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The Fortification of the Firth of Forth 1880–1977

'The most powerful naval fortress in the British Empire'

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Chapter 2

THE NAMING OF PARTS

2.1 The guns of the Forth

The Forth was armed with a variety of guns between 1880 and 1956. The eight types described here were those on which the defences relied for that period. In each case, the version most common in the Forth is described, although other variants are referred to. All but the last type, the 6-pdr twin (a light quick-firing anti-boat gun with two barrels developed during the 1930s), were adaptations of naval guns. The maximum ranges listed are theoretical: the effective range was limited by the distance to which fall of shot could be observed, the capacity of range-finding equipment, visibility and any assistance given by aerial observation or, later, by radar.

10-inch RML

The 10-inch Rifled Muzzle Loading (RML) gun was the armament installed on Inchkeith and at Kinghorn in 1880, when the new forts were built. The guns had been made in 1868. The last two were removed from Kinghorn in 1903–4. The gun fired a shell of 181–186kg to a maximum range of *c* 5,500m. Figure 2.1 shows the gun emplaced in the North Battery on Inchkeith, as set out for the firing trials by HMS *Sultan* in 1884, demonstrating the arrangements for hoisting the charge and shell up to the mouth of the gun using the gun's 'muzzle derrick'. The gun crew comprised a Gun Captain, Gun Layer and nine other men.[1] In the centre of the floor of the gun emplacements was an iron post on which a wrought-iron sliding carriage was pivoted on an iron platform with four wheels. The whole platform could be turned like a railway turntable and elevation and depression were achieved by the use of a worm-wheel gear. The recoil was checked by hydraulic buffers secured to the platforms.

Breech-loading (BL) guns

Modern coast defence guns were divided by weight and role. 'Counter-bombardment' guns were designed to engage enemy ships attempting to bombard coastal targets or anchorages at long range; in the Forth, this was the role of the 9.2-inch guns and, in the Second World War, of the modern 6-inch guns on 45° mounts at Kincraig. 'Close defence' guns were intended to engage enemy vessels attempting to enter a harbour, or to block it, or to smash boom defences. In the Forth, these were mainly the 6-inch guns (and 4.7-inch and 4-inch in the First World War). 'Anti-MTB [motor torpedo boat]' guns (as they were called in the Second World War) were designed to tackle light fast-moving boats attempting to enter a harbour to attack shipping or dock gates; in the Forth, these were 12-pdr and (from 1940) 6-pdr twin guns.

9.2-inch BL Mk X

Although the 9.2-inch gun was the main counter-bombardment gun (p xix), the decreasing likelihood of capital ships being used to bombard the coast meant that they were more likely to tackle enemy heavy cruisers. A single Mk I gun was mounted on Inchkeith in 1893. The Mk X, which was to remain in service until 1956, was introduced in 1899[2] and

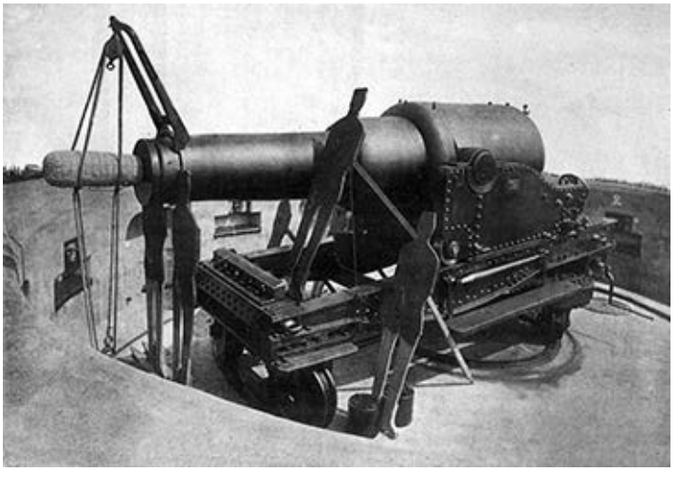

Figure 2.1
A photograph from the official report of the HMS *Sultan* firing trials in 1884, showing the 10-inch RML gun in the North Battery on Inchkeith, as set up prior to the commencement of firing, with dummy crew and shell in the process of being loaded

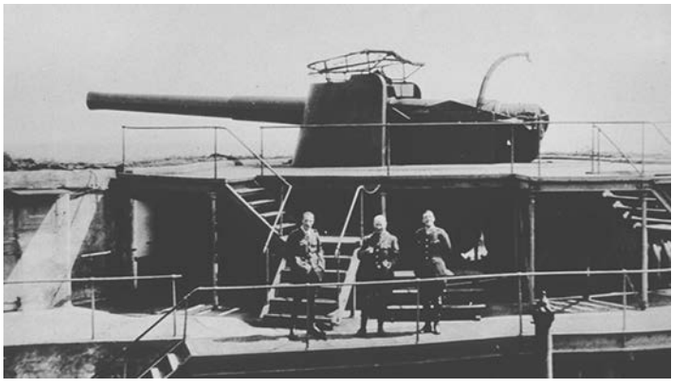

Figure 2.2
The 9.2-inch BL Mk X gun, on Mk V Central Pedestal mount at Kinghorn, shortly before the Second World War (© Bruce Stenhouse Collection)

seven guns of this mark were installed on Inchkeith and at Kinghorn and Braefoot between 1903 and 1915, the Inchkeith guns remaining in service until after the Second World War.

The Mk X 9.2-inch gun delivered a shell weighing 172kg. Maximum ranges given by different authorities using the Mk V mount (with a maximum elevation of 15°) vary significantly, between 15,900m and 26,500m.[3] The range at which there was a 33% chance of hitting a target 30 ft (*c* 9.1m) high was 11,500 yards (*c* 10,500m).[4] A firing rate of 2–3 rounds per minute could be achieved.

The gun was set on top of a high pedestal in a deep emplacement (Fig 2.2); the men who served the gun worked on a steel platform over the top of the pit; the large space below the gun platform (the emplacement floor) was used for the storage of ready-use ammunition, around its wall or in niches.

Cartridges in silk bags (kept in protective cases until they reached the gun) and shells were stored in separate spaces below ground and were transported to the emplacement floor by separate lifts. They were moved by trolley to hoists on the gun mounting, which would be used to lift them to the loading level.[5] Different sizes or numbers of bags could be loaded behind the shell to increase or decrease its range and power.

In July 1916, the complement at Kinghorn to man the single 9.2-inch battery was two officers and 36 other ranks.[6] The gun detachment was of 15 men, five of whom had a role in aiming the gun: Gun Captain, Rocking Bar [Sight] Layer, Auto-Sight Layer, Setter for Range, Setter for Training. The other ten 'gun numbers' were mainly employed in handling ammunition. Three men were needed to ram the shell and cartridge home into the breech. Nine men – the ammunition detail – were employed below ground in the magazines. On guns where only one lift was provided from below ground, it was used exclusively for shells, the cartridges being carried up to the emplacement floor by hand in their protective cases.[7]

6-inch BL Mk VII

The Mk VII 6-inch BL guns were intended to fight light cruisers and to tackle block-ships and boom-smashers (p xix). As enemy ships became more powerful, 6-inch guns were relegated to deal with heavy modern destroyers. The first 6-inch guns mounted in the Forth were Mk II guns, on Elswick Hydro Pneumatic disappearing mountings, on Inchkeith. All 6-inch gun installations between 1898 and 1942 were of Mk VII guns, usually on Central Pedestal Mk II mountings, set in an emplacement (Fig 2.3). The loaders worked on the gun floor, either a steel platform or directly on the concrete of the emplacement; ready-use ammunition was stored in niches around the gun emplacement. The guns could be fired at nearby targets using an auto-sight, or at more distant targets with information from sights mounted on the gun or from the Depression Position Finders.[8]

In the 6-inch batteries in the Forth built up to the end of the First World War, the silk-bagged cartridge and the shell were lifted from the underground magazines using separate lifts, the former to the emplacement floor (the silk bags held in their storage containers), the latter usually to the gun platform (see the 'ladder lift' on Inchkeith, below (Fig 11.19; Fig 11.20)). Cartridges and shells were manhandled from the lifts into the loading position.[9]

The Mk VII 6-inch gun delivered a shell weighing 45kg to a range of up to 11,000m, using the 15° elevation Mk II carriages in use in the Forth.[10] The range at which there was a 33% chance of hitting a target 30ft (*c* 9.1m) high was 8,500 yards (*c* 7,700m).[11]

In July 1916, the complement at Kinghorn of the two-gun 6-inch battery was three officers and 55 other ranks.[12] The 13-man gun crew comprised five men who had a role in aiming or firing the gun: Gun Captain, Rocking Bar Layer, Auto Sight Layer, Setter for Range, Setter for Training; and eight other 'numbers' in the crew, mainly involved in handling ammunition. There was an eight-man ammunition detail below ground.[13]

Figure 2.3
One of the 6-inch guns at Kinghorn, within its relatively small Mk II shield, with Inchkeith just visible on the horizon. Probably taken in the 1930s (© Bruce Stenhouse Collection)

Two Mk XXIV 6-inch guns were mounted at Kincraig in 1943, in mounts that allowed 45° elevation and a longer range. These guns were provided with radar aiming systems.

Most of the guns in the Forth were equipped with Mk II shields (Fig 2.3) until 1931, when, as part of the implementation of the Interim Defence Scheme, some Mk IV shields were mounted. The Mk IV was a larger round-fronted shield that wrapped round the sides of the gun and provided overhead protection.

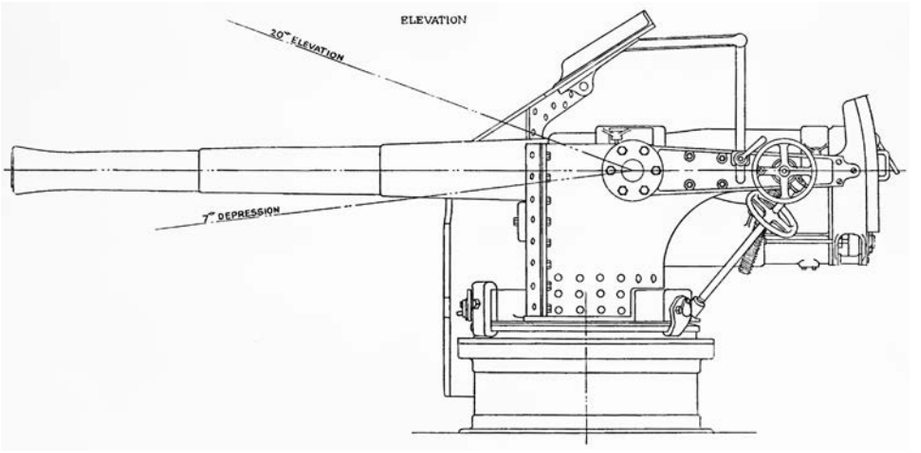

Figure 2.4
The cross-section of a 4.7-inch QF gun, from the 1901 Royal Artillery handbook for the gun

QF (Quick-firing) guns

QF guns were provided with a rapidly operating (or even semi-automatic) breech which allowed for rapid firing. The ammunition of all these guns, apart from the 4.7-inch, was in a single piece, the shell fitted into a brass cartridge case. The 4.7-inch QF had, like the larger guns, ammunition in two parts – with separate shell and bagged cartridge.

4.7-inch QF

The 4.7-inch QF gun was intended to assist the 6-inch guns against light cruisers, block-ships and boom-smashers, and also to target torpedo boats and destroyers (Fig 2.4). Four 4.7-inch QF guns were mounted in the Forth, at Inchkeith (Mk IVb) and Kinghorn (Mk IIIb). The four guns were moved, in 1903 and 1915, to Dalmeny and Downing Point respectively. All four moved again, in the restructuring of the Forth's defences, in 1916, when they all went to Inchcolm. They were still part of the approved armament of the river in November 1927, and were removed with the rest of the armament in 1930.[14]

The 4.7-inch gun delivered a shell weighing 20kg to a range of 10,790m.[15] The range at which there was a 33% chance of hitting a target 30ft (*c* 9.1m) high was 7,500 yards (*c* 6,860m).[16] The complement of the two-gun battery at Dalmeny, in July 1916, was three officers and 38 other ranks.[17] The crew of a single gun would comprise ten men.[18]

12-pdr QF

The 12-pdr QF gun was introduced in 1894 on ships and in coast defence to deal with fast-moving torpedo craft. In 1902, 12-pdr guns were mounted in the Forth to provide cover for the controlled minefields and to sink any small vessels trying to grapple and drag the mines out of the way. After 1906 they were repurposed to provide defence against torpedo boats. These guns were usually assisted by electric lights – either fixed, to illuminate an area, or moving, to pick up and follow a target.

The 12-pdr was on a 'free' mounting, which allowed the gunner to push it round using his shoulder and thus follow a fast-moving target. It had a shield of 3-inch steel plate to protect the crew (Fig 2.5).[19]

The gun delivered a 5.4kg shell up to a range of *c* 7,300–9,230m (depending on which authority one follows) and could reach a rate of fire of 15 rounds per minute.[20]

The gun's crew comprised the Gun Captain and Gun Layer (both NCOs) and five other men. The Gun Captain had control of the pistol grip trigger and the sight fitted on the shield. The Layer had control of the other sights.[21]

12-pdr (Naval) 18cwt

These high-velocity naval guns were mounted in the Forth between 1915 and about 1921. While the 12-pdr (12cwt) gun described above was also a naval gun, it had been adapted for coast defence use with the addition of auto-sights to aid the targeting of fast-moving craft. The 12-pdr (Naval) 18cwt was provided as a stop-gap and, although more powerful, was not so equipped. The 5.4kg shell could be fired a distance of around 8,500m, and a rate of fire of 15rpm is reported.[22]

In July 1916, there were 14 12-pdr (Naval) 18cwt guns, organised in seven Gun Groups in the Forth. Each Group had two officers and between 28 and 30 other ranks, including gun crew, their reliefs, and men handling the ammunition.[23]

4-inch QF

In July 1916, there were four 4-inch Mk II guns on Inchgarvie (Fig 2.6), split into two Gun Groups; one group had two officers and 36 other ranks, while the other had two officers and 32 other ranks.[24] The 4-inch gun was a mainly naval weapon with

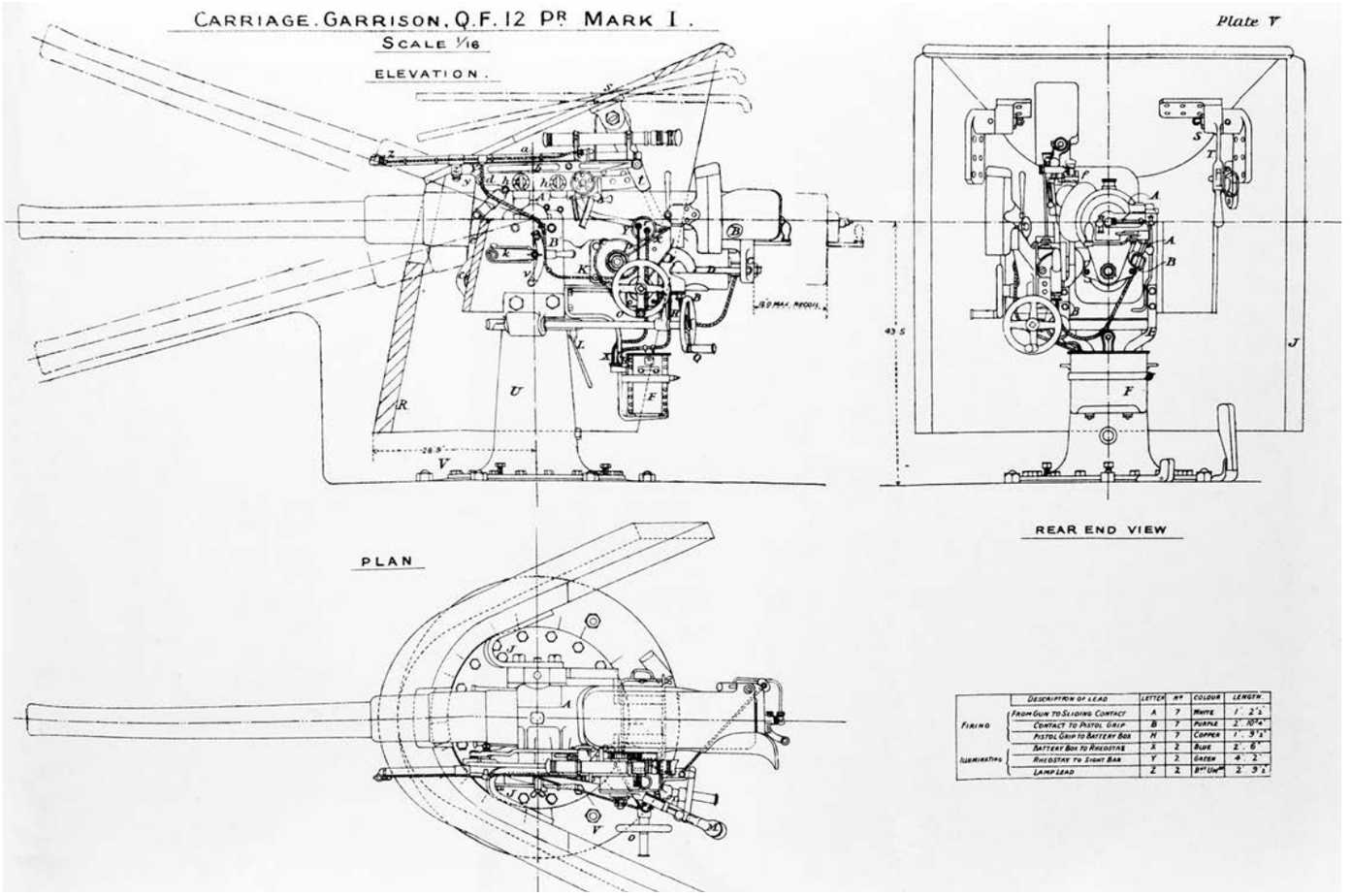

Figure 2.5
The cross-section, rear elevation and plan view of a 12-pdr 12cwt QF gun, on a Mk I carriage, of the kind used at Coastguard and Inchgarvie Batteries, from the 1903 Royal Artillery handbook for the gun

a range of *c* 8,780m and a weight of projectile of between 11kg and 14kg. A rate of fire of 8–10 rounds per minute could be achieved.[25] The gun crew comprised Gun Captain and Layer (both NCOs) and six other members. The guns were moved to Inchcolm in the reorganisation of the defences in 1916.

Twin 6-pdr

This was the only gun used in the Forth originally designed for coast defence work, to deal with small fast-moving motor torpedo boats or other fast coastal craft. The existing 2-pdr 'pom-pom' gun was effective against such craft, but its weight of shell was considered inadequate. Development of the 6-pdr twin began in 1925 and the first units were built in 1933.

Trials that year compared the effects of a pair of 12-pdrs and the new 6-pdr twin guns on coastal motor boats. The new 6-pdr was found to be very satisfactory, achieving, in bursts of 10–12 seconds, a rate of fire equivalent to 65rpm. The modernised 12-pdr equipment was capable of firing 13rpm per gun. The conclusion was that the new 6-pdr twin was 'definitely superior' to the 12-pdrs, which had, however, performed very well. These conclusions determined the light armament of the Forth in 1939–45.[26]

The two barrels of the 6-pdr twin were mounted side-by-side in a rotating steel cabin (Fig 2.7; see also Fig 10.34), open at the back but providing good cover for the crew. Behind the guns were trolleys on rails, on which the ready-use ammunition was carried when the gun was in action. Although the rounds were loaded singly by hand, the design of the semi-automatic breech allowed the very high rate of fire. The guns were operated by two independent teams, who had merely to throw the round into the breech and pull the firing lever as soon as the breech closed. The gun was laid using data from a separate director and range-finder mounted in the Director Tower behind the gun. In the Italian raid on Malta on 25–6 July 1941, the 6-pdr twin defences sank five motor torpedo boats in less than two minutes.[27] The standard

Figure 2.6
One of the 4-inch guns on Inchgarvie, in one of the former 12-pdr emplacements, at a date between July 1915 and early 1917. Note the ready-use ammunition stored on trolleys. The original caption reads '"F2"2 12 pdr 18cwt Q.F. 1st and 2nd Battle Cruiser Squadrons', referring to the ships moored in the background (© Bruce Stenhouse Collection)

emplacement, as built in the Forth, provided concrete cover to sides and rear, and over the rear part of the cabin.

2.2 Terminology and conventions

In the list of abbreviations and key terms (p xix) we have tried to provide a glossary of the main acronyms and terms in use from 1880 to the closure of Coast Defence in 1956. There are three sets of terms that might cause confusion.

Defence Electric Lights (DELs) were the searchlights, some moveable, some fixed (albeit moveable by one or two degrees), used to illuminate targets for the guns at night. In 1940, they were renamed Coast Artillery Search Lights (CASLs) but we have decided not to reflect this change in the description of every battery, and use 'DEL' throughout.

Second, there is the changing nature and nomenclature of battery command buildings. Towards the end of the 19th century, batteries began to be provided with Battery Control Posts, open spaces provided with a pillar to which a Depression Range Finder could be attached. These could also be referred

Figure 2.7
One of the few remaining surviving 6-pdr twin installations, at Battery Belmont, Fort Rodd Hill, British Columbia (© John Stanton)

to as Battery Commander's Posts,[28] and in time more complex roofed buildings, known as Battery Command Posts, were provided, often incorporating posts from which the DELs were controlled. For the 6-pdr twin guns of the Second World War, the equivalent structures were termed Director Towers. The later nomenclature, Battery Observation Post, could refer to a pre-existing Battery Command Post or to a structure with a role in a more complex arrangement of battery command. For example, the Kincraig Battery, the only permanent 6-inch gun battery built in the Forth after 1916, had not only three different Battery Observation Posts (Close Defence, Counter-Bombardment and Radar) but also a Control Post (where the Commander was based) and a Battery Plotting Room.

Third, throughout the text we refer to the 'approved armament' of the Forth and what was actually 'mounted'. The former was what was officially determined as the armament of the estuary; what was actually 'mounted' might be more or less than what was 'approved'. Plans to increase or decrease the number of guns, or to change the calibre of guns, might have to wait for years before funds could be found. Often, the 'approved armament' would be changed again to take account of new defence needs or new technology before the previously

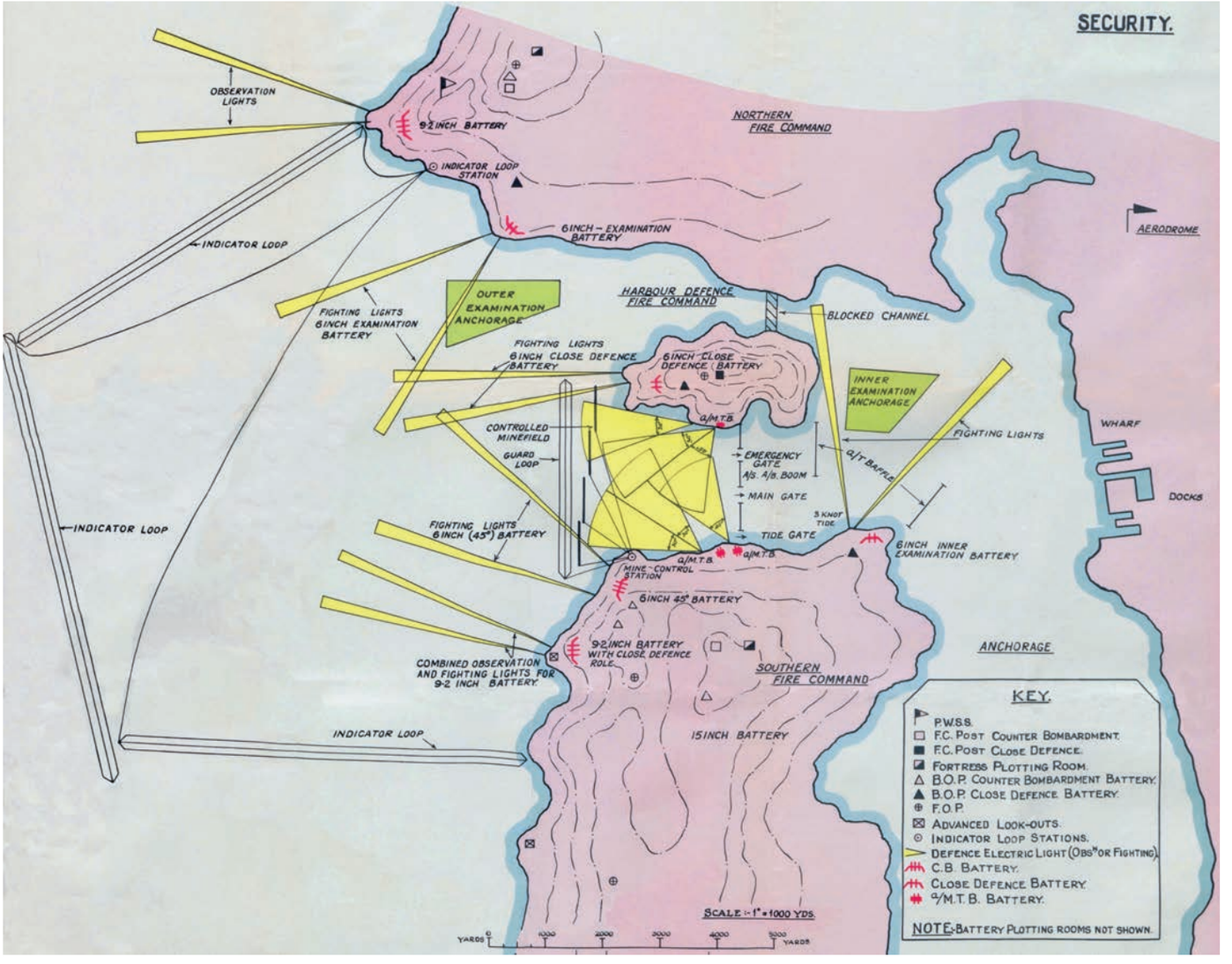

Figure 2.8

The ideal layout of a defended harbour, as set out in a Royal Engineers manual of 1943. The key elements, working from outward (left) are: Indicator Loops to detect submarines; Counter Bombardment batteries of 9.2-inch guns; the Examination Anchorage covered by 6-inch guns; a Guard Loop; controlled minefields ('Mine Loops'); Close Defence batteries of 9.2-inch and 6-inch guns, with Coast Artillery Search Lights; Anti-MTB guns, with lights; Anti-submarine and anti-boat booms, with gates. The guns are shown as divided between three Fire Commands 'Northern', 'Harbour defence' and 'Southern'. There is also an Inner Examination Anchorage (War Office 1943 *Military Engineering (Vol II) Supplement (Coast Defence*)

approved changes had been made. On the other hand, guns taken off the 'approved armament' might remain mounted (without ammunition or men to crew them) for many years, heavily greased and protected from the weather.

In the text, we give metric equivalents for measurements given in Imperial units in original documents and use metric units for modern measurements. Where an Imperial measurement is clearly an approximation, we give an approximate metric equivalent, rounded up or down.

2.3 How the defences were intended to work

This section is intended to give the reader an idea of how the defensive system of the estuary was intended to operate in its heyday. More detail on the technology and installations is given in subsequent chapters.

In the earliest stages of defence, from 1880 until the turn of the century, the three forts on Inchkeith and that at Kinghorn were intended to fight independently, their commanders choosing targets for their guns. All four forts were defended as separate entities. As the power, number and rate of fire of guns increased from the last decade of the 19th century, and modern range-finding equipment was available, the guns were increasingly fought as part of a single complex, in a series of Fire Commands. The Forth was one of the first British fortresses to be organised in this way.

The organisation of the defence of the river remained largely the same for the first four decades of the 20th century, although the role of devices to detect the passage of vessels, aerial reconnaissance and finally radar did extend the capacity of the defences to detect enemy ships at greater ranges, in poor weather, submerged and at night. Manuals for the organisation and fighting of coast defences are preserved in the National Archives, published by the War Office in 1911 ('Provisional'), 1914 and 1930, and what follows is taken from these documents.[29] There are, additionally, a Second World Manual, couched more in terms of principles, and a military engineering supplementary pamphlet on Coast Defence, published in 1943.[30] It is from the latter document that Figure 2.8 is reproduced. It illustrates the ideal arrangement of the defences of a port, and the defences of the Forth in the Second World War conformed closely.

The artillery defences of the Forth were commanded by the Fortress Commander. Executive command was exercised by his subordinates, the Fire Commanders, who each commanded a number of batteries; each Fire Command comprised the batteries firing on one area of water. In the First World War, there were three Fire Commands in the Forth: at Inchkeith (Outer), on Inchcolm (Middle), and at Carlingnose (Inner). The role of the Fire Commander was to co-ordinate the fire of his batteries to ensure that all suitable target vessels were engaged by the correct combination of guns. This was particularly important for the Quick Firing guns of smaller calibre designed to tackle swarms of small boats, where the Gun Commanders knew which targets they were to aim at, so that, for example, two guns were not firing at the same vessel while another target passed the guns unscathed. A chart of all the water covered by a Fire Command would be gridded so that the Fire Commander could determine in which square a target was located and identify that target to a battery using the grid number. The chart was positioned under the Position Finding instrument in the Fire Command HQ.

The Fire Commander's orders would be passed to the Battery Commander (for medium guns) or to the Gun Group Commander for the lighter QF guns. These officers were responsible for transmitting the Fire Commander's orders to their guns, choosing the type of projectile and the point of attack on a particular target, and for maintaining fire as long as directed.

The movements of an enemy force towards a defended port would be detected visually from a War Signal Station or other observation post (such as a Coastguard Station), by a naval vessel, or, from about 1912, by naval aerial reconnaissance. As more civilian vessels were equipped with radio, the number of ships capable of making a timely report of enemy activity increased. Such sightings would be passed to the Port War Signal Station and specifically to the Extended Defence Officer (the XDO), who was a naval officer responsible for the maritime elements of the defences (patrol vessels, anti-submarine and anti-boat booms, including the operation of the gate vessels in the booms, controlled mining, hydrophones, guard loops). He would alert the naval defences and the Selected Military Officer, usually the Royal Artillery officer in command of the outermost Fire Command. In the Forth, this would be the Fire Commander on Inchkeith, close to the PWSS.

During the First World War, technology was developed and deployed in the Forth which provided the XDO with information to supplement purely visual observations. Hydrophones (First World War) mounted on the seabed and on defence vessels could passively detect the sound of vessels, including submerged submarines; between the wars ASDIC improved on this by creating a sound wave that would hit a submerged submarine and be reflected back. Harbour Defence ASDIC sets were mounted on the seabed. Finally, detector loops, developed in 1918, could detect the passage of a steel vessel over cables laid on the seabed. Any inexplicable detection by any of these instruments would lead to the gun defences and the naval defences being brought to full alert.

The outer gun defences would comprise counter-bombardment guns, usually 9.2-inch and 6-inch guns, intended to fire at enemy warships standing off a port to bombard it from a distance. In the Forth, these guns were, from 1916 to 1939, concentrated at Kinghorn, Inchkeith and Leith Docks. These guns would also fire in a 'Close Defence' role should enemy ships come closer to the batteries, perhaps with the intention of running past them into the naval anchorage.

The 6-inch batteries were provided with 'fighting lights', powerful searchlights which could be moved to illuminate a fast-moving target at night.

A battery of 6-inch guns in these Outer Defences would also act in support of the naval Examination Service. Examination vessels would stop any neutral or otherwise suspicious vessel and, where necessary, search it for any materials (such as explosives) or persons likely to be a threat. This search would be carried out in the Examination Anchorage under the guns of the Examination Battery. In the Forth, the Examination Anchorage was moved on a number of occasions, but was most often sited just west of Inchkeith, under its guns.

The guns of the Outer Defences were organised, by 1911, in a single Fire Command on Inchkeith (previously split into two around 1905). The Fire Commander would establish the number, size, course and speed of the enemy vessels approaching and would distribute targets to the individual Battery Command Posts. The system was designed in such a way that if communications broke down between the Fire Command and the Battery Command Post, or if the Battery Command Post was knocked out, individual Gun Group Commanders had operating instructions that determined the types of target they were to engage and, if there were more than one, the order in which they were to be engaged.

In the Second World War, a modern 6-inch battery from 1942 with radar, in a Counter Bombardment and Close Defence role, was established at Elie, mainly to protect the Largo Bay convoy anchorage.

At the level of Inchkeith enemy vessels on the surface or submerged would find a strong and complex series of obstructions – booms, nets and, in both wars, controlled minefields (which could be set off by an operator on shore).

It was thought unlikely that the enemy would risk elements of its main battle fleet in an attack on a port. The defences were designed to stop armoured cruisers, destroyers and fast-moving torpedo craft. It was feared that the latter two classes might attack in 'swarms' to overwhelm the defences, and that they would be accompanied by larger vessels (for example merchantmen) to break through booms or to be sunk in the entrances to docks. The defences further upriver were designed to deal with these threats – 6-inch guns to sink block-ships and boom-smashers and to try to tackle cruisers (which over time began to become too powerful for 6-inch guns to deal with); 4.7-inch and 4-inch guns to tackle destroyers; and 4-inch and 12-pdr guns to tackle torpedo boats (with the specially designed 6-pdr twin gun in the Second World War).

The Fire Command at Inchcolm controlled the fire of batteries on Cramond Island, Inchmickery, Inchcolm itself and (from 1939) a battery on the Fife mainland at Charles Hill. In both wars, the islands were armed mainly with QF guns intended to cover the anti-submarine and anti-boat booms that closed the river at that point. The areas of water between the batteries in the Fire Command were provided with fixed Defence Electric Lights, which illuminated a large area in front of and between the guns, as well as with moveable fighting lights, which could pick up and follow a target, and were also used to illuminate the booms between the islands. The lights would be powered up whenever an alert was received, but the shutters of the emplacements would not be opened to allow the lights to shine out until the Battery Commander decided it was the right time. While the moveable lights could be controlled from their emplacements, they were usually controlled remotely from the Electric Light Director Post, usually co-located with the Battery Command Post.

In the First World War, the Inner Defences at the Forth Bridge formed a third Fire Command. The guns here had initially been deployed to cover a controlled minefield which protected the main naval anchorage, which at that time lay upriver of the bridge. Until 1916, the guns were a mixture of 6-inch, 4.7-inch, 4-inch and 12-pdr guns, provided with fighting and fixed lights; after 1916 the guns of larger calibre (4-inch and upwards) were moved out to the Middle and Outer lines, to be replaced by 12-pdr guns moved from the Inchcolm Fire Command. The Inner Defences were disarmed before the Second World War.

Finally, through most of the period under discussion, the batteries were given the power to defend themselves. Firing positions, smalls arms, barbed wire entanglements, pill-boxes, machine guns, even land minefields and field guns were provided to ensure that the coast defences could not be neutralised by attacking enemy infantry or marines.

2.4 Who manned the guns?

Throughout the history of modern British coast artillery, it was never the intention that Regular trained artillerymen would man them.[31] Batteries would have a small Regular cadre, responsible for the maintenance of the guns and ammunition and for the training of the locally based volunteer artillerymen who would form the majority of the garrison in times of war.

In 1899, the Royal Artillery was divided in two: Royal Horse and Field Artillery, and Royal Garrison Artillery (siege, mountain and, forming 80% of the corps, coast artillery). The coast artillery was manned by Royal Garrison Artillery (RGA) Volunteers. With the establishment of the Territorial Force in 1908, Territorial RGA units associated with specific fortresses and batteries were expected to take their place alongside the small Regular RGA companies based at each battery.

The reader will see below that in most batteries built before the First World War, only limited accommodation was provided for the Regular RGA company (Adjutant, NCOs Master Gunner, instructors and so on) or even only for a caretaker. During the First World War, extensive camps were built at many batteries to accommodate the permanent wartime complement.

The increasing complexity of coast defence required not only training for specialist functions (such as range-finding) but also the involvement of Royal Engineers, to operate the Defence Electric Lights, the engine rooms that powered them, the telephone system and so on. During most of the period in which the Forth was defended, detachments of Royal Engineers shared life on the batteries, although usually accommodated separately. The plan of Downing Point (Fig 9.32 below) shows that the other ranks of the Royal Artillery, Royal Engineers and the infantry garrison all had their own separate accommodation, cookhouses, dining rooms and ablutions, while the officers messed together. The Territorial Royal Engineer units were reinforced by men transferred from the Submarine Miner Royal Engineer companies, disbanded after 1905.[32]

In the 1920s, the Royal Garrison Artillery ceased to exist as a separate entity, coast artillery was integrated back into a unified Royal Artillery, and the coast artillery was handed over wholly to Territorial units of the Royal Artillery and Royal Engineers. In December 1939, it was decided that the Royal Artillery would take over the operation of the searchlights and the engine rooms from the Royal Engineers, most of the Territorial Fortress Engineers being absorbed into the Royal Artillery. During both wars, conscripted men served on the batteries and, in the Second World War, as the need for coast defence reduced and the need for artillerymen to man field batteries grew, the Territorial and conscripted men in the coast defences were to some extent replaced, where possible, by Home Guard, either to reinforce a Royal Artillery garrison or even to replace it.

2.5 Visiting the surviving remains

It is possible to visit many of the defence sites as they lie on land treated as publicly accessible or on well-used public paths. Because of natural decay and deliberate destruction, surfaces are uneven and there are pieces of sharp exposed metalwork. There are few remaining safety handrails and some of the structures are high. Infestation by pigeons and gulls causes significant health hazards from their excrement and dozens of rotting carcasses. The removal of manholes or ventilators for scrap and the disappearance of stairways has left many fall hazards. Wooden and metal stairways, if still surviving, are unsafe. There may be exposed asbestos.

Of the Inner Defences, at the Forth Bridge, Dalmeny is the best preserved. At the time of writing, the site was in the process of being sold to Network Rail for their new Forth Bridge visitor centre; we have been assured that the battery will be conserved and interpreted for the visitor. Inchgarvie is private property. It is very unsafe to land on and to explore, and landing should not be attempted; it can be seen very clearly from the water. Coastguard is almost wholly buried, although one or two buildings are visible from the public road, and the searchlight housings are clearly visible from the sea. The gun emplacements and underground structures survive at Carlingnose, but they are on private property and in gardens. The Battery Command Post is visible from the public road.

In the Middle Defences, Hound Point and Downing Point are on land visited extensively by walkers, and the latter is now being kept clear of vegetation by an active local management group. Hound Point has trip and sharp metal hazards but is quite well preserved. Cramond Island, although privately owned, is much frequented by visitors, but there are fall hazards and safety issues raised by vandalism. Inchmickery is managed as a bird sanctuary by the Royal Society for the Protection of Birds, who discourage access. It is very well preserved but is very dangerous to explore, having the whole range of possible fall, metal and other hazards. Inchcolm is opened to the public by Historic Environment Scotland; although the defence sites do not in the main fall within the area under their guardianship, they do undertake conservation and interpretation for the visitor; nevertheless, the ground is uneven and there are some pieces of exposed sharp metal. Charles Hill is on private land but is in an area frequented by walkers. Work by Fife Council has made the site cleaner and safer than most, but there are fall and sharp metal hazards.

One can explore the quiet streets of Kinghorn Ness looking for the traces of the fortress, but not much is left. The searchlight emplacement with surviving shutters in very difficult to access. Inchkeith is privately owned and is very unsafe to visit. No trace remains of Leith Docks Battery.

The Kincraig Battery and its surviving searchlight housing are on a coastal footpath. The ground is very uneven in places and care must be taken. Some parts of the battery are very well preserved. The Fidra Battery is on private land. Visits to the May Island are permitted by Scottish Natural Heritage in the season, and the few surviving remains are worth seeing.

Notes

1 Royal Regiment of Artillery 1903a: 72.
2 Hogg 1998: 180
3 Maurice-Jones 1959: 172; Hogg 1978: 198.
4 WO 33/513.
5 Hogg 1998: 181–2.
6 WO 33/766.
7 Royal Regiment of Artillery 1913c. Two British Pathé Gazette newsreels of guns being fired have been made available on YouTube (accessed June 2017). First, in 1935, a one-minute ten-second clip shows the loading and firing of a 9.2-inch gun (https://www.youtube.com/watch?v=eG1NTpq5lro) Newsreel No. 43–33, from 1943, on the subject of 'South Africa Coast Defence', includes a 40-second sequence of the firing of a 9.2-inch gun (although a 6-inch also briefly appears) (https://www.youtube.com/watch?v=osyQ1lINFQc.). Interestingly, the range-finding in South Africa was being undertaken by female service personnel.

8 Hogg 1998: 182.
9 Royal Regiment of Artillery 1913a.
10 Hogg 1998: 184.
11 WO 33/513.
12 WO 33/766.
13 Royal Regiment of Artillery 1913a.
14 CAB 36/18.
15 Hogg 1998: 180.
16 WO 33/513.
17 WO 33/766.
18 Royal Regiment of Artillery 1917.
19 Royal Regiment of Artillery 1903b.
20 Maurice-Jones 1959: 173; Hogg 1978: 189.
21 Royal Regiment of Artillery 1913b.
22 DiGiulian 2015.
23 WO 33/766.
24 WO 33/766.
25 DiGiulian 2015.
26 WO 196/26.
27 Hogg 1978: 186–7.
28 WO 78/5157.
29 WO 33/513; WO 33/697.
30 WO 287/84.
31 This short section is summarised from Maurice-Jones' account in his *History of Coast Artillery in the British Army* (1959).
32 Brown 1910: 274.