

EQUIPMENT

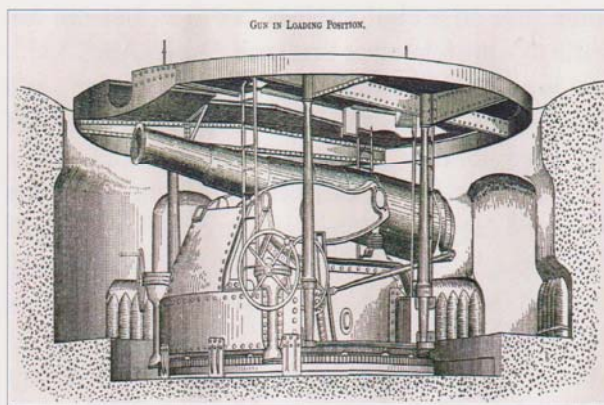
The Disappearing Gun

by Alan Hall Smith

A disappearing gun is a type of heavy (mainly coastal) artillery where the gun retracted or recoiled into a protected pit or bunker after firing. The advantages of the system were concealment and cover from enemy fire, especially during reloading. The concept fell out of use in the first half of the 20th century due to its complexity, limited advantages, and vulnerability to air attack.

When the gun was fired, the recoil forces overcome the resistance of the hydraulics and the barrel was eased backwards and downwards, moving in a vertical arc around the base of the two massive arms. At this point, the barrel has dropped below the parapet, and has 'disappeared' from view of ships, etc., hence the name 'Disappearing Gun'.

While the barrel was in the 'disappeared' position it was reloaded and then the hydraulics re-engaged to lift the barrel up to the firing position again.

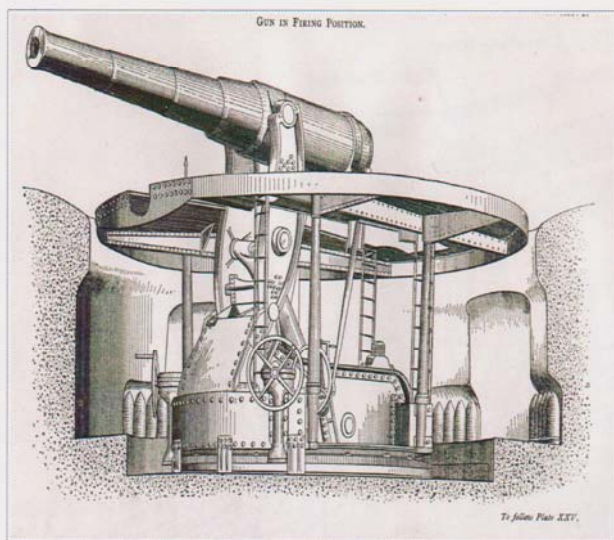


advent of armour and powerful guns on ships led to the adoption of armoured forts in which guns were protected by casemates with enormous thickness of iron and granite to protect them. This was a very expensive method of construction; a single armoured casemate for one gun, together with its necessary magazine arrangements, cost over £3,800 Pounds (Sterling), without the cost of the gun being considered.

Further, the slowness of the rate of fire of the heavy Rifled Muzzle-Loading (RML) guns demanded the development and construction of large fortifications with numerous guns to swamp the enemy with gunfire. Picklecombe Fort in Plymouth Sound, for example, was prepared with forty-two armoured casemates, an expense of £160,000, before the guns were installed.

By way of comparison, the Moncrief carriage and its pit cost a mere £1,345, a considerable saving. A second problem of the day, as with the Naval Ordnance Engineer, was that of controlling recoil in confined spaces.

As early as 1835, Colonel DeRussey of the American army had suggested mounting a gun on a form of standing carriage in which the wheels were mounted eccentrically so that as it rolled back, it would descend behind the fort's parapet for concealment. On the face of it this was a fairly sound idea, but one which was difficult to put into practice,



History

In the 1860s, with the rise of the ironclad ship and the general improvement in shipboard armament, the coast defences of the world had been extensively overhauled in an attempt to keep pace. At the beginning of this period the standard method of deploying coast guns was in open batteries, but the

largely due to the difficulty of running the gun back into its normal firing position.

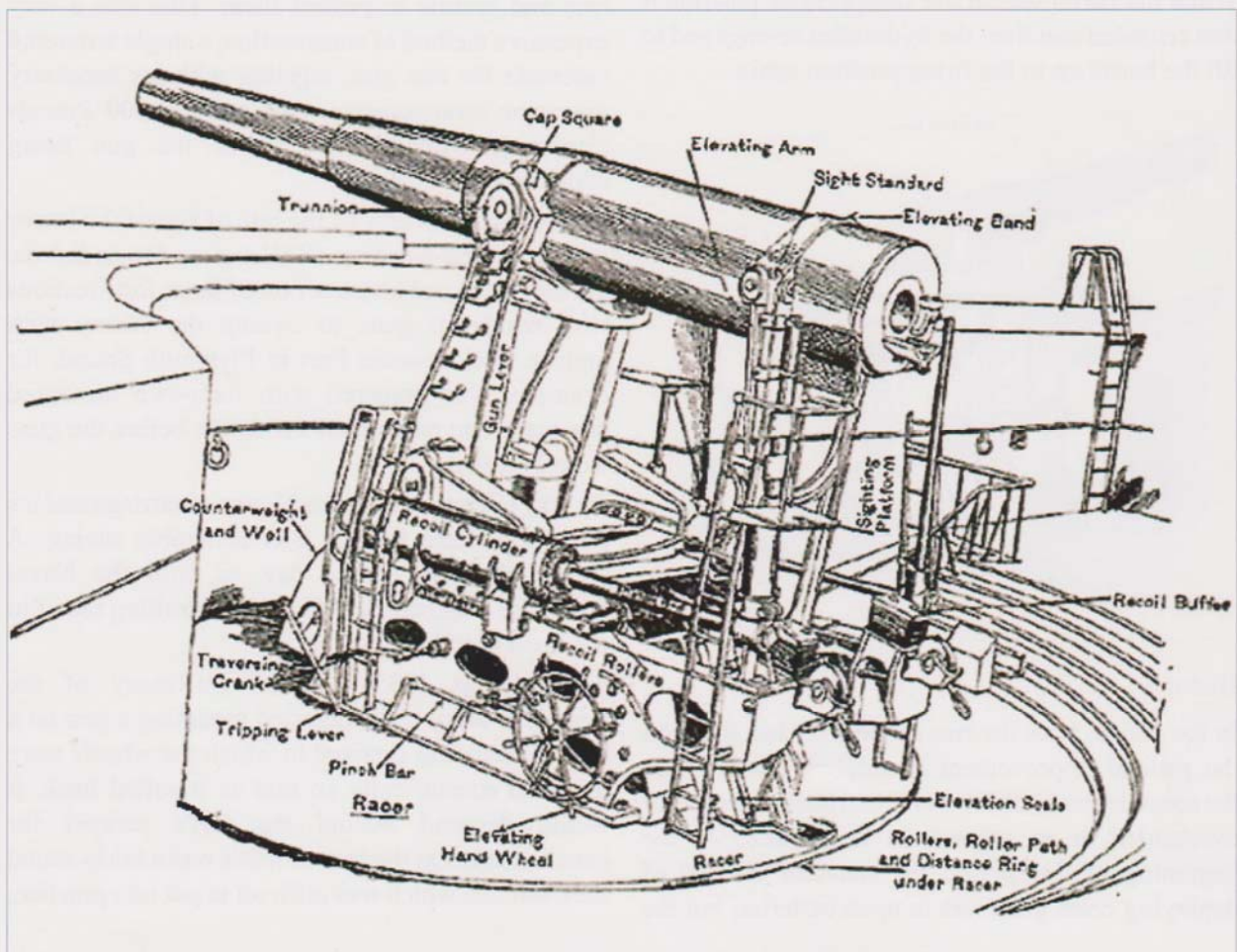
All of the above problems and related factors were reconciled in the design of a gun carriage put forward in late 1860s by Captain Moncrief of the Edinburgh (Militia) Artillery. Alexander Moncrief (1829 - 1906) was the son of an Officer in the Madras Army (Presidency of Madras in India - British East India Company). He was born in Edinburgh, and after studies in the ancient universities of Aberdeen and Edinburgh, he spent some time in a civil engineer's office, but did not settle to a profession at that time. On 16 April 1855, he was commissioned into the Forfar and Kincardine Artillery (Militia) and promptly went off on leave to the Crimea, where he watched the Russian guns being knocked out in the Mamelon Fort on 6 July 1855. The damage done by the shots put through the embrasures of that fortification inspired him to design a disappearing artillery carriage in 1868.

Moncrief transferred to the Edinburgh Artillery (Militia) in 1863, became a Major in 1872 while attached to the Royal Arsenal Woolwich, and was made Colonel in 1878. He was elected a Fellow in the Royal Society in 1871, and knighted in 1890.

A previous design of a counterpoise carriage was proposed about 1860. While theoretically sound the Buffington Carriage would have been difficult to make up into an operational weapon, and it had to wait for significant improvements before it would prove its worth.

Moncrief's proposal was in the form of a counterbalanced gun carriage. In 1871 twenty of these were issued. The gun, a 7-inch RML, was mounted in a light carriage and this was connected to the top of a pair of curved arms which could roll back on a lower carriage. The rear of this gun carriage had two wheels which ran in an inclined plane. Thus, when the gun was fired, the recoil forced it back so that the curved arm rolled and allowed the wheels to run down the plane, bringing the gun below the level of the parapet. A large counterweight was fitted to the bottom of the curved arms to resist the force of the recoil, and this together with the curved face of the arm brought the gun to rest where it was retained by a pawl. Loading was now carried out under cover and then the pawl was released allowing the counterweight to swing the gun up over the parapet into the firing position:

This provided a gun which was invisible from the sea until the time came to fire, and which protected



the crew while loading and serving the piece was accomplished. The lower carriage could be moved to provide traverse, and an arc and screw on the top carriage controlled elevation. The only snag lay in the sights, which were still of the direct fore-sight and back-sight type, which meant that the gunlayer had to leap up on the platform and expose himself to lay and fire the gun. This was a small drawback though, and the Disappearing Carriage (as this class came to be called) rapidly caught the fancy of every nation looking for a suitable gun mounting.

In Moncrief's first model a sub-carriage was used to keep the gun at a constant angle as it disappeared. The counterweight at the foot of the rolling arms was an iron box filled with several hundredweight of gravel. Moncrief, in 1877, produced an improved version of his mounting; the Mark II carriage for the 7-inch (178 mm) or 7 ton RML. This modification dispensed with the top carriage and slung the gun directly on top of the 'elevators' as the curved arms are now known.

In the USA, Captain (later General) Crozier of the Ordnance Department had taken an early idea attributed to General Buffington, in which the gun was mounted on a parallelogram, modified it and added hydraulic cylinders and a counterweight to produce the Buffington - Crozier Disappearing Carriage. This modification was the zenith of this kind of unit, guns of 14-inch calibre were commonly mounted on this carriage and the last and biggest were two 16-inch guns mounted at Panama during the First World War and dismantled late in the Second World War.

In the 1890s, a series of Royal Navy/New Zealand Division of the Royal Navy trials carried out in New Zealand (where numerous disappearing guns had been bought and installed during the Russian Scares) revealed the virtual impossibility of a small shore installation being hit by a warship, except by chance. Others dispute that the advantages were so limited, and point to the efficiency of such artillery in for example, the Battle of Port Arthur. In any case, with their protective benefits thus cast into doubt, no further production of the expensive gun carriages was undertaken in New Zealand.

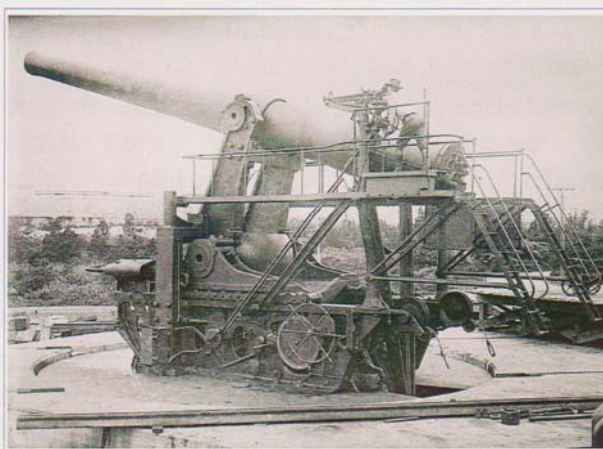
By 1912, the guns were declared obsolete in the British Army, with only some other countries, particularly the United States, still producing them up to World War I and keeping them active through to the end of World War II.

Though effective against ships, the guns turned out to be vulnerable to aerial attack. After World War I batteries of disappearing guns were usually

casemated for protection or covered with camouflage for concealment.

Gun Lift Battery

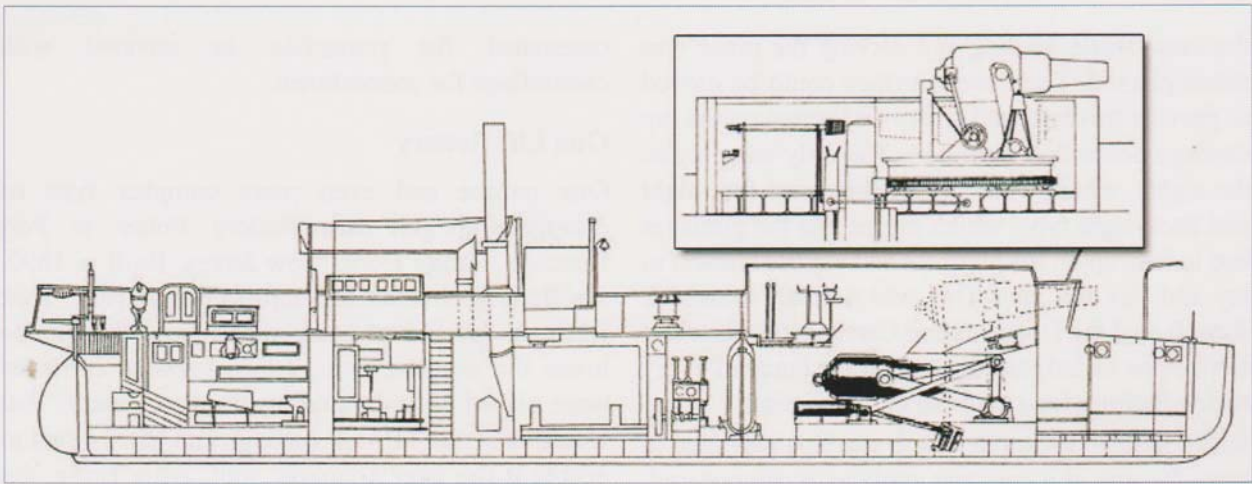
One unique and even more complex type of disappearing gun was Battery Potter at Fort Hancock, Sandy Hook, New Jersey. Built in 1892, the Battery covered the approaches to New York Harbour. Instead of using recoil from the gun to lower the weapon, two 12-inch barbette carriages were placed on individual hydraulic elevators that would raise the 110-ton carriage and gun 14 feet to enable it fire over a parapet wall. After firing, the gun was lowered for reloading using hydraulic ramrods and a shell hoist. While the operation of the battery was slow, taking 3 minutes per shot, its design allowed an unlimited field of fire.



Battery Potter required a huge amount of machinery to operate the gun lifts, including boilers, steam pressure pumps and two accumulators. Due to the inability to generate steam quickly, Potter's boilers were run non-stop during its 14 year life, creating a significant operating cost. After the proving of the Buffington Crozier carriage, the United States Army abandoned plans to build several additional gun lift batteries.

Naval Artillery

In the Royal Navy in the 1880s another problem surfaced. This was the problem of a balance of firepower on a ship between broadside and frontal firing guns. An interesting attempt to solve the problem was the 'HMS Temeraire' completed in 1877 at the Chatham Naval Yard south of London, England. The design utilised in 'Temeraire' was a central battery structure, but in addition mounted two pivot guns, one at each end of the ship. The pivot gun, had by this date fallen into disrepute due to the difficulty of protecting it, but in the 'Temeraire' this was solved by adopting a device



which had been originally developed for Coast Defence; the disappearing carriage. It was this hydraulic carriage which was now adapted to naval service in 'Temeraire'; two carriages, each mounting a 12-inch RML gun were used, one in each pivot gun position.

Instead of the 'pit' of a land gun, these were protected by armoured 'barbettes', armour-plated circular structures within which the guns could be worked and over the top of which they were fired, recoiling down and behind the protection between shots. Thus all-around fire was secured with protection.

However the 'Temeraire' was never repeated; the hydraulic disappearing carriage was a temperamental device at the best of times, cosseted by artificers in fortress applications and undoubtedly prey to every defect that salt and water could devise in a naval application. Further what the shifting balance of a heaving ship would have done to the sensitive geometry of the carriage is something about which the naval records are strangely silent.

In any case, heavy gun turrets soon afterwards entered naval service, making the idea moot.

Function

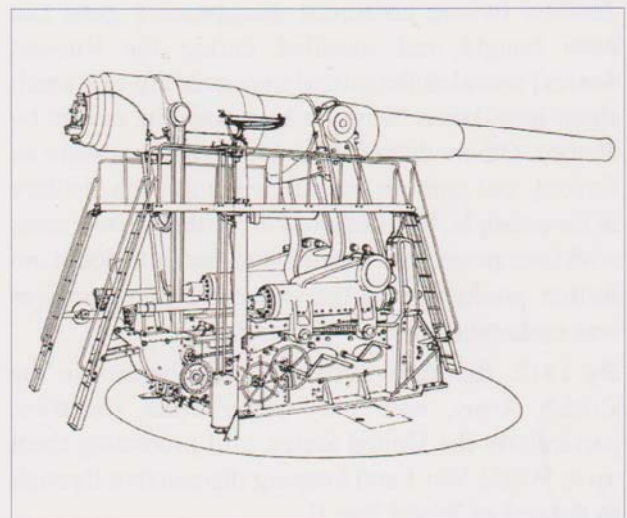
The gun was usually moved into the pit or protective housing by force of the gun's recoil, and was raised again by releasing energy stored in a hinged counterweight. Some also used compressed air, while a few were built to be raised by steam.

The recoil pushes the gun on it's curved elevators back and downward to the loading position, the energy of the recoil being used to raise a heavy, cast-iron counterbalance weight, which can be used to return it to the firing position. This improved carriage did away with the sub-carriage, and the counterweight was made of massive iron blocks. Over eighty of these were taken into service, and

installed in British fortifications all over the world. Later 'disappearing' carriages employed hydro-pneumatic or hydraulic recoil buffers.

The Elswick Ordnance Company married the hydro-pneumatic recoil buffer to the Moncrief principle and produced a mounting hydro-pneumatic mounting which became the standard British pattern. Protected by a nine-foot deep pit and an overhead shield, they were emplaced in British defences from London River to Hong Kong.

The Buffington-Crozier Mounting was the acme of disappearing carriage design, the American coast defences mounted everything up to and including the 16-inch naval rifle on these carriages. Taking Buffington's idea, Crozier turned it into a practical device. The gun arms lift a massive counterweight and are damped by hydraulic buffers at the pivot point, due to the gun arm pivots moving back. The gun describes a complex path during recoil.



Advantages

The disappearing carriage had several principle advantages:

- It afforded the gun crew protection from direct fire by enabling the carriage to raise the gun to shoot over a solid parapet from a lower position which was convenient for loading.
- It stored the force of the recoil so that the force could be used to raise the gun back from the loading to the firing position.
- Interposing of a moving fulcrum between the gun and its platform lessened the strain on the latter and allowed it to be of lighter construction while limiting recoil travel.
- In addition, simple, well protected earthen and masonry gun pits were much more economical to construct than the previous practice of constructing the standing heavy walls and fortified casements of a more traditional gun emplacement.
- Lastly, the entire battery was hidden from view when not in use, unlike a traditional fort, enabling ambushade fire.

Disadvantages

In the early days of coastal gunnery, shooting was a leisurely affair, but the improvement in the speed of warships demanded an increased rate of firing and the disappearing carriage was at a disadvantage compared with a gun which stayed in position. Such a gun could be laid continuously on the target while loading and firing went on. Another advantage of the stationary gun was that the demand for protection was not now so great, since the more powerful guns could keep enemy ships out at a range where they could hardly see the shore weapons, particularly if some intelligence was applied to the matter of concealment and camouflage.

- The carriage design restricted maximum elevation to under 20° and thus lacked the necessary range to match newer naval guns entering service during the early part of the 20th Century. The additional elevation gained by mounting the same gun on a later non-disappearing carriage greatly increased their range.
- The time taken for the gun to swing up and down and be reloaded slowed the rate of fire. Surviving records indicating a rate of fire of 1 every 1 to 2 minutes on an 8-inch (200 mm) gun, significantly slower than less complicated guns.

- While adequate for coastal gunnery against slow moving ships, the improvement in the speed of warships demanded an increased rate of firing.
- The disappearing gun was at a disadvantage compared with a gun that stayed in position as one could not aim or reposition a disappearing gun while it was in the lowered position.
- The gunner still had to climb atop the weapon via an elevated platform to sight and lay the weapon after it was returned to firing position.
- Their relative size and complexity also made them expensive compared with non-disappearing mounts.

Specific Installations

Australia

- Ben Buckler Gun Battery, Bondi, NSW
- Flagstaff Hill Fort, Wollongong, NSW
- Fort Queenscliff, Port Phillip, Victoria, with a recovered gun from South Channel Fort
- Fort Nepean, Port Phillip, Victoria
- Fort Scratchley, Newcastle, NSW
- Henry Head Battery, Sydney, NSW
- Steel Point Battery, Vaucluse, Sydney, NSW
- Signal Hill Battery, Watsons Bay, Sydney, NSW
- South Channel Fort, Port Phillip, Victoria

Canada

- Cape Spear, Newfoundland
- New Zealand (Armstrong Disappearing Guns)
- Fort Jervis (Lyttelton), one mostly intact BL 6-inch Mk V and one working-order BL 8-inch gun
- North Head (North Shore, Auckland), one remaining gun barrel with mostly intact carriage
- Taiaroa Head (Dunedin) one restored BL 6-inch Mk V

Philippines

- Fort Mills, Corregidor Island, Manila Bay, Luzon
- Fort Wint, Grande Island, Subic Bay, Luzon

Thailand

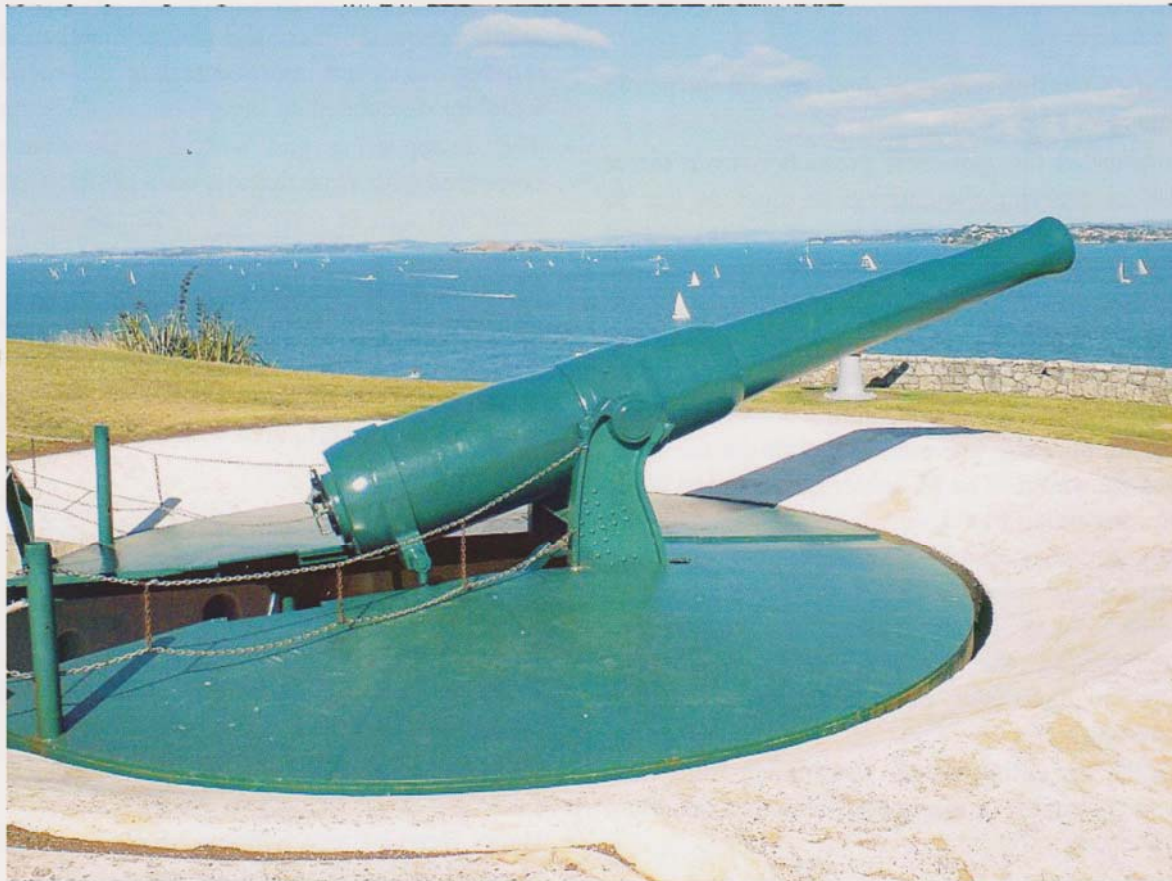
- Phra Chulachomklao Fort, Bangkok, seven Armstrong BL 6 inch guns on hydro-pneumatic disappearing carriages, all in working condition

United Kingdom

- Flat Holm, Bristol Channel, Wales
- Fort Cumberland, Portsmouth, England

United States

- Battery Chamberlin, California
- Battery Potter, Fort Hancock, Sandy Hook, New Jersey. This is only remaining steam hydraulic battery.
- Fort Casey, Washington



The BL 8-inch Disappearing Gun of the South Battery, at North Head in Devonport, New Zealand



Armstrong BL 6-inch Mk V Disappearing Gun at Tairaroa Head, New Zealand



The mount for an 8-inch (200 mm) Disappearing Gun at South Channel Fort Victoria showing the hinged retraction mechanism, Victoria



A Disappearing Gun emplacement at Middle Head Fortifications

Hi John, Alan is delighted with your request and we are very pleased to give permission for its use as requested. Please note the list of location within Australia that Alan provided was only a proportion of the complete situation here as follows:

Regards Kevin Browning, Royal Australian Artillery Historical Company. Many thanks Kevin & Alan, John Osborne 30 August 2015

10 inch 26 cwt Eagle's nest Victoria

9.2 inch 22 ton

Two were purchased for a proposed fort at Glenelg SA which was not built. Barrels were.

Signal Hill, South Head, Sydney NSW

Shark Point, Coogee, Sydney NSW

Ben Buckler, Bondi, Sydney, NSW

A fourth barrel not used and sent to UK at start of WW1 and used as railway guns.

Fort Nepean, Melbourne Vic (two)

Fort Queenscliff Melbourne Vic

8 inch 12 ton

Fort Scratchley, Newcastle NSW

Shepards Hill, Newcastle NSW

Fort Queenscliff, Melbourne Vic later moved to Crows Nest

South Channel Fort, Melbourne Vic

6 inch 5 ton

Fort Lytton, Brisbane Qld (two)

Fort Scratchley, Newcastle (three)

South Head, Sydney (two)

Inner Middle Head, Sydney (two)

Georges Heights, Sydney (two)

Henrys Head, Botany bay, NSW (two)

Bare Island Fort, Botany bay, NSW

Flagstaff Hill, Wollongong NSW

Fort Queenscliff, Melbourne Vic (three)

Fort Nepean, Melbourne Vic (two)

Fort Largs, Adelaide SA (two)

Alexander Battery, Hobart Tas (two)

I think the two listed in Hobart were actually 5 inch 2 ton guns and their mounting was probably as follows



