The Landmark Trust

CROWNHILL FORT

History Album

Researched and written by Alastair Dick-Cleland, 1998

Re-presented in 2015

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BASIC DETAILS

Designer	Captain Edmund Du Cane
Built	1863 - 1872
First Regiment	The Royal Engineers
Listed	Grade II*
Acquired by the Landmark Trust	1987
Creation of Landmark	1995
Architect	John Bucknall of Caroe & Partners
Quantity Surveyors	Bare Leaning & Bare
Contractors	Landmark staff

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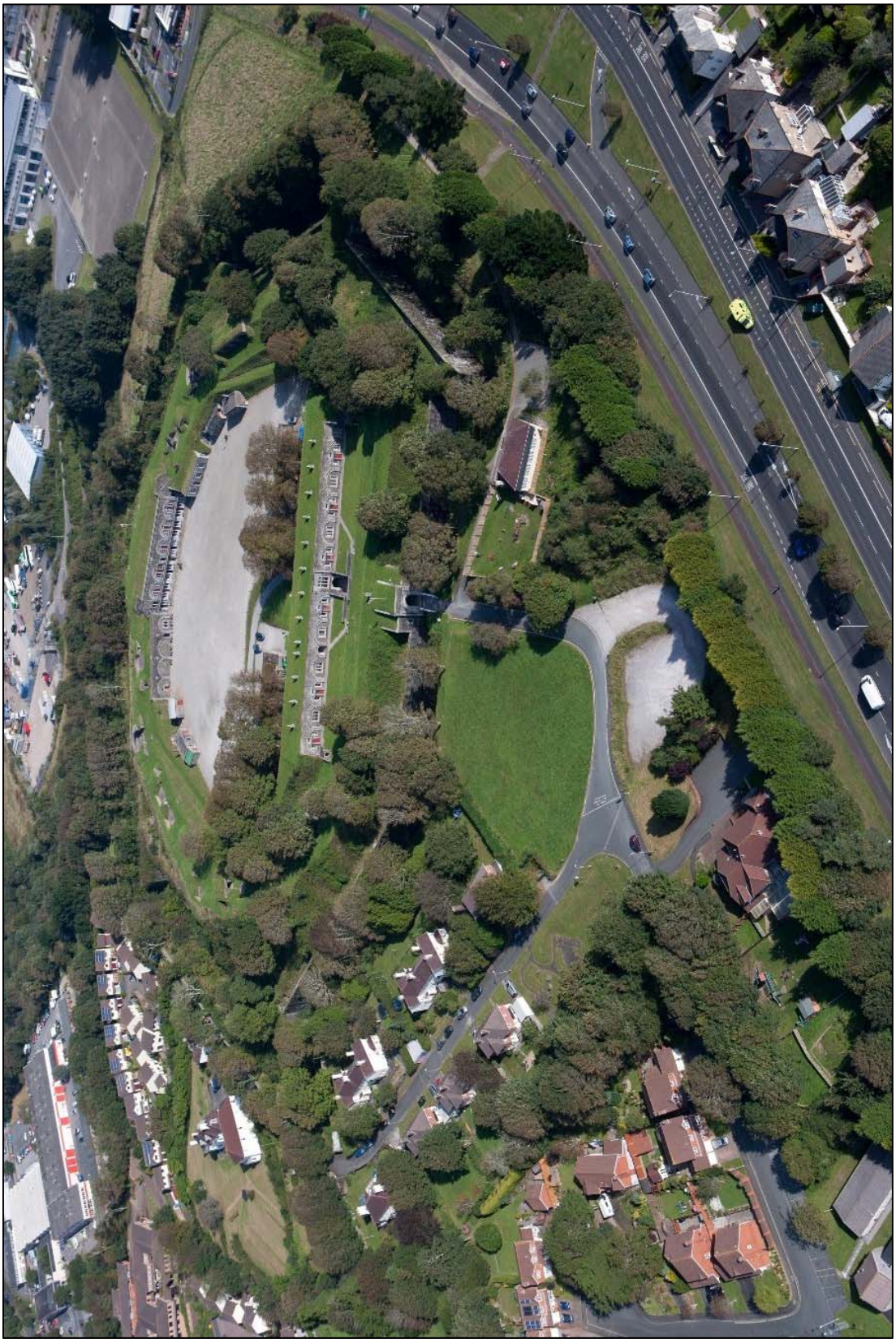


Summary

A DESCRIPTION OF CROWNHILL FORT

Crownhill Fort was built between 1863 and 1872 as the key to the North-East Defences of Plymouth which stretched from the Tamar River on the west to the Cattewater on the east and included nine other forts and batteries and one keep in between. It was built as part of the largest fortress building boom in British history against the perceived threat of French invasion. The 1850s and 60s were a period of mounting international tension, especially after Napoleon Bonaparte's nephew, Napoleon III, declared himself Emperor in France in 1852. There were mutual feelings of fear and distrust between the two nations and after France launched the armoured steam frigate "La Gloire" in 1858, the British Navy's ability to defend the country was seen to be gravely threatened.

Steam power had greatly improved the accuracy and range for artillery. The adoption of explosive shells, combined with ironclad ships reduced the effectiveness of existing defences. The Channel had been an obstacle to sailing ships, but by mid-century was "nothing more than a river passable by a steam bridge." In 1859, the Prime Minister, Lord Palmerston, responded to the alarm from a Royal Commission report on the defences of the United Kingdom.

The commission called for a massive fortress building programme to protect dockyards and strategic harbours at an estimated cost of £111,850,000. Parliament reduced the scales of the undertaking but nonetheless by 1867, 76 forts and batteries had been built or were under construction around the principal naval ports of Britain. Over £3,000,000 was spent on the Plymouth defences alone, with Crownhill Fort construction costing £76,000.

Crownhill Fort, the largest, most advanced, and least altered of Plymouth's 19th century forts, commands one of the highest points in the city yet is surprisingly inconspicuous. Though covering 16 acres and surrounded by a broad, deep ditch hewn from bedrock, the fort appears from only a short distance to be nothing but a forested hilltop. There are, however, four fighting levels with placements for 32 cannons and six mortars, nearly a half mile of tunnels, and accommodation for 300 soldiers and officers concealed within it.

Like the rest of the North-East Defences, Crownhill Fort was designed by Captain (later Major General) Edmund DuCane who also designed Staddon Fort and, with Captain William Crossman, Tregantle Fort. The great advances in military technology enabled them to break from the centuries old practice of continuous line defences. Each of the forts was designed as a polygon surrounded by a ditch which itself was protected by caponiers (powerful, casemated structures which provided flanking fire across the ditch). Guns, sometimes in casemates, lined the tops of the ramparts and the barrack blocks within were made bomb-proof by the use of mounded earth.

From its completion in 1872 until 1986, Crownhill Fort was under continuous military occupation. As the French threat receded, the fort was used as a training centre for local volunteer forces in the 1880s and 90s. During the First World War, Crownhill Fort was used as a recruitment and mobilisation depot, with thousands of men sent to fight in the Gallipoli Campaign. In World War II, the fort was refortified as a Point of Resistance, with machine guns replacing cannon and many slip trenches cut to the inner and outer banks. In the early 1980s, 50 Commando provided logistical support to the Falklands Campaign from Crownhill Fort, but shortly after it was declared surplus to requirements.

The Landmark Trust, a building preservation charity, recognised the importance of Crownhill Fort and in 1987, wishing to give it a secure future, bought it from the Ministry of Defence. This was during the years that Landmark was supported by its founder, John Smith's Manifold Trust. Forts were a particular enthusiasm of John Smith's. Landmark's intention was not only to ensure the Fort's preservation and to restore its original layout as far as possible, but also to open it to visitors so that they might both learn from and enjoy the experience.

THE RESTORATION OF CROWNHILL FORT

After acquiring the fort in 1987, Landmark initially focussed on the restoration of the grounds. Over the years, changing uses and indeed lack of use in some cases, led to blockage of pathways and tunnels and altered levels at various points. The covered way and chemin des rondes (the paths around the outside and inside of the ditch respectively) which were badly overgrown and impassable, were cleared and re-opened. There is now a permissive pathway, nearly two-thirds of a mile long, right round the outside. Rifle ranges dating to the 1930's and a post-World War II commando assault course were removed from the ditch and the original levels restored. Modern buildings around the parade ground were demolished, and hundreds of yards of tunnels were limewashed in traditional fashion.

Next attention was turned to the buildings, most of which are now let to local businesses. In the Soldiers' and Officers' Quarters, doors and windows were repaired and air vents unblocked. Their earth roofs were replaced, and Landmark holiday accommodation was created for eight people in the Officers' Quarters. Two of the Caponniers have been restored and armed with original and replica artillery pieces typical of those used in the 1880s.

Today, Crownhill is financially self sustaining, and a thriving little community-within-the-community. Several hundred school children visit the Fort each year to learn about its history and discover what life was like for Victorian soldiers. Through all this, after hours, those staying in the comfortable Officers' Quarters have the place all to themselves.

Introduction

There are three principle English historic dockyards of the Royal Navy - Portsmouth, Chatham and Plymouth. They have all been crucial for the maintenance of the fleets that have been Britain's first line of defence. Their protection from attack has always been vital, be it from sea or land, and as the range and destructive power of guns has advanced, so the defences have had to move outwards to counter the threat to the dockyards and the towns which served them. This has led to the creation of successive rings of fortifications of ever greater complexity.

In the late 1850s there was a real and increasing fear that Napoleon III of France would invade Britain. His newly-launched and seemingly invincible iron-clad battleships were seen as a particular threat. A worried government set up a Royal Commission in August 1859 to consider the state if the country's defences. The Commissioners' Report was published in 1860 and one recommendation was that a ring of forts be built around Plymouth, to protect the naval base. The Prime Minister, Lord Palmerston, ordered that work should start on this as soon as possible.

Crownhill Fort is the largest of the Palmerston Forts and was the key to the city's North-Eastern defences. It was to become the jewel in the crown of Plymouth's defences. Work began in 1863 and was eventually completed in 1872 at a cost of £76,409. The fort was designed by Captain E. Du Cane of the Office of Fortifications and Works, and the construction was overseen by General Burgoyne and Major Jervois. The original contractor was George Baker but he went bankrupt after a general strike in Plymouth in 1869. The fort was completed under the direction of the Royal Engineers, the regiment which formed the first garrison.

Napoleon III and Queen Victoria

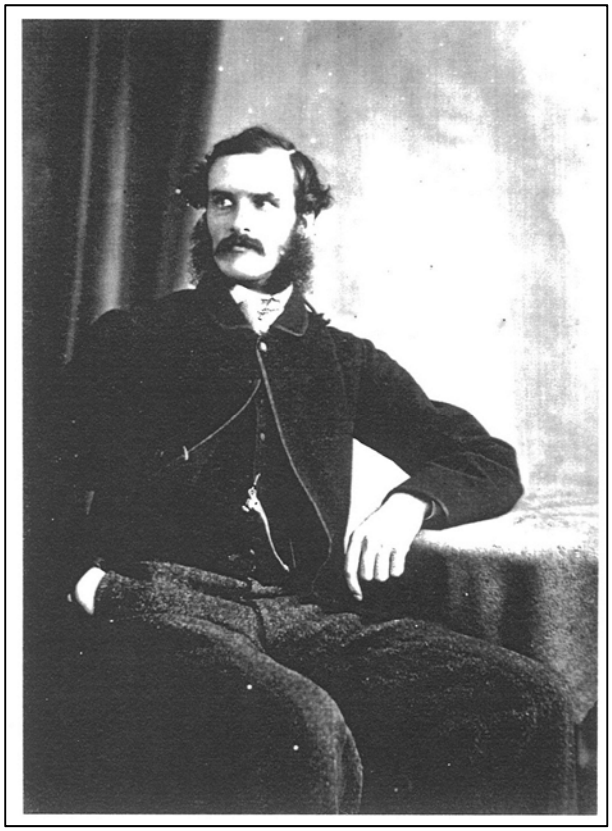
Burgoyne's plan for Plymouth was based on the traditional encircling defence wall, connecting forts in strategic positions. Modern artillery made these connecting walls vulnerable and they reduced the efficiency of covering fire between the forts. Burgoyne's assistant, Major William Jervois, argued against the construction of these walls, saying that forts built at strategic distances apart could provide efficient and powerful artillery defence through their overlapping fields of fire. This would make the building of connecting walls unnecessary. Jervois carried the day with this argument and no walls were built.

William Drummond Jervois was a rising star in the fortifications world. His work in 1852-4 on the re-fortification of Alderney (including Fort Clonque which is also cared for by the Landmark Trust), had brought him to the notice of the military authorities. He was made Assistant Inspector of Fortifications and became Secretary to the Royal Commission on the Defences of the United Kingdom. Further promotion followed when he was made Director of Works in 1862.

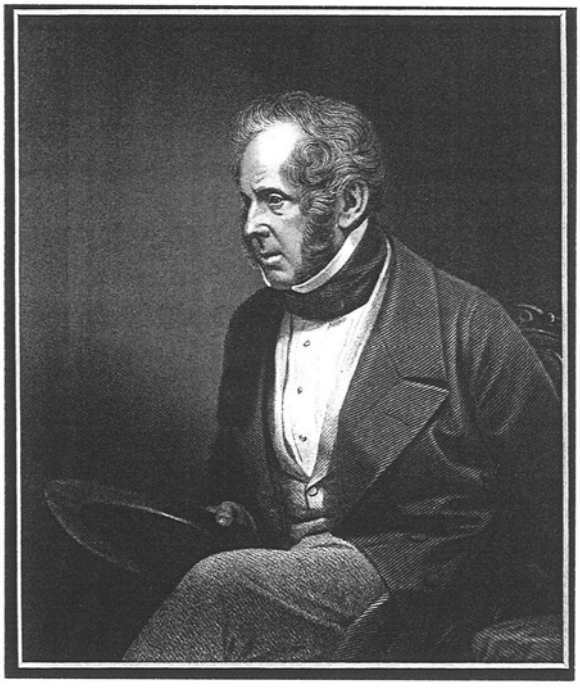
As is ever the case, the extensive fortifications proposed by the Commissioners were greatly reduced by Parliament. At Plymouth this included the abandonment of any defences on the Saltash peninsular, and some of those proposed for the North-Eastern section, from the Tamar on the west to the Plym on the east. Jervois warned the government of the danger of such non-completion, particularly with regard to the omission of the Saltash defences, which left a dangerous gap in the line and thus weakened the whole work of fortification.

Work on Crownhill, the largest of the North-Eastern defences, began in 1863. It was designed by Captain Edmund Du Cane and the staff of the Office of Fortifications who showed, in areas such as the gatehouse, that they were good architects as well as military engineers. Du Cane had joined the Royal Engineers in 1848 and spent the years 1851-6 organising convict labour involved in public works in Western Australia. On his return to England in 1856 he worked under the Inspector General of Fortifications. He was promoted to Second Captain in 1858. He was responsible for designing most of the land works at Dover as well as those of the North-Eastern positions at Plymouth, including Crownhill and Stanford, Staddon, Brownhill, Polhawn and Tregantle Forts. In 1863 he became Director of Convict Prisons and Inspector of Military Prisons. He believed that prison labour should be devoted to works of national utility.

Crownhill was to be the principal fort of the North-Eastern defences. It was to be 'state of the art' in terms of fortification design. A report on progress of work in 1868 described it as of key importance and noted that '*much care and skill have been bestowed on its construction; it is a formidable work to attack, and, if properly defended, would require the development of very powerful means for its reduction*.' Although substantially complete in 1869, finishing works continued under the Royal Engineers until 1872.



Captain Edmund Du Cane

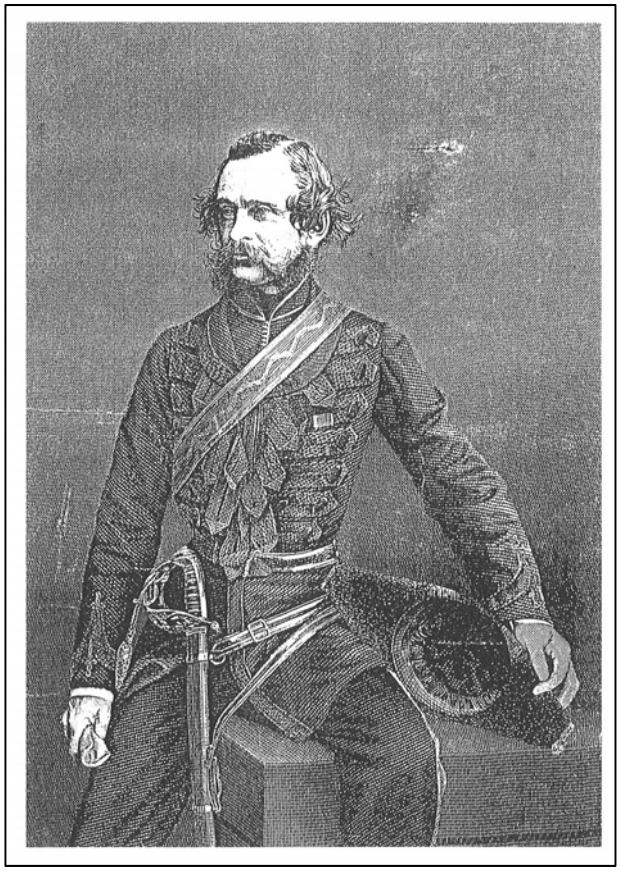


Lord Palmerston, Prime Minister

A Defence Committee report of 1868 described Crownhill Fort thus:

Crownhill Fort is constructed for an armament of 32 guns, of which four are in Haxo casemates, and 6 mortars. The highest point of its parapet is 450 feet above the sea. The ditch is 30 feet broad at bottom, excavated in the solid rock; the escarp is revetted with masonry, and the counterscarp formed, as in the other works, at a slope of one-half to one; one double and five single caponiers for guns and musketry flank the trenches of the ditch; in front there is a covered way, and the Leats which convey the principle part of the water supply of Plymouth and Devonport pass under the northern glacis in tunnels having communications so constructed as to be available as countermines if required. There are casemated barracks for 300 men, and provision is made in well protected magazines for an ample supply of powder and shells. Suitable provision is also made for artillery stores, side-arms etc. The expenditure to 30th June 1868 was £57,000 and a further sum of £19,409 is required to complete it, making a total of £76,409.

Though it would have been fascinating to see how such a formidable design would have coped under attack, Crownhill was never actually put to the test: the advances in artillery, which had led to it being built, soon overtook it, and fortresses became obsolete as military strategy came more and more to depend on temporary entrenchments and flexible manoeuvres. These forts at Plymouth and at Portsmouth were all expensive to build - they cost the country a massive £12,000,000 to build and a further £5,000,000 to arm them. This rapid obsolescence has led them to be called 'Palmerston's Follies.' Whilst it is easy with hindsight to dismiss these fortifications as 'white elephants', they were well conceived, beautifully constructed, and represented the very latest advancements in military technology of their day. They also successfully fulfilled their purpose at the time in terms of national security and prestige abroad.



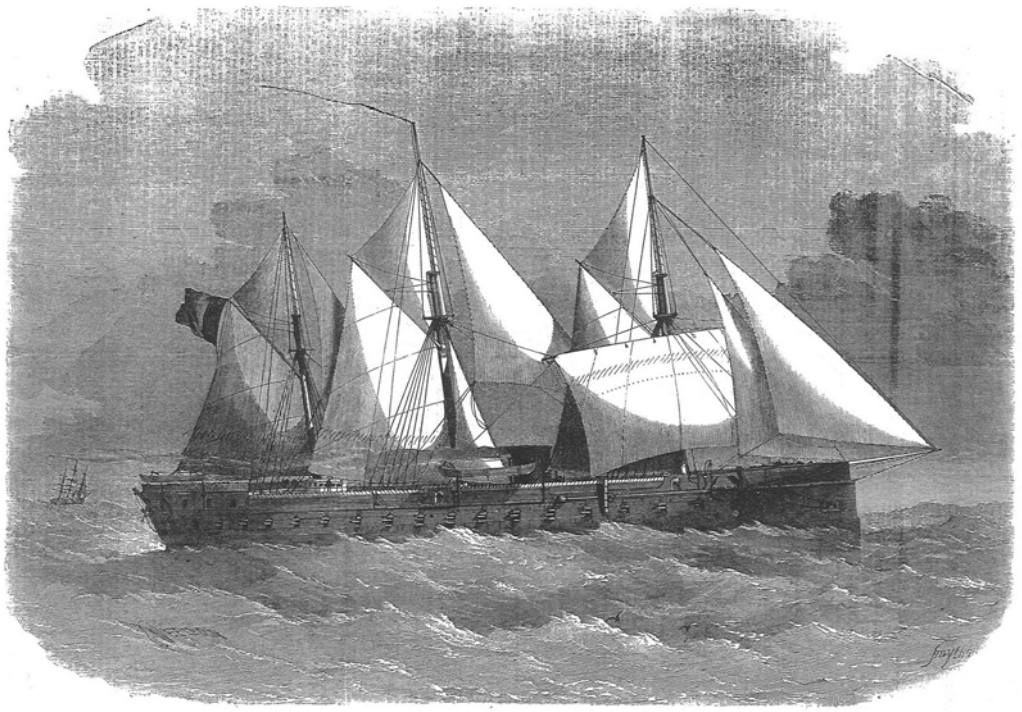
William Drummond Jervois

Sir John Fox Burgoyne, Inspector – General of Fortifications

Unlike many other of the mid-Victorian forts in Plymouth and elsewhere, Crownhill was kept by the army and has therefore not suffered serious alteration in the last 100 years. In 1986 Crownhill Fort was declared surplus to Ministry Defence requirements. The next year it was acquired by the Landmark Trust, with the aim of restoring the fort and making it accessible to the public. The first few years were spent removing many tons of debris from the great ditch, opening up tunnels, reinstating the ramparts and correcting levels everywhere. Attention was then turned to the buildings. After much work, these are beginning to look as they should once again, with a Landmark being created where you now are, in the Officers' Quarters.

The Threat from France

It was the expansionist foreign policies of the Emperor Napoleon III of France that were largely the cause of a review of coastal and land defences in Britain and the Channel Islands. The nephew of Napoleon I, he was elected President of the French Republic after the 1848 Revolution and established himself as absolute ruler three years later. As soon as he announced the Second Empire in 1852, the British kept a wary eye on this possibly dangerous neighbour. As long as his foreign policies were allied to British interests (e.g. during the Crimean War) they were not seen as a serious threat, but it took very little to whip up a war scare.

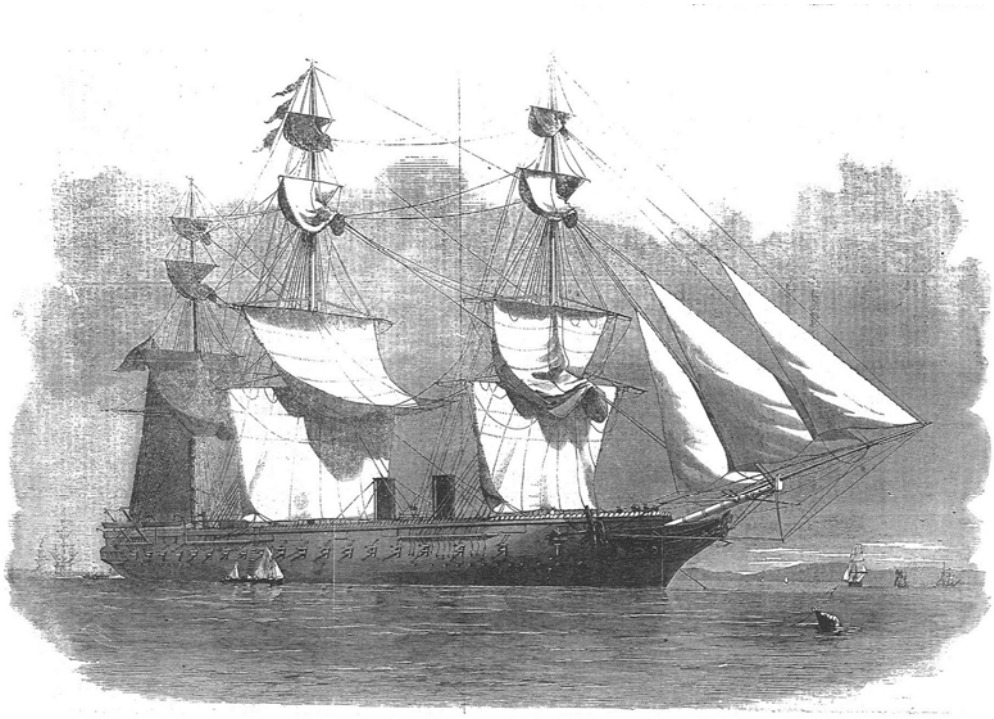


The French iron-coated frigate, La Gloire

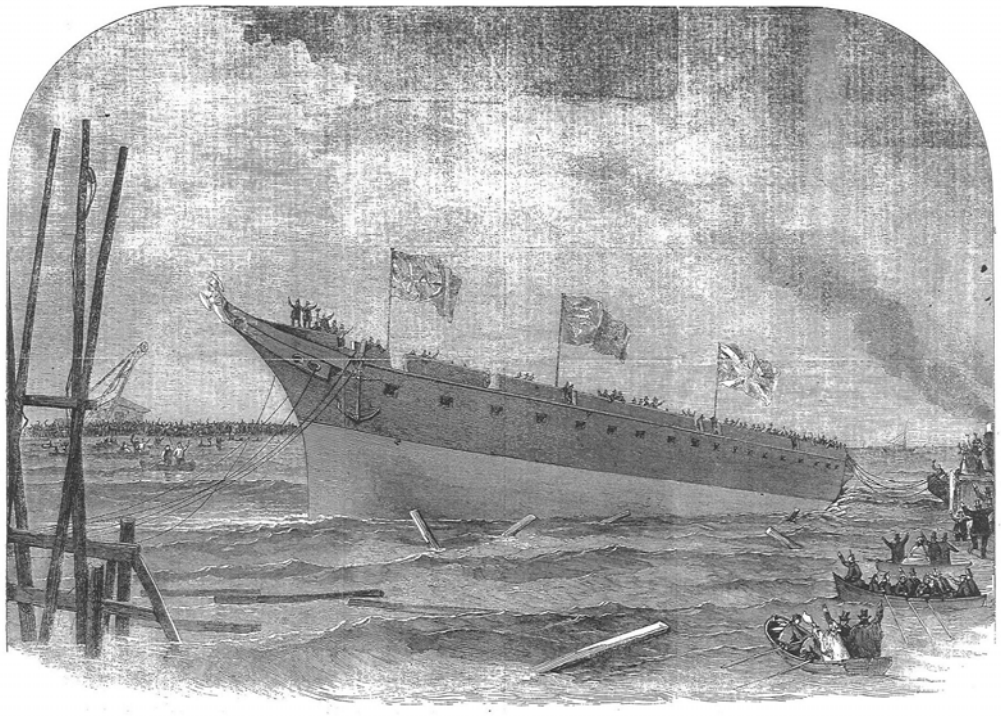
In particular, there was felt to be an imbalance between the two navies. In so many aspects of Victorian life, technology was developing at a furious pace in the middle of the 19th century and naval developments were no exception. In 1858, the same year that Napoleon opened a large new basin at the heavily defended naval dockyard at Cherbourg, the French launched the world's first ironclad warship, 'La Gloire', thus rendering the Royal Navy suddenly obsolete at a time when Anglo-French relations were worsening. Steam driven, armour clad, manouvrable and heavily armed, she represented for a short time the key to French maritime supremacy. Such ships could withstand fiercer fire than wooden ones and so offered more of a threat to land-based fortifications. The English retaliated by immediately starting work on their own ironclad ship, HMS Warrior, which was launched in 1860. After very lengthy repairs, HMS Warrior went on display at Portsmouth where she is open to the public.

Alongside these developments in ship-building, there was a revolution going on in artillery. In 1859 Sir William Armstrong began production of a breech-loading rifled gun, which was both more accurate and faster to load. Deadlier explosive shells were also being perfected. All these inventions brought forward the need for coastal and land defences and they influenced the way in which the new forts were built - they had to be as impregnable as the ships from which they might be bombarded.

Lord Palmerston, as Prime Minister, was responsible for setting up the Royal Commission on the 20th August 1859 '*to consider the defences of the United Kingdom.'* Its recommendations were published the following year and were met with resistance from Gladstone, who was Palmerston's Chancellor of the Exchequer. Palmerston sought to dismiss Gladstone and wrote to Queen Victoria that it would be '*better to lose Mr Gladstone than to run the risk of losing Portsmouth.'*

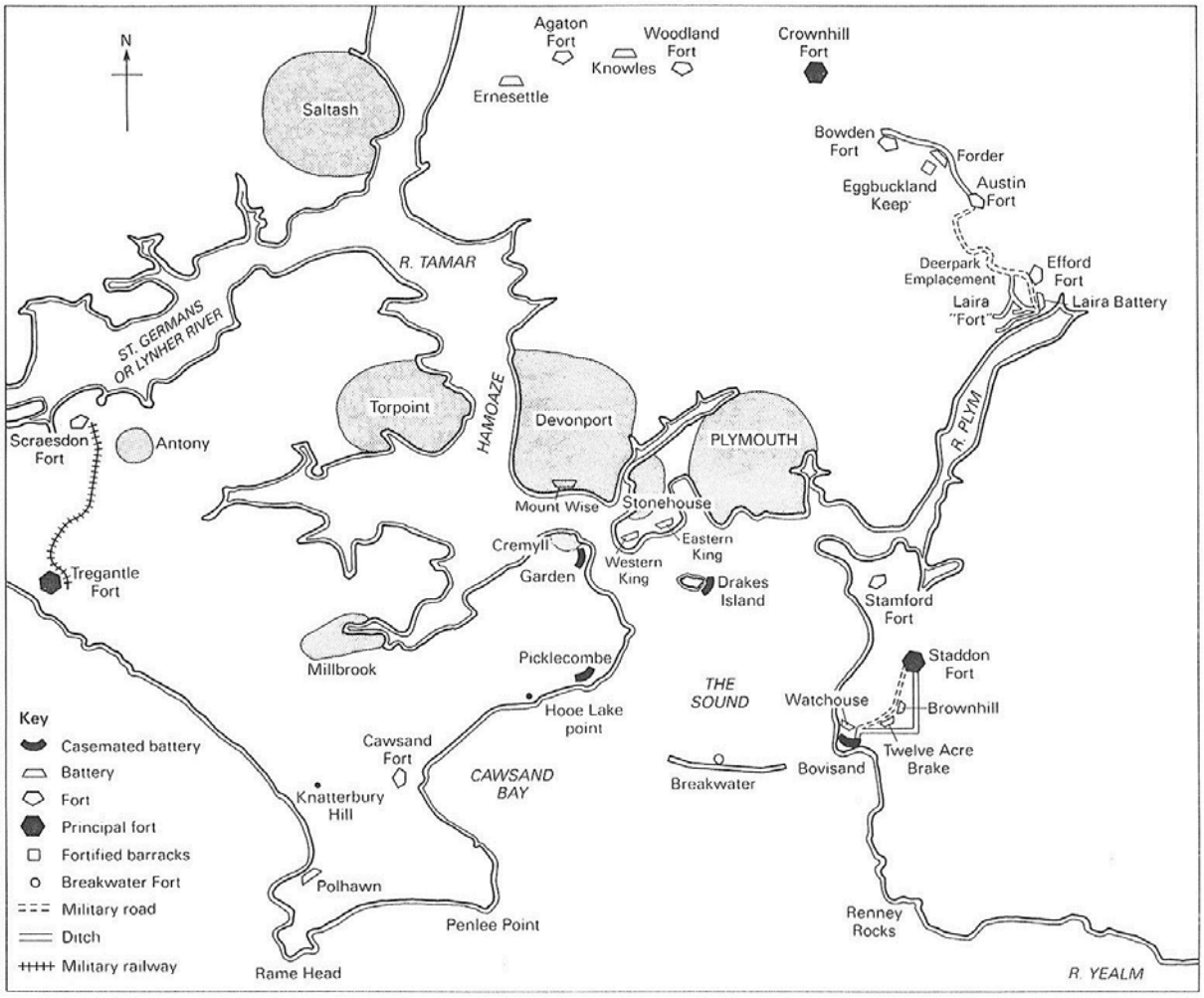


The iron-clad Warrior fitted out in August 1861



HMS Warrior from *The Illustrated Times*, 1861

The 1860 Report and an earlier memorandum by Sir John Fox Burgoyne, Inspector-General of Fortifications, spoke of the need to defend Plymouth as '*the second great naval arsenal and port-of-men, in the United Kingdom.'* Burgoyne entered the Royal Engineers in 1798 and served in Malta, Sicily and Egypt from 1800-7. He served with the Duke of Wellington's army throughout the Peninsular War and was appointed Inspector-General of Fortifications and Works in 1845, a post he held until 1868. It was in this last role that he facilitated the re-fortification of Plymouth by writing a confidential report in 1858 entitled *Memorandum on Defences for the Protection of the Naval Arsenal at Plymouth and Devonport*. It was this document that acted as the catalyst which promoted the formation of the Royal Commission. While not so vital as Portsmouth for the protection of the heart of the country, Plymouth had a value in itself which made it essential to provide '*very considerable permanent means for its security.'* Moreover, '*its attack has always entered into the projects of France as an accompaniment to an invasion of England.'*



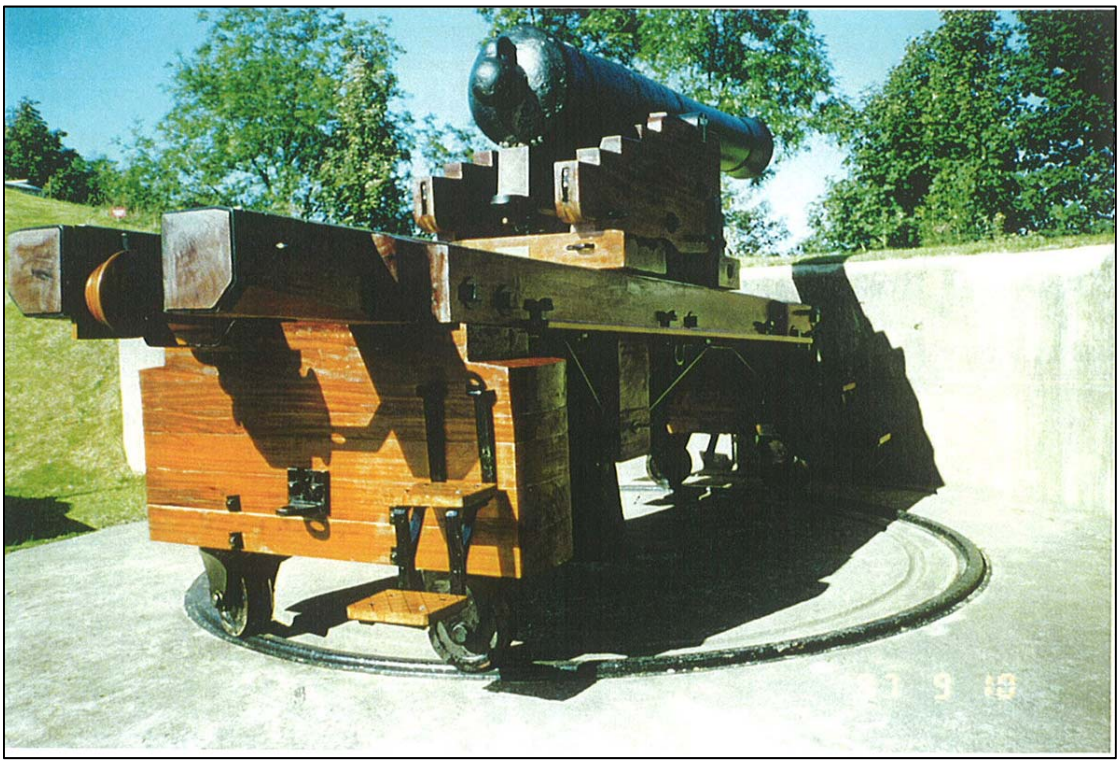
The Victorian forts and batteries around Plymouth, 1860-80

Background History

Plymouth, with its large natural harbour, has been an important naval base for many centuries. The story of its defences dates back to the 14th century when fortifications were built to keep out French pirates. As the significance of the dockyard increased so did the fortifications, until the stage was reached when some 70 or more forts and batteries have been built from Tregantle in the west, north through Crownhill, to Wembury Point in the east. From the 14th century until the middle of the 19th century, Plymouth's permanent defences were intended only to resist attack from the sea. The town was remote from any internal power struggles centred on London, and because England, unlike continental countries, was rarely threatened with invasion, Plymouth could ignore the threat of a sustained attack from the land. Consequently, it was never walled nor surrounded by elaborate land defences, other than by temporary earthworks which were erected at the time of the Civil War.

It was only in the 1860s for a period of less than 20 years that the threat of a full-scale invasion from France caused land defences to be built to cover both Plymouth and Devonport from attack by an army landed further along the coast to east or west. The purpose of these forts, as outlined by the 1859 Commission, was '*to enable a small body of troops to resist a superior force which may attack it.'* The second purpose was '*to enable partially trained bodies of men to contend successfully with those more perfectly disciplined than themselves*.' The British standing army was traditionally kept very small and most troops were required to guard overseas possessions. Invalid soldiers, militia and volunteers formed the bulk of the home defence army in wartime during this period and would not have deterred an attacking force but permanent fortifications could increase their effectiveness.

A postcard dated 1927 showing the approach to Crownhill



A 32 pounder smooth bore muzzle loaded gun on a 'C' pivot carriage

The Crimean War lasted between 1853-6, and was between Russia and the allied powers of Turkey, Britain, France and Sardinia. It arose out of what contemporaries called the 'eastern question.' Its pretext was a quarrel between Russia and France over guardianship of holy places in Palestine. The war led to a period of unprecedented development in the design of warships and guns. Smooth bore muzzle loaded guns (SBML), which were similar in principle to those used in Henry VIII's reign, were replaced by rifled, breech loading (RBL) guns that could fire huge explosive and armour-piercing shells eventually to ranges nearly eight times those of smooth bore guns. A 50 year period saw ships change from wooden men of war depending mainly on sail to steam-driven ironclad warships.

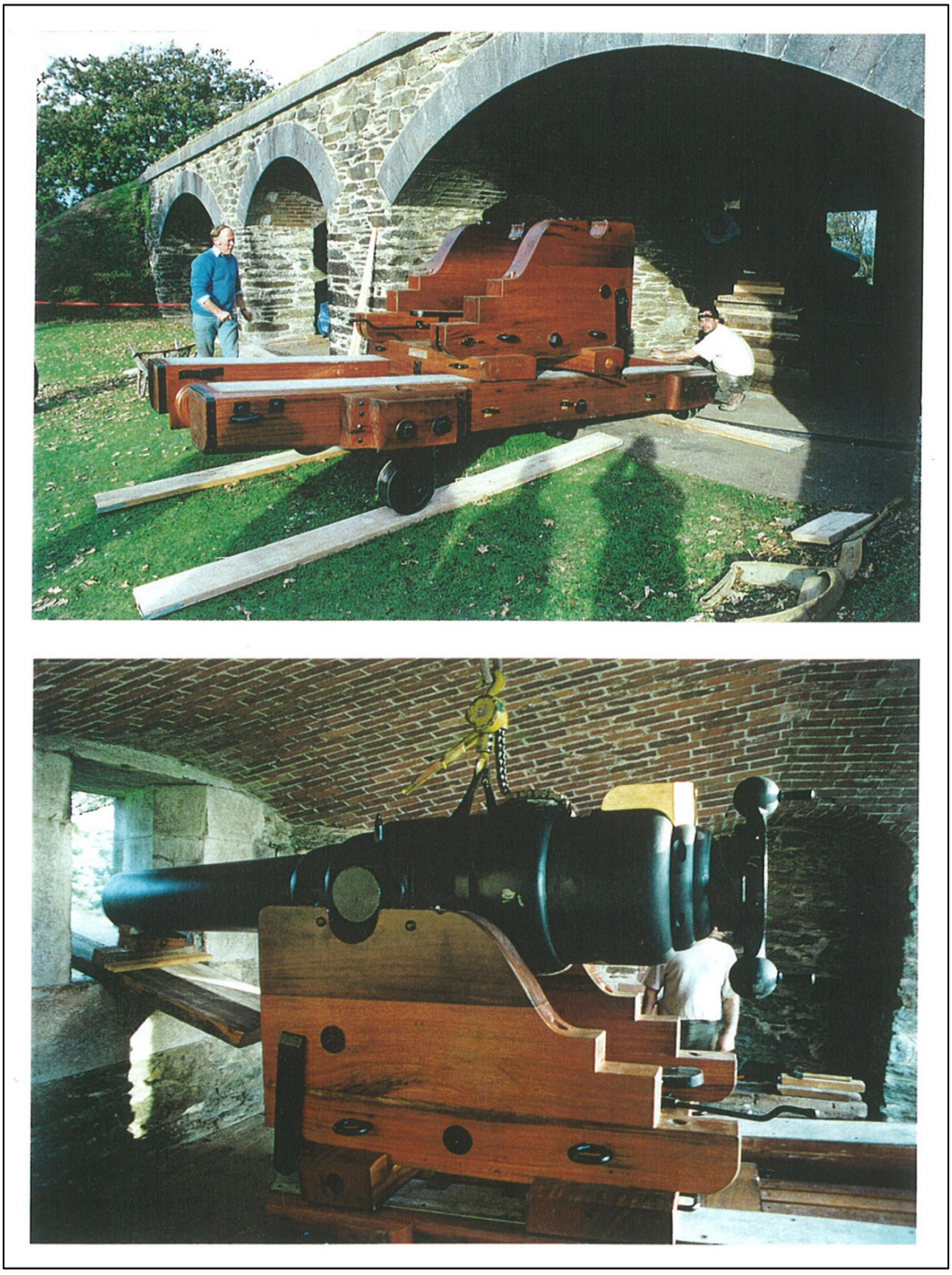
These technological developments had been demonstrated to the British on the 17th October 1855 during the Crimean War. A combined British and French fleet approached the old fort of Kinburn. This fort had been built by the Turks but passed into the hands of the Russians after one of their frequent disputes. It was the principle guard to the entrance of the Dnieper River. The fleet was largely comprised of wooden ships, but the French produced three 'armoured floating batteries' reputedly designed by Napoleon III himself. They were constructed of 4 inches of iron plating over 17 inches of wood on their sides, each armed with 16 56 pounder shell guns. Whilst the remainder of the fleet (including the British) stood off out of harms way, the three ironclads anchored 800 yards from the fort and began a systematic shelling. The Russian defenders opened fire in retaliation, but although the ironclads were hit several times, the iron plating was merely dented by the balls. After four hours the interior of Kinburn was demolished and the Russian commander surrendered.

A 110 pounder 7-inch Armstrong gun

The French ironclad warship, 'La Gloire', presented coast defences with new problems. Such a ship could reach the English coast in 6 to 8 hours regardless of the wind, and in an attack would suffer relatively little damage from the existing coast guns. The dockyard at Devonport had always presented a problem to attacking ships because of the difficult and winding passage past the Hoe and up the Hamoaze, but a screw-driven ship could negotiate such a passage whatever the wind.

The 1859 Commission proposed 10 batteries for coastal defence and 20 forts or batteries for the defence of the dockyard in a circle round Plymouth from Staddon Heights to Whitesand Bay. The land defences were divided into four sectors by the Lynher (St. Germans), Hamoaze and Plym estuaries and were referred to as the Western, Saltash, North-Eastern and Staddon Heights defences. The total barrack accommodation was to be for 7,000 men and the garrison was to be increased to 15,000 at a time of expected attack. 742 guns were required, and the estimated cost of the works was £2,670,000.

After pruning by the Cabinet, the Royal Commission's recommendations resulted in 6 new coast batteries, together with Breakwater Fort, and a ring of 18 land forts and batteries based on 3 principal forts at Staddon, Crownhill and Tregantle. These land fortifications were polygonal in design, the shape and number of sides depending on the ground which they were required to cover. Each face was covered by the fire of guns and rifles from galleries projecting into a deep ditch, called caponiers. In front of the ditch was a parapet which concealed the ditch from the enemy. In front of the parapet sloped a cleared glacis, covered by the guns on the ramparts behind the ditch. Beyond the glacis was an extensive clearance area, which could be cleared of obstructions such as buildings and trees when invasion threatened. Guns mounted on the front rampart of the fort fired over an open parapet; those on the flanks of the fort were vulnerable to fire from the side so were in Haxo casemates on top of the ramparts.

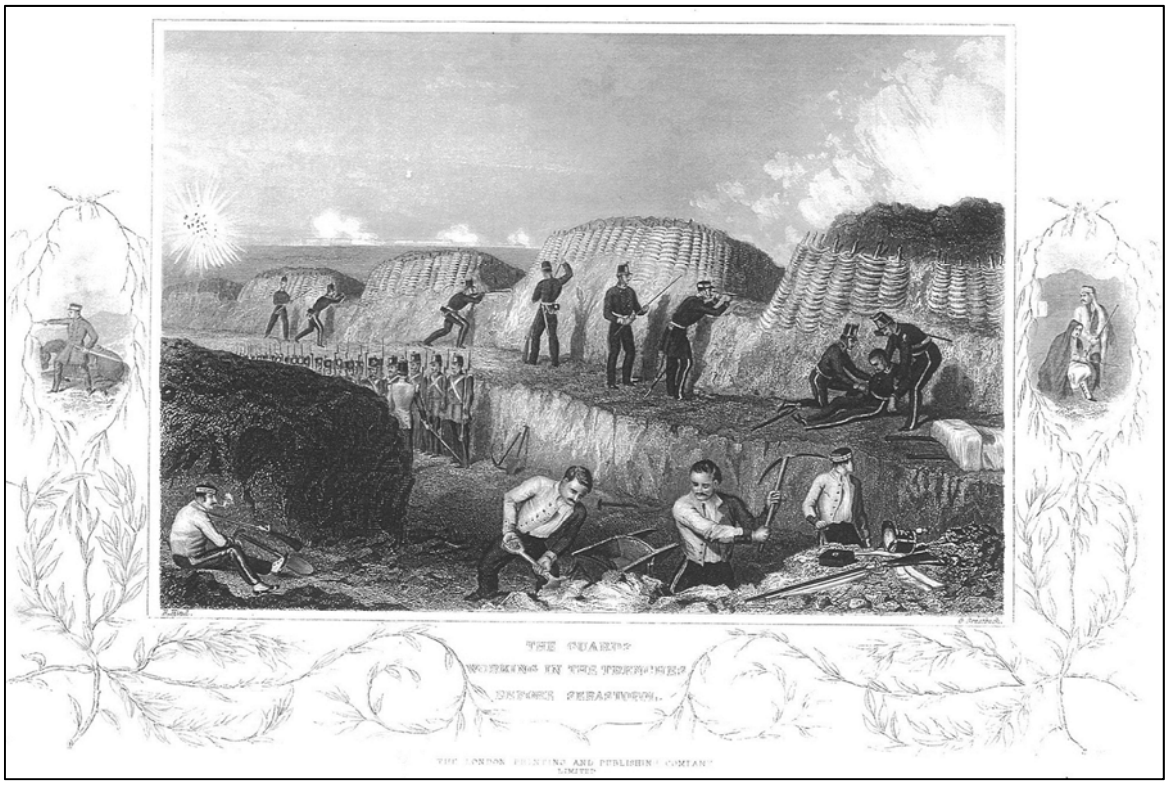


A 110 pounder Armstrong breech loaded gun

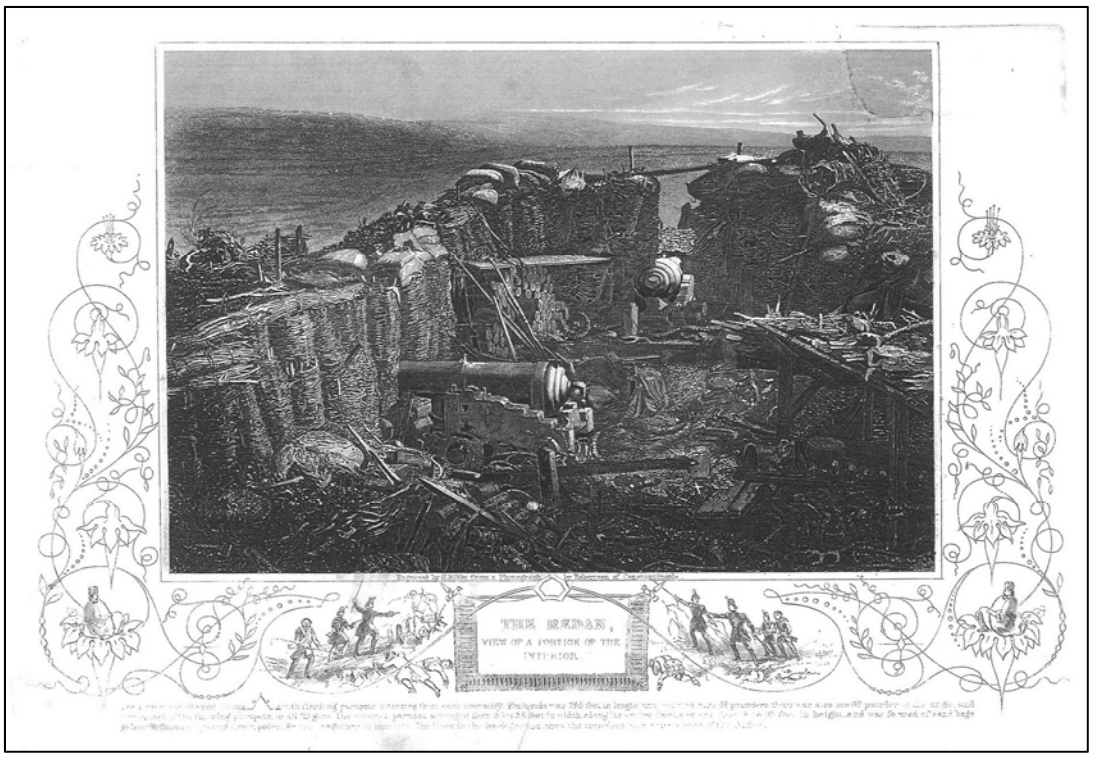
Crownhill makes much use of casements - brick vaulted chambers covered with a deep layer of earth (e.g. 7 feet) to resist bombardment by absorbing the impact of the shell. These had been developed by Edvard Ivanovitch Todleben (1818-1884), Captain of the Sebastopol Engineers. He rose to prominence during the defence of Sebastopol, the heavily fortified base of the Russian fleet, in the Crimean War. After a long and bloody siege, the city fell in 1855 and the war ended. By this time Todleben had risen to the rank of General in recognition of his genius at rapid fortification in sensitive positions during the siege. His defensive batteries has provided a formidable and lengthy resistance to allied attack.

In 1864 General Todleben visited the north-eastern defences of Plymouth and '*he expressed himself highly in praise, remarking that the manner in which the valleys in front of the position were searched by batteries of different works was particularly well managed*.' He called the position of Crownhill '*magnificent .... the keystone of the land defences of Devonport .... a considerable work, as strong to the rear as to the front*.'

The North-Eastern defences were originally proposed to be closer in to the city, but in July 1861 a new line further away was adopted, largely to reduce the cost of land purchase. The amount allocated for the purchase of the land was £755,000, which fell short of the amount required for the full proposals by some £150,000. By moving the North-Eastern line out, savings could be made and it would also reduce the risk of cannonading and bombardment. The centre of the line was to be based at Knackersnowle, a cruelly apt name - nowle is a hill, and the fields on it were used to graze horses before they went to the knackers yard. This became known as 'crown hill' because when the land was purchased by the war department it was referred to as 'crown' property. All the North-Eastern defences were to be linked by a military road to their rear, protected along much of its length from incoming fire by an earthen parapet.



The Guards working in the trenches before Sebastopol



A Redan

Crownhill was the key to this system, set slightly forward of the main line, which commanded the watershed between two valleys and the main route north to Tavistock. North was the direction from which the enemy were expected to attack.

Crownhill Fort probably lies on the site of an earlier defensive enclosure, reflected in the occurrence of 'castle' in the field names on a map of 1840. It has 7 faces which are covered by one double and 5 single caponiers, firing along a deep ditch cut mainly out of solid rock. Each face of the caponiers has two guns designed to fire case or grape shot, and musketry slits at three levels. The original armament was to have been 32 guns and 6 mortars, but the outbreak of the Franco Prussian War in 1870 removed the threat of invasion from France. Long before that, the escalating costs, especially of the new and much more elaborate RML guns, meant that many of the forts were only partially armed. The priority for guns was always the Royal Navy first, then the coast defences and only then the land defences. Crownhill was finally equipped by about 1890 with 11 7-inch RBL, 5 64-pounder RML and 14 32-pounder SBBL (for use in the caponiers).

The main contractor, a builder called George Baker, commenced work in 1863 and proceeded to schedule until 1865 when there was a general strike in Plymouth. The origin of the strike had nothing whatsoever to do with the fort building programme, but its escalation resulted in Baker going bust. The government, recognising that the resultant breach of contract had been beyond his control, decided not to pursue any claim for compensation, and instead, the war department decided to complete the works under the direct supervision of the Royal Engineers using day labour.

Crownhill Fort's Materials

Crownhill was the last of the forts to be completed and although not the largest, it was the most important to the defences of Plymouth and Devonport. Its designer Du Cane was of course constrained in his design by the topography of the land and the functional requirements of the fort. However, he exercised some architectural sensibility to give the buildings something more than a purely functional look. This was a period when architects borrowed quite freely from past architectural styles. Du Cane decided that the Norman style was the most appropriate, recalling the great castles and keeps built by William the Conqueror. The most lavish decoration was kept for the entrance, but the typically Norman round-headed arch can be seen throughout the fort. Other buildings received a more Tudor style with square-headed windows divided by mullions and transoms. To add more interest to the two barracks, the line of the vaults is marked ornamentally on the exterior in stone of a contrasting colour.

A variety of materials was used in the fort's construction. Limestone was used for the quoins, voussoirs, mullions, transoms, copings and window sills. It has also been used for decorative mouldings. Quarried from Pomphlett, just outside Plymouth, this particular limestone is noted for its colouring with pink veins running through it, and when polished it resembles fine marble. It was used extensively for Plymouth's pavements, leading people to say that the city was paved with marble.

Granite was used for steps, quoins and sills on the No. 2 artillery shed and most noticeably on the ornate Norman dog toothed gate arch. It is believed to have come from the Hingston Down area, about 8 miles from Plymouth. Sandstone was used for flooring in the caponiers, often supported using old rail track as beams, to prevent rising damp. Sandstone was also used for the balcony of the Soldiers' Quarters, but this decayed and was replaced by concrete in the 1970s.

The bulk of the walls is made from Hurdwick stone, quarried about 5 miles from the fort, next to Tavistock. Common clay bricks were used in all the casemated structures for the first skin of the ceilings, together with all the tunnel roofs. These bricks would have come from one of the many local brickworks established to meet demand from the fort building programme.

When the ditch was hewn from the indigenous rock, the spoil was used to construct and profile the ramparts. Much thought and effort went into the construction of these, and they are not just piles of spoil tipped and then shaped. The lessons learnt at Sebastapol showed that earth protection was far superior to masonry when it came to absorbing the impact of more powerful artillery. The ramparts at Crownhill are constructed so as to provide the best possible absorption of the shock imposed by an impacting projectile. This is achieved by laying the flat sheets of stone or skillet as level as possible with earth sprinkled in between to stabilise it. The soil on top is supported by grass to bind it in further.

A Tour of the Fort

1. The gateway, guard room and cell block.

The inner section of the bridge was originally a drawbridge raised by chains and assisted by a counterweight of heavy iron links. It is hoped to reinstate this feature in the future. It was filled in and the bridge removed to allow heavy fighting vehicles to enter whilst awaiting transportation to the beachheads of D-Day in June 1944. Other vehicles were parked in the ditch with camouflage nets strung over them.

Just inside the doors are a pair of drop bar holes. These were to be used to shore up the doors with baulks of timber to resist attempts to batter then down.
To the left is the cell block, with space for an attendant with two single man cells. These cells were for detaining members of the garrison who had broken the rules of military discipline. Neither cell has a window and they would have contained little more than a bed. To the right is the guardroom and both this room and the cell block have a door giving access to the chemin de ronde.

2. The entrance tunnel

The tunnel from the entrance continues through a cutting which provides access to the upper levels of the fort and also light to the tunnel. It passes under the mess of the Officers' Quarters, now the Landmark kitchen, where the triple light window could be manned in an emergency and used by troops to enfilade the tunnel.

Photographic evidence suggests that the original cutting towards the parade ground may have been straight.

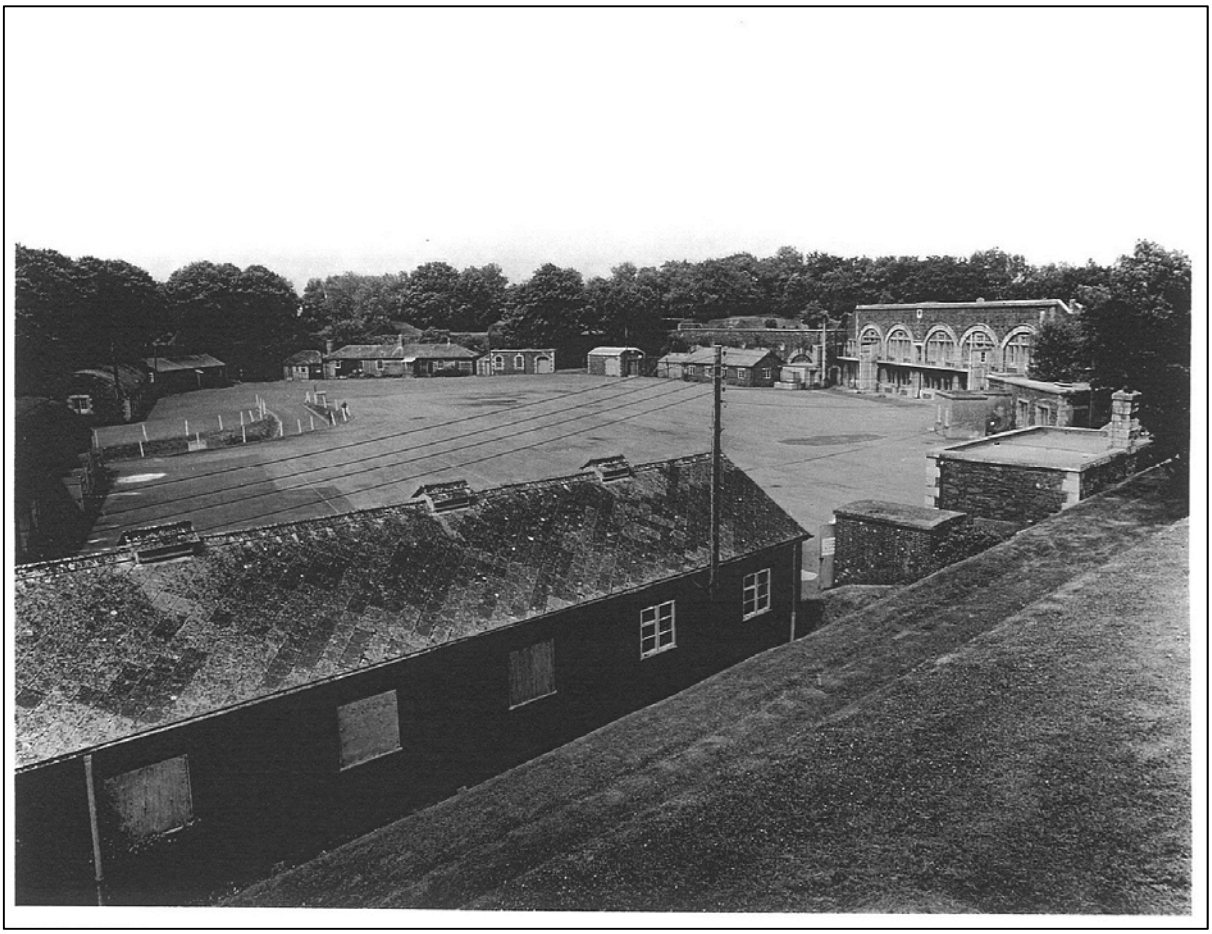
3. The parade ground

From at least 1938 the parade ground was tarmaced, but in 1994 we restored it back to gravel as it would originally have been. It was used for mustering troops, and for parades and drills. If the fort was under attack, troops would have been too exposed to cross it when getting from their barracks to their gun positions, and so tunnels run from the barrack blocks down to the chemin de ronde. Unlike some of the Portsmouth defences, where the ground is chalk, there are no tunnels running under the parade ground.

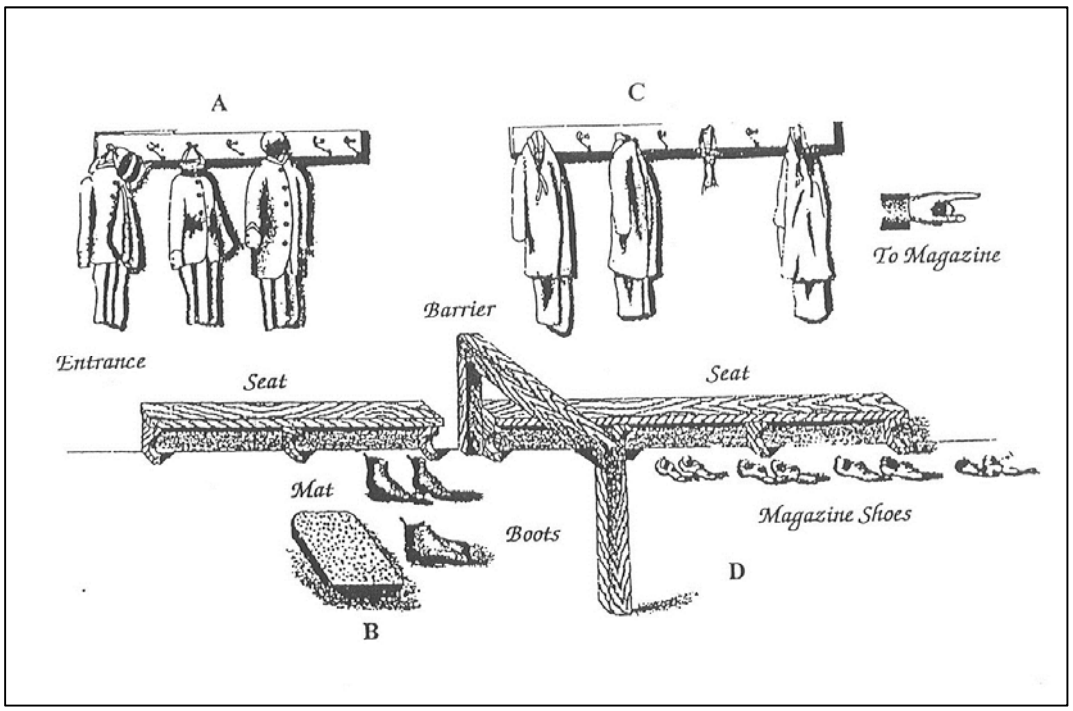
Around the parade ground were the buildings needed for military life, and at various times these have included, to the west of the central Soldiers' Quarters - the medical inspection room, lecture room, orderly room, officer commanding's office, coffee bar, recreation room, tailor's shop, lamp room, Royal Artillery store, shoe shop, carpenters' shop and the main magazine. To the right or east there has been a telephone room, store, bread and meat store, cookhouse, ablutions block and an armourers' shop.

Opposite all these buildings are two artillery sheds that were used to store the pieces that formed the Field or Siege Train consisting of light artillery pieces and howitzers to be used outside the fort to arm small field batteries.

Both the main magazine and the two accommodation blocks are bomb-proofed. Tunnels lead from the central parade ground under the ramparts to each of the caponiers and to two sunken mortar positions on the north and north-west faces outside the ramparts. A scarp wall pierced with rifle slits runs right round the fort. The gun emplacements remaining correspond with the armament table of 1893.



The buildings in the rear and foreground were demolished in 1986



The general layout of a shifting lobby

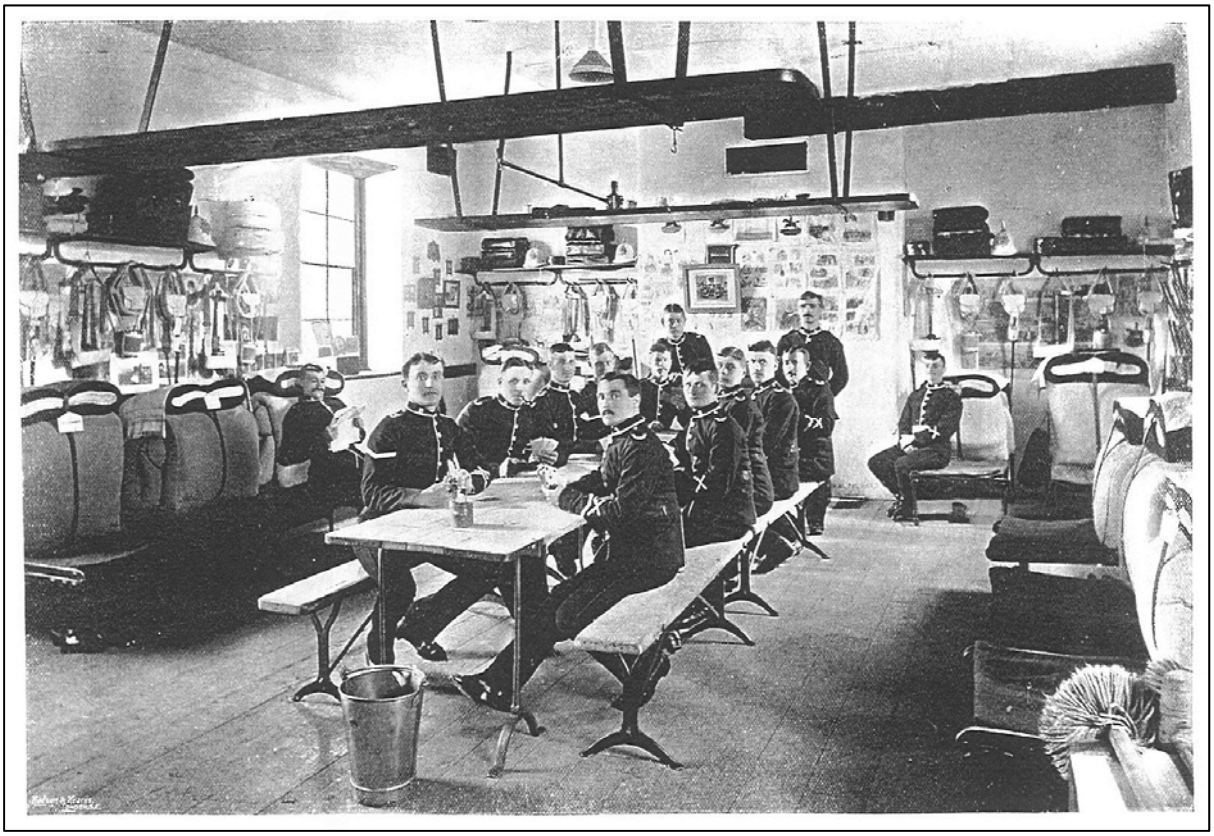
4. The Main Magazine

The large building to the left of the Soldiers' Quarters is the main magazine. This is an unusual position for it. The usual arrangement was to place the main magazine in a comparatively safe place deep inside the fort, often under the parade ground at a much lower level, rather than under the ramparts as here.

The interior has been much altered (in later years it became a gymnasium), but the original layout was three large bays for the storage of gunpowder in barrels on racks or skidding. The ammunition for the guns consisted of two parts - powder contained in a serge or silk bag (the cartridge) and the projectile (the shot or shell). Originally, the preparation of these two components was kept strictly separate.

The magazine would also have had a 'shifting lobby' where troops on magazine duty would change into special working clothes that could cause no sparks.

Around the three bays runs a lamp passage which allowed light to enter the magazine from glazed recesses cut into the wall without the risk of naked flames.



Infantry soldiers quarters in 1896 that are very similar to those at Crownhill

The Soldiers Quarters – the lavatory blocks were removed in 1986

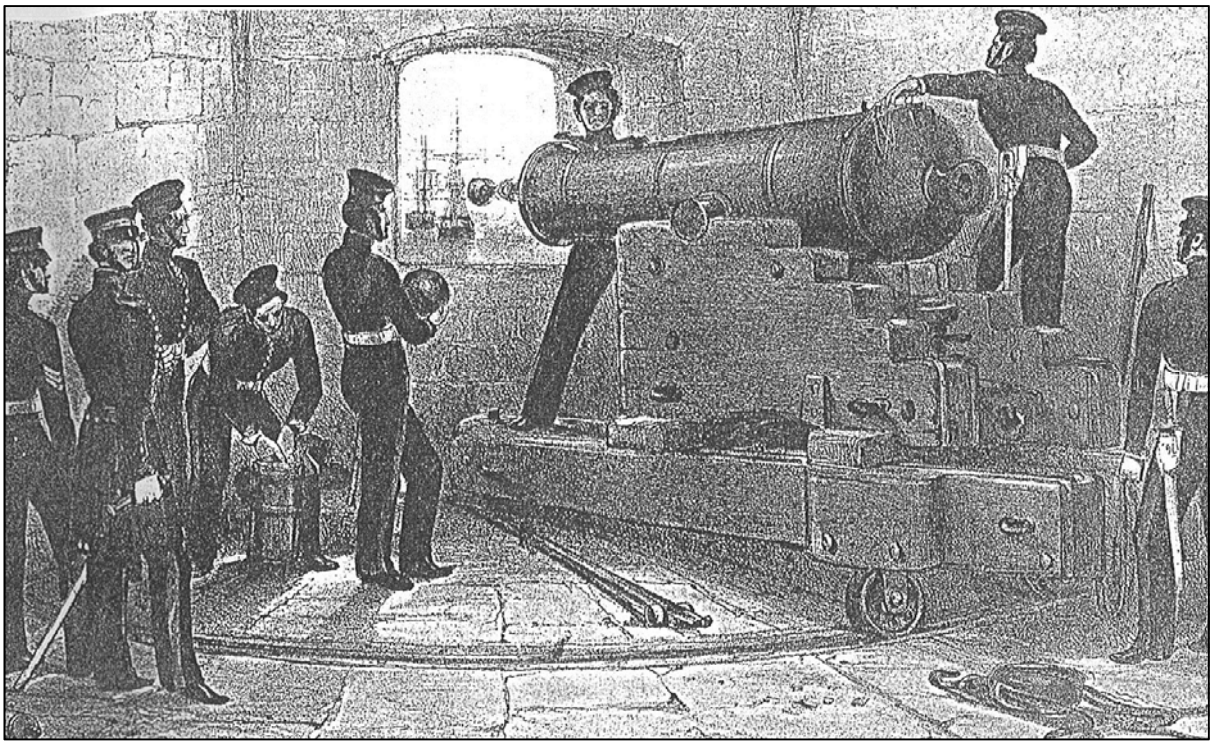
5. The Soldiers' Quarters

The peace time garrison for a fort such as Crownhill was calculated as being the number of main guns on the ramparts multiplied by 20. For Crownhill's 32 guns this would give a garrison of 640 men. Working on the principle that only half of the garrison would be on duty at any one time, the fort had to cater for 320 men. With 10 rooms in this block and a further 5 in the western part of the Officers' quarters this gave approximately 21 men to a room. These relatively cramped quarters led the Army Sanitary Commissioners to set new regulations, reducing the number of men per room to 12 on the ground floor and 13 above.

The beds were made of iron, in two halves with six legs so that the beds could be telescoped back to give room along the centre for a table and benches. Here the soldiers would eat and spend their off-duty hours.

6. The Officers' Quarters

The 1904 room designations show that the 4 westernmost rooms were used to accommodate 38 soldiers, whilst the 5 easternmost were for 5 single officers. There was also an officers' kitchen, pantry and mess room (over the tunnel) together with two rooms for a total of five officers' servants. North of the entire length of the officers' block there was an earth bank built up to the roof level of the block, which was designed to absorb much of the shot and shell that may have overshot the ramparts to burst above or on the parade.



A 68 pounder gun in a casemate, in an engraving of 1845

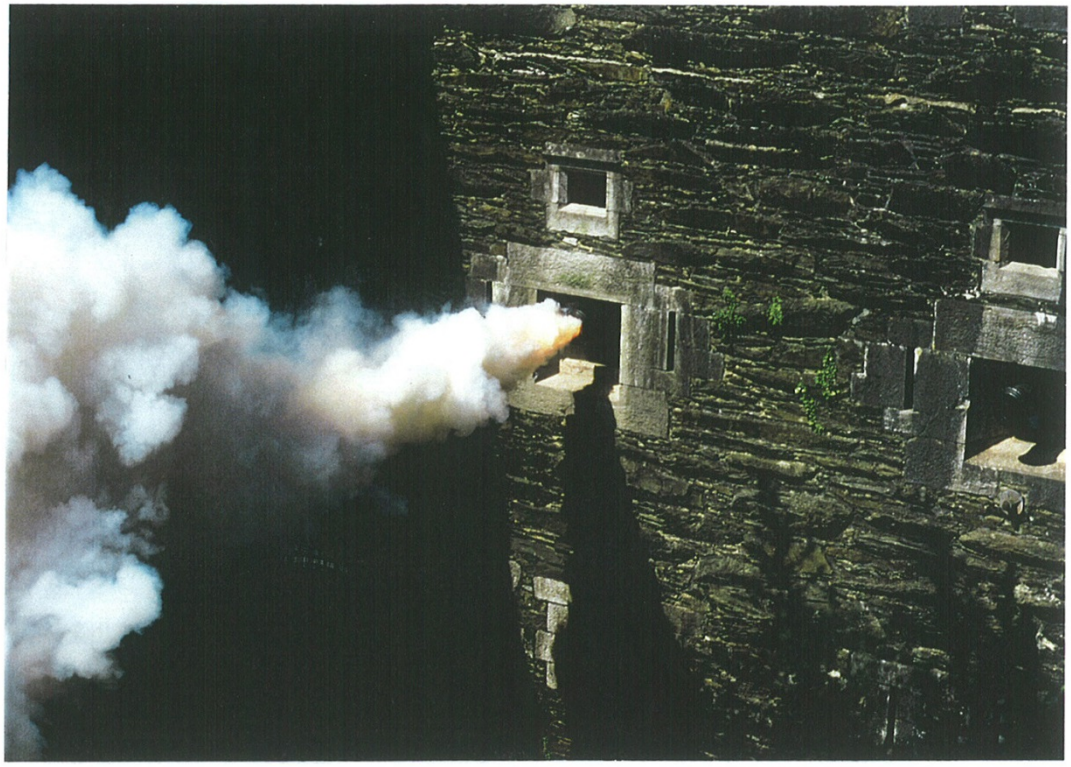
7. Gun emplacements on the terreplein

There are three gun ramps leading from the parade ground level up to the ramparts. They were used to haul the guns up to the gun positions. The ammunition for the guns on the ramparts was contained in earth covered bomb-proof expense magazines. These were filled from the main magazine prior to time of attack and ammunition from these stores was issued to be stored closer to the guns in shell and cartridge recesses cast into each gun emplacement. As a safety measure, it was only at the gun that the two separate components were brought together. The bomb-proof Haxo casemates had their ammunition supplied by lifts in vertical shafts from expense magazines beneath the ramparts. Each shell would be hauled up in a purpose built cage.

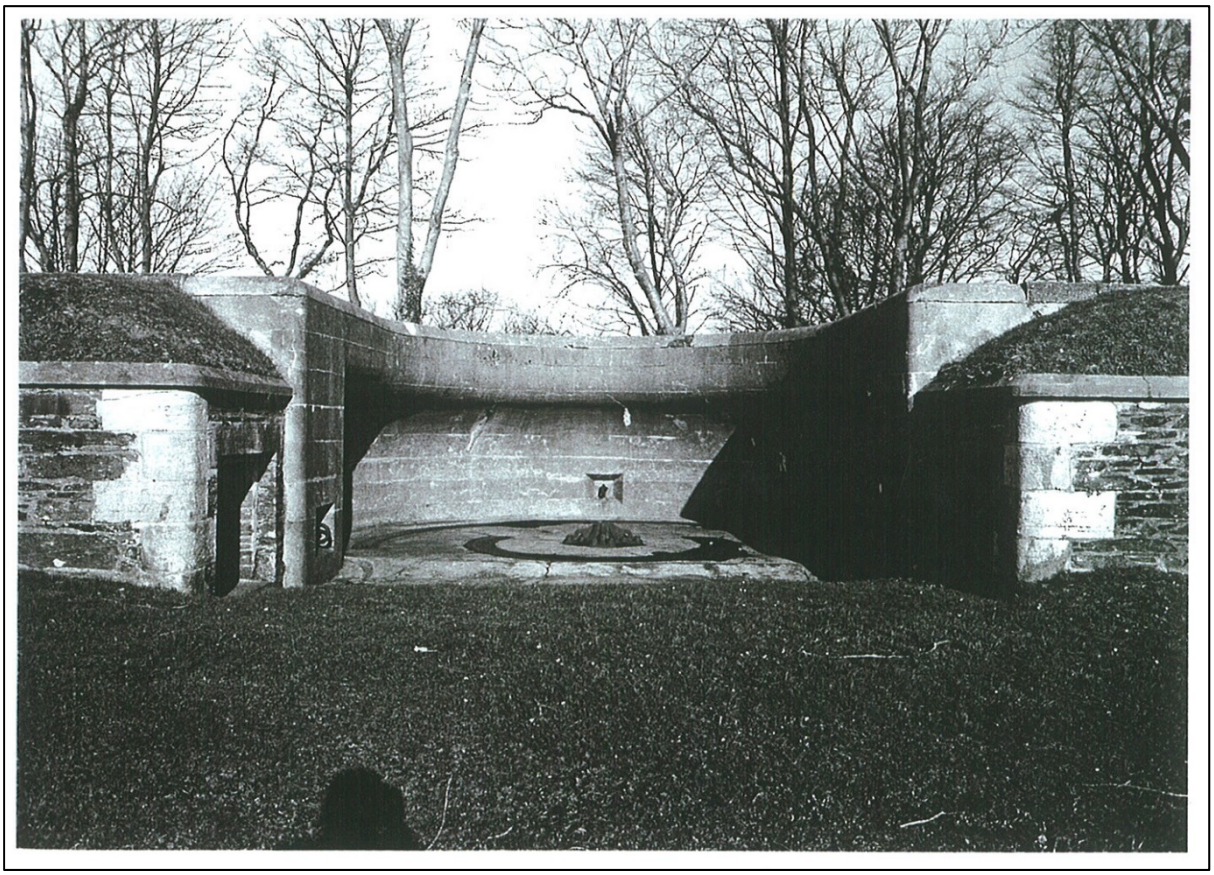
Also of note on the ramparts is the Ordnance Survey Pillar Mk. 1 (dating from 1949) on top of the westernmost Haxo gun position. It has a significant place in Britain's typographical history as it, together with its companion in Fort Austin to the east, formed the Plymouth base line in the triangulation of the UK, resulting in the first re-mapping of the nation since completion of the 1810-55 triangulation. It was also used to assist in updating the Royal Navy's charts needed because of movements in the earth's crust.

8. The Chemin de Ronde

Du Cane incorporated into his design a chemin de ronde which allowed defenders to walk the entire length of the escarp parapet from guardroom to lockup. In some places the chemin is enclosed to form an impressive escarp gallery. The escarp wall is loopholed for most of its length allowing for rifle fire across the ditch. Leaving nothing to chance in so sophisticated a fort, the open sections acted as a 'berm', where erosion of the ramparts due to shell fire could collect rather than fall into the ditch where it could be used by a besieger to build a ramp in order to climb the escarp. Such debris in the ditch would also mask the fire of the guns in the caponiers.



A 32 pounder smooth bore breech loaded gun



A Moncreiff Pit

9. Caponiers

There are six caponiers at Crownhill, with the greatest concentration on the more vulnerable east side. Only the north caponier is a double one (i.e. it can fire in two directions). They were all designed to take 32 pounder SBBL guns, which were old smooth bore guns with the breech end cut off and a new screw thread breech mechanism fitted. They were designed to fire case shot along the length of the ditch to clear it of enemy troops.

Each caponier has three levels. The middle level contained two guns firing through gun ports, with loopholes to allow defenders to fire across the face of the caponier to prevent an enemy laying mines against its walls in order to blow their way in. The bottom and top floors are fitted with loopholes for infantry defence. Each caponier has a sally port used to allow access to the ditch to clear it of small parties of the enemy; to remove such items as scaling ladders; and to clear obstructions to the line of fire of the flanking guns.

The south-east caponier is the one referred to in the 1898 manual for the drill and operation of the 32 pounder SBBL gun. It was used before that date to iron out the finer points of the drill.

In most of the caponiers, provision was made for the occupation of the gunners by the inclusion of fireplaces. This would be for extended occupation during exercises or siege. Brackets also exist in the main casemates of the caponiers for 'Tremlett's Naval pattern fighting lantern' used from 1874. These lamps were used to illuminate the breech of the gun when firing at night and a moveable reflector in the lamp ensured that the gun position was not given away by preventing light shining out of the gun port. No examples have survived.

The north caponier is a double or 'full' caponier. It was built to take five guns with the fifth one facing the countermining gallery. The lower floor contains a well, supplied by a natural spring. In its later life this caponier was converted for use as a classroom for signals staff, and later still into the fort's chapel. World War II modifications included partly bricking up the gun ports and inserting embrasures for Lewis or Browning machine guns.

In many places in the fort, signs can be found in white lettering on a black background, identifying routes to and from the main fighting areas. This was necessary as the forts were to be manned by volunteers in time of need.

10. The Ditch

This is cut out of the natural rock of the hill. It is approximately 40 feet deep and 30 feet wide at the base and was intended to be dry. The ramps into the ditch near the entrance are later additions to enable vehicle access. The ditch has also been used for a Commando Assault course, which in turn overlaid the 50, 100 and 150 yard rifle ranges from the 1930s.

11. The Countermining Gallery

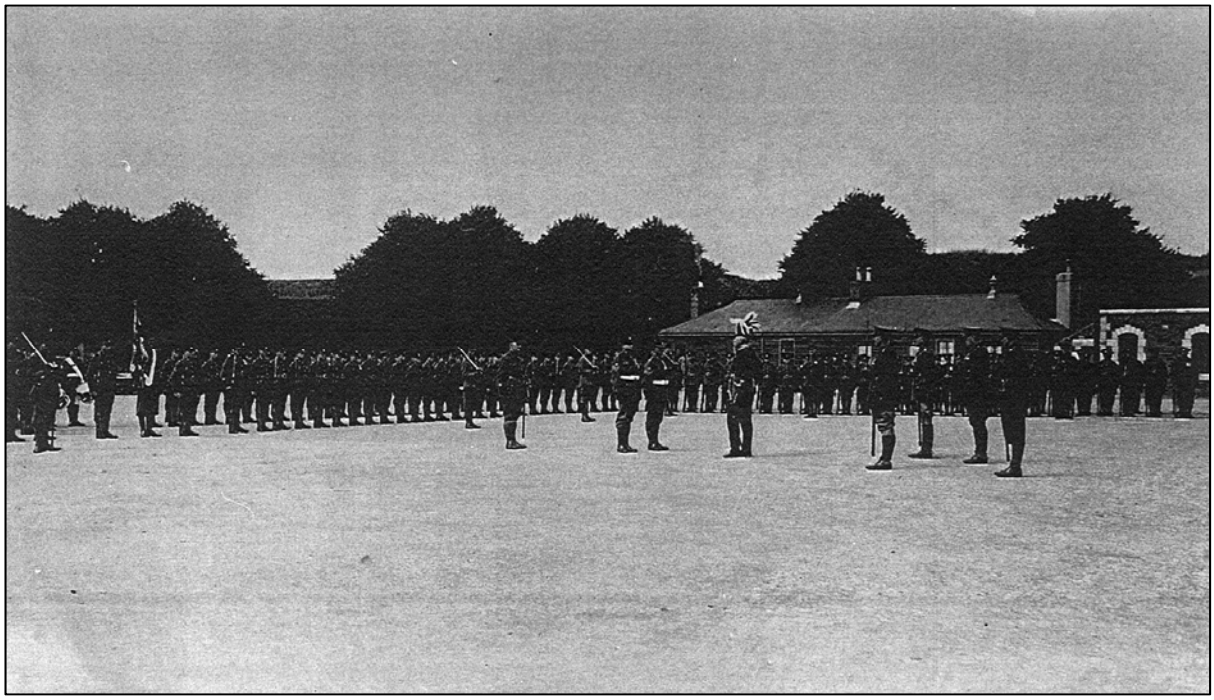
Of particular interest to aficionados of fortifications is the countermining gallery opposite the double caponier. Sentries would wait inside this gallery listening for the sounds of pick and shovel on rock - the sounds of enemy sappers preparing to lay charges to blow up the ditch wall or counterscarp. It utilises the earlier Plymouth and Devonport Leats, and is the only known example extant in Britain. It was reached by a ladder from the ditch floor.

Regimental History

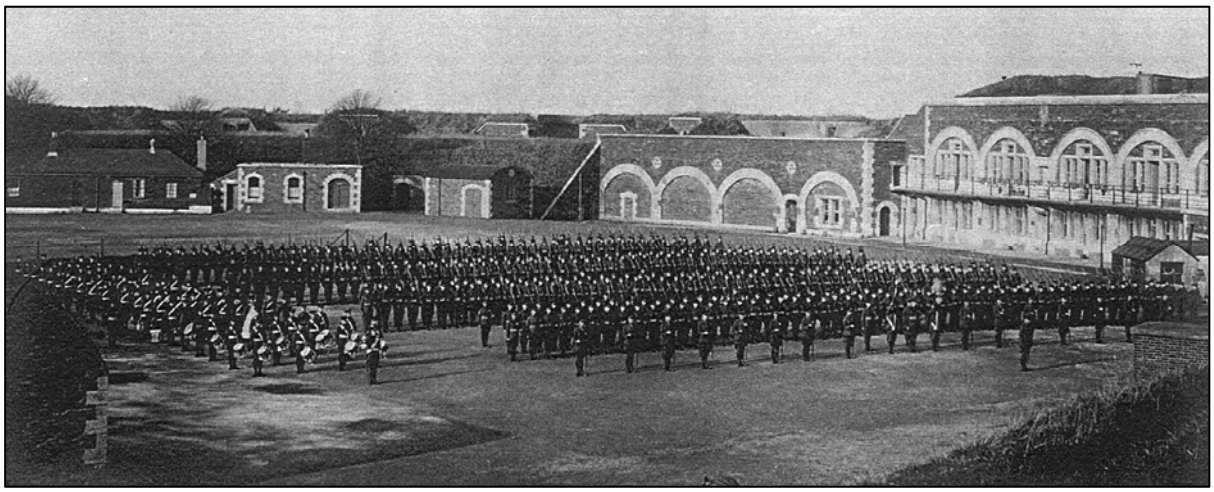
The regiments involved with Crownhill divide into two main categories - those that were actually garrisoned at the fort and those that 'used' the fort. In about 1900 and again some 15 years later, a number of wooden huts were built to accommodate the large number of soldiers returning from foreign campaigns, resulting in many regiments using the fort for exercises and drill, but according to official documents not being 'stationed' or garrisoned there.

The regiments known to have been stationed at Crownhill are as follows (some dates are conjectural):

1873	Royal Engineers
1914	Royal Corps of Signals
1914-19	Royal Munster Fusiliers
1923-24	South Staffordshire Regiment
1938	2nd Battalion The Gloucester Regiment
1939	Royal Corps of Signals
1947	668 (M) Heavy Anti-Aircraft Regiment Devon and Cornwall 81 Anti-Aircraft Brigade Royal Artillery 81 Anti-Aircraft O.R. Royal Artillery (TA) 594 Company Royal Army Signal Corps 684 Army Dental Centre Built (Leicestershire Regiment)
1962	116 (Devon and Cornwall) Corps, Engineers Regiment (TA)



The South Staffordshire Regiment in the early 1920s on Cloutman's Day



The South Staffordshire Regiment on another ceremonial occasion

1964	1st Battalion Kings Shropshire Light Infantry
1965	2nd Infantry Brigade Royal Welsh Fusiliers
1967	24 Brigade 1st Battalion Argyll & Sutherland Highlanders
1980-85	59 Independent Commando Squadron, Royal Engineers

During the course of renovation work a number of artefacts with direct links to other regiments have been discovered - such things as cap badges and buttons - indicating that they may have held exercises or been based at the fort.

Officers of the Gloucester Regiment, 1926

World War Two fox-holes

Recent History and Restoration

During World War I a few additions were made to the coastal defences, and local defences around all the batteries were strengthened. The 1860s land forts and batteries were by now only used from time to time as barracks and stores, apart from Crownhill which was a depot for coast artillery. The fort was also used as a recruitment and transit depot for troops en route to the Turkish and African fronts.

In World War II the 1860s forts were used for a variety of purposes, not only as barracks. Crownhill was a strongpoint in the local defence plan. Towards the end of the war heavy anti aircraft (HAA) guns were emplaced at Crownhill. Many sites exist around the fort of a fieldwork nature for Boyes anti-tank rifles, Bren light machine guns, and Vickers heavy machine guns. At the end of the war Crownhill Fort was used as a demobilisation depot.

Crownhill was used as an assembly point for the Falklands war in 1982, and 647 troops and 1,897 tonnes of war material were despatched from here.

When the Landmark Trust acquired Crownhill in 1987 the fort was somewhat rundown and vandalism had added to the problem. Lacking the necessary resources it had to stay that way for several years. Our objective has been to restore and conserve as well as possible, maintain and present the fort as one of the best examples of a Victorian fortification. The early years were taken up with correcting ground levels, removing and thinning out the considerable vegetation that had taken hold. Debris, up to 10 feet high, was removed where it had accumulated in the ditch. More recent buildings that were not part of the original design were removed so that efforts could be concentrated on the original Victorian buildings, and the tunnels and caponiers were opened up.

The parade ground with a tarmac surface

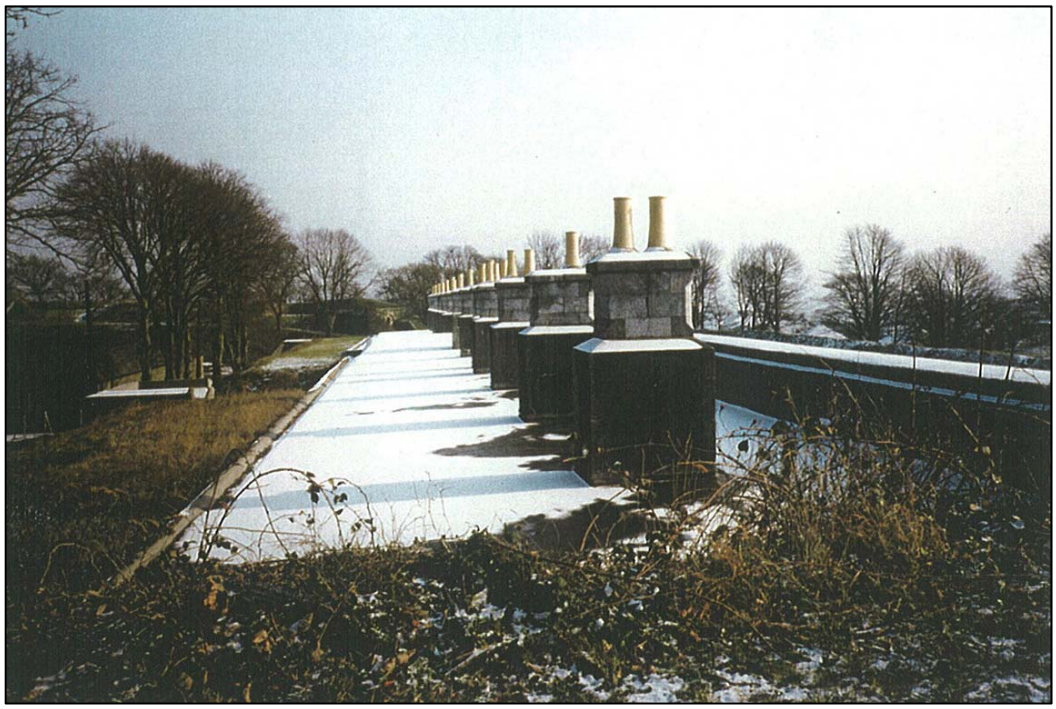
Drainage was installed under the parade ground in 1994

With the assistance of a European regional development fund grant, preparations were made to open the fort to visitors. New services were required - lighting for the entire length of the tunnels and caponiers, upgrading of lavatory facilities, provision of a visitor car park and further landscape improvements.

Slowly work progressed. The architect Peter Hall was appointed to carry out the retanking of the roof over the guard and detention rooms, and also the magazine roof. Experience has shown that no matter how carefully the work is done, covering a roof with six feet or so of earth is a sure way for water to get in sooner or later. Paul Roberts joined in 1990 to manage the building works using a mixture of direct labour and specialist contractors. New services were installed with the aid of an EU grant, and the tarmac was removed from the parade ground to be replaced with the existing gravel as would have originally been the case.

Caroe and Partners were then appointed architects to Crownhill and John Bucknall produced the designs for the conversion of part of the Officers' Quarters to a Landmark. Peter Bird from the same firm did the designs for the conversion of the former cookhouse to the Tea Room. For all these works Paul Roberts acted as the main contractor.

A grant from the Heritage Lottery Fund has brought the fort to life by recreating the soldiers' barrack room appearance, building a working replica gun, and producing an educational centre for school children in the main magazine.



The Officer's Quarters in 1990 before the earth covering was reinstated

The west bedroom in the Officer's Quarters

The Officers' Quarters Landmark

This building is formed by a row of 13 casemates and part of the parados across the rear of the fort. It is referred to as the Officers' Quarters, but in terms of accommodation only the 5 easternmost casemates were used for the 5 officers to sleep in. Two other casemates were used to accommodate the officers' servants, and another was used for their kitchen. The officers' mess was situated in the casemate over the tunnel entrance. By contrast, the remaining 4 casemates, situated west of the tunnel which passes through the building to the parade ground, were used to accommodate a further 38 soldiers. A bell and wire system existed to enable the officers to summon the servants.

The building is built of rubble stone with limestone dressings and granite thresholds. There are 13 limestone ashlar chimney stacks servicing two fireplaces per room except for the officer's mess room over the entrance tunnel which had only one. A passage runs the entire length of the building connecting all rooms, which have timber floors. It remains something of a mystery why each room had two fireplaces. They were unbricked in 1994 as damp was penetrating through (largely because the chimney pots had been left open and not capped), and this showed that only one of each pair had been used. The two vents on the outside of each casemate were not, as originally thought, for the usual underfloor ventilation, but were in fact ducted directly onto the back of each fireplace to provide the incoming airflow for the 'heatilator' vents that you can see above the fireplaces. The absence of the conventional vents had resulted in all but four of the casemates needing their floors to be replaced.

Damp from above as well as below has been a problem for the Officers' Quarters and the cement render on the south elevation was an earlier attempt to stop water penetration. An area at the east end has had the render removed to reveal the rubble stonework underneath.

The original plans for the fort have not been located, the earliest being from 1908, so the exact original layout has not been conclusively established. It is believed that until the 1930s the Officers' Quarters were still used to accommodate officers in rooms 1 to 5. A plan dated 1945 shows that all the accommodation had been converted to offices, with 4 rooms in the west portion used by the Royal Signals, and the remaining rooms taken up by Plymouth Garrison administrators. Apart from some minor temporary stud walls, this layout remained until the building was vacated by the MOD in 1986.

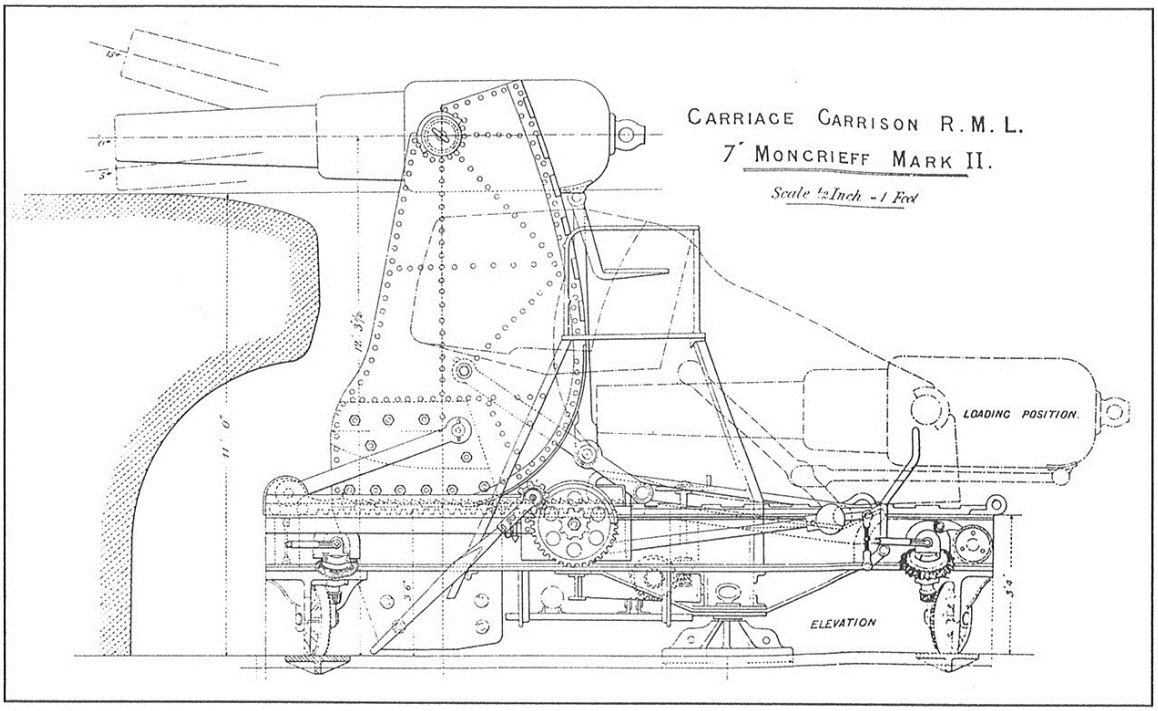
An addition on the parade ground side of the block (to the east of the tunnel) grew from being lavatories in the 1920s to include a decontamination unit in the 1950s. It was demolished in 1986. Other significant works to this building include the removal of the soil from the roof to facilitate waterproofing during the 1960s; the earth was not replaced until 1994. The 4 rooms to the east were converted to form offices in 1995 and the Landmark accommodation that you now occupy was created from the 5 rooms east of the tunnel.

This work to form the Landmark was all done in-house, with the design drawings done by John Bucknall of Caroe & Partners.

The Moncrieff Story

Crownhill Fort contains two concrete pits, up on the ramparts, designed to mount a type of gun known as a 'Moncrieff Disappearing Gun.' The inventor was a Captain Colin Scott Moncrieff of the Edinburgh Military Artillery. The story of this type of gun is a complicated one, and Moncrieff went through many trials and tribulations in his attempts to gain recognition for his method of mounting guns.

Artillery experts had long sought a method of mounting a gun so that it projected over the parapet when in the firing position, but could fall below the parapet and so out of the line of direct fire in order to load and aim it in relative safety. The force of the gun's own recoil could, if harnessed efficiently, be used to raise the gun again to the firing position.



Moncrieff's Mark II Disappearing Gun Carriage. The gun shown is a 7-inch RML – Crownhill had RBLs by 1885.

Such a system was first proposed by Corneille Redeichkeit in 1775, but it proved to be cumbersome and easily put out of action. Other ideas were developed in America and France, but it was not until the 1850s that a workable system was presented by Captain Moncrieff. He thought of using a counterweight to raise a gun and control its descent and recoil in June 1855, whilst watching the effects of the bombardment of British earthen batteries in the Crimea. He submitted a design in 1858 to his Commanding Officer, General Sir R Dacres, who thought it of sufficient merit to bring to the attention of the Secretary of State for War. Although invited to submit drawings and models, he was unable to at that time, and when they were finally submitted some six and a half years later, the Director of Ordnance replied that the government had declined to entertain the subject further, raising four objections:-

1. *'that it is too complicated in its arrangement to be serviceable.'*

2. '*that the protection that it would afford was, at best, imperfect.'*

3. '*that its great weight equal to that of the present gun and carriage taken together would necessitate the provision of special platforms, pivots and racers*.'

4. '*that in the opinion of the Select Committee, the advantages which you anticipate from the adoption of a gun carriage of the kind proposed, are much over-rated and are incommensurate with the expense which would attend its introduction, and under these circumstances Earl de Grey must decline to entertain this subject further.'*

Moncrieff was not a man to be put off so easily. He courted the Royal United Service Institution and following a lecture he gave and its subsequent question and answer session, the Chairman in summing up stated that Moncrieff had *'undoubtedly, by not very complicated machinery, produced an effect which we have all long ago thought desirable.'*

But a further submission to the government met with a similarly negative response, and so Moncrieff decided to conduct an experiment at his own expense. General Peel supplied him in Edinburgh with an iron 32 pounder, which Moncrieff mounted on a less than ideal carriage, but one that he hoped would thoroughly try his principle. The experiment proved to be gratifying. Not only did the carriage stop the recoil without strain, but it did so with a smoothness and an absence of vibration that satisfied all those who saw it.

Moncrieff continued to gain the support and endorsements of senior officers in the artillery establishment but the government remained stubbornly unconvinced. He lamented that he had *'for eight years endeavoured to bring my system forward without success, but my failures in doing so, cannot convince me that I am wrong, nor will they make me desist; from my feelings being old-fashioned in such matters, I have all along declined to ask for that satisfaction, which I knew I could get abroad, before first receiving it in my own country - and I console myself with the reflection that the time will come, when it will only be a matter of surprise that so simple an application, and one so consistent with common sense was not sooner adopted*.'

It was not until February 1869 that the Ordnance Select Committee reported that a carriage should be made up in the Royal Carriage Department, under Moncrieff's superintendence. He was awarded £15,000 as a reward for his invention and reimbursement for the costs that he had incurred in his previous experiments. But subsequent trials and designs for heavier guns proved troublesome and frequent design modifications were required. In 1871 the committee had to remark that '*the carriages ... which have been made are not as yet in the condition to justify their issue. Trial after trial appears only to bring to light new defects and fresh difficulties*.' Finally, in December 1871 the design was approved for service.

But Moncrieff's problems were far from over. Lieutenant English savaged his design in an address to the Royal United Services Institution in March 1873, concluding that *'I entirely fail to see that … there is anything in Major Moncrieff's invention which is likely to overturn the recognised principles of fortification.'* However, the Major was eloquent in his rebuff - *'the lecturer was so desirous to make his case and to reach his conclusions, that his faith removed on that evening the mountain that stood in his way'*, and he proceeded to demolish English's arguments point by point. Captain Selwyn, a witness to this row, commented - *'We have heard of the faint praise which condemns, and I think we have in Lieutenant English's paper a magnificent specimen of faint attack which is a high compliment on Major Moncrieff's system.'*

Discussions continued over the relative merits of dispersed versus concentrated gun positions, with Moncrieff referring to the current policy of massing guns in large iron plated batteries as *'the cuckoo in the sparrow's nest.'*

The years rolled on and in April 1884, Moncrieff, now a Colonel, CB and FRS, wearily addressed the Institution again: *'The hopes and expectations that were expressed by me on the last occasion have been so completely disappointed, and that part of the subject in which I am most interested so much neglected, that it is with a sense of lost opportunities that I now address you. I feel, however that the subject is so important to the State and the tax payer, that it is my duty to continue the ungrateful task on which I have been so long engaged.'* He proceeded to give a paper on a modification of the Moncrieff system using 'hydropneumatic' carriages, spelling out again the advantages: *'I employ a hitherto destructive force of recoil to lower the gun below the natural surface of the ground where it can be loaded and worked in security and in comfort; and, at the same time, I have made that destructive force so much my servant that I compel it at my pleasure to raise the gun again into the fighting position whenever it is required.'*

The idea was that the pits for the guns should be placed to take advantage of the topography of the ground, so giving the attacking guns no defined target to aim at except at the moment the gun was up, and therefore fire could not be directed on it with the same precision as a conventional battery. To place the pit on the terreplein of a fort, as was done at Crownhill, where its rampart is an easily defined target, was a contradiction of Moncrieff's principles.

The great and the good continued to support Colonel Moncrieff, but the Department of the Director of Artillery remained as stubborn as ever. Admiral Ryder, a keen advocate of the system, could not understand why, after 7 committees had reported agreement with Moncreiff, was the mind of one person or department so 'thickly plated' that Colonel Moncrieff could not get his shot in? He doubtless hit the nail on the head when he said, with admirable honesty, *'I have noticed in my experience that it is sometimes a mistake to prove your case too thoroughly; it annoys people. I have felt it myself when a person proves to me that I am so absolutely wrong that I cannot say a single word in my own defence; it is utterly detestable, and I am tempted to hate the man who does it, and oppose him more and more.'*

The Abstracts of the Department of Artillery for 1877 note that 14 counterweight and 6 hydropneumatic carriages were to be produced for the Plymouth forts with Crownhill receiving 3 and 1 respectively for 7 inch RBL guns. Only two pits exist at Crownhill so these figures were obviously amended.

Moncrieff did enjoy some happier moments. A trial in 1885 at Portland Bill was a success. HMS Hercules was instructed to fire at a pit constructed for a dummy gun on its disappearing carriage. Every two minutes the gun was raised to the firing position, stayed up for 20 seconds, emitted a puff of smoke and returned to the loading position. Not one hit was made on the gun, and more importantly, Hercules failed to even hit the pit! After this Moncrieff carriages were more

widely adopted, and many were installed worldwide, although few seem to have been mounted in Britain.

After 1887, Colonel Moncrieff abandoned disappearing guns altogether, and concentrated on High Angled Fire guns - which unfortunately turned out to be something of another blind alley.

At Crownhill Fort a Mark II 7 inch 7 ton RML gun has been made from the original drawings. It was installed at the fort in March 1998 and it is the only working model of its kind in the world.

Glossary

Breech The rear of a gun barrel furthest from the muzzle.

Breech-loader Any gun which could be loaded by opening part of the breech of the barrel.

Caponier A work defending a ditch by extending into it or across it, and enabling fire to be brought to bear on the width of the ditch.

Carnot Wall A detached wall in front of the rampart, separated from it by a chemin des rondes, the wall being built with arched niches on the rear face to protect the men defending it.

Carriage The cradle in which a gun is mounted. It can be standing or sliding.

Casemate A vaulted chamber in the rampart with a port to permit artillery to be fired from it.

Case shot A variety of shot, also called canister shot, used against troops over ranges of up to 300 yards. It consisted of a canister of metal balls that spread out on firing. It was often used in flank defence guns in caponiers to clear a ditch of enemy troops.

Chemin de Ronde A species of covered way between a fausse braye and the rampart for the assembly and movement of troops.

Countermining Gallery A gallery excavated to counter an attacking army's mining.

Counterscarp The exterior wall of the ditch below the glacis.

Covered Way or Sentry Path A space between the top of the counterscarp and the glacis which allows troops to form for defence or for a sortie.

Ditch An excavation in front of the rampart; it may be wet or dry.

Embrasure An opening in a casemate to allow artillery to fire.

Emplacement A position for a gun.

Enfilade To bring musketry or artillery to bear on a work and so sweep it with fire.

Escarp The inner wall or face of the ditch, below the rampart.

Expense magazine A small magazine in which powder for the immediate use of the guns is stored.

Glacis An elevated mound of earth on the country side of the ditch, sloping outward in a continuation of the Superior Slope, so that an enemy attacking the ditch must move up it and thus be exposed to fire from the parapet.

Haxo Casemate A casemate formed in the parapet, arched with masonry and covered with earth, and open in the rear to the terreplein.

Loophole An aperture in a wall (e.g. Carnot wall) for firing a rifle through.

Magazine A place for the safe storage of gunpowder.

Mortar A large calibre gun for firing a heavy shell at high angles. It is so named because it resembled the chemist's mortar.

Muzzle The front of a gun barrel.

Muzzle-loader Any gun loaded from its front end.

Parados A rampart protecting the rear of a fort from fire from the front.

Parapet A bank of earth over which a soldier may fire. In permanent works it crowns the rampart. Also known as a breastwork.

Racer track A curved iron track found inside gun emplacements used for manoeuvring the gun.

Rampart A bank of earth behind the ditch, on top of which is formed the parapet. This gives greater command to the parapet. The rampart is generally built from the earth excavated in the construction of the ditch.

RBL Rifled Breech Loading gun

Rifled gun A gun whose bore was cut along its axis with spiralling grooves so as to spin an elongated shell and make its flight more accurate.

RML Rifled Muzzle Loading gun.

Sallyport A small entrance and tunnel leading out of the fortifications so that troops can exit in order to engage the enemy.

SBBL Smooth Bore Breech Loading gun. Used for flank and ditch defence in caponiers.

Smooth Bore A cannon that has no rifling in its barrel.

Terreplein Broad level fighting platform on the rampart behind the parapet.

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