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NEW FOR OLD: THE DEVELOPMENT OF NEW TAVERN FORT AT GRAVESEND IN THE INDUSTRIAL AGE

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An overview of the history of the artillery defences at Gravesend from Tudor times appeared in this journal for 1974.[1] This paper concentrates on the comparatively rapid development which took place in the second half of the nineteenth century and early twentieth. The Industrial Revolution led to a succession of major improvements to the instruments of war, providing the catalyst for a military technological revolution in the mid nineteenth century. As exemplified by developments at New Tavern Fort this fundamentally affected Britain's coastal fortifications, with each innovation in the means of attack requiring new defensive countermeasures.

Despite the alliance in the Crimean War from 1854-6, there remained a long-standing mistrust of France and a sense that she was evolving a geopolitical agenda unfavourable to Britain. The building of a new channel port at Cherbourg was seen as a provocation and a convenient base from which to challenge the Royal Navy's superiority in home waters. With other French harbours recently enlarged, it was also regarded as a place from which potentially to launch an attack on Britain itself, whether on her ports and naval bases on the Channel coast or those in the Thames and Medway.[2] Moreover, the modernisation of the French fleet with steam ironclads armed with the new and more powerful rifled guns (famously symbolised by the *Gloire* which was launched in 1859) seemed calculated to outclass Britain's wooden wall navy and her coastal defences, both armed with obsolescent smooth bore ordnance. Resulting British anxieties led to a determination to modernise her fleet as the traditional first line of defence (exemplified by the launching of the *Warrior* in 1860 and the *Black Prince* in 1862), and to massively upgrade the defences on land. Preceded by important memoranda,[3] an imperative to improve the land defences led in 1859 to the setting up of the Royal Commission on the Defence of the United Kingdom whose deliberations were so rapid that it was able to report in 1860, with a raft of proposals for the refortification of key strategic areas, including the Thames.[4]

The defences of the Thames in 1860 and the strategic importance of the river

The pre-existing defences of the Thames consisted of outer and inner lines of artillery forts on the riverside at either end of Gravesend Reach, sited to cross their fire over the central channel. The outer line, where the river is 1,500 yards across, was formed of Shornemead and Coalhouse forts, both earthworks built in the 1840s and 50s on the site of smaller predecessors from the 1790s. The inner line, where the river narrows to 800 yards, consisted of New Tavern Fort, an earthwork built in 1780, and Tilbury Fort, a revetted earth-bastioned fort with riverbank gun lines having earlier origins (constructed in 1680) and later modifications.[5]

In considering the strategic importance of the river, the commissioners affirmed that the defence of the Thames involved 'interests of vast magnitude', citing the need to protect the powder magazine at Purfleet, the arsenal and dockyard at Woolwich, victualling stores and the ship building yard at Deptford, 'the large amount of valuable property extending for many miles on either bank of the river; the fleet of mercantile shipping moored in the port of London; and, lastly, the metropolis itself'.[6] Security of the strategic Gravesend/Tilbury river crossing was also a necessity.

Putting New Tavern and Tilbury forts in a 'thoroughly efficient state'

The Commissioners accepted that the existing Thames forts had been well sited but, having regard to an adversary likely to arrive with steam ironclads armed with rifled guns, they considered that they were 'insufficient to meet the description of attack that would probably be brought against them'; adding that any penetration of the Thames 'renders it probable that a very powerful naval force would be employed in such a service'.[7] Indeed, experience during the Crimean War and subsequent experimentation had demonstrated the superiority of rifled guns (which could fire more accurately, more destructively and to a 25% greater range than the existing smooth-bores) and had underscored the threat to which defences might be subject in the future. Further, the performance of the French armoured floating batteries at Kinburn during the Crimean War had demonstrated the robustness of iron plate to round shot fired by smooth-bore guns.[8] Although the Commissioners outlined their expectations for the replacement of the two old batteries of the outer line at Shornemead and Coalhouse Point, and for additional works at Cliffe Creek and Allhallows, as well as for others to protect the Medway, they did not expand on the needs of the inner line for the Thames at Gravesend and Tilbury, saying only that (a) 'these works should be put into the most thoroughly efficient state in every respect', their guns to cross their fire at a distance of 2,000 yards downstream and (b) there should be a boom

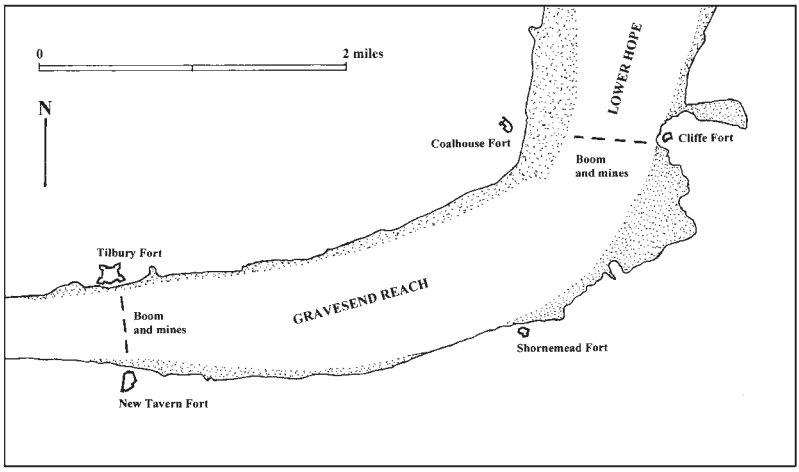

Fig. 1 Map of the Royal Commission defences of the Thames in 1870 (Victor Smith 2012).

defence across the river between them in wartime. (**Fig. 1**) The use of blockships to impede the channel to an enemy and the deployment of floating batteries were also recommended. However, Priority was given to construction of defences of the outer line, on which work began in 1861.[9]

Immediately before the appointment of the Royal Commission, New Tavern Fort presented much as it had when originally constructed. It was a zigzag-shaped earthwork of conventional construction, with an angled battery facing the river joined by a rampart to a smaller, also river-facing straight battery, with a further line of rampart extending south-west from it to meet a loopholed brick wall built in 1795 to close the rear of the fort. Fronting the rampart an unrevetted ditch contained a palisade obstacle and was secured at one end by a flanking and loopholed gallery called a caponier. Piercing the rampart were 15 embrasures, behind which were 24-pounder and 32-pounder smooth-bore guns mounted on timber traversing platforms (which had replaced the earlier standing carriages in 1846). There was also a moveable armament of 18-pounder smooth-bore guns mounted on field carriages. Surface magazines behind the rampart provided storage for gunpowder.

In the north-west corner of the fort the medieval Milton Chantry was used as a barracks. Fort House, interrupting the middle section of the rear defence wall, was the quarters for the Commanding Royal Engineer (CRE). The entrance to the fort was between the Chantry and the western extremity of the angled battery. Nearby, a jetty for the landing of supplies

projected into the river. The government had assumed to itself 'clearance rights' to prevent the blocking of the field of fire between the fort and the river as well as to landward. However, it was acknowledged that the fort was little defensible 'by its own garrison against an attack by land'.[10]

New Tavern Fort marks time

With appropriate structural adjustments, the fixed armament of New Tavern Fort had been replaced by 10 x 68-pounders in 1859, shortly before the Royal Commission reported.[11] These were the apogee of the older smooth-bore technology, with an extreme range of 3,500 yards. Although not a solution to the technological challenge to be expected in an attack on the Thames, they were just powerful enough at near distances to crack the thin armour plate used in the earliest French ironclads. By 1865 this armament had been modified to 8 x 68-pounders, 2 x 10-in. and 1 x 8-in. shell guns, all still smooth-bores and not the way of the future.[12] The 18-pounder guns of the moveable armament had earlier, in 1862, been replaced by 4 x 40-pounder Armstrong rifled guns. These were early breech-loaders with a full-thread mechanism, and were mounted on field carriages.[13]

In other respects during the early phase of construction of the outer line for a modern armament, New Tavern Fort marked time. Hoping to initiate some progress, on 30 January 1865, Major C. Pasley, the CRE at New Tavern Fort, argued strongly for it (and its counterpart at Tilbury) to be armed with the 'heaviest [of the new rifled muzzle-loading (RML)] guns which can be given to them in order to afford the necessary security for their fire taking effect against an enemy's ironclads attempting to pass Gravesend and we consider the positions of these batteries eminently adapted for the heavy 13-in., 9-in. and 7-in. guns ...'.[14] However, none of these guns had yet entered service and a 13-in. RML was never to do so.

In 1866 Lt Col Charles Gordon (of later Khartoum fame), CRE in succession to Major Pasley, suggested that the experimental giant smooth-bore Horsfall Gun be mounted at New Tavern Fort. This weapon, roughly the equivalent of the contemporary American Rodman and Dalhgren guns, had been tested at Shoeburyness to find out whether super-heavy smooth-bores had a future as an armour-smasher. Although its effects on armour were catastrophic, it lacked the long range and accuracy of a rifled gun. This curiosity came to find itself not at New Tavern but at Tilbury Fort.[15]

During construction of the outer line, New Tavern and Tilbury forts were left as the only armed defences for the Thames. At length, by 1866/7 there was further discussion of how to modernise these two forts, plans and sketches being produced.[16] Details are absent but in 1867 and on receipt of instructions from the War Office, Gordon requested the Royal

Artillery at Sheerness to remove three guns at New Tavern in preparation for 'the reception of a Rifled Gun'.[17] What subsequently happened is unknown. A War Office report of 1867 on the progress with strengthening the river defences contained little mention of what was to be done at Gravesend and Tilbury, noting only that a funding vote for works at these places had, for the time being, been withdrawn.[18]

An uncertain start to a new fort

Progress with decision making had seemingly been achieved when, in January 1868, Gordon advised the Commander, Royal Artillery, at Sheerness that he had 'received instructions from the War Office to commence the reconstruction of Tilbury and New Tavern Forts'.[19] In preparation, the affected parts of New Tavern were fenced off, as shown in a rare photographic representation of 1869/70.[20] From within this enclosure the smooth-bore armament was dismounted and transferred to the Canal Basin 300 yards to the east to be placed on skids, ready for removal from the district. Soon after this the pre-existing magazines and ramparts were demolished. The contractor for the works was Messrs Aird and Sons, a company with experience of civil and military engineering projects.[21] Suggesting work soon to begin, in February a barge loaded with bricks arrived at Gravesend. As complained about by Gordon, with the forts of the outer line still incomplete and now New Tavern and Tilbury forts without guns other than the Horsfall Gun and a saluting battery at the latter, the whole of the Thames was now defenceless against an enemy fleet.[22] In this embarrassingly naked state, only naval forces could have defended the river.

It might reasonably be supposed that by this stage there was an agreed building plan for New Tavern Fort. Yet in June of 1868 Gordon had, in response to the War Office Director of Works, been required to submit options for the possible adaptation of the fort for the mounting of guns either in barbette emplacements or on Moncrieff counterweighted disappearing carriages. His frustration was evident in his urging of the War Office to make up its mind.[23] Such uncertainty surrounding the Thames defences – as those elsewhere – inevitably stemmed from rapidly continuing technical improvements in artillery and advances in their manufacturing, including the new ability of industry to produce large and thick iron armour plate as clad to warships and the potential this offered for its use on land.

Design issues must have been finally resolved as documents refer to a flow of building materials to New Tavern and Tilbury forts and to the need for the contractor to periodically test the mortar he was using and to provide regular progress reports on the laying of concrete and asphalt. Gordon warned of the possibility of uneven settlement from the

incorrect laying of concrete, the use of which in large quantities was a recent development.[24] A contemporary photograph shows a moveable construction gantry over the rampart of New Tavern Fort.[25] By November 1868 there was a surplus of earth from 'excavation of galleries and magazines'. It was suggested that this might be transferred to Shornemead Fort to be spread in front of it as a glacis but the outcome of this proposal is unclear.[26] By this date the decision had been taken to protect the guns at New Tavern Fort with shields of armour plate inserted into embrasures, making the fort an ironclad on land, like its counterpart at Tilbury and the new casemated works downstream.

The new fort built (**Fig. 2**)

Expenditure on the fort to 31 March 1869 was £31,823 16*s*. 7*d*. suggesting that by then considerable progress with construction had been made.[27] Completion took place by around the spring or early summer of 1871 by October of which year Gordon had been succeeded as CRE by Colonel George Wrothesby. Some minor additional touches were applied in 1872. It is said that the finishing of New Tavern Fort was marked by a visit from a senior representative of the army.

The new fort continued the pre-existing layout of rampart and ditch, and comprised 10 emplacements set in an earthen bank, with the guns served with their ammunition from underlying magazines from which shell and cartridge lifts ascended. The pre-existing ditch was broadened.

The fort was divided into three firing units: the two forming the sides of the salient of the riverside angled battery were, according to their orientation, called the North and East Faces and the smaller straight battery in the middle of the fort the Garden Face, because of its closeness to the gardens occupying part of the interior of the fort.

The guns

When New Tavern and Tilbury Forts were armed is not precisely known but a letter from Gordon in July 1871 suggests that by then this had at least partly taken place, with 9-in. and 12-in RMLs.[28] These were later given as 9 x 9-in. and 1 x 12-in. at New Tavern Fort and 12 x 9-in. and 1 x 12-in. (subsequently replaced by an 11-in.) at Tilbury Fort, with 8 x 10-in. smooth-bore shell guns for the land defence of the latter. The 12-in. gun at New Tavern Fort was mounted at the apex of the angle formed by the joining of the North and East faces. Although the backs of the room identification plates to be found in the magazines of New Tavern Fort make reference to 11-in. guns, no documentary evidence has yet been found to suggest that such guns were ever mounted there.

The RMLs at New Tavern Fort were powerful armour-piercing

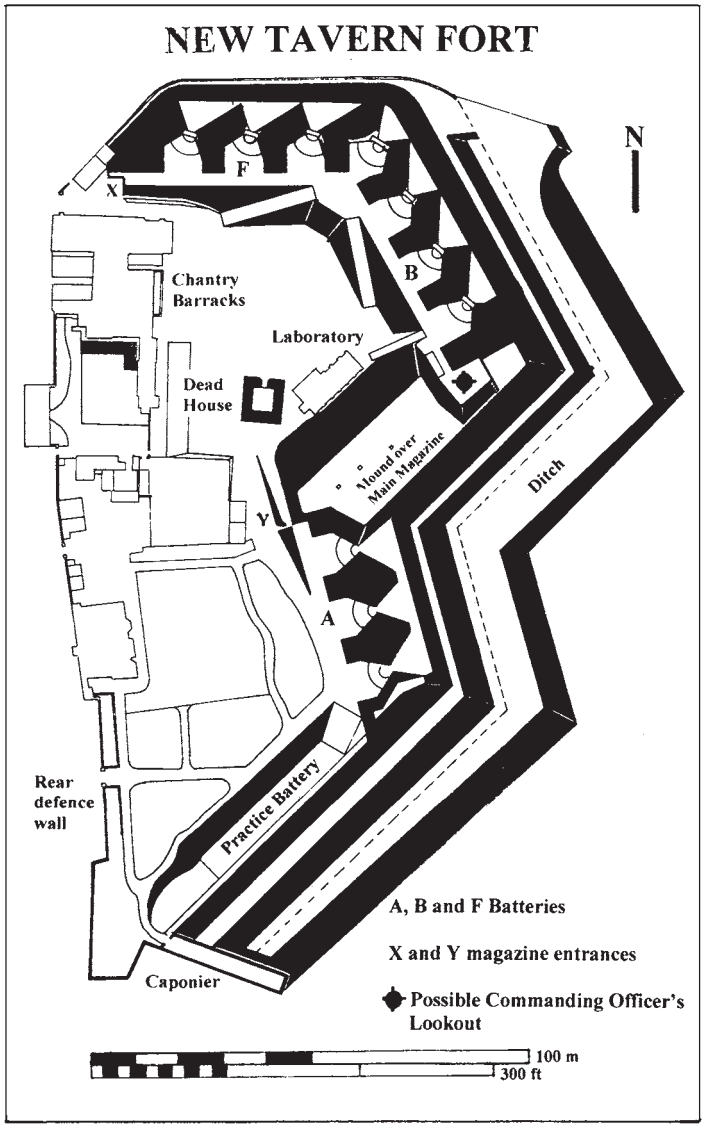

Fig. 2 A plan of New Tavern Fort as remodelled in 1868-72 (Victor Smith 2012, after NA WO78/3903).

weapons, respectively able to pierce 12-in. and 9-in. of armour at 1,000 yards but with lesser penetration at a greater distance. They fired cylindro-ogival projectiles; solid shot for penetration and shells for explosive effect. Their range of up to 4,600 yards was made possible by the new propellants resulting from advances in chemical science; likewise the greater explosive effect of the shells they fired. The guns were mounted on wrought iron carriages resting on traversing platforms. Benefitting from the recent development of machine tools and new factory production methods, these will have been fitted with hand gearing and with hydraulic compressors to retard recoil on firing.

The most likely adversary in the 1870s would have been a French combined steam and sail ironclad arranged for broadside firing but with more advanced warships also coming into service or planned in the navies of other Continental powers. Any such vessels might have been expected to suffer a severe mauling from the forward batteries before coming under the fire of the forts of the inner line.

The gun emplacements

The emplacements were recessed into the rampart, in similar positions to their predecessors which had been well-positioned to project a down-river cross-fire with Tilbury Fort. As portrayed in later plans and in a further contemporary photograph, each consisted of a concrete terreplein flanked by brick serving rooms forming a traverse between them, fronted in the case of the North and East Faces by wrought iron ported shields and in the Garden Face by unarmoured embrasures (**Fig. 3**).[29]

The shields were set against granite backing blocks. Their double thickness of 2 x 5-in. plates separated by a 5-in packing layer could be supplemented by a third plate if required. Shields had been subjected to exhaustive resilience tests at the Shoeburyness artillery range, the CRE at Gravesend having ordered a member of his staff to become familiar with the results of this activity.[30]

Suspended and moving on vertical and horizontal bars behind the shield was a thick rope mantlet or split curtain. This was closed over the port to keep splinters from incoming fire entering the emplacement and was open only when the gun was ready to fire, the mantlet being soaked with salted water to inhibit its catching fire from the flame of discharge. There were no external shutters as had been provided for the shields of the casemated forts of the outer line. Accidents during construction occurred and, owing to human error, during the arrival of the shields at New Tavern Fort in February 1871 a labourer was struck by one of them which swung as it was suspended on ropes and caused severe injury.[31] From the presence of backing blocks in the emplacements of the Garden Face (**Fig. 4**) these had also been prepared for the reception of shields although these were

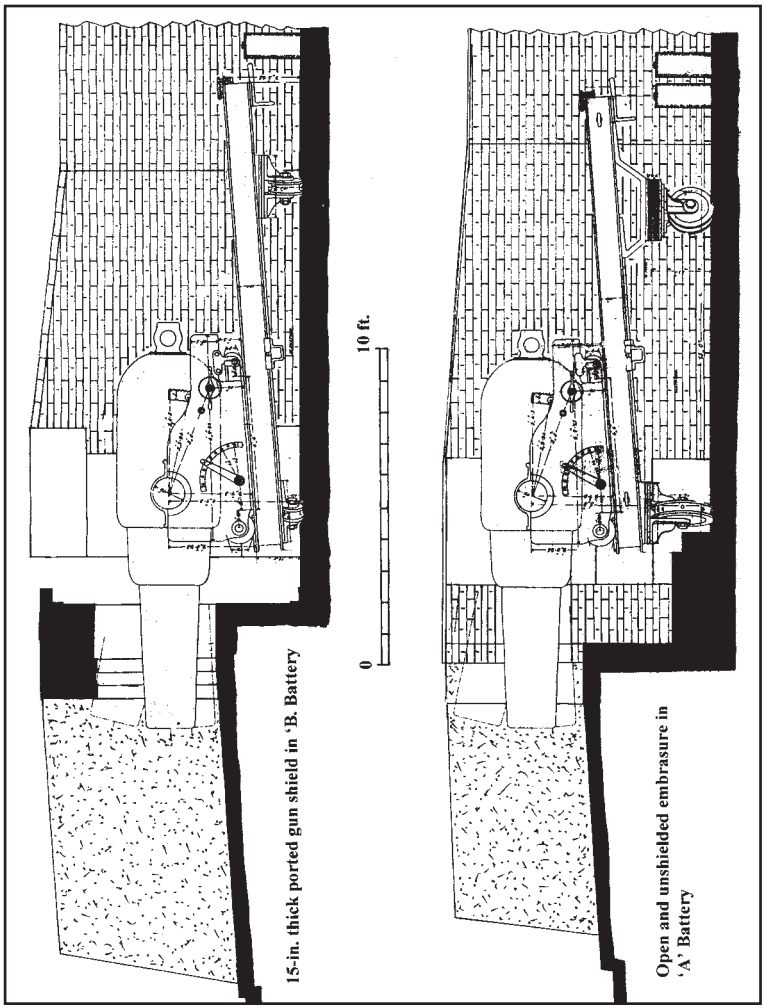

Fig. 3 Profiles of 9-in. rifled muzzle-loaders (RMLs) on a casemate platform (upper) and a dwarf platform (lower). New Tavern Fort, *c.*1875 (Victor Smith 2012).

Fig. 4 Mounting of a replica 9-in. RML in the Garden Face, with backing blocks for an intended iron shield in the background (Victor Smith 2010).

not provided, the positions being judged, not necessarily wisely, as less directly vulnerable to bombardment and, in consequence, not justifying the expense.[32]

The guns in the shielded emplacements of the North and East Faces may have been loaded by a block and tackle suspended from the mantlet bar to raise the projectile on to a tray resting on lugs at the muzzle from which it could be pushed into the bore. The guns of the unshielded open battery can only have been loaded by means of a muzzle derrick, with the rammer resting on a metal trestle placed each time on the sill of the embrasure. The terrepleins of all the emplacements were fitted with two curved iron racers let into granite setts for the traversing of the gun. To the rear, was a brass arc graduated in degrees for laying the gun on to target.

Each of the serving rooms, alternately for shells and cartridges, was supplied via a lift shaft from the expense stores in the magazines. Extraction was from the rear facing doorway and round into the emplacement. Most of the serving rooms supplied more than one gun. Inside the shell serving rooms were wall-brackets for the storage of rammers and other side arms required for loading the guns.

The magazines (**Fig. 5**)

The magazines were brick arched structures and were, in varying combinations, protected against incoming fire by covering layers of

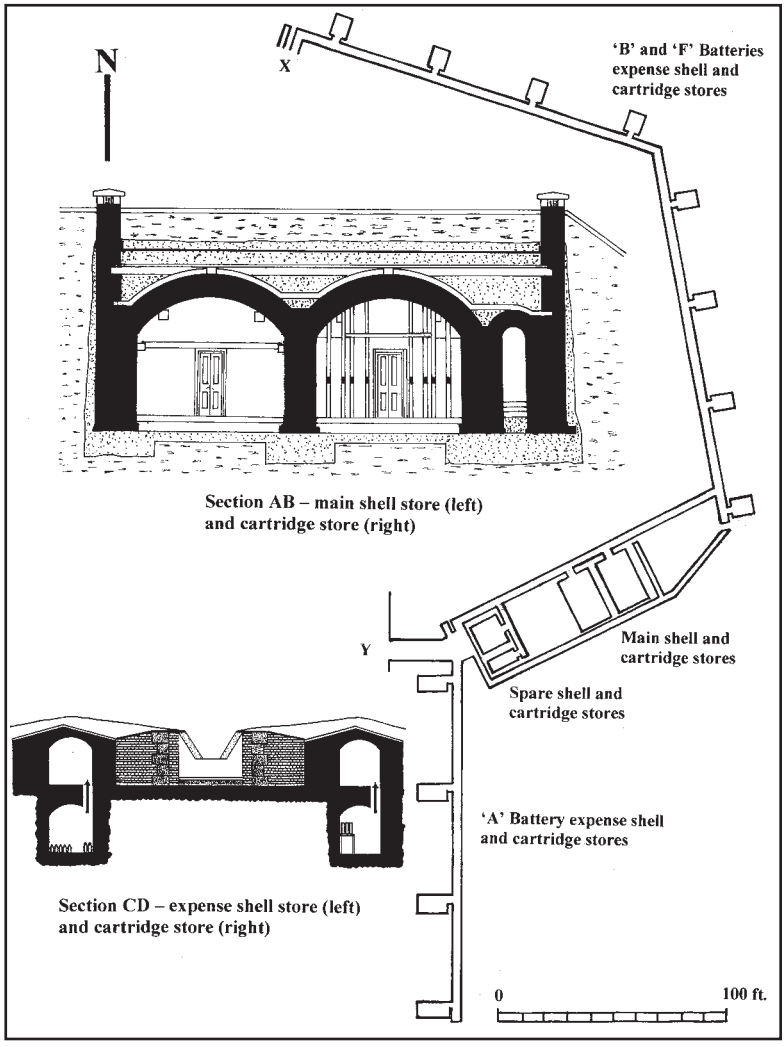

Fig. 5 Plan of the magazines as built in 1868-72, with cross-sections. To relate entrances X and Y to ramparts see Fig. 2 (Victor Smith 2012, after NA WO78/3903).

Thames ballast, dry filling and cement concrete, topped by earth and turf. Their burial reflected the vulnerability of the earlier surface structures to the fire-power of the new weapons now in the hands of an enemy. The magazines followed the line of the ramparts and emplacements above and consisted of a sequence of 16 storage chambers, at operationally guided intervals, off a 600 ft. long and 4 ft. wide general passage.[33] Entry to the magazines was from a main entrance at the northern extremity of the Garden face and from a subsidiary entrance at the western end of the North Face. The main magazine was in the section under the rampart joining the East Face to the Garden Face and consisted of two 30 x 15ft shell and cartridge stores. Within them shells were stored on their bases and cartridges in zinc cylinders on a timber framework. According to need, these were transported along the general passage to supply the smaller shell and cartridge expense stores. In those for shells the 250lb. projectiles were suspended in the grip of a nose caliper and raised up the lift shaft by a mechanical crab lift. An open cupboard for storage of fuzes and tubes was fixed to the back wall of the shell expense stores (**Fig. 6**).

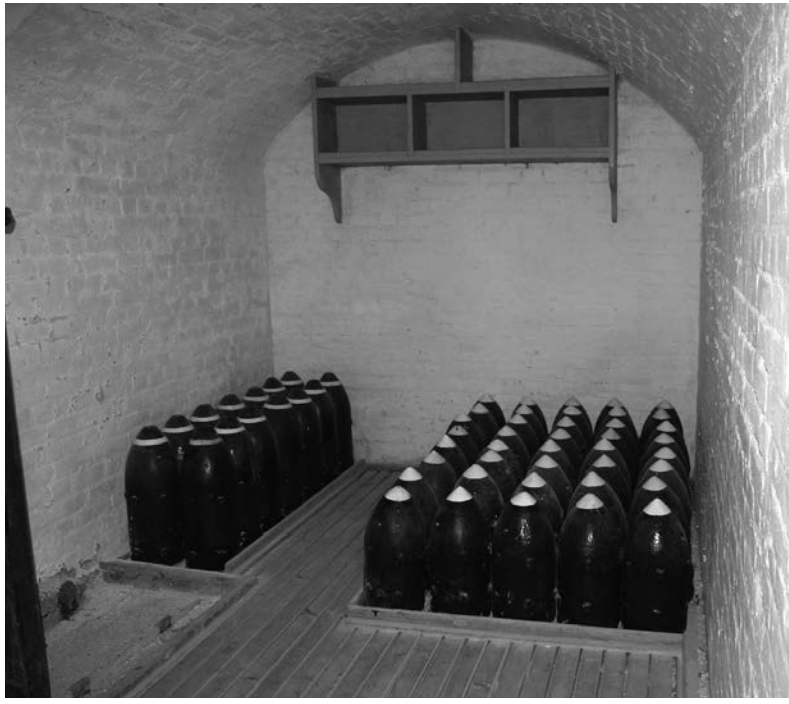

Fig. 6 A restored shell store, with replica shot and shell (Victor Smith 2009).

Cartridges were stored on wooden tables and, being lighter, were raised inside a metal lattice cage with a block and tackle. Both types of expense store were fitted with a voice pipe and a signal whistle for two way communication with the serving room. Close to the main entrance to the magazines were also spare shell and cartridge stores, whose intervening wall shows a blocked or intended hatchway to connect them.

Particular emphasis was placed on safety arrangements to lessen the opportunity for an explosion from human error. This expressed itself firstly in the shifting lobby arrangement in which a physical barrier was provided at either entrance to remind soldiers assigned to work inside to remove spark-making hobnailed boots and outside uniforms which might carry grit in folds, also with the theoretical potential if rubbed together to create sparks, and to put on special magazine slippers and safety clothing; secondly, there was lining of walls and floors in timber to prevent the dislodging of grit from them and, thirdly, safety lighting was introduced, under whose provision the expense stores and the passage outside were illuminated by candle lanterns lowered down shafts from the serving rooms to shine externally through glass screens. The main magazine and the spare shell and cartridge stores were illuminated from lamp recesses served from a lighting passage, which also gave access to a lamp on a miniature railway truck in a glazed lamp box spanning the general passage outside the main magazine.

The *Report on Fortifications and Armaments of Mercantile Ports* (1887) stated that 'the ammunition for [the fort] is not permitted to be kept there, except for a few rounds. It is stored in the middle of Gravesend'. If so, this is likely to have been a temporary arrangement, perhaps due to the appearance of damaging dampness which was generally to be controlled by opening and closing internal ventilators according to the ambient temperature and humidity which was routinely to be tested by wet and dry thermometers. The only suitable alternative storage for the ammunition was at Milton Barracks where a magazine already existed.

The laboratory

There had been considerable recent improvements to the design of the facilities in forts for handling and making up of cartridges and the filling of shells. This was evident in the building of a laboratory at New Tavern Fort in the mid-1870s. This free-standing 55 x 15ft rectangular building had brick walls and a light pitched roof, so that any explosion inside might be deflected less harmfully upwards. Its entrance for the admission of laboratory workers, cartridges and shells, was provided with a shifting lobby as for a magazine. The centre of the laboratory was a work room with benches and powder measures for the filling of cartridges. Let into the floor were oak blocks on to which shells were placed for filling. There

was a floor-level issuing hatch. Externally served lamp recesses provided for the safe illumination of the laboratory. Despite a regulation that for safety purposes laboratories were to be no closer than 40 yards to any magazine, that at New Tavern Fort was built just a few feet away. Such closeness reflected the impossibility of adherence to regulations, given the limited areas of some forts.[34]

Barracks for the garrison

It was important for the artillery detachments to be accommodated close to their guns. Their barracks were, as has been mentioned, conveniently located in the north-west corner of the fort within the former medieval Milton Chantry whose premises, including those added during its use as a large inn, had been adapted for military purposes in 1780.[35]

The east-west oriented 90 x 25ft chapel block was two storied, both levels being divided into three rooms. Its 4-5ft thick walls derive from its medieval origins. There was also a two-roomed attic. The 65 x 50ft adjoining south block was also two-storied but was without attic rooms. Its ground floor comprised 11 rooms and the first floor 13. The 18-in. thick brick walls reflect its largely post-medieval construction although part of it may have originated as a medieval timber hall, later encased in brick. The two blocks were reciprocally connected by staircases and doorways, with staircases between floors. The eastern elevation of the south block connected with the men and women's wash houses and latrines, part of the premises being used as married quarters.[36]

The barracks had been reorganised in the 1840s when parts were converted into a hospital for the treatment and recuperation of sick soldiers returning from overseas service.[37] About the same time, the living areas for soldiers were improved with the provision of new cast iron bedsteads, wall storage racking and overhead hanging shelving for the storage of mess equipment. From the mid-1850s there was a general call for enhancement of conditions for soldiers in barracks, a chief part of which was to give them greater airspace by having fewer beds in rooms. The spacing of the scar lines of fittings evident in one of the rooms suggests that this was achieved at New Tavern Fort. Several patent Galton Grate fire places also survive.

Other buildings

There was a mortuary in the middle of the fort for those who did not recover from their stay in the hospital and for those who died on board troopships in the estuary on their way to Gravesend. This was a 30ft square brick structure with a pyramidical slate roof.[38] Other buildings and features included stables, latrines, washrooms, a lamp store, workshops

and an area of gardens and cultivation. Fort House appears to have been improved during this period when its most celebrated resident was Colonel Gordon who, during his off-duty hours, gave educational and religious instruction to underprivileged local boys.[39] Midway between this building and the Chantry was a 45 x 20ft brick Royal Engineers Office.[40] At least for a time, however, Gordon appears to have used office accommodation on the first floor of a building across Commercial Place on the eastern side of the Custom House. The ground floor of this building was also used as a store.[41]

Tactical operation of the fort

The interaction of men, guns and materiel in well thought out operational procedures was vital for the effective operation of the fort. But how the fire of the guns was to be directed and orders given to their detachments is unclear although it is known that runners and speaking trumpets were used for this purpose more generally.[42] There would have been a commanding officer's lookout, provided with a spotting telescope on a tripod. This may have been a small space known to have existed at the joining of the East Face with a bank covering the main magazine. From here the best view of the river could be obtained and the commanding officer could issue firing instructions. Although rangefinders existed they were not yet in general use but combining knowledge of familiar places on the riverbank as reference points with the use of a map would have enabled the ranges of approaching warships to have been estimated and for the graduated sights on the guns to be set for firing. How fire was to have been coordinated with Tilbury Fort is also uncertain but flag signalling during the day and lamps at night were probably to be used. The labelling of the three sets of emplacements as Faces was not to be used in the spoken commands. Instead sequential letters were employed for each group of guns from right to left as when viewing the river from within the fort: the Garden Face was 'A', the East Face 'B' and the North Face 'F', the intervening letters 'C', 'D' and 'E' not being used because as spoken they might be confused by the listener with ' B', leading to unintended results.[43]

With the growing complexity of guns and magazines the operational procedures for fighting the fort had become more demanding. Frequent drills and disciplined communication were therefore necessary to achieve the smooth flow of ammunition from the magazines to the guns and for the working of the latter. Training of the Kent Artillery Volunteers who were to man the fort with the assistance of regulars was undertaken regularly both on site (where their blank-firing sometimes broke windows in nearby properties) and at their drill hall in Windmill Street, Gravesend.[44] In order to maintain a training competence during the reconstruction of the fort,

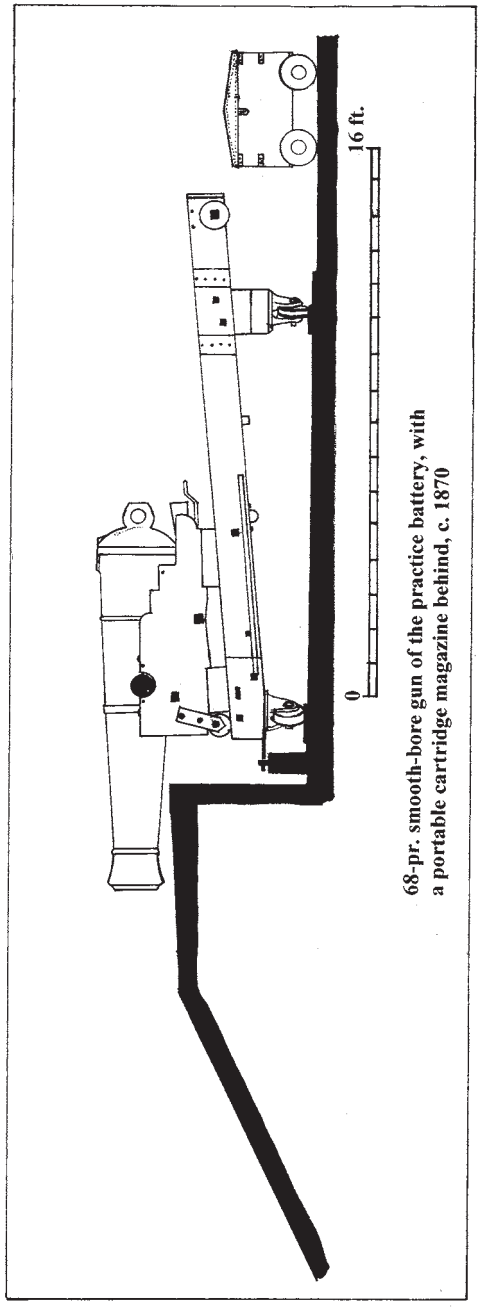

Fig. 7 The practice battery c.1870 (Victor Smith 2012).

in 1868 Col Gordon built a pair of barbette emplacements for guns on traversing platforms outside the contractor's fence at the south end of the fort (**Fig. 7**).[45] Although these were obsolete heavy smooth-bores, they filled a gap until the RMLs were in place. Adjacent was a terreplein for guns on field carriages. The brick revetments, pivots and racers of the practice battery remain but are in poor condition.

Booms and mines

There is no further mention in documents of provision for a boom defence but contingency arrangements will have been made for one. There were plans for the placement of anti-shipping minefield during wartime in the river between Gravesend and Tilbury. Use of the new technology of electricity for firing mines was highlighted in the supply of Leclanche cells to New Tavern Fort. Mines were a relatively recently introduced weapon, then called torpedoes, and had shown their destructive value during actions in the American Civil War.[46]

The first 15 years of the new fort

Despite the opening of a purpose-built hospital at the new Milton Barracks in Gravesend in 1869, plan evidence suggests that the hospital function at New Tavern Fort continued for at least 15 years. A plan of 1883 shows that there were then 4 wards on the first floors of the chapel and south blocks, with a fifth ward and a room for hospital orderlies in the attic. On the ground floor of the south block there was a surgery, waiting room, hospital sergeant's quarters and a hospital cookhouse. Soldiers' accommodation then occupied the ground floor of the chapel block only, with a separate cookhouse for the Royal Artillery next to the hospital cookhouse in the south block.[47] In the event of war, no doubt some of the ward accommodation would have been evacuated in favour of providing extra space for fighting soldiers.

Soldier occupancy of the fort was variable, sundry detachments of various regiments being present from time to time. The most consistent element from 1859 was the Coast Brigade which was, in effect, a force of technical caretakers consisting of officers, master gunners, non-commissioned officers and gunners, all with not less than 12 years service, responsible for the care, maintenance, preservation and upkeep of guns, carriages, ammunition, instruments and related stores. They also assisted in giving training to the volunteer artillery. Gravesend became one of the Brigade's 10 divisional headquarters, with administrative and operational responsibility for detachments in all the forts of the Thames, the Medway and Sheerness.[48] Life for them at Gravesend was one of the maintenance of an unchanging armament and routine duties.

Sometime in the mid/later 1880s the security of the fort was improved with the erection of a 6ft 6in. high patent steel Dacoit obstacle fence in its ditch. Soon, as an initiative by Gravesend Corporation and others, the saltings in front of the fort were leased from the War Office for reclamation and conversion into what, in commemoration of the late General Gordon, became the Gordon Promenade for the recreation of local people and visitors. The Gordon Pleasure Gardens and Gordon Recreation Ground were also created just to the east and south of the fort. Each of these developments would have required approval under the regulations governing clearance rights.[49]

The fort in the community

New Tavern Fort was very much part of the consciousness of the local community, its brooding ramparts having been a prominent feature of the eastern extremity of Gravesend since the later eighteenth century, its presence being reinforced by the sound of the blank-firing of guns during practice. This was enhanced by the formation of the Gordon Promenade mentioned above, from which visitors could look up and see the muzzles of the great guns. More than this, connections existed in the successive generations of local volunteers who entered for regular training sessions and in the presence of members of the regular soldiers at the fort in the streets of the town, frequenting shops and ale houses. As well as this, some businesses benefited from local procurement of supplies for the garrison and, in a small way, there was employment at the fort for local people. There were occasional social events on the lawns next to Fort House, attended by guests from Gravesend's elite. The fort was almost a tourist attraction, having been mentioned as a point of interest in successive guide books to Gravesend with, on rare occasions, favoured visitors being allowed to enter and look round under military supervision.

The schemes that never were

A sense of a French threat continued intermittently until the end of the nineteenth century, exacerbated by the tensions of colonial competition and the occasional expression of anti-British sentiments, including the remarks of Admiral Aube, the French Minister of Marine, in 1884 that Britain's ports, including London, might soon be burnt by a victorious fleet.[50] It was this atmosphere, coupled with knowledge of the enlargement of the French fleet, that led in the later 1880s to a spate of proposals for enhancement of Britain's naval and military defences. Locally these included a revival of an earlier, unimplemented plan for converting the Hoo Peninsula into a strategic entrenched camp, with a proposal for building a line of works from Gravesend, cross-country to the Medway

opposite Fort Borstal, thereafter to join with the works of the Chatham ring fortress, then under construction. Colonel Geary, President of the RA/RE Works Committee, considered this to be so urgent as to demand immediate survey and design but no construction took place.[51] Recognising the importance of securing the strategic Gravesend/Tilbury ferry crossing, he further recommended that 'an extended position or bridgehead must be constructed in wartime, designs being prepared beforehand'.[52] There was also a contingency scheme for a pontoon bridge between Gravesend and Tilbury for the reciprocal movement of defending forces from one side of the river to the other. This also formed part of the planning for the London land defence scheme of the 1890s and was actually executed during the First World War.[53]

New technological challenges and breech-loading

At sea there had not only been an enlargement of the French fleet but signs of a qualitative improvement, with the introduction of new classes of thickly armoured steel ships powered by steam alone and armed with more powerful breech-loading (BL) guns, which had long superseded the obsolescent rifled muzzle loaders in their service.[54] In Britain mistrust of the Armstrong breech of the 1860s for heavier calibres of gun had led to a return to muzzle-loaders, which were to be found in ships of the Royal Navy into the early 1880s and in coastal forts for rather longer.[55] But thanks to the development of the interrupted screw breech mechanism and better seals to maximise the power of the propellant, the foundations of British improvement had been already been laid at the end of the 1870s, although it took time and much money to replace the nation's out of date weaponry whether at sea or on land.

At first the War Office responded to this situation somewhat tentatively with proposals both to mount comparable weapons in new batteries and to extend the life of other existing RML defences by giving them greater powers of structural resistance against bombardment by the new weapons. It was the latter approach which, in their reports of 1887-8 the War Office commended for New Tavern Fort, it being commented of the existing armaments that (as for Tilbury Fort) 'the guns are crowded, and behind weak parapets; the parapets should be revised, and the number of guns reduced, so that they may be more effectively mounted'.[56] It was therefore proposed to remove from the armament 1 x 12-in. and 4 x 9-in. RMLs but to retain 5 x 9-in. RMLs, two of the latter behind existing shields, presumably with a third plate added, and three mounted in new emplacements *en barbette*, giving them a wider field of fire.[57] Had this scheme been implemented, the barbette guns would have been given modified carriages extending their elevation to increase their range from 4,600 yards to 6,000 yards. In the event this form of amelioration was not

pursued, the guns and the layout of the fort being left unchanged for the time being.[58]

The idea of continuing the use of RMLs to counter the threat of the new seaborne breech-loaders was soon discredited, it being recognised that the future could be based only on the comprehensive use of other breech-loaders. From 1889/90 this process began in the outer line defences of the Thames with new wing batteries constructed at East Tilbury and Allhallows and, later, the addition of breech-loaders to the roofs of Coalhouse and Cliffe forts, although a few RMLs were retained for a time.[59]

Attention was subsequently given to the modernisation of the inner line. At first the installation of 9.2-in. guns at Gravesend was considered but this was judged to be an excessive and inappropriate calibre for the revised expected risk of attack by a cruiser, perhaps of the new *Depuy-de-Lome* type, accompanied by boom smashers and by fast torpedo boats. As a lesson to all, the latter class of vessel had, in French hands, demonstrably proved its worth in the attack on warships at Foo-Chow in 1884. Targets for torpedo boats in the Thames were considered to be mercantile shipping and the lock gates of Tilbury Docks.[60] Shortage of the new quick-firing breech-loading guns recently introduced to counter torpedo boats and to defend minefields led to the RMLs at New Tavern and Tilbury Forts being provided with a supply of special case shot. In the manner of a shot-gun this allowed a spread of shot to be fired to cover a general area to hit a fast-moving target, compensating for this slower-traversing type of gun.[61]

Following proposals of 1898-1900 the first steps at modernisation of the inner line were taken, though not at Gravesend but at Tilbury Fort where, by 1902, 2 x 6-in. Mk4 breech-loaders with a converted single-action breech mechanism were installed in concrete emplacements, as well as 4 x 12 pounder quick firers against torpedo boats in place of the temporary solution referred to above.[62] The provision of 2 x 6-in. guns had also been approved for New Tavern Fort but these had yet to be mounted. By 1903, however, the 7 x RML guns of the North and East Faces were removed to make way for construction of the new battery. According to the memories of now deceased local residents shared with the writer in the 1960s,[63] the displaced RMLs were moved out of the fort on horse drawn wagons. For the year or more during construction of the new battery this left the three obsolete RMLs mounted in the Garden Face as the only armament of the fort.[64]

Fewer guns and a new design of battery introduced, 1904 (**Fig. 8**)

As exemplified at New Tavern Fort, as well as throughout the Thames and beyond, a smaller number of BLs succeeded a larger number of RMLs. This acknowledged that the higher performance of the new weapons

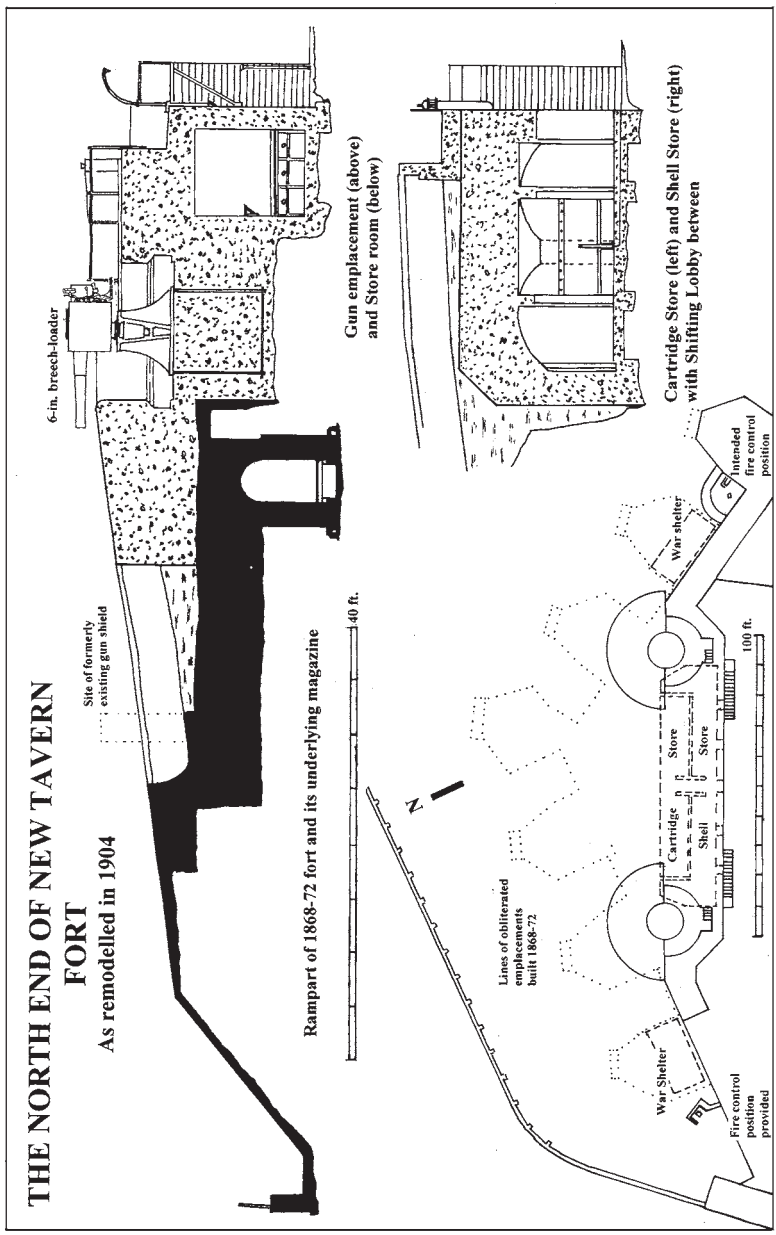

Fig. 8 Plan, profiles and sections of the 1904 battery (Victor Smith 2012, after NA WO78/4244).

did not require a one for one replacement. Another factor in limiting the number of the new weapons was that they cost more to manufacture.

The design of the batteries for this class of weapon rejected some of the more visible architecture of the Royal Commission in favour of the introduction of low profile forms, less obvious to the eyes of an enemy observer and which had already started to be introduced in the later RML era. Furthermore, whereas the use of concrete had been a component of construction under the Royal Commission, this now became employed as a primary material, reflecting advances in building science. As projected in a design plan for New Tavern Fort of 1902,[65] the new battery consisted of a pair of semi-circular concrete emplacements 100ft apart, and joined by a covered way, with underlying magazines entered from the parade, the pre-existing RML magazines being in the wrong place to be used. On either side of the new battery the rear part of two of the RML emplacements were retained and roofed over to provide war shelters for the gun detachments. To the left of the battery a small concrete position was provided for directing the fire of the guns. Pursuant to the need for concealment, the ground in front of the battery was landscaped into a sloping turf-covered glacis, the parapets of the emplacements and the covered way being almost invisibly flush with its top.

The guns, their emplacements and war shelters

Breech-loading allowed more rapid loading and hence the higher rate of fire of 5 or 6 shots per minute. With the further advances in chemical science producing an even more powerful propellant, firing ranges had more than doubled to over 6 miles, enabling the 3½ mile length of Gravesend Reach to the Lower Hope to be covered with ease. The forward batteries, especially at East Tilbury, had been provided with guns having the range and power to interdict shipping attempting to approach the Lower Hope in an advance from the estuary along Sea Reach. As well as advances in the ranges of guns, chemical science had also produced Lyditte high explosive filling for shells which dramatically increased their explosive effect.[66]

The guns, loaded and sighted from the top of a 4ft high concrete platform, were mounted on a centrally pivoted and rotating steel carriage fixed to the top of a pedestal deeply bolted down within a pit, their barrels firing over the top of a concrete apron (**Fig. 9).** It was this combination which conferred an unprecedently wide 180-degree field of fire. The apron was to be painted green to blend it with the turfed glacis.[67] This new design achieved a high degree of structural concealment. However, the gun itself remained visible above the apron, its detachment being given the protection of a 6-inch thick steel shield fixed to and turning with the carriage as the gun was traversed. The gunners could also, if called upon,

Fig. 9 The restored and re-armed 1904 battery (Victor Smith 2012).

elevate or traverse the gun under cover, by standing in the pit and turning alternative overhead hand wheels. Although not known to have been in the specification for the new battery, it might have been possible for the guns to have been turned to fire inland, should the tactical situation have demanded this. Photographs of both New Tavern and Tilbury forts in 1906 show the guns so facing.[68]

The drop at the rear of the loading platform was secured by a detachable tubular steel safety fence, breached by access steps. Recesses on either side of the emplacement were provided for the ready-use storage of shells and cartridges, a function performed in the RML era by the use of serving rooms. Resupply from the magazines was by a sloping chain lift for shells which emerged under a cover on the loading platform and for cartridges by a vertical ladder lift which rose into a recess in the emplacement wall.

The War shelters were stand-by accommodation for the gun detachment to which they could, if necessary, also retreat under an intense bombardment. This widely used innovation originated as a feature of forts from the later 1880s, before which there was no such provision for open batteries. Their 26 x 10ft rooms, with a single centred entry door and four steel-barred windows to admit light, were furnished simply with the bare minimum of seating benches and a table. There was also a stove to provide heating in cold weather.

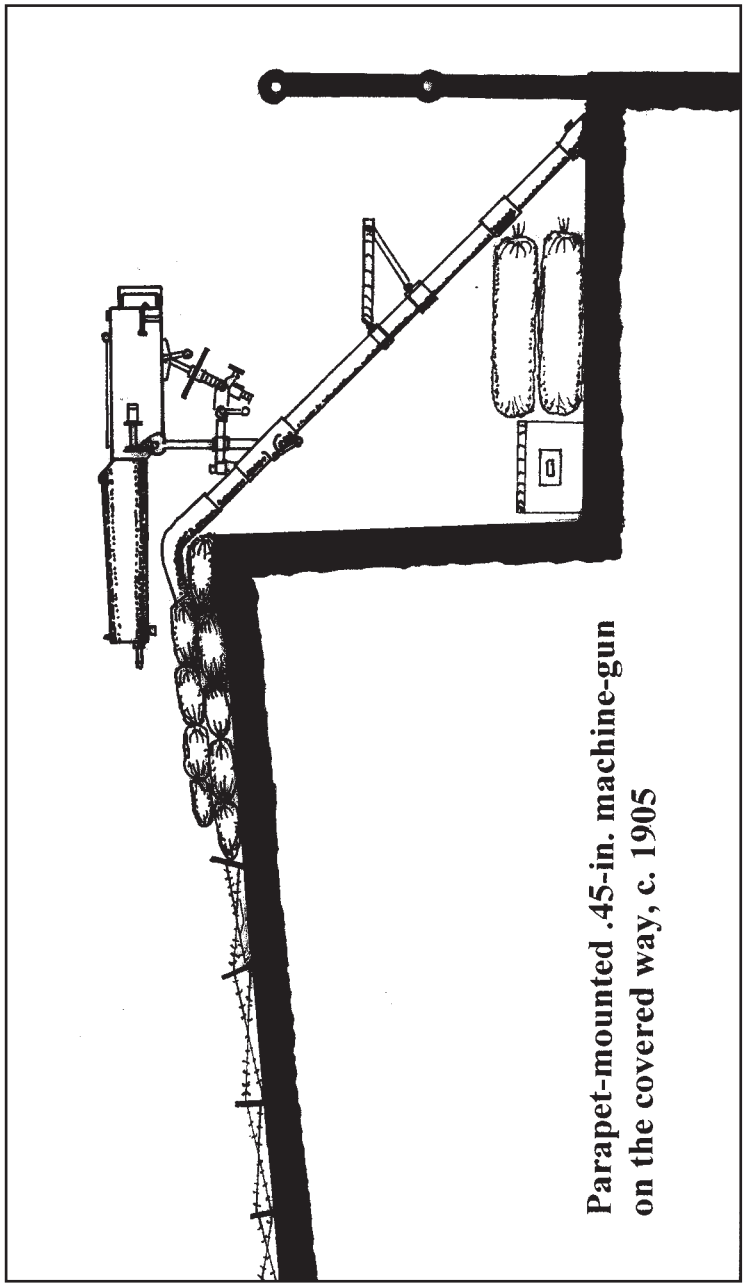

Fig. 10 A reconstruction of the covered way mounted with a machine-gun in 1905 (Victor Smith 2012).

The covered way (**Fig. 10**)

This 4ft 6in. wide path on top of the rear edge of the magazines was fronted by a 4ft high concrete parapet. As its name suggests, it was a footway with front-facing protection to allow walking communication between the emplacements. Taking advantage of Hiram Maxim's improvements to rapid-firing small arms, three of his machine guns were provided on parapet mountings for firing either at a landing party approaching the fort from the shore or at torpedo boats attempting to advance past the fort. Near the bottom of the glacis a slightly cantilevered obstacle fence was added. Perhaps as an original feature, mid-way along the covered way a collar had been fixed to the parapet into which a flag pole could be placed. From this – as at Tilbury – a large Union flag would have been flown.[69]

The magazines and store rooms

The east-west orientated magazines, consisted of two parallel brick-vaulted chambers, contained within a protective 6ft thick concrete shell fronted by a thick layer of sand under the glacis to help absorb the explosive effects of incoming fire. One chamber was for the storage of 200 shells (100 per gun) and the other for 200 cartridges.

Entry from the parade led into the shell store, with controlled ingress to the cartridge store behind via a shifting lobby. Lighting recesses in the party wall, served from the shell store, were for lamps to illuminate the cartridge store. There were smaller recesses in the shell store itself for its own illumination. The shells were stored on their bases at chest height on tables formed of thick timber boards resting at either end on steel uprights.[70] A shell lift was at either end of the shell store, next to which were floor-fixtures where shells would be attached for manipulating and setting their fuzes. Cartridges were contained in metal cylinders up-ended on floor battens. When needed these were passed through a hatchway at either end of the cartridge store to a vertical timber-cased lift.

In the event of failure of the lifts, there was an 8cwt davit to the rear of either emplacement outside but, if required, the 100lb shells could be taken by hand up the double steel staircase against the parade-facing elevation of the magazines as, indeed, would have the lighter cartridge cylinders. Either side of the magazine and entered from the parade are store rooms; two to the right and three to the left. These were arranged slightly differently from the plan of 1902.

The fire control position (**Fig. 11**)

This mounted a Depression Range Finder (DRF), combining optics and triangulation with the use of a mechanical computer to establish the range

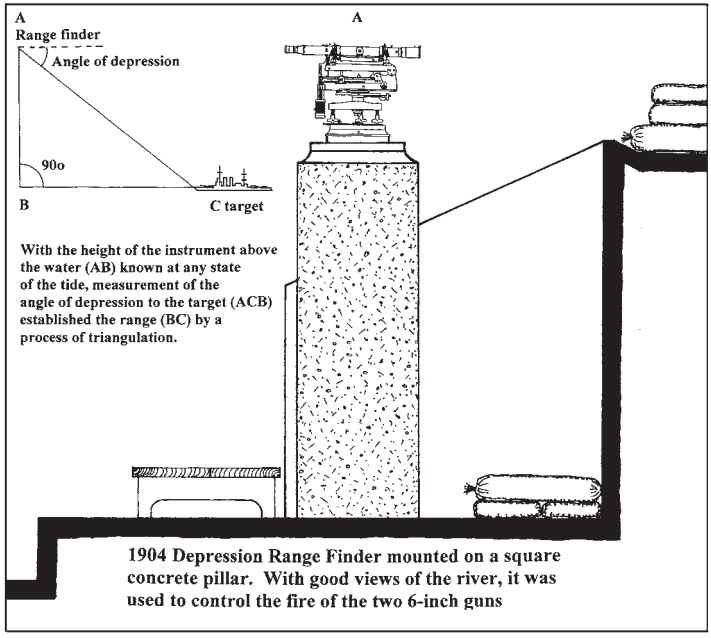

Fig. 11 A reconstruction of the Depression Range Finding cell in 1904 (Victor Smith 2012).

to target. Such instruments began to appear in British coastal defences in the 1880s and it is possible that one had been supplied earlier for New Tavern Fort during its later RML phase.[71]

It had been the original intention to place the fire control position on the roof of the former RML shell serving room of the right emplacement of the East Face, whose interior was to be converted into a telephone room, a window in its wall having apparently been a preparation. However, a change of plan led to re-siting west of the left 6-in. emplacement. Here a square pillar was provided on which the DRF was to be fitted when required. It was set within a small open rectangular space, protected by a concrete parapet. The latter was enlarged on one side for the placement of a map of the river. Remains of fixtures around the parapet may indicate preparation for the fitting of a temporary weather cover. There is photographic evidence that may show that this position was later used for the placement of a flagpole, instead of the position in the covered way.

As with the RML era, it is not clear how the information about the range to target was to be communicated to the gun detachments. This might have

been by use of an electric dial or a range indicator board. In the event of the failure of the DRF, the guns were provided with auto sights which could be fitted to their carriages. Neither is it certain how the fire of both Gravesend and Tilbury could have been coordinated, whether at night or during the day. There was no direct telephone contact between them, although it was technically possible to achieve voice communication by routing calls through three other telephone exchanges.[72] There was, however, provision for communication by some form of visual signalling from the parapets of both forts.[73]

Advances in electrical technology had earlier led to the introduction of searchlights into the coastal defences to facilitate firing at night. There were none at Gravesend and reliance must have been placed on a pair of carbon arc light projectors built on the flood defence embankment in front of Tilbury Fort.

The Thames District Defence Scheme

The role of New Tavern Fort is described in a defence scheme of 1904 and this again mentions its relationship with Tilbury Fort for the prevention of raids by cruisers and torpedo boats as a second line behind the batteries at the eastern end of Gravesend Reach and beyond. Indeed, the successful Japanese torpedo boat attack on Port Arthur in this same year proved to be a further object lesson to focus the minds of those responsible for the Thames and other defences on the threatening potential of this type of raid. Forces based at Milton Barracks in Gravesend were to be held as a reserve to act against a landing in the Hoo Peninsula. They were also to be available to provide manpower for reinforcing Slough Fort on the Hoo peninsula with field defences.[74]

A changing enemy

These defensive preparations had been made as much against a perceived continuing French threat as with recognition of the challenge of a rising Imperial Germany. But the entente of 1904 initiated better relations with the French, leaving Germany to loom larger as the more likely future enemy, which might have deployed the *Furst Bismarck* or *Friedrich Carl* types of cruiser for an attack on the Thames.[75]

The Owen Committee of 1905 and a reversal of fortunes

Modernisation of New Tavern Fort was only a year old when, with its partner at Tilbury, it found its very rationale and continuance placed in doubt by the findings of the joint military and naval Owen Committee which had been appointed in 1905.[76]

Following decades of political competition between the Admiralty or 'blue water' school which promoted the primacy of the fleet and the army 'bolt from the blue' lobby emphasising land-based defences, the naval members secured prominence. They did so because of the dramatic technological improvement in the new warships of the Royal Navy.[77] Their greatly increased power and numbers, including the introduction of the *Majestic* and *King Edward VII* classes of battleships (soon to be followed by the revolutionary *Dreadnought* type), with a profusion of cruisers and other vessels, became seen as a surety against invasion, even if launched against Britain and Ireland at the same time.[78] As a corollary, the committee recommended swingeing cuts in the number of batteries and guns around the coasts of Britain, including those of the Thames, and involving the elimination of armaments from New Tavern and Tilbury forts. This also reflected the effects of further technological advances in artillery, with the new long range heavy guns at Grain, Sheerness and Shoeburyness now being able to reach out in a crossfire to command the whole of the Thames estuary. As a consequence it was considered that inner lines of defence needed to be no further upstream than East Tilbury, making the defences at Gravesend and Tilbury redundant. Despite some dissatisfaction from the War Office, the rationale of the committee's findings was accepted by the government. Implementation was not immediate however, and New Tavern and Tilbury forts again figured in an update of the defence plan in 1906 which, despite the recent entente, mentioned in a cautionary way the possible threat from the presence of bases for torpedo boats along the French coast. The owners of the headquarters of a sailing club built in 1905 at the eastern end of the promenade were, in the event of a threatened attack on the Thames, required to undertake its immediate dismantling to remove possible obstruction of the field of view from the fort.[79] But by 1908, and after a very short modernised existence, both New Tavern and Tilbury forts had been disarmed.[80] The 3 x 9-in. RMLs remaining in the Garden Face of New Tavern Fort were offered to Gravesend's council which rejected them.[81]

The later history of New Tavern Fort

Despite being disarmed, the fort remained War Office property but its ditch was acquired in 1910 by Gravesend's council which, with the planting of trees, bushes and shrubs, laid it out as an ornamental walk for the public.[82] In consequence the military Dacoit fence was moved inwards to the foot of the escarp bank to preserve the security of the military property retained within the rampart. In the same year the Gordon Promenade, Recreation Ground and Pleasure Gardens were bought outright from the War Office by Gravesend Corporation.[83]

When war with Germany was joined in 1914, part of a home defence fleet protected entry to the Thames from bases at Chatham and Sheerness. As well as surface vessels, submarines had a harbour protection and coastal defence role.[84] However, confidence in the ability of the Royal Navy to prevent invasion had weakened since the expansion of the German fleet. This gave rise to a revived emphasis on defences on land but security of the river continued to rely on the riverbank defences downstream of Gravesend and Tilbury, the latter two being absent from the artillery chain of command. But port operations were controlled from a still extant building close to New Tavern Fort in Whitehall Place, East Terrace. Linked with this, the Examination Service for the searching of ships was enforced by the guns of Coalhouse Fort in Essex.[85] Although there was revived occupation of New Tavern Fort this was to provide a depot for a Royal Engineers company which was engaged in various tasks, including the laying of telephone lines and duties in connection with the wartime pontoon bridge between Gravesend and Tilbury. This presence resulted in an accretion of temporary buildings within the perimeter of the fort.[86] Perhaps sometime during the war, the inside of the caponier was converted into a rifle range, archaeological investigation in 1989 having shown the remains of a target post erected at its far end, and revealed evidence of bullet strikes against the brickwork behind. Two captured German guns were displayed on the adjacent promenade immediately after the end of the war and at least until 1921.

A War Office plan of the fort in 1909, revised and annotated in 1911, 1913, 1922 and 1926 has some limited value as an aid to chronicling the use of the fort over those years.[87] All the emplacements had been deleted from these representations. The plan mentions the presence of Royal Engineer offices, stores and a developing room. It also notes that Milton Chantry was transferred to H.M. Office of Works in 1925. An official presence at the fort remained for a time post-war, the barracks being used as married quarters. In 1930 the fort was re-armed with a 6-in. gun (causing damage to premises in the process) but this – remaining in place for several years – was purely for the training of the Gravesend coastal artillery unit of the Territorial Army whose war station would have been elsewhere.[88] The fort was purchased by Gravesend's council in the same year and laid out as a public garden in time for a ceremonial opening in 1932.[89] This resulted in the juxtaposition of a fenced area for the gun next to lawns and flowerbeds. The residue of earlier clearance rights around the fort appear to have been given up at about this time. The historical nature of the fort and its connections with Colonel (later General) Charles Gordon of Khartoum fame were well understood and expressed in the council's souvenir booklet issued for the public opening of the garden. However, conversion to a public garden led to the loss or mutilation of a number of military buildings.

Interwar, the continuing development and technological superiority of airpower threatened air raids on an apocalyptic scale in a future European conflict, with the prospect of the killing and injury of large numbers of civilians. Indeed, by early 1939 and with the expectation of another war with Germany in mind, some parts of the RML magazines at New Tavern Fort were gas-proofed to form a civil defence control centre but that role came to be subsumed by Town Hall premises in Gravesend's High Street.[90] Some painted signs on walls of the magazines and outside survive from this period. During the war, the fort was used as a civil defence training centre and an equipment store for Gravesend. Anti-gas decontamination showers were provided in the Chantry. A garage was also added next to it for a trailer pump of the auxiliary fire service. The former 6-in. magazines were used as both a civil defence store and as an air raid shelter. Other civil defence store buildings were added against south perimeter wall of the fort and, nearby, a concrete air raid wardens' post was built.[91] Both were demolished by the council in the 1980s. Still unexplained was the use of the RML magazines, reportedly by the Royal Navy, during the war. Two pylon-like steel masts were erected on top of the main magazine and several contemporary eyewitnesses have reported that these were for intelligence gathering by monitoring German military radio traffic, radio sets for this purpose being provided for the listeners in the magazines but this has yet to be confirmed by documentation. The magazines may have had more than one use during the wartime period.[92]

There is oral evidence that a light anti-aircraft gun was mounted at the fort for a short time.[93] Fort House had been pressed into use as a food ration office. But in a new age of long-range rocketry, it became a casualty of the war, having been so damaged by a German V2 rocket exploding nearby in 1944 that it was later demolished and its site cleared.[94] The combustion chamber from the rocket was displayed in the Fort Gardens but this interesting feature was, unfortunately, sold by the council in the 1970s.

Post war the fort returned to its role as a public garden, its interior being amended from time to time by changes to the layout of flower beds and paths. Incrementally this caused damage to parts of the counterscarp bank of the ditch and intrusions into its near glacis. Part of Milton Chantry was demolished by Gravesend's council in 1948 but from 1953-70 the chapel element became the Gravesend Historical Society's local history museum. The premises also had a short re-use as a civil defence training centre in the early part of the Cold War. Further and catastrophic demolition in 1969 resulted in the loss of over half of the remaining Chantry complex.[95] From 1972 the chapel block residue was taken into guardianship by English Heritage and opened to the public. Its last transition was in 1995 to become, under the management of Gravesham Borough Council, a heritage centre in which role it continues today.

In partnership with Gravesham Borough Council, since 1975 the New Tavern Fort Project (renamed Thames Defence Heritage in 2000) have re-armed and restored the fort and opened the magazines from the RML phase for public access.

Discussion

During the later nineteenth and early twentieth centuries the development of New Tavern Fort – as indeed of its cross-firing partner at Tilbury – was a symbiosis of the evolving technology of war and changing defence strategies. Eventually it became their victim as, following the recommendations of the Owen Committee, the locus for artillery protection of the Thames moved downstream.

The hybrid open emplacements with shields erected at New Tavern and Tilbury in 1871 contrasted with the more enclosed and comprehensively protected armoured casemates of the outer line at Shornemead, Cliffe and Coalhouse, probably because the outer line was expected to be subject to a heavier form of attack. Nevertheless, such emplacements had considerable frontal resilience to incoming fire and could, if necessary, be converted into casemates by adding a supported roof of timber baulks covered with sand and earth. However the shields had abutments at the bottom and sides only, and in contrast with the fully casemated forts of the outer line, an unsupported top. Set in a grassed earthwork as at New Tavern and Tilbury they could be rendered less visible than vertical casemates if the fronts of their shields and external concrete splays were coloured to match their surroundings. Indeed, paint traces were found on exposed surfaces when the front of one of the emplacements at New Tavern was excavated in the 1979.

Such emplacements were also built in forts at Bermuda and Gibraltar as well as other variants elsewhere. As with most shielded emplacements, their gun ports allowed only limited traverse to 45 degrees, elevation to 10 degrees and depression to 4 degrees. Although they could bombard approaching vessels over a distance, with these constraints and having a slow rate of fire of 1 round in every 1½ minutes, it is doubtful whether more than one or two shots could have been fired at a warship actually steaming past.

The replacement of vulnerable surface magazines with buried ones having ammunition lifts connecting to the emplacements was characteristic of new recommended universal practice which emerged in the 1850s and 60s. Similarly a raft of safety arrangements, including the use of glazed lamp recesses to illuminate rooms.

Unlike the works of the outer line which were provided with alternative protected war accommodation in the rear of their casemates the pre-existing barracks at New Tavern and Tilbury offered virtually no protection.

As built for breech-loaders at New Tavern Fort in 1904 and at Tilbury Fort in 1902, the low profile concrete emplacements allowed both wide traverse for the firing of their centrally pivoted guns and structural inconspicuousness, being an archetypal design adopted from the 1890s for British, European and American defences. The confident use of concrete in construction is noteworthy. The underlying two-cell magazines were a template approach to two gun batteries, being widely used in British defences at home and abroad. The building of these two BL batteries had in the end proved to be an error as they were almost immediately made redundant under the Owen Committee proposals and from the availability of the greater firepower of the guns in the forts and batteries downstream.

Conservation aspects

Despite the progressive demolition of internal buildings and parts of the rear defence wall during the council's occupation of the site the fort retained, for horticultural design purposes, key and diagnostic elements in the form of the gun emplacements, magazines, the defensive ditch and, for the time, the whole of the Chantry barracks. The importance of these survivals resulted in the award of Scheduling for the fort and the Milton Chantry, both having been earlier granted Listed Grade II* status.

As commented in the scheduling documentation, New Tavern Fort is regionally and nationally recognised for its exhibition of a sequence of guns representing its development from the later eighteenth century to its temporary arming in the Second World War, a display approach that might be reinforced. In contrast with Tilbury where its shielded emplacement is hard to see, New Tavern Fort is unique in Britain in prominently displaying shielded and unshielded open emplacements for RMLs on the same site, within which are displayed replica guns. The refurnishing and re-equipping of the underlying magazines has been taken to a completeness nowhere else achieved. Uniqueness also applies to the BL phase, the fort being the only completely armed 2-gun battery of its kind on the British mainland. On the glacis in front of it the outline of the RML positions in the North and East Faces which had been demolished to make way for its construction have been surface marked in brick for visitors. In 2010, trees and bushes were removed from the ramparts by Gravesham Borough Council as part of their Great Expectations scheme for the improvement of Gravesend's Riverside Leisure Area (**Fig. 12**). There was also some associated archaeological investigation by contract units. Although works associated with the Great Expectations project have not been without a little damage to buried archaeology the overall result has given an improved view of the military landscaping and, therefore, provided a better perception of the site as a fort. In doing so, however,

Fig. 12 The cleared rampart of New Tavern Fort (Victor Smith 2012).

most external interpretation was removed, as well as battery furniture and this has compromised a more full appreciation of the fort. This needs to be addressed, together with further surface marking of previously existing key features, and continuing attention to the maintenance and effective presentation of guns. Above all, the barrack phase of Milton Chantry requires adequate explanation and presentation for visitors. Removal of intrusive leisure furniture from the near glacis fronting the counterscarp would be advantageous to improve the setting of the fort, together with an extension of Scheduling to protect this area for the future. The disintegrating practice battery requires attention urgently to ensure its survival as a feature of the fort.

Future research and publication

The writer is collecting further evidence for the origins and earlier development of New Tavern Fort, with a view to the production of a second research report. Against the background of his own research findings he also hopes to examine the discoveries of the contract archaeological units working at the fort during Gravesham Borough Council's Great Expectations project. It is further intended to compile for public access a dossier of documentary and plan evidence for the fort. Collectively this should lead to an enhanced understanding of the site and perhaps provide a basis for improved interpretation.

ACKNOWLEDGMENTS

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ENDNOTES

1 V.T.C. Smith, 'The Artillery Defences at Gravesend', *Archaeologia Cantiana,* LXXXIX (1974), 141-168.

2 A. Saunders, 1989, *Fortress Britain*, Liphook, 171 *et seq.*

3 *Memorandum on the General Principles of Standing Defences suggested for Great Britain,* War Office, 1855; *Memorandum on Defences for Great Britain,* War Office, 1856; and *Memoranda on Home and Foreign Defences and the Report of the Committee on Home Defences*, War Office, November, 1858.

4 *Report of the Commissioners appointed to consider the Defences of the United Kingdom*, HMSO, 1860.

5 V. Smith, 2002, *Defending London's River*, Thames Defence Heritage.

6 *Op. cit*., see note 4.

7 *Ibid.*

8 I. Hogg, 1974, *Coast Defences of England and Wales 1856-1956,* Newton Abbot, pp. 18, 27.

9 *Op. cit*., see note 4.

10 R.E. Letter Books, Gravesend 1864-65 (5 July 1864); V. Smith, 1998, *New Tavern Fort*, New Tavern Fort Project; V.T.C. Smith, 'The Rear Defence Walls of New Tavern Fort, Gravesend, 1795', *Archaeologia Cantiana,* CXVI (1996), 283-292.

11 *Gravesend Reporter*, 27 August 1859.

12 R.E. Letter Books, Gravesend, 1864-65 (3 January 1865).

13 *Op. cit*., see note 11, 15 November 1862.

14 *Op. cit*., see note 12, 30 January 1865.

15 R.E. Letter Books, Gravesend, June 1866-February 1869 (9 July 1866); J.D. Wilson, 'Later Nineteenth Century Defences of the Thames', *Journal of the Society for Army Historical Research*, xli (1963), 195.

16 R.E. Letter Books, Gravesend, June 1866-February 1869 (2 January 1868).

17 *Ibid.* (28 January 1867).

18 *Report with reference to the progress made in the construction of the fortifications for the defence of dockyards and naval arsenals of the United Kingdom*, War Office, 1867.

19 *Op. cit*., see note 16.

20 National Maritime Museum, Gould photo collection, 2078.

21 *Op. cit*., see note 16 (26 March 1868).

22 *Ibid*.

23 *Ibid*. (7 June 1868).

24 *Ibid.* (14 June 1868).

[25] *Op. cit*., see note 20.

[26] *Op. cit*., see note 16 (20 November 1868).

[27] *Report of the Committee appointed to Enquire into the Construction and Cost of the Fortifications erected or in the course of erection under 30th and 31st Vict. and previous statutes*, HMSO, 1869.

[28] R.E. Museum 8107.10/11, letter from C.G. Gordon to Sir Francis Head, 18 July 1871. See also NA WO78/3903.

[29] NA WO78/3903 and NMM Gould 528 and 1766.

[30] *Op. cit*., see note 16 (23 June 1868).

[31] *Gravesend and Dartford Reporter*, 7 February 1871.

[32] *Op. cit*., see note 27.

[33] NA WO78/3903.

[34] NA WO33/29 and J.F. Lewis, 'Permanent Fortification', *R.E. Occasional Papers*, vii (1882), 119.

[35] V. Smith, 1998, *op. cit.*, see note 10.

[36] *Op. cit*., see note 33.

[37] V. Smith 1998, *op. cit*., see note 10.

[38] *Op. cit*., see note 33.

[39] A.J. Philip, 1954, *A history of Gravesend and its Surroundings from prehistoric times*, Wraysbury, 155.

[40] *Op. cit*., see note 33.

[41] *Ibid*.

[42] I. Hogg, *op. cit.*, see note 8.

[43] These letters may be seen on the surviving contemporary signs on the walls of the magazines.

[44] Their regime of training was regularly described in the *Gravesend Reporter*.

[45] V. Smith 1998, *op. cit*., see note 10, 19.

[46] A. Cantwell and D. Moore, 'The Victorian Army and Submarine Mining', *Fortress*, 18 (1993), 32 *et seq.*

[47] *Op. cit*., see note 33.

[48] K.W. Maurice-Jones, 1959, *History of Coast Artillery in the British Army,* Woolwich, 157 and NA WO33/37.

[49] The line of this fence is shown in NA WO78/3903. For information about the development of the promenade, see ACTA, 2005, *Gravesend Riverside Leisure Area – Outline Conservation Plan,* Vol. 1, text.

[50] NA WO33/48, A138.

[51] NA WO396/3.

[52] *Ibid.*

[53] *Handbook for the London Defence Positions,* War Office 1903; F.A. Mansfield, *c*.1930, *History of Gravesend,* Gravesend.

[54] E.H. Jenkins, 1973, *A History of the French Navy*, London, 259 *et seq*.

[55] *Op. cit*., see note 8.

[56] *Op. cit*., see note 51.

[57] *Ibid*.

[58] V.T.C. Smith, 1998, *op. cit*., see note 10.

[59] V.T.C. Smith, 2002, *Defending London's River,* Thames Defence Heritage.

[60] NA WO33/220, Reports of Colonel Montgomery's Committee on substitution of BL and QF guns for existing RML guns, 1898.

[61] *Ibid.*

[62] P. Pattison, 2004, *Tilbury Fort*, English Heritage.

[63] *Pers. Comm*. to the writer by the late James Benson, 1965.

[64] NA WO33/311.

[65] NA WO78/4244.

[66] *Op. cit*., see note 8, 76-9 and 81.

[67] *Op. cit*., see note 65.

[68] Photographic postcard of Gravesend's promenade in the collection of Gravesend Public Library and an image of Tilbury Fort in NMM Gould 1227.

[69] As shown in NMM Gould 2335.

[70] Specification extracted from an official source in V.T.C. Smith Fortbase archive Mag. PT125.

[71] *Op. cit*., see note 8, 82.

[72] *Op. cit*., see note 65.

[73] *Op. cit*., see note 64.

[74] *Ibid.*

[75] F.T. Jane, 1906, *Fighting Ships,* 1906/7, London, 240 and 242.

[76] C.S. Dobinson, 1996, *Twentieth Century Fortifications in England, VI. Coast Artillery, 1900-56*, CBA, 143 *et seq.*

[77] V.T.C. Smith, 1985, 'Chatham and London: the changing face of English Land Fortification, 1870-1918', *Post Medieval Archaeology*, 19, 141.

[78] NA CAB2/1/69.

[79] NA WO33/395.

[80] *Op. cit*., see note 76.

[81] Minutes of Gravesend Council's Paving, Lighting and Works Committee, 8 April 1910.

[82] Gravesend Corporation, *Mayoral Tercentenary Souvenir Opening of Fort Gardens 1932*, 31.

[83] *Op. cit*., see note 79, 4 November 1910.

[84] H.R. Moon, 1968, 'The Invasion of the United Kingdom', PH.D. thesis, University of London.

[85] NA WO33/671; F.A. Mansfield, *op. cit*., see note 53, 133.

[86] See successive issues of *Searchlight* magazine for the First World War, RE Library, Chatham.

[87] The map of the fort is in NA WO78/2250.

[88] An internal memorandum of Gravesend Corporation 26 September 1930 relates to the mounting of a gun.

[89] *Op. cit*., see note 82.

[90] S. Harker, 1979, *The Book of Gravesham*, Buckingham, 126.

[91] V. Smith 1998, *op. cit*., see note 10, 24.

[92] *Ibid.*

[93] *Ibid.*

[94] *Ibid*.

[95] R.H. Hiscock (ed.), 2006*, A Historical Walk through Gravesend and Northfleet,* Gravesend, 73.