

THE BARNBOW Lasses

Education visits Part Three



Shells, shells, and still more shells!

A guide for Teachers

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See Part four for:-

The trouble with cordite!

A Day In The Life Of A Barnbow Lass, Extract from Agnes's fictional letter to Alfred, 26th June 1916, Worksheet 08 with answers, A Day In The Life Of A Front Line Soldier, The battle of the Somme : July 1st to November 18th 1916, Now it is personal... Barnbow Lasses Worksheet 09: A Day In The Life Of A soldier, Barnbow Lasses Worksheet 09: answers, The journey of a shell from Barnbow to the Somme, "The Purpose of an explosive...is to explode" - The night of December 5th 1916, Poems about the First World War, Barnbow Lasses Worksheet 10 – My War Poem, More ideas for teachers.

Introduction

2014 marks the centenary of the start of the First World War – the War to end all Wars. In Leeds, an inspiring story of dedication and sacrifice unfolded between 1914 and 1918. Some men and women paid the ultimate sacrifice. For others, its effect lasted for the rest of their lives and has echoed down the years, even to their grandchildren.

Leeds City Council's Parks and Countryside Service were approached by local ward member, Councillor Pauleen Grahame, who asked us to provide a fitting tribute to the men and women who worked at the Number 1 Filling Factory at Barnbow. This was one of a chain of munitions factories that operated during the First World War around the country.

On December 4th 2012 we unveiled a new memorial plaque and two interpretive boards at the corner of Manston Park, to these brave men and women. We also wanted to create a “learning” legacy, and have written and compiled a pack of information on the local history of the First World War, illustrating both sides of the conflict, from the women who fought by manufacturing shells in the factories of Leeds, to the men of the Leeds Pals who used the millions of tons of explosives in the fight overseas.



The pack is in four parts and can be downloaded individually from the Parks and Countryside website as a series of PDF's. They are, in order

- 1 Life In The 1900's – Welcome To Leeds
- 2 Oh What A Lovely War!
- 3 Shells, Shells, and Still More Shells!
- 4 The Trouble With Cordite

The subject matter covers many elements of the new 2014 National Curriculum for Key Stage 2 History, Geography, English and Science, primarily underpinning “a study of an aspect of history or a site dating from a period beyond 1066 that is significant in the locality” and also “a significant turning point in British history”. It covers major elements of Key Stage 3 History and Geography, including “Challenges for Britain, Europe and the wider world 1901 to the present day”: women's suffrage; the First World War and the Peace Settlement, a local history study and Human and Physical Geography. We very much hope that the packs are of use to teachers and children alike for many years to come.

THE SITE OF THE NO. 1 FILLING FACTORY AT BARNBOW, NEAR CROSS GATES, LEEDS, WEST YORKSHIRE



Shells, Shells, And Still More Shells

For Leeds Lasses like Agnes Sykes and her brothers and sisters, life immediately after the announcement of war with Germany didn't change much, but as you can see from the next extract from her diary, as the months progressed, the war began to affect everyone.

Extract from Agnes's fictional Diary for
December 21st 1915



“I have finally stopped crying myself to sleep at night and have accepted the idea now, but this past year, since my Alfred joined the Leeds Pals on the 5th of September last year, has been the saddest I have ever known. Oh how I wish he hadn't done it. Father says we shall have conscription soon enough, so why did Alfred have to go and volunteer? He was training in Colsterdale, but now he has been shipped to Egypt of all places! Of course, I am very proud of him, even so. He's with Number 9 platoon C company and has sent me a photograph of himself in his uniform. He always knew how to make the best of himself.”

“Everywhere you look you see posters with Lord Kitchener's face on them asking for volunteers. There's less food in the shops now and everyone's talking about how it's not so bad to pull our belts in with all the food rationing. We have a laugh because we all know “it will all be over by Christmas” and all we say now is “which Christmas would that be?” It's nearly here again and Alfred is so far away. What if they send him to France? A nice present that will be, I'm sure. His mother's so upset, even though he writes to her almost every day. I go round to her house two or three evenings a week now and we just sit and knit socks for the soldiers and chat about the latest news, and if our

prayers for his safety were armour, he would never be hurt or injured."

Agnes has collected a handful of posters from the First World War. Have a look at them. What do they tell you about life in Leeds in 1915?



**THE
KITCHEN**

IS THE



TO

VICTORY

EAT LESS BREAD



**IT IS FAR BETTER
TO FACE THE BULLETS
THAN TO BE KILLED
AT HOME BY A BOMB**

**JOIN THE ARMY AT ONCE
& HELP TO STOP AN AIR RAID**

GOD SAVE THE KING



**Your King & Country
Need You.**

A CALL to ARMS

An addition of **100,000** men to His Majesty's Regular Army is immediately necessary in the present grave National Emergency.

Lord Kitchener is confident that this appeal will be at once responded to by all those who have the safety of our Empire at heart.

Terms of Service.

General Service for a period of 3 years or until the war is concluded.
Age of Enlistment between 19 and 30.

RATES OF PAY:

1s. 3d. to 10s. 6d. a day, according to Branch of Service and qualifications.

How to Join.

Full information can be obtained at

or any Post Office in the Kingdom or at any Military Depot.

GOD SAVE THE KING.

W. F. DICKINSON, PRINTER, HIGH STREET, HAIDHOPE.



Barnbow Lasses Worksheet: 06

Teachers, get your class to write a letter to a soldier on the front line or a letter from a soldier to their friend, parent or sweetheart at home.

Use the character information below to give your class some idea of the kind of life Agnes Sykes had by Christmas 1915. Get your class to compare the different lives Agnes and Alfred now had.

Read this fictional account inspired by real contemporary documents and see if you can use it to write your own letter from Agnes in Leeds to Alfred, who is in Egypt.

Agnes....

By 1915, Agnes Sykes was 20 years old. She was the oldest of eight children and lived at 18, Pepper View, Hunslet, Leeds with her parents. She was unmarried but had a “young man” she walked out with. Alfred had joined up to fight the Germans. They were very serious about each other, but being sensible, they had decided to wait until after the war to get married.

Agnes had left school at 14 and after three years working at Burtons (the tailors) she left to get a job closer to home, so she could help to care for her seven younger brothers and sisters. A job was advertised in the Drapers shop on Dewsbury Road Beeston, with clean conditions and fewer working hours for more money. There she sold fabrics, lace, ribbons, sewing thread and accessories for trimming clothing and hats. Her previous experience at Burton’s had helped her to get this job. She was very good at looking after her brothers and sisters, and her skills naturally extended to taking care of her customers. Agnes loved reading.... anything, from newspapers and magazines to books on history, cookery and household management. Her handwriting was excellent and the Shop Manager always asked her to write the price labels for the clothing and fabrics they sold. This is where she met Alfred.

By December 1915, Alfred was with the Leeds Pals in Egypt. Agnes had seen a poster that was to change her life forever. She managed to get one from the Post Office for her collection and together with her younger sister Edith, who had left school that summer, aged 14, they discussed “joining up” to help the war effort in any way they could.

They took the poster with them and went along one Wednesday afternoon, to Wellesley Buildings in Leeds, the Leeds Employment Bureau, to discuss what they could do for the war effort. Agnes had read Alfred’s letters and knew that although he was reasonably safe in Egypt, it was only a matter of time before he would be sent to fight in France...and she wanted to do her bit! By teatime on December 22nd 1915, Agnes and Edith Sykes had both signed up to work at the newly built No. 1 Shell Filling Factory at Manston near Cross Gates. Their mother was furious!



Read this fictional account inspired by real contemporary documents and see if you can use it to write your own letter home from Alfred to Agnes.

Alfred....

Alfred was two years older than Agnes and lived with his parents further down Dewsbury Road from the Draper's shop. He worked with Agnes Sykes, until he volunteered for the Leeds Pals. His father worked for an engineering firm, but Alfred didn't want to go into the machine shop and after seven years, had real prospects and was already the assistant manager of the Drapers. He was kind and patient, handsome and well-liked - especially by the lady customers - and was good at mathematics. It was Agnes who suggested he should study book-keeping one evening a week so that he could better himself. He was mad about Charlie Chaplin and saw every film up until he left for France. He and Agnes used to go to the pictures every week together and she collected Charlie Chaplin film posters.

"As you know Aggie, we left Leeds on September 22nd 1914 after a rousing send off at Leeds City station. They say that at least twenty thousand folk turned up to wave us off, so you weren't on your own! We went up to Masham which is a pretty quiet



little place. They didn't know what had hit them. From the station we marched a brisk 6 miles to Breary Bank, and we found ourselves under canvas. It was quite nippy at night, but we are in the army now so shall make the best of it."

"We've been taken good care of here in Colsterdale. I've no complaints, except for all the usual - square-bashing and bayonet practice. Those of us half-decent at cricket are up for training as bombers. The only other thing I've had enough of is eating rabbit stew. The hills around here are wick with rabbits and it's all free food. Our cook, serves us rabbit stew so regularly that I swear I'll never eat it again in my life so long as I live. The best thing about this place has been the friends I've made. Many of them are from Beeston and Armley and Holbeck and Hunslet. Richard Matthews, Fred Lewis and James Eddison are just ordinary lads like me and we have a right laugh and help each other out. Even the toffs from Roundhay are quite decent chaps and treat us well."

"We've heard rumours that if Gallipoli doesn't go well, all those Turks we are fighting now are going to be a threat elsewhere and Kitchener knows they'll be put to good use, so we reckon they'll try to take control of the Suez canal if some one doesn't stop them. We reckon that'll be our job."

"We went off to meet our ship in Liverpool. She was called the "Empress of Britain" and we sailed on the 7th December. She was big enough to take all 6,000 of us from 93 brigade. She was a proper liner, but we wouldn't be getting any cabin service!"

"We were zig-zagging to avoid enemy submarines, but despite being surrounded by all this ocean, you cannot credit it that we hit another ship, a French mail ship and had to put in at Valleta Harbour in Malta for repairs to be done. When we left, we were nearly hit by two torpedoes from a German submarine, but they missed us and we docked safely in Egypt. We disembarked on the 22nd December and were marched to No 8 camp, to rest up a bit, but after Christmas we're going up country to guard the Canal and various other places about here. It's very cold, especially at night and I've never seen such stars! They're so bright you can see millions more than when we walk out at night in Leeds."

A note to remember...

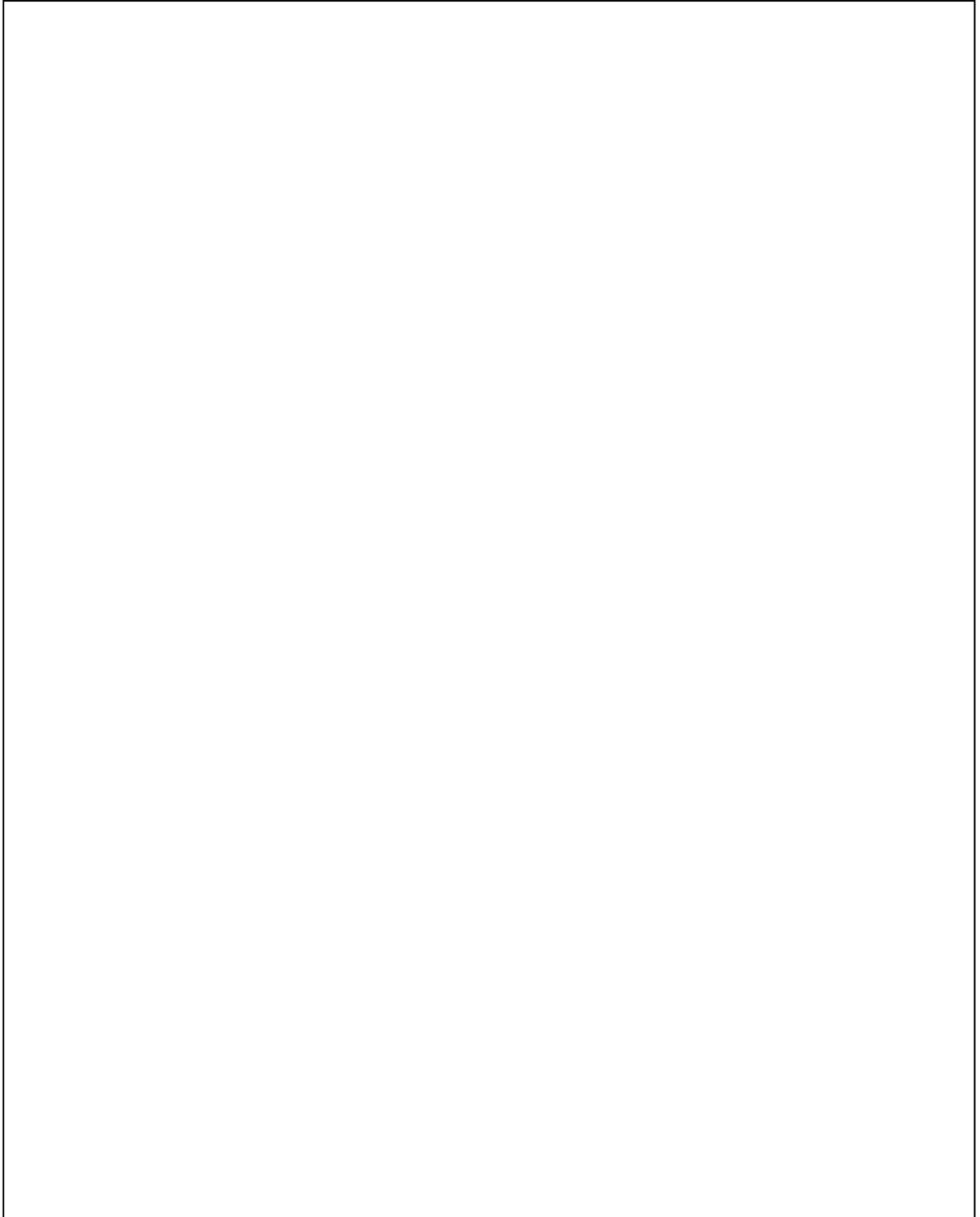
Parents and friends who wrote to soldiers usually told them about what was happening at home, who was doing what, who had got married, how everyone was doing at school or at work, which latest film was showing at the Picture Palace. They always tried to make everything sound normal and happy, even if they were going without food and were worried sick about what was happening to their son or brother, husband or boyfriend.

Soldiers didn't often write about what was happening in the trenches and just told their loved ones how much they were thinking about them and how much they longed to get home on leave. Occasionally they did write things that cracked open this glossy exterior and let their families see what they were really going through.

A soldier's commanding officer had a duty to censor anything too graphic or that might give useful information away to the enemy, but some thought that realism was a good thing and let the letters through anyway.

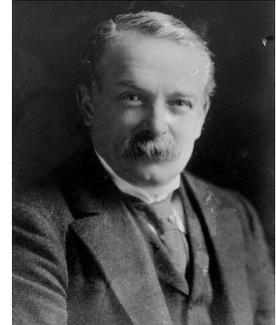
Barnbow Lasses Worksheet: 06

Write your letter here.

A large, empty rectangular box with a thin black border, intended for the student to write their letter in.

The industry of War

“Shells, shells and yet more shells” was the cry that went up from the new government. By 1915, not only was Britain at war with Germany, but there was a shortage of artillery shells on the allied front lines. The **Shell Crisis of 1915** lost the Liberal government support from the public because people thought that the production of artillery shells for use by the British Army was inadequate. Failures like this are not usually forgiven. As well as the resignation of Admiral Fisher after the failed naval attack on the Dardanelles, the Shell Crisis was a big factor in the fall of the Liberal Government, which was replaced by a coalition, and in the rise to power of the new Minister of Munitions, David Lloyd George, who would replace Asquith as Prime Minister in the coming political crisis of December 1916.



As minister of munitions he was a great success and quickly rolled out the construction of a number of Shell Filling factories around the country.

When war broke out in 1914, the number of British firms producing armaments could be counted on one hand. The strain on these industries was enormous and Woolwich Arsenal in London was soon overwhelmed.

As Field Marshal Lord Kitchener was making a speech about needing more shells, the combined Chambers of Commerce were meeting in London for their annual conference. Sir Algernon Firth, a major West Riding manufacturer and the Honourable Rupert Beckett, head of a great banking firm in Leeds seized on the opportunity to do business and do themselves and the city of Leeds a great deal of good in the process of making war on Germany. They couched it in patriotic terms, they made a watertight case for taking the initiative, and indeed what they achieved helped Britain enormously to win the war... but business was business!

In Leeds, shells were already being made in the city and then filled and armed at Leeds Forge Company in Armley, which filled between 7,500 and 10,000 4.5 inch shells per week. There were other Ordnance Factories at Newlay and Goodman Street, Hunslet. The old works at Tannet, Walker and Co in Goodman Street were overhauled. New machinery was brought in including some that were imported from America (the first shipment was lost to a torpedo strike by German U boats). 9.2 inch and 15 inch shells were produced here and the factory “rectified” or mended many thousands of defective shells that were re-cycled and sent out to the front for a second time.

After a short while the Hunslet ordnance factory was switched to making guns. After 18 months of war, our guns were literally wearing out. After a trip to Woolwich Arsenal, staff were trained to re-line the guns that were being shipped back from France. New machinery was installed to do the job and the first re-lined 18 pound gun was finished on May 18th 1917. Within two months, a gun every twelve hours was being “re-cycled” ready for action on the battlefields of Europe. By the end of the war, 2,500 guns had been given an overhaul.

The No. 1 Filling Factory, Barnbow

However, much more was needed. A management board, comprising Mr Joseph Watson, Mr. T. L. Taylor, the Honourable Rupert Beckett, Mr. Bernal Bagshawe, Mr. Arthur G. Lupton and Major G. Yewdell was created in order to build a purpose-built munitions factory and met for the first time on May 22nd 1915. They were to oversee construction of a site, chosen at Barnbow, between Cross Gates and Garforth.

A field at Manston

The land earmarked for development was farmland belonging to two tenanted farms, Shippen Farm and Lazencroft Farm. Shippen Farm was so old it was mentioned in the Domesday Book and the Lazencroft area had been lived on since medieval times. Barnbow had a Hall, until it was demolished in 1722 and the land was now owned by Colonel Trench Gascoigne of Lotherton Hall. The tenant farmers had to leave. Auctions were held, the land was cleared, the site was levelled and building work began on what would become a 400 acre site. Within four months, shells would be produced and that production would not cease for another three years.

Wind, water and power

The North Eastern Railway Company arranged for a gang of men to lay tracks straight into the factory complex to transport raw materials in and munitions out. A platform 820 feet (240 m) long was laid and Barnbow Halt was born. You can still see the platform today although the buildings are gone. Munitions workers arrived here for one of three shifts and departed homewards after working their eight hours.

Messers Reid & Macdonald, architects to the Ministry of Munitions drew up plans for a mass of factory buildings. 56 working rooms in eight blocks were put up, together with large component stores, explosives magazines, fuse and gaine rooms and finished Ammunition Magazines. Gales demolished the A Assembly block and three finished Ammunition Magazines, but they were quickly rebuilt.

At the start of filling operations in December 1915 the lack of large volumes of electricity was a real factor in limiting production, but soon a small belt-driven dynamo from Manor Farm, Garforth was pressed into service, providing electric lighting and after this, an electrical sub-station was built with a 10,000 volt extra high-tension main wire was connected to drive the ever-increasing demand for electricity with power from the Yorkshire Electric Power Company.

The nearest source of water to Barnbow, was a mile away at Stanks and for the first four weeks, water had to be carted across ploughed fields and uneven tracks before a water main could be laid to supply 200,000 gallons of water per day. After that, changing rooms and a canteen were rapidly built. For the first few weeks of production, workers took their lunches outside, at first sitting under the nearby hedgerows for shelter! The whole site covered 200 acres (0.81 km²). The factory opened with roughly a hundred workers, but this rapidly grew until the site had to build its own 90,000 gallon (409,140 litre) collecting and screening tank for sewage which was then pumped to the Leeds Sewage Works at Killingbeck.

The size of it

In the course of the next three years almost 6,000,000 bricks, from Whitaker's Brick Company, 18,000 tons of gravel and 5,400 tons of cement were used to build the Barnbow complex, which was serviced by 33 miles of water, fire and sewage mains.

The buildings needed 4,500 standards of timber. A "standard" was a traditional unit of volume used in northern Europe during this time, to measure the volume of finished lumber. The "standard" measurement amounts to 165 cubic feet, which is equivalent to 1,980 board feet or about 4.672 cubic meters. Based on this, Barnbow used 21,000 cubic meters of wood!

There were 28.5 miles of electrical power and distribution cables and 60 miles of hot water and steam pipes. Over the next three years, Barnbow used 165,000,000 gallons of water and nearly 50,000 tons of coal to fire up its 12 massive boilers. 13.5 miles of wide gauge rail line and 10 miles of narrow gauge trolley track connected the buildings and at the height of production over 16,000 workers, 93% of them women, worked one of three shifts every day.

At the same time as the buildings were going up, the Employment Bureau in Leeds was recruiting and selecting female assistants to work in the factory. At the start of the war, the first batch of operatives were trained for a month at Woolwich Arsenal in London, but after that, those who joined up were trained by those who already worked there. Today we call that "learning on the job".

The Leeds Textile Industry

The city of Leeds was famous for its textiles industry. Weaving and dyeing of linen, wool and cotton fabric and the tailoring of cloth into clothing were the biggest businesses in the city. During the three years of production at Barnbow, over forty textile firms supplied fabric of all kinds to help in the production of shells.

So what does a length of cotton have to do with making bombs and shells? The textile industry tied all the processes of shell-production together – literally.

Textile Stores on Wellington Street, in Leeds, had four large warehouses, covering an area of 6 acres, (the size of four and a half football fields). It was controlled by the same Directing Board as at Barnbow. They supplied cartridge bags in all sizes, exploder bags, smoke bags, silk cotton, sewing twine and cotton to Barnbow and to every other Filling Factory in Britain. They stored over a hundred different raw materials and produced over 27,000,000 meters of silk, linen and cotton thread, 150 tons of silk, braid, cotton tape and 142,000,000 meters of linen tape.

This company had to test all their materials for chemical and physical defects that might affect the quality and safety of what they were producing. This is called quality control. If inferior materials had been allowed into the shell-production process, it may have led to more accidents and deaths in the Filling Factories. These bags also required other components like discs, washers, collars and tubes that had to be made very accurately, but in bulk. To the end of September 1918, 1,017,230,000 discs alone were produced for shells. That is over a hundred million little components.

The Naming of Parts

The No. 1 Shell Filling Factory did lots of different jobs but their most important job was obviously to fill shells.

What is a shell?

A shell is a payload-carrying projectile made of metal, which contains an explosive or some other kind of filling. Originally it was called a "bombshell", but gradually this has been shortened to "shell". "Bombshell" is still used to describe a shocking revelation or unexpected happening today.



This is a picture of a shell exploding near Amiens in France during the First World War. Smoke and dust billow out from buildings further up the street. The Germans used a huge gun mounted in a railway wagon, to shell Amiens from their lines 16 miles away.

All explosive and incendiary-filled projectiles used to be called *grenades*. This word came from the pomegranate fruit, whose seeds are like grains of powder. Shells are hollow projectiles made of cast carbon steel that have been machined smooth inside and out, filled with an explosive and then fired by artillery guns and combat vehicles like tanks and warships. They are usually cylinder-shaped with a flat base and an oval nose, which helps them fly through the air very quickly.

The bomb business.

Common shells used early in the war were filled with older kinds of explosives like gunpowder or Common Lyddite. These shells burst on impact. They were used a lot in the Boer War, but soon after the start of WW1, they were replaced by TNT and the shells became known as High Explosive (HE). Common shells were fired by 5 inch howitzers, but were renowned for poor fragmentation on bursting.

During the First World War, shrapnel shells and explosive shells inflicted terrible casualties on foot soldiers or infantry, that accounted for nearly 70% of all casualties and led to the adoption of protective steel helmets on both sides. Shells filled with poison gas were used from 1917 onwards. Frequent problems led to military disasters when shells failed to explode, most notably during the 1916 Battle of the Somme.

In the First World War, shrapnel shells came in two different designs. The first was a basic or common shell, with a charge in the base and a combination fuse. The other sort was a high-explosive shell, fitted with a combination fuse and a high-explosive head which exploded on impact.

"HE" is short for "high explosive" such as Trotyl (the British term for TNT), which was starting to be used when World War I began. TNT is short for a really long name.

Tri-nitro-toluene is a combination of the elements carbon, oxygen and nitrogen, which means that when it burns, it produces highly stable substances (CO, CO₂ and N₂) with strong atomic bonds that release a great deal of energy. This is a common feature of most explosives. It can change very quickly from a solid into a hot expanding gas. TNT has less potential energy than petrol, but the high speed this energy is released at is what produces the blast pressure. This very high speed reaction is called a *detonation*.

TNT is also explosive because it is chemically unstable - the nitro molecules are so closely packed that they get stressed by their proximity to their neighbours. So it doesn't take much force to break some bonds and the molecules fly apart. Typically 1 gram of TNT produces 1 litre of gas, which gives a 1000 fold increase in volume.

How they did it

There are a number of advantages that TNT has for ammunition manufacturers. First, it melts at a reasonably low temperature (81°C), which means it can easily be poured into shells and bombs. Secondly, it is stable enough to be handled fairly safely during manufacture and operation. TNT will not spontaneously explode. In order to get an explosion, TNT must first be detonated using a pressure wave from another smaller explosive called a *detonator*.

The HE shell filling was detonated by a fuse, usually assisted by an extra charge, called a "gaine", which ensured complete ignition, causing the thick steel shell case to shatter into fragments of various sizes at high speed, causing maximum damage to buildings and people.

Britain first used pure TNT for land warfare shells from late in 1914, but it was expensive and difficult to make in the large quantities needed and was also quite inefficient. A lot of energy was lost and given off as heavy black smoke.

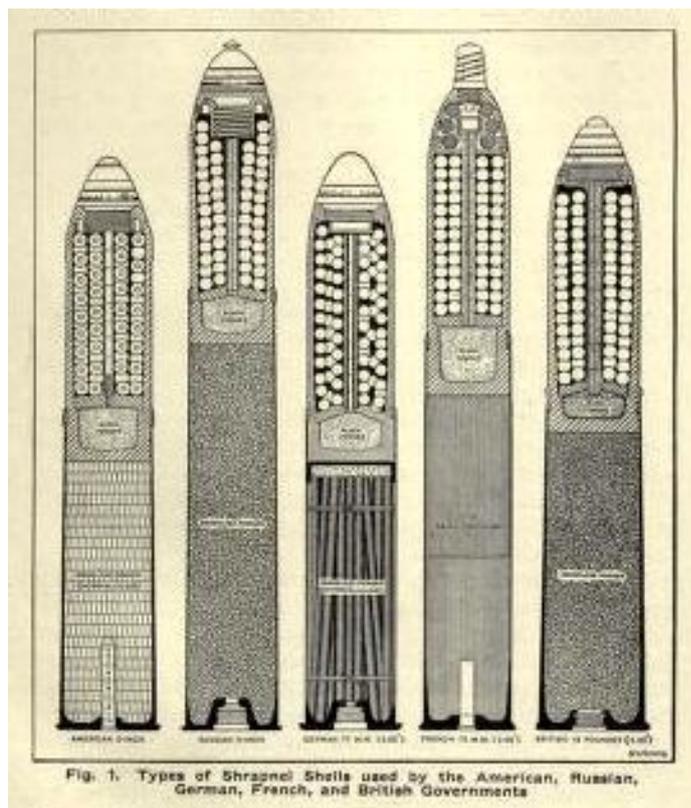


Fig. 1. Types of Shrapnel Shells used by the American, Russian, German, French, and British Governments

Amatol, a mixture of cheap Ammonium Nitrate and TNT at the ratio of 40:60 ammonium nitrate to TNT for land shells and 80:20 ammonium nitrate to TNT from 1917) proved almost a third more powerful than pure TNT and was soon adopted as the preferred HE filling for shells in World War I. TNT and Amatol were approximately 20% less sensitive to shock and so were safer than old fashioned Lyddite. Also, Amatol 80/20 mix cost only 7 pence per pound to produce in 1917 compared to 1s 11d for Lyddite and 1s 3d for TNT, so there was really no contest.



Producing shells filled with Amatol was fairly simple. The TNT was heated with steam or hot water until it melted into a syrup. The correct ratio of powdered ammonium nitrate was added and mixed thoroughly. Workers filled the shells by pouring a molten mixture through the fuse hole in the shell nose or base, where it was allowed to cool and solidify. This was well suited to Lyddite filling, but Amatol with more than 40% Ammonium Nitrate did not pour well. The lowest grades of amatol could not be produced by casting molten TNT. Instead, dry flaked TNT was mixed thoroughly with powdered ammonium nitrate and then compressed or pushed into the bomb casing.

Amatol remains soft for a long time, but it is hygroscopic, which means it easily soaks up water, so cannot be stored for long without degrading. To prevent moisture problems, amatol charges were coated with a thin layer of pure molten TNT or bitumen. Storage for any length of time was not a problem anyway during the war!

Amatol could not be stored in containers made from copper or brass, as it formed unstable compounds that were sensitive to vibration. Pressed, it was relatively insensitive but could be detonated by severe impact, whereas when cast, it was extremely stable. Experimentation continued and by the end of World War I the process for pouring 80/20 Amatol to fill land warfare shells was perfected and in large-scale production.



The Naming of Other Parts

The No. 1 Shell Filling Factory did lots of other jobs as well as filling shells. By April 1916 the first Amatol factory had been set up at Barnbow with its own melting house, milling machinery to crush, dry and mix the chemicals required to fill the shells. By June 22nd another Amatol C or the Press Factory had been built with two large

incorporating houses with weighing rooms, TNT magazines and Ammonium nitrate stores, three large Press Houses that had 18 enormous hydraulic 100 ton shell-presses and two other large stores for empty and filled shells.

Changing rooms, three Canteens and Administration buildings were added, where staff could change from their "civvy" or civilian clothes, into their special uniforms, and where they could be fed and paid at the end of their six day weeks.

At the same time, a Breech-loading extension to the Cartridge Factory was built and a Box Factory opened. Ammunition had to be packed in sturdy wooden boxes and 15,000 of these were made each week and others repaired. Fuse boxes were also repaired before being returned to the front lines and empty propellant boxes were lined with metal to make them watertight and had corner plates, cleats and rope handles attached for transporting them. Barnbow made 5,000 of these every week. Defective cartridge cases were renovated and re-filled so they could be used again. A building was even devoted to the production of "wood wool" from lengths of timber that could not be used for building purposes, so that shells could be packed safely in their boxes around layers of crisp shavings.

To feed the thousands of workers, Barnbow built three canteens and soon had its own dairy with girls trained to milk and feed the 120 cows. At maximum production, these animals produced 300 gallons of milk every day. Vacant land around the factory buildings was planted with crops that produced root vegetables like swedes, turnips and 200 tons of potatoes. Pigs were kept and a slaughter house and butchers shop provided home-cured bacon and pork for the canteens.

Barnbow had a medical staff of doctor, qualified nurses and two dentists that looked after the health and welfare of the Barnbow Lasses. A team of Voluntary Aid Detachment volunteers helped with daily welfare issues with thousands of workers.

Emergency Services at Barnbow



With such a high risk of explosion and fire, Barnbow needed its own fire service and thirty "Lasses" were trained to become fire fighters along with six men and an experienced Firemaster from London. They drilled and practiced every day, learning to control the heavy fire hoses with brass nozzles; they climbed ladders to accustom themselves to heights, cleaned and inspected all their fire-fighting equipment,

patrolled the buildings and grounds checking for fires or fire risks and trained for all emergencies. The hoses were so heavy that once filled with water and under pressure, if the person holding the nozzle lost their grip, or weren't strong enough to control the pressure of water, the nozzle could whip round and hit them or someone nearby so hard they could be knocked out or killed. It took strength to control these "living water snakes" so that no one would be injured and any fire could be put out efficiently.





Barnbow Lasses Worksheet: 07

New Employment Opportunities

Imagine you are 14 years old. You have just left school and must find a job. The New Munitions Factory at Barnbow has just opened and the pay is really good. Here is a list of some jobs you could do. Explain what you think they will involve, the risks you might encounter and skills and other benefits you could gain by agreeing to work there. Remember you will need to get qualifications and experience for some jobs!

Employment	What they do	Risks	Benefits
Canteen cook			
Toilet Cleaner			
Box Factory Worker			
Saw Mill Operator			
Agricultural worker			
Dentist			
Electrician			
Fire Fighter			
Factory Manager			
Machinery worker			
Fuse Packer			
Shell Filler			

Now write a short letter to the Management Board explaining why you would be perfect for one of these jobs listed above. Think about all your skills, your interests, hobbies and any experience you already have. Really sell yourself!

Dear Sir,