitions Committee.  
*Munitions:* assembly and gauging.  
*Notes:* became National Ordnance Factory No. 6.

21. NFFF Leeds (Wellington Street)

*Original function:* unknown.  
*Management:* Leeds Munitions Committee.  
*Munitions:* fuzes.  
*Notes:* became National Ordnance Factory No. 5.

22. NFFF Luton - Chaul End

*Construction started:* date unknown. New factory of George Kent Ltd.  
*Opened:* June 1916.  
*Management:* George Kent Ltd.  
*Munitions:* No. 80 fuse.

**National Fuse Rectification Factory**

23. Phoenix Place - London (Gray's Inn Road)

*Opened:* existing factory nationalised in May 1916.  
*Management:* William Cobitt Ltd.  
*Munitions:* rectifying, repairing fuses and conversion of American supplied type 100 fuse.

**National Trench Warfare Filling Factories**

24. NTWFF Denaby (Rotherham)

*Construction started:* 21 August 1915, factory completed by February 1916 but was later extended due to the demand for Stokes mortar shell.  
*Opened:* 11 December 1915.  
*Management:* British Westfalite Ltd.  
*Munitions:* filling 3in Stokes mortar shell.  
*Notes:* built close to the works of the British Westalite Ltd.

25. NTWFF Erith - Crayfordness, Slade Green

*Construction started:* 21 August 1915.  
*Opened:* 9 October 1915.  
*Area:* 14 acres.  
*Management:* Thames Ammunition Works.  
*Munitions:* filling 2in and 6in mortar shells.  
*Notes:* built close to the Thames Ammunition Works.

26. NTWFF Fulham (Stevenage Road)

*Construction started:* existing factory of WE Blake Explosives Loading Company Ltd.  
*Contractor:* WE Blake Ltd.  
*Opened:* nationalised in February 1916.  
*Area:* 3 acres, land owned by Ecclesiastical Commissioners.  
*Management:* WE Blake Explosives Loading Company Ltd. of Stevenage Road, Fulham.  
*Munitions:* filling grenades, Stokes bombs and pyrotechnic work.  
*Notes:* magazines located at Worm Holt Farm, Shepherds Bush.

27. NTWFF Selby (Barlby Road)

*Opened:* nationalised in June 1916.  
*Management:* Ardol Ltd.  
*Munitions:* hydrogen and hydrogenated oils and charging chemical shell.

28. NTWFF Watford No. 1 (Balmoral Road)

*Construction started:* 19 February 1915.  
*Opened:* October 1915.  
*Area:* 20 acres.  
*Management:* direct control.  
*Munitions:* assembly of fuses.  
*Notes:* i) built adjacent to HMEF Watford. ii) site consisted of 19 filling sheds.

29. NTWFF Watford No. 2 - Callowland (Bushy Mill Lane)

*Construction started:* 19 February 1916.

*Opened:* July 1916.

*Area:* 40 acres

*Management:* direct control

*Munitions:* heavy trench mortar bombs, trench mortar fuses and assembly of chemical weapons.

*Notes:* i) work from here taken over by the Greenford Chemical Shell Assembly Station in January 1917. ii) 26 filling sheds were constructed here and a magazine with a capacity of 300 tons.

**National Ordnance Factories**

1. NOF Leeds (See NPF)

*Munitions:* 18-pdr., 60-pdr., 6in, 8in guns and 9.2in howitzers.

2. NOF New Basford

*Original function:* lace mill and taken over at the end of 1917.

*Opened:* February 1918.

*Area:* 40,000 sq ft.

*Management:* Coventry Ordnance Works.

*Munitions:* 1.5-pdr. Gun.

3. NOF Nottingham

*Munitions:* 18-pdr. Guns.

4. NOF Sheffield

*Munitions:* 60-pdr. and 8in guns.

**National Projectile Factories**

1. NPF Birtley (A and B)

*Construction started:* August 1915 - April 1916.

*Contractor:* Sir WG Armstrong Whitworth & Company Ltd.

*Opened:* August 1916.

*Area:* (A) 9 acres (B) 52 acres.

*Management:* Belgian Government.

*Munitions:* (A) cartridge cases, (B) shell projectile factory 4in, 4.5in, 60-pdr., 6in and 8in. shell.

*Notes:* i) the main works of Armstrong Whitworth were at Elswick. ii) administration and labour at Birtley provided by the Belgian Government. iii) Site sold at the end of 1919 to Sir William Angus Sanderson.

2. NPF Cathcart - 'Holme Foundry' (Glasgow)

*Construction started:* September 1915.

*Contractor:* G & J Weir.

*Opened:* April 1916.

*Management:* G & J Weir.

*Munitions:* 8in shell and aeronautical work

*Notes:* built adjacent to the companies existing factory at Minto Avenue, Cathcart.

3. NPF Darlington

*Construction started:* existing works of North Eastern Railway Company.

*Contractor:* Sir WG Armstrong Whitworth & Company Ltd.

*Opened:* July 1916 (nationalised).

*Area:* 2 acres, land owned by the North Eastern Railway Company Ltd.

*Management:* North Eastern Railway Company Ltd.

*Munitions:* 18-pdr. HE shell and 6in shell; naval practice shot.

*Notes:* i) NE Railway Company acted as sub-contractors to Armstrong Whitworth, factory built adjacent to locomotive works. ii) not strictly a NPF, but a nationalised munitions factory specialising in large shell.

4. NPF Dudley - Waddam's Pool

*Construction started:* August 1915.  
*Contractor:* Harper Sons & Bean Ltd.  
*Opened:* 27 May 1916.  
*Area:* ? Land owned by Mr./ Mrs. Bean and Edward Harper.  
*Management:* Bean and Sons Ltd.  
*Munitions:* 6in HE, 8in shell, 18-pdr., 60-pdr. shrapnel and aero-engines

5. NPF Glasgow - Cardonald - Paisley

*Construction started:* August 1915.  
*Contractor:* William Beardmore & Company Ltd.  
*Opened:* March 1916.  
*Area:* 8.25 acres, land owned by Sir William Beardmore.  
*Management:* Sir William Beardmore & Company Ltd.  
*Munitions:* 18-pdr., 6in and 8in shell.  
*Notes:* also known as Craigton.

6. NPF Glasgow - Mile End- 'Grant's Mill'

*Construction started:* existing building.  
*Opened:* late 1916.  
*Management:* Sir William Beardmore & Company Ltd.  
*Munitions:* 6in and 60-pdr. HE shell.  
*Notes:* factory used existing cotton mill at Bridgeton.

7. NPF Glasgow - Mossend

*Construction started:* August 1915.  
*Opened:* November 1916.  
*Management:* Sir William Beardmore & Company Ltd.  
*Munitions:* shell forgings 9.2in, 6in, and 60-pdr. HE shells.  
*Notes:* built adjacent to existing Beardmore factory.

8. NPF Hackney Marshes - London

*Construction started:* 15 October - 26 February 1916.  
*Contractor:* Dick Kerr & Company Ltd.  
*Opened:* February 1916.  
*Area:* ? Land owned by London Corporation Council.  
*Management:* Dick Kerr & Company Ltd.  
*Munitions:* 6in HE steel (chemical) and 6in cast-iron (HE).

9. NPF Lancaster

*Construction started:* 11 September 1915.  
*Contractor:* Vickers Ltd.  
*Opened:* November 1916.  
*Area:* 33 acres.  
*Management:* Vickers Ltd.  
*Munitions:* grenade mortars, 9.2in, 6in, 8in and 60 pdr. shell, repair and trench warfare work.

10. NPF Nottingham (King Meadow Road)

*Construction started:* September 1915.  
*Contractor:* Cammel Laid & Company Ltd.  
*Opened:* March 1916.  
*Area:* 14 acres.  
*Management:* Cammel Laird & Company Ltd.  
*Munitions:* 9.2in and 6in shells and making 18-pdr. Guns.  
*Notes:* became National Ordnance Factory (1917-1918).

11. NPF Ponders End (Middlesex)

*Construction started:* 1914.  
*Opened:* 1914 and nationalised 1917.  
*Management:* Rees Roturbo Manufacturing Company.  
*Munitions:* 6in, 8in, 12in, shell and repairing guns.  
*Notes:* not strictly a NPF, but a nationalised factory that specialised in large shell.

## 12. NPF Renfrew 'Aisne' Factory

*Construction started:* November 1915.

*Contractor:* Babcock & Wilcox Ltd.

*Opened:* May 1916.

*Area:* 10 acres.

*Management:* Babcock & Wilcox Ltd.

*Munitions:* factory built for mashing 60-pdr. Shrapnel.

*Notes:* built adjacent to Ypres factory and existing works of Babcock & Wilcox Ltd.

## 13. NPF Renfrew 'Ypres' Factory

*Construction started:* September 1915.

*Contractor:* Babcock & Wilcox Ltd.

*Opened:* July 1916.

*Area:* 6 acres.

*Management:* Babcock & Wilcox Ltd.

*Munitions:* 9.2in and 12in forgings and shell.

## 14. NPF Sheffield - Tinsley - Templeborough

*Construction started:* September 1915.

*Contractor:* Hadfield Ltd.

*Opened:* January 1916.

*Area:* 13 acres owned by Earl Fitzwilliam.

*Management:* T Firth & Sons Ltd.

*Munitions:* 9.2in shell 60-pdr. HE shell forgings and gun repairs.

*Notes:* built adjacent to the existing T Firth Ltd. factory at Tinsley. Became a NOF.

## 15. NPF Sheffield - East Hecla Works

*Construction started:* September 1915

*Contractor:* Firth Ltd.

*Opened:* March 1916

*Area:* 14.75 acres owned by Hadfield Ltd.

*Management:* Hadfield Ltd.

*Munitions:* 9.2in HE shell; 60-pdr. guns and gun repairs

*Notes:* i) built adjacent to Hadfield's works. ii) became a National Ordnance Factory in February 1918.

## **National Shell Factories**

### 1. NSF Aberdeen (80 Spring Gardens)

*Original function:* workshops belonging to McKinnon Ltd.

*Opened:* March 1917.

*Munitions:* 6in shell.

*Notes:* known as the 'Spring Garden Iron Works'.

### 2. NSF Barnsley - No. 1 Dominion Works (Johnson Street)

*Original function:* unknown.

*Opened:* January 1916.

*Management:* Barnsley Board of Management.

*Munitions:* 4.5in shell.

### 3. NSF Barnsley - No. 2 Hope Works (Sackville Street)

*Original function:* weaving shed.

*Opened:* October 1917.

*Management:* Barnsley Board of Management.

*Munitions:* 6in shells.

### 4. NSF Birmingham - Washwood Heath - Midland Works

*Original function:* Midland Railway Company Ltd Wagon Works.

*Opened:* January 1916.

*Management:* Birmingham Munitions Committee.

*Munitions:* 4.5in and 18-pdr. shells and cartridge cases.



5. NSF Bradford - Valley Dyeworks (Valley Road)

*Original function:* dyeworks.  
*Opened:* 26 June 1915.  
*Management:* Bradford Munitions Committee.  
*Munitions:* 4.5in shell, fuses and gaines.

6. NSF Bristol - St. Philips Marsh (Victoria Road)

*Original function:* 'Castle' iron works of J Priest and Son Ltd.  
*Opened:* early 1916.  
*Management:* West of England Board of Management.  
*Munitions:* 18-pdr. HE and shrapnel.

7. NSF Bury - Central Tramway Depot

*Original function:* tram depot.  
*Opened:* September 1915.  
*Management:* Bury Munitions Committee  
*Munitions:* 4.5in and 18-pdr. and rectifying shell.

8. NSF Cardiff - Grangetown (Ferry Road)

*Original function:* spinning hemp and yarn shop and another building owned by the Taff Railway Company.  
*Opened:* early 1916.  
*Management:* Cardiff Board of Management.  
*Munitions:* 18-pdr. shell, 60-pdr. shell heads and 6in proof shot

9. NSF Carnarvon - 'Vulcan Foundry'

*Original function:* foundry belonging to Humphrey Owen & Sons.  
*Opened:* after October 1915.  
*Management:* local board of management.  
*Munitions:* 13-pdr. and 18-pdr. shell.

10. NSF Chester

*Original function:* tramway depot.  
*Opened:* August 1915.  
*Management:* Chester Munitions Committee.  
*Munitions:* 18-pdr. and 2.75in shell.

11. NSF Chiswick - Standon-on-Green

*Original function:* motor works of the Alisa Craig Motor Company.  
*Opened:* mid 1916.  
*Management:* Metropolitan Munitions Committee.  
*Munitions:* 4.5in shell.  
*Notes:* became National Projectile Factory.

12. NSF Derby - Peel Foundry (Darwen Terrace)

*Original function:* foundry of Russell and Sons Ltd.  
*Opened:* December 1915.  
*Management:* Derby Munitions Committee.  
*Munitions:* 4.5in, 4.7in, 60-pdr., 6in shell heads and aero-engine cylinders.

13. NSF Dundee (51-63 Mains Road)

*Original function:* jute mills belonging to Crimond of Dundee.  
*Opened:* September 1915.  
*Management:* local board of management.  
*Munitions:* 18-pdr. and 2.75in shell, forgings and burster containers.

14. NSF East Cumberland - Carlisle (Strand Road)

*Original function:* the Territorial Force Association Hall and Rifle Drill Hall.  
*Opened:* 18 September 1915.  
*Management:* Munitions Committee of East Cumberland.  
*Munitions:* 18-pdr. HE shells and 18-pdr. smoke shells, rectifying proof shot.

15. NSF Ebbw Vale

*Original function:* Ebbw Vale Steel Iron and Coal Company factory.  
*Opened:* June 1915.  
*Management:* local board of management.  
*Munitions:* 18-pdr. and 60-pdr. shell.  
*Notes:* closed down July 1916.

16. NSF Grimsby (Victoria Street)

*Original function:* herring-curing factory.  
*Opened:* 4 December 1915.  
*Management:* Grimsby Engineers.  
*Munitions:* 4.5in and 6in shells.

17. NSF Hartlepool - Central Marine Engine Works

*Original function:* marine engine factory.  
*Opened:* mid. 1917.  
*Management:* Central Marine Engine Works.  
*Munitions:* 8in shell.  
*Notes:* closed in December 1917

18. NSF Huddersfield (Fitzwilliam St./Viaduct St/Green Street)

*Original function:* derelict factory.  
*Opened:* November 1915.  
*Management:* Huddersfield Munitions Committee.  
*Munitions:* 18-pdr. shell and shell heads.

19. NSF Keighley - No. 1 (Dalton Lane)

*Original function:* premises rented from Price Smith & Son Ltd.  
*Opened:* autumn 1915.  
*Management:* Keighley Board of Management.  
*Munitions:* 18-pdr. HE and chemical, 6-pdr. anti-aircraft shell and 6in shell heads.

20. NSF Keighley - No. 2. (Dalton Lane)

*Original function:* premises rented from Hall & Steels Ltd.  
*Opened:* by September 1918.  
*Management:* Keighley Board of Management.  
*Munitions:* 4.5in and 18-pdr. shell casings.

21. NSF Leeds (Armley Road)

*Original function:* railway carriage shops rented from Leeds Forge Company Ltd.  
*Opened:* September 1915.  
*Management:* Leeds Forge Company Ltd. and Gun Manufacture Department.  
*Munitions:* 6in and 18-pdr. shell.  
*Notes:* became National Ordnance Factory No. 3. for the rifling of guns.

22. NSF Leeds - Newlay

*Original function:* premises rented from Schoen Wheel Company Ltd. (locomotive wheels).  
*Opened:* April 1916.  
*Management:* Leeds Forge Company Ltd.  
*Munitions:* 9.2in and 15in shell.  
*Notes:* became National Ordnance Factory No. 1.

23. NSF Leeds - Hunslet (Goodman Street)

*Original function:* unknown (derelict factory).  
*Opened:* August 1916.  
*Management:* Leeds Board of Management.  
*Munitions:* 9.2in and 15in shell; making and repairing guns.  
*Notes:* became a National Ordnance Factory.

24. NSF Liverpool - North Haymarket - Agricultural Hall

*Original function:* agricultural hall.

*Opened:* late 1915.

*Management:* Liverpool Munitions Management Committee.

*Munitions:* 18-pdr. 2.75in HE, 60-pdr. and 6in shell

25. NSF Liverpool - Gladstone Docks (Rimrose Road)

*Original function:* new warehouse belonging to the Cunard Steamship Company Ltd.

*Opened:* after June 1915.

*Management:* Cunard Steamship Company Ltd.

*Munitions:* 4.5in, 6in and 8in shell.

26. NSF Liverpool (Edge Lane)

*Original function:* building located on the site of the Liverpool Exhibition.

*Opened:* August 1916.

*Management:* Liverpool Munitions Committee.

*Munitions:* 4.5in and 6in shell forgings; 4.5in cartridge cases.

27. NSF Liverpool (Lambeth Road)

*Original function:* tramway workshops.

*Opened:* July 1916.

*Management:* Liverpool Munitions Management Committee.

*Munitions:* 15-pdr. and 18-pdr. and 2.75in shell.

28. NSF Liverpool - Chester

*Original function:* boiler house of electricity works.

*Opened:* late 1915.

*Management:* Liverpool Munitions Committee.

*Munitions:* 13-pdr.

29. NSF Llanelly - Burry Extension Works

*Original function:* tinplate and toy factory belonging to Richard Thomas Ltd.

*Opened:* 19 September 1915.

*Management:* Llanelly Board of Management.

*Munitions:* 6in shell.

30. Rectification Factory Llanelly

*Construction started:* September 1916.

*Opened:* after September 1916.

*Management:* Llanelly Board of Management.

*Munitions:* up to 6in shell rectification.

*Notes:* this was a new structure built adjacent to the 'Burry Extension Works'.

31. NSF Manchester (Hyde Road)

*Original function:* tram depot.

*Opened:* summer 1916.

*Management:* Manchester Corporation Tramways Committee.

*Munitions:* 4.5in shell.

32. NSF Newport - Maesglas

*Original function:* engine sheds belonging to the Great Western Railway Company and factory owned by the Tyne Engineering Works.

*Opened:* late 1915.

*Munitions:* 60-pdr, 4.5in shell and 9.2in nose bushes.

33. NSF Nottingham - Spring Close Works, Old Lenton

*Original function:* textile and lace making mill.

*Opened:* mid. 1916.

*Management:* Nottingham Munitions Committee.

*Munitions:* 13-pdr., 18-pdr. HE and smoke and 2.75in shell.

34. NSF Portmadoc - Boston Lodge Works

*Original function:* workshops belonging to the Festiniog Railway Company.  
*Opened:* October 1915.  
*Management:* North Wales Munitions Committee.  
*Munitions:* 13-pdr. and 18-pdr shell.

35. NSF Rawtenstall - Irwell Mill (Rawtenstall and Bacup)

*Original function:* weaving shed owned by Mr. Hargreaves.  
*Opened:* early 1916.  
*Management:* local board of management.  
*Munitions:* 4.5in shell.

36. Rectification Factory Bacup - Height Barn Mill (Rawenstall and Bacup)

*Original function:* weaving shed.  
*Opened:* early 1918.  
*Management:* local board of management.  
*Munitions:* rectification of shell forgings 18-pdr., 4.5in and 6in.

37. NSF Rochdale (Mellor Street)

*Original function:* tram shed.  
*Opened:* late 1915.  
*Management:* Rochdale Munitions Committee.  
*Munitions:* 6in shell.

38. NSF Rotherham

*Original function:* locomotive wheel workshops belonging to John Baker Ltd., Owen & Dawson Ltd. and the Brinsworth Ironworks.  
*Opened:* November 1915.  
*Management:* Rotherham Munitions Committee.  
*Munitions:* 4.5in HE and 4.5in chemical shells.

39. NSF Swansea - Landore

*Original function:* factory of Baldwins.  
*Opened:* late 1915.  
*Management:* local board of management.  
*Munitions:* 18-pdr. and 4.5in shell.

40. NSF Uskside - National Works

*Original function:* factory of Uskside Engineering Company and purpose built munitions shop.  
*Opened:* 1915.  
*Management:* Uskside Engineering Company.  
*Munitions:* 18-pdr. shell until June 1917 when new shop built for 4.5in and 6in shell production.

41. NSF West Cumberland - Workington - Hawkeshead Foundry (Stanley Street)

*Original function:* 'Hawkeshead' foundry (derelict) belonging to TA, J and P Milburn.  
*Opened:* August 1916.  
*Management:* West Cumberland Board of Management.  
*Munitions:* 18-pdr. HE and smoke.

42. NSF Willesden - College Park

*Original function:* engine packing company?  
*Opened:* nationalised in October 1915 when the owner, a Mr. Klinger was arrested because of his German nationality.  
*Management:* Metroplitan Munitions Committee.  
*Munitions:* shell components.  
*Notes:* became a National Projectile Factory.

43. NSF Wrexham - Corporation Electric Works

*Original function:* electric generation station  
*Opened:* spring 1916  
*Management:* local board of management  
*Munitions:* 18-pdr. and 13-pdr. shell

## **Anti-Gas Factories**

### 1. Holloway - Batavia Mills - HM 'Green Band' Respirator Factory

*Opened:* August 1918.

*Management:* Anti-Gas Department.

*Products:* making respirators.

### 2. Holloway - Holloway Mills - HM 'Green Band' Respirator Factory

*Opened:* August 1918.

*Management:* Anti-Gas Department.

*Products:* making respirators.

### 3. Stamford Hill - HM Granule Factory

*Original function:* London County Council Stores Depot.

*Opened:* February 1917.

*Management:* Anti-Gas Department.

*Products:* making granules.

## **Casting Shop**

### 1. Sheffield (Bacon Lane)

*Opened:* ?

*Products:* casting bullets

## **Chemical Warfare Factories**

### 1. Langley

*Constructed:* spring 1918.

*Opened:* September 1918.

### 2. Middlewich

*Opened:* 1917

*Management:* Electro Bleach and By-Products Ltd.

*Munition:* phosgene gas.

### 3. Rainham

*Opened:* existing factory nationalised in 1918.

*Other details unknown.*

## **Cylinder Depot**

### 1. Bucknall - Hanley

*Opened:* existing factory nationalised in July 1917.

*Management:* direct control.

*Products:* evacuating and refilling cylinders with chemicals.

## **Government Cartridge Factories**

### 1. GCF 1 Blackheath

*Opened:* December 1916

*Management:* Birmingham Metal & Munitions Company

*Products:* small arms ammunition .303in Mk.VII

### 2. GCF 3 Blackpole

*Construction finished:* February 1917.

*Opened:* early 1917.

*Area:* 67.25 acres.

*Management:* King's Norton Metal Company Ltd.

*Product:* small arms ammunition.

### 3. GCF 4 Edmonton (Angel Road)

Construction finished: August 1916 on land owned by Great Eastern Railway Co.  
Opened: May 1917.  
Area: 13 acres.  
Management: Eley Brothers.  
Products: small arms ammunition - 7.62 mm.  
Notes: transferred to the Air Board for aero-engine repair work, early 1918

### 4. GCF 2 Woolwich

Details unknown

## **Government Rolling Mills**

### 1. Southampton - Weston Grove Estate

Construction finished: May 1916 to September 1917.  
Opened: December 1916.  
Area: ? Land owned by Mr. Tankerville Chamberlayne.  
Products: cupo-nickle strip for manufacture of cartridges.

## **Gun Carriage Repair Factory**

### 1. Southampton (Empress Road)

Construction finished: early 1918.  
Opened: early 1918.  
Products: repairing gun carriages and breech mechanisms.

## **His Majesty's Cotton Waste Mills**

His Majesty's Cotton Waste Factories were the source of the cotton used in a nitration process to produce guncotton, In turn, guncotton was gelatinised with nitro glycerine to produce cordite the most important propellant for shell firing guns and small arms used by Britain and her Allies in the First World War.

1. Bury - Calrow Mill
2. Charlesworth - Lee Calley Mill
3. Glasgow - Whiteinch
4. Greenfield (Yorks)
5. Hadfield - Waterside Mill
6. Kilmarnoch (Bonington Road)
7. Oldham
8. Rawenstall - Cloughfold - Constable & Holme Mills
9. Whaley Bridge - Hall's Mill
10. Woodley - Arden Mill

## **Manufacturing Warehouse**

### 1. Sheffield (50 Porter Street)

Opened: 1917.  
Management: direct control.  
Products: cupro-nickel strip.

## **Mine Sinker Assembly Station**

### 1. Cowley (Oxford)

Opened: August 1917.  
Management: WRM Motors Ltd.  
Products: assembling naval mine sinkers.

## **National Aero-Engine Factories**

### 1. NAEF Hayes

Original function: the 'Goss' printing works.  
Opened: unknown.  
Management: Mitchell and Shaw & Co. Ltd. until October 1917, then Ministry of Munitions.  
Products: aero-engines.

## 2. NAEF Ladbroke Grove

Original function: existing factory of Clement Talbot Ltd.

Opened: 1 January 1918.

Management: Clement Talbot Ltd.

Products: 608 off Rolls Royce aero-engines repaired and production of engine spares.

### **National Aircraft Factories**

#### 1. NAF 1 Waddon - Croydon

Construction started: September 1917 until 13 July 1918.

Contractor: Holland, Hannen & Cubitt Ltd.

Opened: January 1918 (office staff) March 1918 (production).

Area: 198 acres.

Management: Holland, Hannen & Cubitt Ltd.

Products: 3,000 off CC type interrupter gears and 241 off DH. 9 aircraft.

#### 2. NAF 2 Heaton Chapel - Stockport

Construction started: 9 October 1917.

Contractor: Unit Construction Co. Ltd and H Matthews & Sons (Builders) Ltd.

Opened: April 1918.

Area: 22 acres.

Management: Crossley Motors Ltd.

Products: Dragonfly aero-engines, 326 aircraft of the DH. 9 and DH.10 types.

#### 3. NAF 3 Aintree - Liverpool

Construction started: 4 October 1917.

Contractor: Trollop and Colls Ltd.

Opened: March 1918.

Area: 70 acres (Stag Farm).

Management: Cunard Steamship Company Ltd.

Products: 126 off Bristol F2b Fighter aircraft.

Notes: built next to Aintree racecourse.

#### 4. Oldham Aircraft Factory

Construction started: 1 March 1918 (on new buildings).

Contractor: Trollope & Colls Ltd.

Original function: cotton mills at Hollinwood (Gorse Mill No.2) and at Shaw (Lilac Mill).

Opened: July 1918.

Management: Alliance Aeroplane Company Ltd.

Products: 10 off partially assembled Handley Page 0/400 aircraft.

### **National Ball Bearing Factory**

#### 1. Chelmsford

Construction started: existing factory nationalised in September 1917.

Management: Hoffman Manufacturing Company.

Products: ball bearings.

### **National Balloon Factory**

#### 1. NBF Finchley - Church End (London)

Original function: cinema, the property of Bohemia Ltd.

Opened: April 1918.

Management: Sidney Davidson Balloon Company Ltd. and Controller of National Aircraft Factories.

Products: 118 off Caquot and Nurse balloons.

Notes: factory closed on 8 February 1919 and sold to the Kiwi Polish Company Ltd.

### **National Box Factories**

#### 1. Castleford (Leeds)

Management: direct control.

Products: making and repairing ammunition boxes.

2. Deptford No.1 - Pier Wharf London

Opened: late 1916.  
Management: direct control.  
Products: making and repairing tin boxes.

3. Deptford No.2 - Kent Wharf

Management: direct control.  
Products: making and repairing tin boxes.

4. Glasgow - Parkhead (Salamanca Street)

Management: direct control.  
Products: making and repairing tin boxes.

5. Guildford (Walnut Tree Close)

Products: making and repairing tin boxes.

6. Leeds (Wellington Street)

Management: JH Abrahams Ltd.  
Products: making and repairing ammunition boxes.

7. Letchworth

Management: Co-partnership Company.  
Products: making and repairing ammunition boxes.

8. Liverpool - Bootle (Brasenose Road)

Management: direct control.  
Products: making and repairing ammunition boxes.

9. Luton

Management: direct control and operated by Austrian PoWs.  
Products: making and repairing tin boxes.

10. Maidstone

Products: making and repairing tin boxes.

11. Paisley No.1 - Caladonia Sawmills

Management: direct control.  
Products: making and repairing ammunition boxes.

12. Paisley No.2 (McKean Street)

Management: direct control.  
Products: making and repairing tin boxes.

13. Woolwich (Trinity Street)

Management: W Watt Tortance & Company.  
Products: making and repairing ammunition boxes.

**National Box Repair Factory**

14. Croydon - Beddington

Original function: cement stores, work on conversion began November 1916 and completed February 1917.  
Opened: early 1917.  
Management: Trench Warfare Supply Department.  
Products: repairing bomb and grenade boxes.



## **National Cartridge & Box Repair Factories**

### 15. Dagenham Dock

Opened: early 1916.  
Management: direct control.  
Products: repairing cartridge cases and ammunition boxes.

### 16. Newport - Alexandra Dock

Opened: early 1917.  
Management: direct control.  
Products: repairing cartridge cases and ammunition boxes.

## **Non-Returnable Box Depots**

### 17. Erith - Cory's Wharf - Belvedere

Opened: April 1917.  
Management: direct control.  
Products: repairing and converting non-returnable boxes.

### 18. Willesden - Park Royal, London

Original function: factory purchased from the Standard Woodwork Company Ltd.  
Opened: April 1917.  
Management: direct control.  
Products: repairing and converting non-returnable boxes.

## **National Gauge Factories**

### 1. NGF Birmingham (Great Tindal Street)

Opened: existing gauge factory nationalised in September 1915.  
Management: Chatwin Ltd.

### 2. NGF Croydon (Gloucester Road)

Opened: existing factory owned by Pintsch's Electrical Manufacturing Company (German owned) and nationalised in November 1915.  
Management: Vidal Engineering Company.

### 3. NGF Kilburn, London (Fairfax Yard)

Opened: May 1917.  
Management: Worlseley Motor Company and operated by German PoWs.

### 4. NGF Pimlico, London (Gatliff Road)

Opened: existing gauge factory nationalised in June 1917.  
Management: Wolseley Motor Company.  
Products: gauges.

### 5. NGF Walthamstow

Opened: nationalised in spring 1918.  
Management: direct control/Newall Engineering Company?

### 6. NGF Woolwich (Upper Market Street)

Opened: nationalised in August 1916.  
Management: Pitter's Ventilating & Engineering Company.

## **National Machine-Gun Factory**

### 1. Burton-on-Trent

Construction started: March 1918.  
Contractor: Thomas Lowe & Sons.  
Opened: 4 January 1919.  
Area: 153 acres acquired from the Marquis of Anglesea.

## **National Radiator Factories**

### 1. Greet

Original function: Motor Radiator Manufacturing Company Ltd. factory.

### 2. Sudbury

Original function: Motor Radiator Manufacturing Company Ltd. factory.

## **National Rifle Factories**

### 1. Birmingham No.1 (Lench Street)

Management: Standard Small Arms Company Ltd.

Products: Farquahar-Hill automatic rifle.

Notes: abandoned in October 1918 before production started.

### 2. Birmingham No. 2 (Garrison Lane)

Management: Standard Small Arms Company Ltd.

Products: Fraquahaer-Hill automatic rifle.

Notes: abandoned in October 1918 before production started.

## **National Sawmills**

1. Berwick-on-Tweed: Allen Brothers
2. Dumfries - Leafield:
3. Elgin - Morayhire Sawmills: A Watson & Co.
4. Glasgow - Partick (45, Milton Street): A McDougall's Timber Co.
5. Glasgow - Whiteinch: J Smellie & Co.
6. Gloucester (Bristol Road): J Griggs & Co.
7. Inverness - The Sawmills: J Walker & Co.
8. Kilmarnock (Bonington Road): Brownlie & Co.
9. Luton - (Dunstable Road): H Brown & Sons
10. Poole - Hamworthy: J T Sydenham & Co.
11. Rotherhithe - London (Plough Road): Priddy & Hale
12. Southampton - Northam: Driver & Co.
13. Warrington - Walton Lay Bye: R A Naylor Ltd.

## **National Slab Factories**

### 1. Gotham

Opened: 1918.

Management: King & Company.

Products: plaster slabs.

### 2. Yate

Contractor: Robert Mc Alpine & Sons Ltd.

Opened: June 1918.

Management: Robert Mc Alpine & Sons Ltd.

Products: concrete slabs and posts for RAF station buildings.

Note: built adjacent to the Western Aircraft Repair Depot.

## **National Small Arms Ammunition Factory**

### 1. Coundon (Coventry)

Opened: September 1917.

Product: RTS incendiary bullet.

Notes: closed 6 September 1919.

## **National Timber Drying Kilns**

### 1. Lancing

Opened: July 1918

Area: two-compartment kiln

Management: London, Brighton and South Coast Railway Company Ltd.

## 2. Swindon

Construction started: September 1917.  
Opened: July 1918.  
Area: four-compartment kiln.  
Management: Great Western Railway Company Ltd.

### **National Tool Factory**

#### 1. Gateshead (Coulthard's Lane)

Opened: August 1916.  
Management: direct control.  
Products: spades.

### **Rolling Mill & Blast Furnace**

#### 1. Merthyr Tydfil - Cyfarthfa

Opened: existing factory nationalised in 1917.  
Management: Crawshay Brothers.  
Products: basic pig iron; rolling 18-pdr. shell steel bars.

### **Optical Munitions Factory**

#### 1. Kentish Town, London (23 Price of Wales Crescent)

Opened: existing factory nationalised in February 1918.  
Management: control through board of directors.  
Products: telescopic sights.

### **Photographic Lens Factory**

#### 1. Brimmsdown - Enfield, London (Green Street)

Construction started: 1918?  
Opened: 1918.  
Management: Guaranteed Lens Company.  
Products: 'Hythe' aircraft gun camera.

Other details unknown

### **Salvage Depots**

1. Blyth
2. Immingham
3. Manchester- Trafford park
4. Renfrew
5. Ridham (Kent)

Notes: all five salvage depots were planned for late 1917 under a direct control management, and used for the recovery, storing and sorting of cartridge cases, boxes, heavy artillery ammunition and anti-gas equipment.

### **Small Tools Factory**

#### 1. Westminster (14 Palmer Street)

Opened: existing company nationalised in 1917.  
Management: Coats Machine Tool Company.  
Products: small tools.

### **Steel Billet Breaking Factory**

#### 1. Trafford Park - Manchester

Product: breaking steel billets imported from USA into shell lengths.  
Notes: This was the largest steel billet breaking plant in the country. The broken billets were despatched to the National Projectile Factories for manufacture into shell.

## **Liverpool**

Aintree, Liverpool LNC National Aircraft Factory 01/10/17 01/06/18 Aeroplanes Cunard Ltd.

Litherland, Liverpool LNC HM Explosives Factory 01/03/16 - T.N.T. Direct Control

Liverpool, Aintree LNC National Filling Factory 01/07/15 01/06/18 Filling shell up to 8-in.; filling and assembling components. Board of Management

Liverpool, Brasenose Road, Bootle LNC National Box Factory Autumn 1917 By Oct 1917 Making and repairing ammunition boxes Direct Control

Liverpool, Clyde Street, Bootle LNC National Shell Factory 01/11/15 - Gauges Board of Management

Liverpool, Cunard Co, Rimrose Road LNC National Shell Factory 01/06/15 - 8-in., 6-in. and 4.5-in. shell Board of Management

Liverpool, Edge Lane LNC National Shell Factory 01/09/15 01/02/16 4.5-in. and 6-in. shell forgings; 4.5-in. cartridge cases. Board of Management

Liverpool, Lambeth Road Tramway Depot LNC National Shell Factory 01/06/15 01/07/15 18-pdr. Shell; completing and rectifying 18-pdr., 15-pdr. 2.75-in., 4.5-in. and 60-pdr Board of Management

Liverpool, North Haymarket LNC National Shell Factory 01/06/15 - 18-pdr., 4.5-in. and 6-in. shell Board of Management

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