

CHAPTER 2

Woolwich Dockyard Area

Naval shipbuilding came to Woolwich in 1512 and settled on the western riverside by the 1530s. Two water-filled docks still mark the spot (Ills 74, 75, 76, 102). The royal dockyard expanded gradually as it became one of Europe's principal shipbuilding establishments, pushing back into a hillside and out onto land reclaimed from the river. After the 1720s there was room to grow in only one direction, westwards. Despite the site's unsuitability for ever larger vessels and other intimations of decline, more ground was taken and by the end of the Napoleonic Wars the dockyard extended as far as present-day Warspite Road.

The development of the western lands in the 1830s and 1840s as a base for the early steam navy was marked by innovations. But drawbacks could no longer be overridden and the dockyard closed in 1869. The site was subsequently used for military storage, as an annexe to the Royal Arsenal. In the 1920s western parts were sold off, principally to the Royal Arsenal Co-operative Society for its Commonwealth Buildings depot. The older eastern dockyard was not disposed of until the 1960s, when Greenwich Council acquired it for housing; here the Woolwich Dockyard Estate was built in the 1970s. Speculative housing developments to east and west followed from 1989. Little remains from the dockyard's early centuries, the

oldest survival being the Clock House, offices of the 1780s. There are more substantial remnants from the steam factory, and the former dry docks and two shipbuilding slips are linked by a long river wall, all naval construction of the 1810s to 1850s.

A separate part of the parish west of Warspite Road is also covered in this chapter. From the 1860s this was dominated by the Siemens Brothers factory, first producing telegraph cables, then telephones up to the 1960s. Several of Siemens's large buildings remain in an industrial estate. An adjacent former board school of the 1890s faces the Woolwich Road as do other fragments of settlement from that time. There are also some independent river wharves and, to the far north-west, there has been clearance for facilities associated with the Thames Barrier, which is outside the parish of Woolwich.

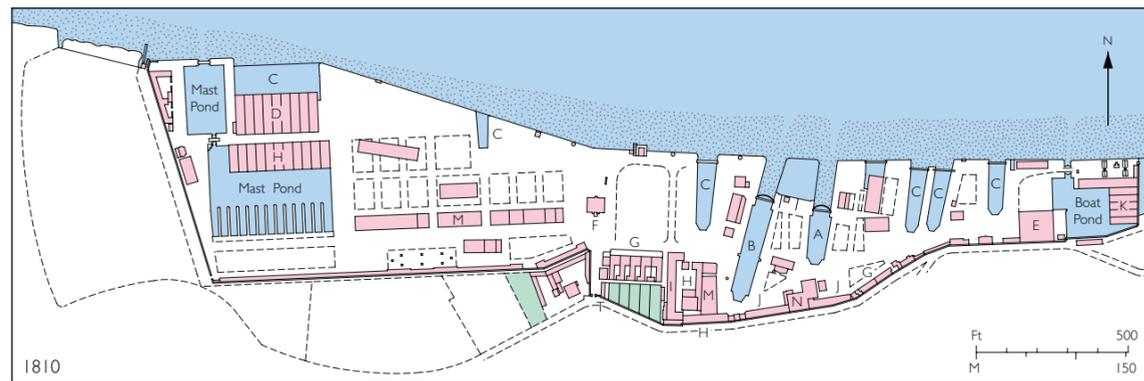
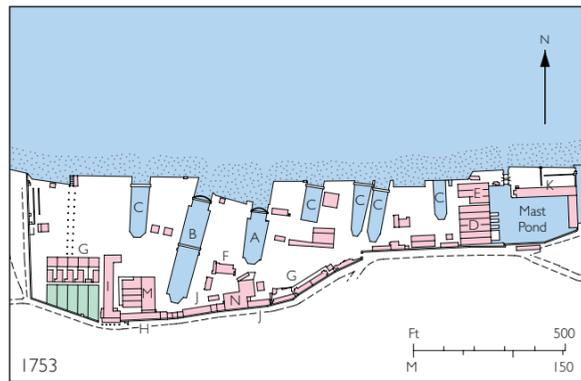
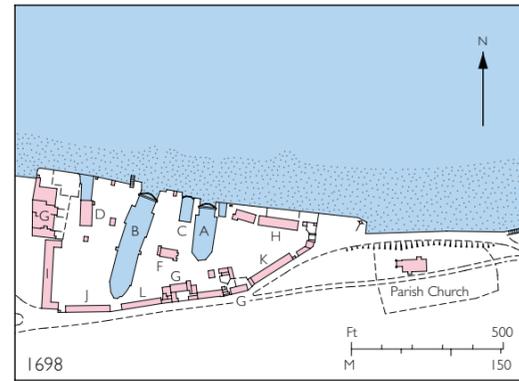
Woolwich Royal Naval Dockyard

Henry VIII's selection in 1512–13 of Woolwich and Deptford as places for the construction and repair of the state's largest warships represented a reorientation

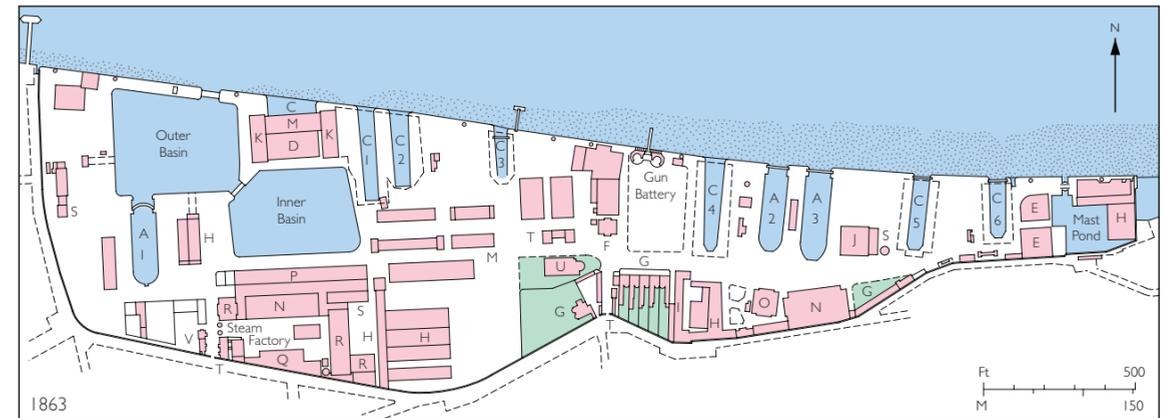


74. Woolwich Dockyard from the north (also showing the medieval parish church) in a watercolour of 1698

- A Dry Dock
- B Double Dry Dock
- C Shipbuilding Slip
- D Mast-house
- E Boat House
- F Clock House/Office
- G Officers' Houses
- H Storehouse
- I Great Storehouse (1690s)
- J Carpenters and Joiners
- K Rigging House
- L Pitch House
- M Sail and Mould Lofts
- N Smithery
- O Steam Hammer
- P Fitting and Erecting Shop
- Q Pattern Punching and Shearing Shop
- R Steam-boiler factory and Coppersmiths
- S Engine-house
- T Police Station
- U Chapel
- V School
- W Hay Pressing and Baling
- X Bathing Pond
- Y Cable Tanks
- Z Pensioners' Covered Parade



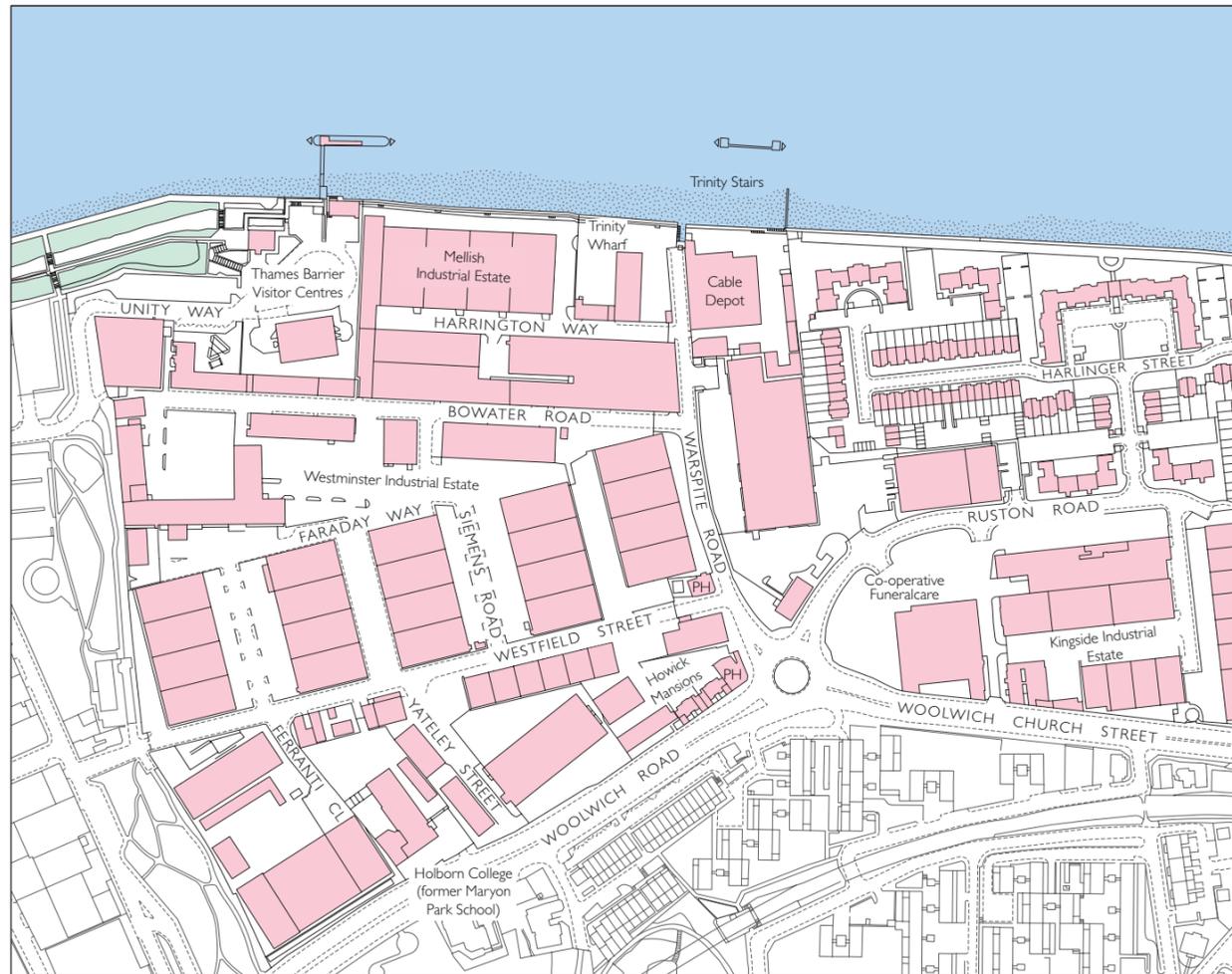
75. Woolwich Royal Naval Dockyard, plans showing the layout of the site in 1698, 1753, 1810, 1863 and (after the dockyard's closure) 1894



in Tudor naval strategy away from Portsmouth towards the metropolis and the Thames. Portsmouth had what has been claimed as England's first dry dock from the 1490s, but its remoteness from London, where ships took on stores and ordnance, underlay the change of emphasis. Naval shipbuilding in Woolwich started in 1512 when work began on the *Henry Grace à Dieu* (or *Great Harry*), a warship of unparalleled size. This was almost certainly built at the centre of the settlement, to the east of Bell Water Gate on what later became Gun Wharf (see pages 37–8). Other ships followed, but Crown activity seems to have fallen away in the 1520s. Further downriver, Erith had the makings of another royal dockyard in the 1510s, but was abandoned after a few years, probably on account of its susceptibility to tidal flooding. This may also have been a problem in Woolwich.

EARLY HISTORY

By the end of the 1530s the Crown was operating in Woolwich from a different place, roughly two acres to the west of the parish church that were identified in 1546, when they were purchased outright, as 'Boughtons Dockys lyeing togyther envyronned wyth a Sandehill callyd Our Laydye Hyll'. This implies that the docks had private origins, the Boughton family having held manorial land in Woolwich since 1495. Perhaps the state's activities near by had inspired a speculative venture. There were two docks on an unlevelled but probably previously quarried tract of Thanet sand very close to the churchyard, which evidently occupied the hillside right up to its margins, rising steeply away from the water's edge. The water line, prior to embanking, may have been

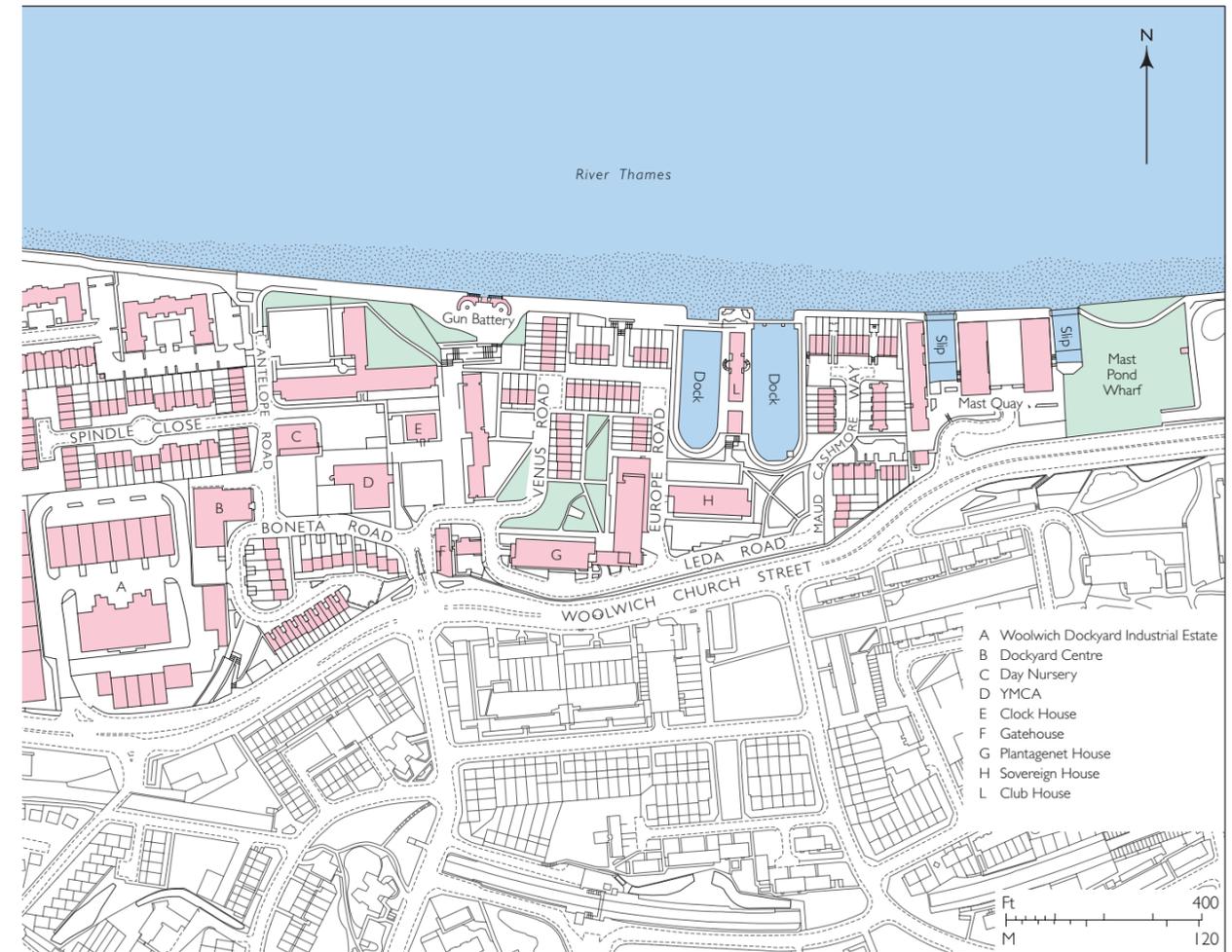


as much as 200ft (60m) further south than at present. A hillside quarry may seem an inappropriate place for a dockyard, but the site was exceptional on the downriver Thames for not being floodplain and for having solid chalk bedrock. Woolwich Dockyard took root on a two-acre enclave, located around the inner ends of the two extant dry docks towards the east end of the later much larger complex (Ill. 75).²

There is little documentation for the physical make-up of Woolwich Dockyard in the second half of the sixteenth century, but large ships were launched, a tile kiln was established, Elizabeth I visited in 1559, and a ropeyard was formed near by in 1573–6. All this suggests the retention of official favour and a fully operational expanding enterprise. It evidently specialized in ship-building and heavy repair work. The two docks probably

comprised mud-cut, timber-lined, slip-like troughs with gates, to permit ships to be floated in and propped up prior to drainage for repair in the dry. On their uneven and sloping margins there would have been a scatter of small buildings; the site's constraints no doubt forced the separation of the ropeyard. After 1570 Chatham Dockyard, nearer the sea, challenged the supremacy of Woolwich and Deptford. In 1586 Peter Pett, Master Shipwright at Deptford and the founder of a fecund dynasty of shipwrights, reported on the poor condition of all the naval dockyards. His recommendations for expenditure on new buildings and repairs at Woolwich appear to have been little heeded.³

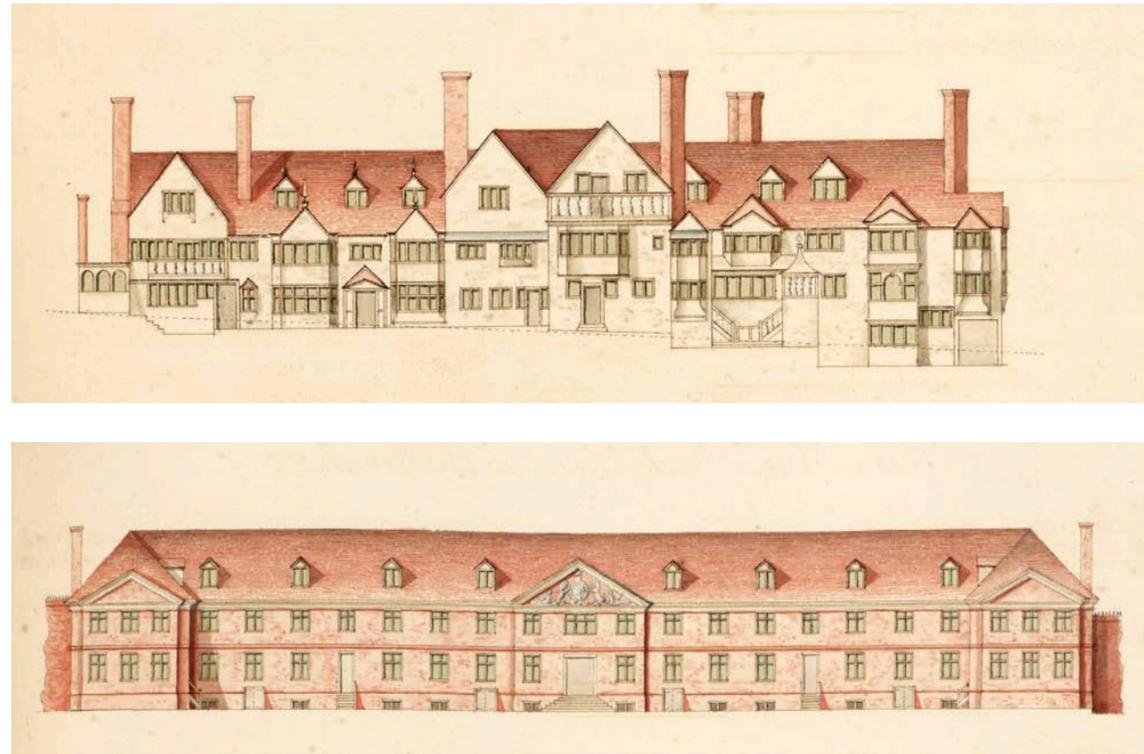
But it was in Woolwich that the next century's most prestigious sea-going ship, the *Sovereign of the Seas*, was built in 1634–7. For the size and quantity of its vessels



76. Woolwich Dockyard area, 2007

Woolwich was among the most important shipyards of seventeenth-century Europe. In large measure this was due to significant improvements, under way by 1607. The selection then of Woolwich for the building of the navy's largest ship, the *Prince Royal*, was no doubt a stimulant. These works were probably overseen by Phineas Pett (Ill. 260), Peter's son and now himself Master Shipwright at Deptford, who operated in the notably corrupt milieu of his patrons, Sir Robert Mansell, navy treasurer, and Sir John Trevor, navy surveyor. Oak paling went up round the yard, and in 1608 Pett supervised the making of new gates for 'Woolwich Dock', using an earthen coffer dam 'so that we wrought always dry'.⁴ The western dock was enlarged to provide space for two ships to be placed in dock, one astern of the other. This 'galley dock' was and long remained the state's only double dry dock suitable

for 'great ships'.⁵ The formation of this exceptional facility was followed by levelling of the yard, to get rid of the slope to the south. Huge quantities of sand were moved in a major engineering project that resulted in an artificially flat tract extending some 500ft (150m) from the Thames to terminate beneath roughly hewn cliffs almost 20ft (6m) high (Ill. 74). The quarried sand may have been used to reclaim land from the river behind an embankment, making reconstruction of the eastern dock necessary. Some such wharfing was built in 1625, when a brick perimeter wall was also begun. The levelled ground within grew crowded with buildings. A survey of 1634 by another Peter Pett, the son of Phineas, with whom he built the *Sovereign of the Seas*, noted houses for the Master Builder (shipwright) and Clerk of the Cheque, storehouses, saw-houses, cranes, timber yards, saw-yards and a smith's forge, as well



77. Dockyard officers' houses of the 1660s and earlier (above), and the Great Storehouse of c.1693 (below). Watercolours of 1698. *Demolished*

as the single and double docks. An additional half acre on the yard's east side was acquired in 1639; this made possible a new main entrance, from a river- and road-side esplanade near the church.⁶

The First Anglo-Dutch War of 1652–4 impelled further improvement. The Admiralty decided against purchasing the East India Company's Blackwall Yard, and in 1653 ordered the building of a new dry dock at Woolwich. Completed the following year, this must have been a reconstruction of the single or eastern dock – Woolwich never had more than two docks. There were new timber sheds, another domestic range replaced the tile kiln to the south, and further buildings were added, including, in 1656, timber-built storehouses to the east. A visit to Woolwich in 1661 prompted Samuel Pepys to comment 'strange it is to see what neat houses all the officers of the King's Yards have.'⁷ Even so, in 1663 the yard was extended westwards via a lease of manorial land that had been a ballast quay with two houses, and there an irregular group took shape, the site's best houses, timber-framed and gable-fronted, for four senior officers (Ill. 77). In front of these, and behind a slip, a brick mast-house was put up in 1667. Other

building (all in timber) that continued into the 1670s included a clock house – workforce discipline had become a pressing problem. This was between the two docks and incorporated a mould loft, an open floor on which ships' lines were drawn and moulds or patterns for their parts made, above an open ground floor with sawpits. There was also another three-storey storehouse.⁸

Despite these works, Woolwich receded in importance. At the end of the century the royal dockyards were compared in a survey prepared for William III by Edmund Dummer, Surveyor to the Navy Board. The value of Woolwich in 1688 was calculated at £9,669, which placed it ahead only of Sheerness (£5,393), and behind Deptford (£15,760), Portsmouth (£35,045) and Chatham (£44,940). Accompanying plans of the yards in 1688 and 1698 (Ill. 75) highlighted improvements overseen by Dummer. During these years of war with France there was great awareness of the importance of sea power and there were vast works elsewhere, including the beginnings of Plymouth Dockyard. But the Woolwich yard saw little more than clearance of its south-west corner for new perimeter buildings. Prime among these was a 'Great Storehouse' of



78. Woolwich Dockyard from the north-west. Engraving of 1750 by John Boydell

around 1693, brick-built and palace-fronted towards the double dock (Ill. 77); Dummer's classicism stood in sharp contrast to what had preceded.⁹

THE EIGHTEENTH-CENTURY DOCKYARD

Once again, and despite diminished standing within the country's naval works, Woolwich Dockyard proved resilient. It overcame incipient decline and saw its largest expansion yet in the first half of the eighteenth century, to more than double in size via extensions east, west and into the river. The construction and reconstruction of numerous water facilities and buildings accompanied this enlargement (Ills 8, 75). There was an attendant rise in the workforce and the increased scale of operations carried ever greater impact in terms of the growth of the town of Woolwich. Residential development along the south side of Church Street prevented any conceivable inland expansion. There were great fluctuations as wars came and went, but whereas 511 men (of whom 320 were shipwrights) were on the yard's books in 1712, there were 1,111 in 1774. Working conditions were exceptionally unhealthy, one reason given for the paving of much of the yard in 1710.

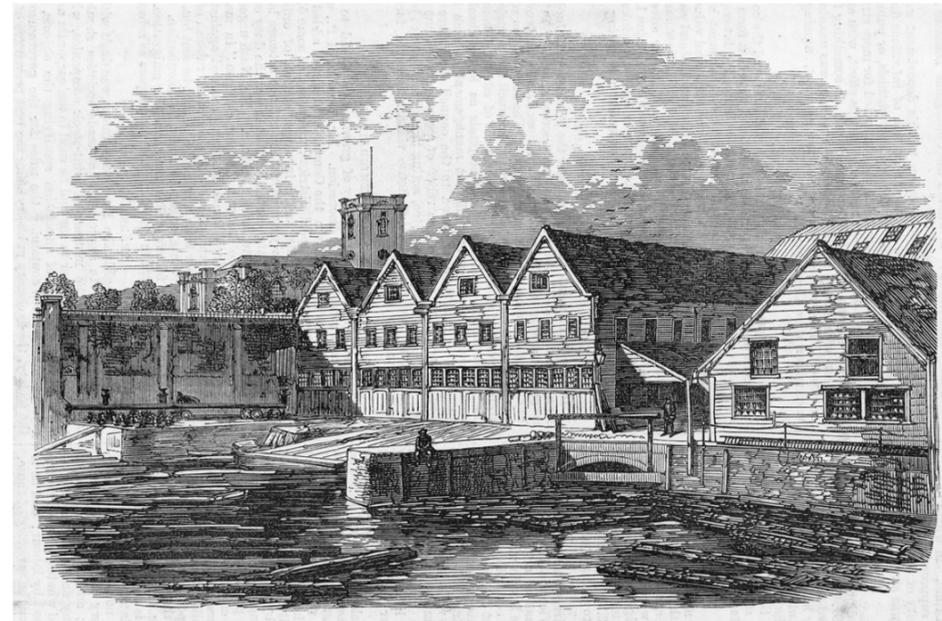
The War of the Spanish Succession provided an early boost. The smaller dock was altered in 1701 to take first-rate ships and by 1713 seventeen new ships had been launched, far more than from any other British yard in this period. The leased western land was acquired freehold in 1705 and 1710. More physical growth followed in the 1720s, a period of relative peace, but one characterized by naval vigilance and armed diplomacy. Yet more came after the resumption of war in 1739. Other dockyards were also improved, and the semi-metropolitan sister yard at Deptford was

comparably enlarged. Through the century both Thames-side yards remained indispensable for the construction of new warships and heavy repair. In addition both, though Woolwich less than Deptford, were well situated to serve other yards and the fleet as depots for stores that had to be purchased from London's commercial markets. These strengths offset the problems of limited space and water depth, which became acute later in the century.¹⁰

Enlargements and rebuilding, 1720–54

The first direction of expansion was eastwards onto the sites that are now Mast Quay and Mast Pond Wharf. This involved the acquisition of part of the churchyard and the reclamation of a swathe of foreshore to permit the construction of a large mast-pond, attendant buildings and three new slips, a great boost to shipbuilding capacity. The project was under way by 1720, when the single dock was also again rebuilt. Soon after this the mast-house and slip of the 1660s were replaced by another slip. The double dock was also remodelled, taking on straighter lines. All these works were probably largely complete by 1728. Around this time the main gate was relocated to a bend in the road, still facing east towards the soon-to-be-abandoned medieval church.¹¹

The next episode of expansion was northwards into the river. By 1747 wharfage had been pushed out along most of the old front to align more or less with the eastern extension. In addition a 3½-acre ballast wharf abutting the west end of the yard was purchased in 1743 from Edward Bowater, who now held the manorial lands. An old brick house was cleared, and in 1746 the wharf was enclosed with a brick wall and equipped with a 'house crane' (one given, its jib aside, a hut-like cover; Ill. 78).¹²



79. Mast-pond and mast-houses of the 1720s, with later boat house to right. Engraving of 1869. *Demolished*

The formation of the mast-pond, where mast timber was stored to prevent it cracking, was a major undertaking. Measuring about 280ft by 200ft (84m by 60m), this rectangular body of water had a double-gated lock entrance from the river and, unlike a wet dock, was capable of being pumped dry. On its west side there were slips up to timber-built mast-houses, where the timber was worked or seasoned and the finished masts stored (Ill. 79). Sheds north of this were for the making of small boats to place on ships.¹³

The construction of the shipbuilding slips would have been comparatively straightforward, as much a matter of reclamation as of excavation. That to the east (nearest the mast-pond) was built entirely on reclaimed land. Repeatedly rebuilt since, it survives at Mast Quay, as, to the west, does another slip more or less where there was once a pair (Ills 75, 76). The early Georgian slips were made with crude timber revetments, and these two, at least, were lined with timber planks. The eastern slip was lengthened in 1753 when the wharf in front was



pushed further forward and faced with brick. The slip that replaced the earlier mast-house in the western part of the yard, enlarged in 1764, was reinforced with timber piling and tie-backs.¹⁴

Much of this improvement would have been initiated and carried out by the yard's own officers, principally the Master Shipwright, John Hayward from 1715, and artisans, who had skills across the range of construction work. The same applies for the many new buildings that went up in the 1720s and 1740s. Along the yard's southern perimeter these included a large timber-framed smith's shop and a pay office, storehouse, lodgings and, south of the mast-pond, a stable range, all of brick. In 1740–1 two significantly larger buildings were erected. A brick rigging house, of three storeys and twelve bays on substantial brick-arched footings, rose up on the anchor wharf on the mast-pond's north side (Ill. 80). Less plain was a sail and mould loft, an upshot of the bringing-in-house of sail-making that provided an opportunity to obtain a much bigger floor for drawing and mould making. Situated east of the Great Storehouse, this looked like an outsized market hall, a long range with an open and arcaded lower storey below two full storeys and garrets; a shaped and pedimented gable faced the river (Ill. 81). Hayward was still Master Shipwright, but designs for a building as large as this may have been prepared centrally, conceivably by Benjamin Glanville, Inspector of Repairs to the Admiralty and Surveyor of Works to the Victualling Office.¹⁵

Integrated use of the western extension of 1743 required clearance of the houses that enclosed the yard to the west (Ill. 78). They were replaced in 1749–54 by a terrace of five officers' houses, west of the Great Storehouse and facing the river, designed in-house but built by contract (Ills 13, 75, 80, 81). Unlike the other naval dockyards, Woolwich and Deptford were under the Navy Board's direct control and did not generally have resident commissioners. The men of greatest consequence at the yard were the Master Shipwright (Thomas Fellowes from the late 1740s to 1752, then Adam Hayes), the Storekeeper, the Clerk of the Cheque, the Master Attendant and the

Clerk of Survey. They were all now accommodated in this handsome row of double-fronted houses. They were also deep in plan and to the rear there were free-standing service ranges and, beyond a lateral passage, private gardens up to the road. This was ample, certainly, but less opulent than earlier and equivalent officers' housing at the other principal naval dockyards. The row most closely echoed at Woolwich was that built in Chatham in the 1720s. The terrace, Great Storehouse and mould loft were all demolished in the early twentieth century.¹⁶

Late eighteenth-century problems and expansion

Neither the Seven Years War, which demonstrated inadequacies in the navy's dockyards, nor the subsequent peace, which gave rise to extension schemes at Portsmouth and Plymouth, had much impact on Woolwich Dockyard. Relative decline was in large measure a matter of awkward access. The larger size of ships, silting in the Thames exacerbated by London's growth, and the deleterious effects on ships' bottoms of long exposure to fresh water all combined to work against Woolwich and Deptford.

There were other difficulties. Labour relations in the dockyards generally had become institutionally fractious. The large waged workforces, without parallel at the time, were well organized across the yards and quick to defend their status against management initiatives for change, most symbolically in relation to 'chips' or waste timber – a traditional right or perquisite to the workers, but theft to the Admiralty. There were frequent strikes, beginning at the Woolwich ropeyard in 1729, and in Woolwich and Deptford dockyards in 1739, 1742 and 1744; stoppages in wartime, when demand for labour was at its peak, were not quiet events and troops were occasionally called in to quell riotousness. Inefficiencies, extending to jobbery, corruption and theft, were left to fester. Another clash between Woolwich shipwrights and the Navy Board came in 1757, after which the former's solidarity was strengthened through the formation of a retail society with its own corn mill (see pages 413–14). The most serious strike, in 1775,

80. Model of Woolwich Dockyard, 1772–4, with the rigging house of 1740–1 (far left) and the officers' terrace of 1749–54 (far right). *Buildings all demolished*





81. Woolwich Dockyard and environs. Bird's-eye view painted in 1790 by Nicholas Pocock, showing western areas of the yard (right) as then intended, though not carried through, otherwise as it existed

was a reaction to the Earl of Sandwich's introduction of a new pay system, 'task work' or piecework, to replace day rates. Resistance was not finally broken until the early years of the nineteenth century. Samuel Bentham, Inspector General of Naval Works from 1795 and an ardent proponent of reform through technological progress, was instrumental in reshaping dockyard production to undermine the shipwrights' 'republic of wood'. He had himself been an apprentice shipwright at Woolwich in 1771–5.¹⁷

The yard's compact size also compromised its efficiency, a state of affairs identified in a report of 1774 and apparent in a detailed model of the dockyard, one of a set presented to George III (Ill. 80). Cramped conditions meant that warships had to be built in private yards. This was addressed through the acquisition of substantial further lands to the west, almost doubling the size of the dockyard (Ill. 75). This western property was already in occasional naval use by 1750, as a frontage for mooring and land for laying up timber. In 1771 the younger Edward Bowater established himself as a ship- and boat-builder on the site, equipping a dockyard with two slips, a brick wharf, cranes, sawpits and a mould loft for the use of the East India Company. But two years later he was taken into the custody of the Marshalsea. The Crown then leased the lands, which, along with a more western expanse of marsh and reedland, were purchased outright in transactions of 1779 and 1784.¹⁸

The main purposes of the extension seem to have been to provide space for storing the imported timber that was used for shipbuilding and repair, and to enhance mast-making capacity at a time when the increased size of English warships' masts meant that only the royal dockyards could make them. Beginning in 1784 the marsh was reclaimed, Bowater's slips infilled, the frontage extended north into the river and the yard enclosed by a high brick wall on piled foundations.

Convicts provided the labour for much of this work. The loss of the North American colonies as a destination for transportation had prompted legislation in 1776 that authorized the (initially temporary) use of hulks to detain convicts on the Thames. This provided a workforce for dredging to improve the river's navigation, in particular access to the naval dockyards at Deptford and Woolwich. Duncan Campbell, who had been the contractor for transportation to America, was given control of the project and immediately moored two hulks off Woolwich. By 1778 these had received 632 convicts, of whom 176 died and 24 escaped. The convicts diversified from dredging to work on the shore, here and at Woolwich Warren (see page 148 and back endpapers). They remained a local presence until the 1850s.¹⁹

Detailed plans for development of the western yard were prepared in the late 1780s to include, to the west, inner and outer mast-ponds with intervening ranges of mast-houses and storehouses and, further east, seasoning sheds and workshops flanking a new mould loft, with sawpits and open ground near the river for the orderly stacking of timber. These improvements were under way by 1789 and, again employing convict labour, seem to

have continued until 1793. A double rope house, extending 1,168ft (356m) along the southern boundary, was projected and depicted by Nicholas Pocock, but not in fact built. Instead, a long shallow open shed was built in this position at some point prior to 1810 (Ills 75, 81).²⁰

Before the western lands were developed, the whole dockyard was given a new fulcrum where the old and new grounds met. This took the shape of an office block (the Clock House) and a new main entrance from Church Street. These are the dockyard's earliest surviving buildings, accounts of which are here brought up to the present.

The **Clock House** is the grandest dockyard building left in Woolwich (Ills 82, 87). It was built in 1783–4 as an administrative headquarters, to replace the old clock house and to house offices at the centre of the enlarged yard. It is an almost cubic block that stood in isolation, a beacon of supervision and control, with aspects to each side – to the river, the old and new working yards, and a new main entrance (Ill. 81). Designs for humbler offices had been prepared in 1778, but the yard's expansion evidently justified greater ambition. The building may have been designed by James Arrow, the Admiralty's Inspector of Repairs, or by or under (Sir) Henry Peake (1753–1825), the Master Shipwright at Woolwich in 1782–5, who moved on to Deptford and then Portsmouth before becoming Surveyor to the Navy. Construction is likely to have been the responsibility of John Johnson, master of the dockyard's forty-three house carpenters, and Joseph Cox, master of its fifteen bricklayers.

Pedimented centres on the entrance and river fronts relieve the building's plain stock-brick elevations, but the proportionally squat block gets more vivacity from its prominent central timber clock turret, with clock faces under segmental cornices to all four cardinal points; an original square upper bell stage was replaced with an octagonal cupola in the nineteenth century. The building's hipped roof gives it an old-fashioned Dutch appearance, but its austerity of form is in step with more contemporary Thames-side villas, and the internal planning, in particular, was reminiscent of designs by Robert Taylor. It housed offices for the yard's most senior officials, resident in the nearby terrace, and their subordinates, who operated in several discrete departments. Each department had its own suite of plain but well-proportioned rooms off a central staircase. This was the first time a purpose-built office building in a naval dockyard was given such inter-departmental links. Previously office departments had been ranged in series, with separate front doors. This step was perhaps inspired by the co-location of government offices to Somerset House, begun in 1776 and occupied by the Navy Board from 1786.²¹

After a succession of office uses the Clock House was largely rebuilt in 1977–8 as a community centre for Greenwich Council, the council's architects using direct labour and Norman & Dawbarn Associates as consulting engineers. Because of concerns about loadings, the interior was gutted and replaced with a concrete structure, while much of the brick walling was remade on a new concrete



82. The Clock House, 1783–4, from the south in 2011



83. Former Master Warder's lodgings, guard house and dockyard entrance, all of the 1780s. From the north, c. 1969

plinth and the porches were renewed. The bell cupola was rebuilt in 1983. Inside there are pictorial Victorian tile panels, moved here from the Clarence Arms public house on the Plumstead Road.²²

Entrance gates, guard house and Master Warder's lodgings. The present entrance gate from Woolwich Church Street, aligned on axis with the offices, was probably formed in 1784, perhaps to designs by Arrow. Its Portland stone-panelled piers bear reliefs of fouled anchors, proclaiming the naval presence. An eastern footway was not formed until the 1790s, perhaps around 1797, when the old dock entrance was closed up. Openings to the west in stuccoed brick are later. From around 1830 a separate carriage entrance with plainer piers led to the yard of a large house (see below); flanking openings followed. An ornamental wrought-iron overthrow between the main piers and a jaunty wooden belfry on the west side, no longer extant, seem to have been added in the late nineteenth century after the dockyard closed. Boundary walls extend along Church Street to east and west, of stock brick with pilaster strips and stone dressings. The eastern wall stands in front of a sheer drop into the dockyard. Both were much rebuilt in the 1840s and long stretches were cut down in height in the late twentieth century.²³

On the inner east side of the entrance gate there are two buildings of 1788–9, erected as a guard house and the Master Warder's lodgings (Ill. 83). The former, nearest the gate, was a single-storey range with a Portland stone Tuscan loggia. It is superficially similar to a design produced in 1764, when dockyard security and deemed theft were matters of growing concern, but its classical purity suggests that it was designed outside the yard, possibly by S. P. Cockerell, the Admiralty's Inspector of Repairs from 1785. The more vernacular lodgings followed local house-

building practice in having its chimney stacks between the front and back rooms. Its double-fronted brick elevation has quasi-Venetian ground-floor windows to its original outer bays, most likely a shipwright's approach to classicism, but conceivably a faint echo of Cockerell's Admiralty House, Whitehall. An entrance and staircase bay to the south is an extension of about 1840, infill that blocked the passage between the officers' terrace and its gardens. The wooden half-glazed porch was removed in the 1970s.²⁴

After Woolwich Dockyard had been redeveloped with housing, the former guard house and lodgings were brought together in 1981 as a public house, 'The Gatehouse', in a conversion for Whitbreads designed by L. R. Luxford and Associates, architects. The buildings were reconverted to flatted residential use by Gallions Housing Association in 2007–8, to designs by Buckley Gray Yeoman, architects, and the Knott and Mercer Design Partnership, with William Dunk Ltd as building contractors. The guard house gained a steel-and-glass upper storey and was extended to the rear with an additional block beyond.²⁵

Wartime adjustments, 1793–1815

The French Wars placed exceptional demands on the royal dockyards, which raced to build and maintain warships that would give Britain naval superiority. Such were the requirements that England's merchant yards, many of them on the Thames, were engaged to an unprecedented degree, building some two-thirds of the navy's ships during the years of conflict. Given the pressures and the navy's preference for repairing its own ships whenever it could, Deptford and Woolwich dockyards remained vital in their time-honoured roles of heavy repair and construction. Woolwich launched the first-rate *Nelson* (in 1814), a second rate, eight third rates, and some fifteen smaller vessels, including frigates and sloops. Industriousness on this scale demanded a huge workforce. That in Woolwich almost doubled from 1,023 in 1792 to 2,026 in 1814; the majority were shipwrights and other artisans, fewer were labourers.²⁶

War kept the dockyard busy, but long-standing drawbacks associated with its distance from the sea, cramped infrastructure and susceptibility to shoaling meant that the threat of closure was rarely far away. These troubles were not unique, and in 1800 Bentham proposed replacing all four eastern naval dockyards with a large new facility on the Isle of Grain. This came to nothing, as did John Rennie's scheme of 1807 for a major yard at Northfleet. But the problems posed by mud and location continued to trouble the Thames yards. Despite the convicts' constant hand-dredging, the greatest depth off Woolwich Dockyard had diminished to just 18ft (5.5m) by 1799, suitable for mooring lightly ballasted frigates, but not the latest warships. Steam-driven bucket dredging, introduced off Woolwich by 1802 and intensely undertaken in 1807–11, created deeper channels and gave respite. This was, however, an expensive and unsatisfactory solution to the mud problem, barely keeping pace. Such was the rate of accumulation

that by 1815 heavily laden craft had to wait until the top of the tide before approaching the wharf.²⁷

Increased activity within the dockyard called for further expansion, warehouses in London having been hired in 1801–2 to store hemp because of the amount of stacked material awaiting reshipment at the two Thames yards. But this could only be done opportunistically. Three parcels of land bordering the western part of the Woolwich yard were acquired and fenced between 1808 and 1811, when John Bowater's estate was passing over to John Long (see page 7). This land comprised seven acres to the west up to what later became Warspite Road, beyond a road and landing place that had been formed in 1781, now stopped up, and a somewhat smaller plot to the south that the then curvilinear Greenwich Road circumscribed (Ill. 75). At the east end of this plot, near the dockyard entrance, there stood a substantial farmstead, a three-storey house with twin bow windows to the west, in front of ranges of outbuildings. This had been occupied by Samuel Hardin (sometimes Harden, or Harding), the foremost farmer in the parish, who died in 1803. His son, also Samuel, died in 1810. The house was made a public house by the 1820s. It later accommodated the dockyard's Commodore Superintendent before being adapted as offices. It was demolished around 1970. There were also some humbler houses along the road – Charlotte Place and Adam's Cottages, but these did not last long.²⁸

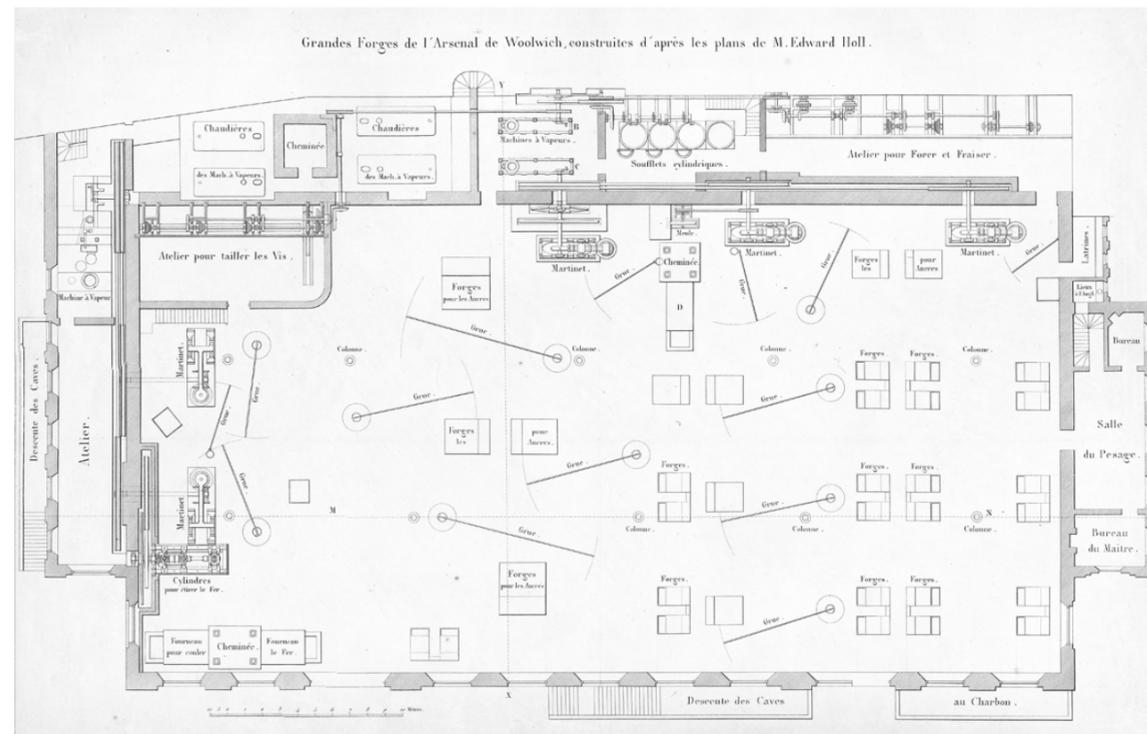
The exigencies of war ceased and the newly acquired lands remained otherwise undeveloped until the 1820s and 1830s, used simply for the storage of timber and other materials. Wartime building activity in Woolwich was confined to the older eastern part of the yard. By 1810 the early eighteenth-century mast-pond and mast-houses had been given over to boat building, and buildings along the perimeter wall near by had been replaced, most significantly with a boiler-house and detached chimney south of the eastern slip. Along with another boiler-house, attached to a temporary smithery on the site of the seventeenth-century clock house between the dry docks, this marked the introduction of steam power to Woolwich Dockyard. Small steam engines may have been in place before 1805, when Bentham departed for Russia. His mechanization programme bore no other fruit in Woolwich, but there were initiatives. The idea that ropemaking could be moved into the dockyard had been ambitiously revived. Bentham, Simon Goodrich, his mechanist, and Edward Holl, the navy's second salaried architect (in a post created by Bentham in 1796), planned a five-storey, quadrangular, fireproof, steam-powered and mechanized ropery in 1802–5, but failed to gain approval for the considerable expenditure involved. There were also unrealized proposals for a steam-powered sawmill designed by Marc Brunel.²⁹

By the end of the war years the benefits and potential of steam-powered mechanization were well established, and Woolwich saw more substantial trial applications. The most renowned of these was a steam-powered anchor forge or smithery, erected in 1814–17 to replace the old smithery between the single dry dock and the perimeter

wall. Designed by John Rennie working with Holl, this smithery was equipped to manufacture the largest anchors and other marine ironwork, and was hailed as the first machine-driven facility of its kind in England, its temporary precursor notwithstanding. The building was also significant from a structural viewpoint, though outwardly of plain brick, with relieving arches and deep bracketed eaves typical of Rennie. Inside, it entirely eschewed combustible timber with a six-bay cast-iron frame, longitudinally divided by two rows of cast-iron columns in arcades with large open spandrels (Ills 84, 85). This was among the earliest iron-framed buildings to have roof trusses assembled from separate castings for its compressive members with wrought-iron tensile elements; it may be that Goodrich had a role alongside Holl in the design of this and similar roofs in other dockyards. Under the direction of Rennie's son, George, Boulton & Watt supplied the engines – two in 1814 to power two forge hammers for anchors, a drilling and boring machine, and a lathe, and for blowing forty-two fires, and another in 1815 as a second forge engine. Ships' parts were not the only articles produced in the smithery; an iron replacement for John Nash's Pagoda Bridge in St James's Park, burned during the grand fête of 1814, was wrought in 1818.³⁰



84. Smithery, 1814–17, interior in 1973. Dismantled



85. Plan, as published by Baron Charles Dupin, 1821



86. Interior as Ordnance College workshop, c.1900

SMITHERY, 1814–17. *Dismantled*

This smithery saw later use as a workshop for the Ordnance College (Ill. 86). It was taken down in 1973–4, with a part of its iron frame salvaged and later re-erected at the Blists Hill site of the Ironbridge Gorge Museum in Shropshire. There it survives, housing displays of wrought-iron manufacture.³¹

Another early application of steam at Woolwich was to the softening of large planks of wood to form curved ship's hulls, a process assisted from 1813 by a plank-bending contraption devised by William Hookey, master boat builder. This helped offset difficulties with the acquisition of increasingly scarce and costly 'compass' timber. Artificially curved and laminated oak pieces were first used in the hull of the *Black Prince*, launched in 1814.³² Experimentation in the auxiliary process of rot-proofing the timber by impregnating it with a mineral solution using high-pressure steam engines proved less successful. In January 1813 a machine burst, killing eight, maiming many others and destroying the workshop and part of the dockyard wall.³³

THE STEAM ERA TO 1849

Shipbuilding, repair and employment levels fell during peacetime, but once again Woolwich Dockyard recovered to enter another period of expansion through modernization. In the late 1820s, as Thames shipbuilders intensified the development of marine steam engineering and a growing number of steam vessels entered naval service, Woolwich became the principal naval yard for fitting out and maintaining the navy's steam fleet. Deptford had been favoured initially, and the navy's pioneer steamships were built there in 1822–4. But the Navy Board came to see Woolwich as having a more suitable scale and location for co-ordinating work derived from technological innovations. Crucially, Woolwich had the necessary space through the western lands that had been acquired in 1808–11. This led to major reconfigurations of the dockyard's water system from the late 1820s through the 1840s, and the building of a steam factory in the decade from 1838, all the while drawing on the availability of convict labour.

River wall, docks, basins and slips

The western section of the dockyard's river or wharf wall (about 750ft/230m) was taken down after a partial collapse and rebuilt in 1817–19 on a more recessed (southern) line, to create a straighter frontage and be less obstructive to the flow of the river. The work followed design proposals from Rennie, amended by Holl and others, possibly including Capt. Samuel Brown, the chain manufacturer and bridge designer. This stretch of brick wall has been refaced in late twentieth-century concrete.³⁴

The planning of a new steam yard behind this frontage appears to have begun in 1825. The dockyard's western grounds permitted the enlargement and conversion of the outer mast-pond to form a substantial enclosed steam basin of almost four acres (412ft/126m by 330ft/101m and 24ft/7m deep). Here boilers and engines could be fitted to the largest ships afloat. The elder Rennie having died, the engineer given responsibility for this was his younger son, John. The basin was already in use in 1827, when employees of Maudslay, Son & Field were fitting out the *Echo* and *Confiance*, the first steam vessels built at Woolwich, though it was not finally complete until 1831. The younger John Rennie also oversaw the building in the late 1820s of two new slips (later 1 and 2) east of the mast-pond. Together these were significant developments, an embryonic first naval steam factory, and a severe blow to Deptford.³⁵

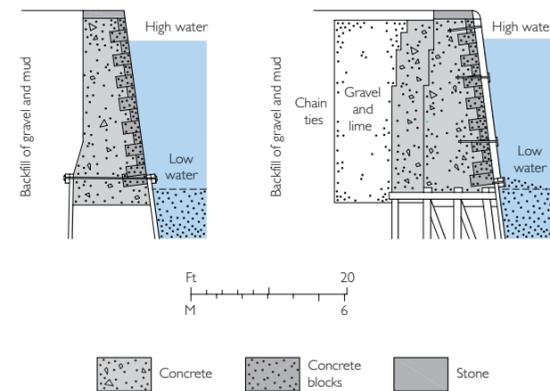
There were plans for the further enhancement of this facility in 1831 when George Ledwell Taylor, Holl's successor as the navy's architect, prepared alternative layouts for a boiler-shop on the side of the new basin. This would have made the complex a real factory, but the timing was unfortunate. Further development was stymied in a climate of general cutbacks, measures imposed by Sir James Graham as First Lord of the Admiralty that included abolition of the Navy Board in 1832. A scheme from Marc Brunel for replacement of the Woolwich dry docks, which he thought the most defective anywhere in the royal dockyards, was stillborn.³⁶

Taylor appears to have found his way round such constraints, even going ahead with works without sanction. For this, and the fact that he underestimated the costs of works at Woolwich, he was forced to resign as navy architect in 1837. The post was replaced by a Director of Engineering and Architectural Works to the Admiralty. Capt. Henry Rowland Brandreth, RE, was given this appointment at the head of an Admiralty Works Department, staffed by Royal Engineers through the Board of Ordnance. Brandreth's input at Woolwich was secondary to that of his talented Woolwich-based subordinate, Lt. (Sir) William Thomas Denison, RE (1804–71), a highly effective manager and reformer who worked and lived in Woolwich until 1845, achieving much in the dockyard, not least the formation of the steam factory, and elsewhere in Woolwich. Knighted, he left England in 1847 to become Governor of Van Diemen's Land (Tasmania), to which thousands of convicts were transported from Woolwich in the same decade. There he began a successful second career as a colonial governor, and rose to serve as Acting Governor-General of India in 1863.³⁷

Realignment of the central sections of the dockyard river wall, overwhelmed by mud, had been under consideration from at least 1818. But before that major project was definitively addressed a small triangle of land at the north-west corner of the yard, part of what had been Long's Wharf (see below), was acquired to square off the site. Here, in 1831–7, a protruding bank was removed and, under Taylor, a new river wall of granite ashlar, about 200ft (60m) long, was formed. These works probably also



87. Dockyard river wall, 1835–8, with landing place in front of gun battery of 1847. Behind are the Clock House and Woolwich Dockyard Estate housing, with Frances Street towers beyond. Photographed 2010



88. Dockyard river wall, 1834–5, sections as begun (left) and as completed (right)

included the granite-paved public river stairs and the stone-sett causeway at the end of Trinity Street (Warspite Road) (Ill. 89). All this survives. In addition, a stock-brick boundary wall with granite plinth and coping was built in 1833 along Trinity Street to seal the dockyard's west side. This too is largely extant.³⁸

The rebuilding of the central sections of the river wall, adopting a more northern and straight line, to help scour the mud, began in 1834. Taylor gave the contract for this work to William Ranger. In an early application of Ranger's patent 'artificial stone' (lime concrete), following on from Brighton's sea wall, his site agent, Charles Nixon, oversaw the use of gravel from the centre of the river for the concrete. It was poured between rows of timber sheet piling for the wall's back parts; precast concrete blocks were fixed to the front (Ill. 88). Lengths of about 300ft (90m) eastwards from the new slips (1 and 2) and 250ft (75m) to the far east in front of Mast Pond Wharf (where there was no realignment) were up before doubts about stability, prompted by problems with a dry dock (see below), led to a redesign by James Walker, an eminent and elderly dock engineer. This introduced bearing piles below much thicker walling. By 1837 a further 700ft (210m) had been built in this way, taking the western frontage past 3 Slip to a point in front of the dockyard's old landing place. But the concrete spalled in the winter of 1837, so Denison, now on the scene, directed refacing – he had worked under Col. Charles William Pasley, RE, who had criticized Ranger's system in 1836. Denison suggested granite, but settled for brick. Some years later he conceded that the concrete might have been sound if left. There was some rebuilding in the 1950s, but parts at least of Ranger's concrete wall must still be in place behind the brick, though much of that is further concealed behind late twentieth-century concrete. The blocked granite-ashlar entrance to

3 Slip remains discernible north of Antelope Road. Another section of the river wall, from and including the central landing place, where there are opposed flights of stairs, as far east as 2 Dock, is probably datable to 1838 and was entirely Denison's responsibility. It is faced with granite ashlar, as are remaining sections from that point east to 6 Slip, which followed around 1844 (Ill. 87).³⁹

A second project undertaken by Ranger in 1834 proved an even less successful application of his patent concrete. This was to be a dry dock on the river at the new north-west corner of the yard. Obligated to deepen the dock after he had begun, Ranger was unable to resist ground water and the dock's concrete bottom heaved 'like the human breast'.⁴⁰ It was to remedy this that Walker was first called on in 1835, but the work had to be abandoned.⁴¹

As Brunel had observed, the dockyard's dry docks were in need of replacement. Another of Denison's early tasks was the rebuilding of the western dry dock (the one-time double dock). This happened in 1838–41, once the new river wall had come this far east. The old timber-built docks were decaying, silted up and too small for contemporary large ships. Denison's granite-lined mass-concrete dry dock (henceforward known as 2 Dock) drew on formal precedents by the elder Rennie and others, but was larger in scale with a 241ft (74m) bottom length (272ft/83m at coping level) and 65ft (20m) entrance width (Ill. 90). The solid bedrock here, where the dockyard had begun 300 years earlier, permitted a flat base rather than the more usual inverted arch. The size of the altars or steps up the dock's sides varied, some narrow to facilitate the shoring of vessels, some wider to permit easy circulation. The dock was fitted with an iron caisson, preferred to gates because of the problems with mud, and made by Ditchburn and Mare of Blackwall. The main contractors may have been Grissell & Peto.⁴²

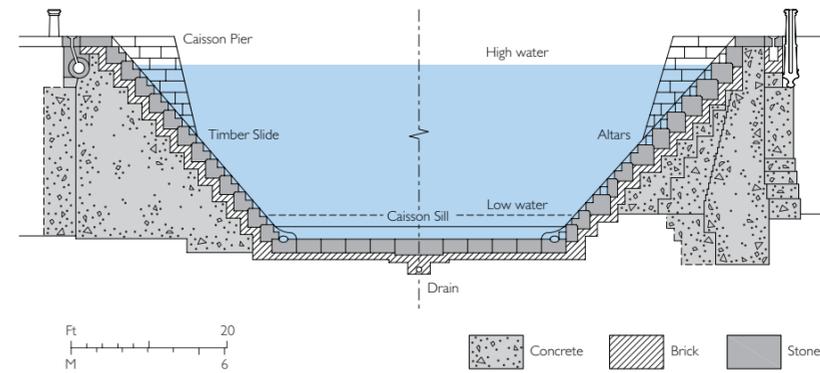


89. Trinity Stairs and causeway, and the west end of the former dockyard's river wall, 1831–7. Photographed in 2011

This firm was certainly responsible for works of 1841–3 at the west end of the dockyard associated with the formation and early success of the steam factory. The late eighteenth-century mast-pond was now enlarged to be a 2½-acre inner basin off the south-east corner of the outer basin (Ill. 75). This enabled two steamships to lie alongside the factory to have their engines, boilers and other machinery fitted simultaneously. In addition, and instead of the failed western dock, a granite-lined dry dock was completed in 1843 off the outer basin's south side. This (1 Dock) was designed by James Walker with John Baldry Redman for their firm, Walker & Burgess, in consultation with the naval architect Oliver Laing; the dock's cross section mirrored that of Laing's *Trafalgar*. At 265ft (81m) in length and 80ft (24m) in width at coping level (250ft/76m and 65ft/20m at the bottom) – big enough to anticipate future growth in the size of ships – this dry dock was considerably larger than any other yet made.⁴³ A proposed third basin on marshland yet further west came to nought. The inner basin was infilled during the First World War, the outer basin around 1930 and 1 Dock around 1960. Ruston Road and Harlinger Street now mark the site.

Back on the river, the eastern dry dock was rebuilt in 1844–6 as 3 Dock, once again of conventional granite-faced mass concrete, to designs by Walker & Burgess. The contractor was Peter Rolt, a descendant of the Pett family, still involved in shipbuilding, and a timber merchant based in Rotherhithe. This was the largest dry dock of all, with an 80ft (24m)-wide entrance, 291ft (89m) top length and 264ft (80m) bottom length. With the completion of this suite of masonry-lined docks Woolwich could accommodate three first-rate ships for repair, and there was room for a further three on the dockyard's slips, an overall capacity exceeded only by Chatham and Pembroke.⁴⁴ The two riparian docks (nos 2 and 3) are the earliest extant dry docks associated with the steam navy. They retain little of their mechanical ironwork, such as capstans, though there is a crane base to the south-east at 3 Dock. Modern steel caissons seal both docks, which, permanently flooded, are used for fishing and recreation as the South-East London Aquatic Centre (Ill. 102).

With the rebuilding of 3 Dock in the mid-1840s flanking sections of river wall were brought forward into line with the work of the 1830s, and the easternmost slip (6 Slip)



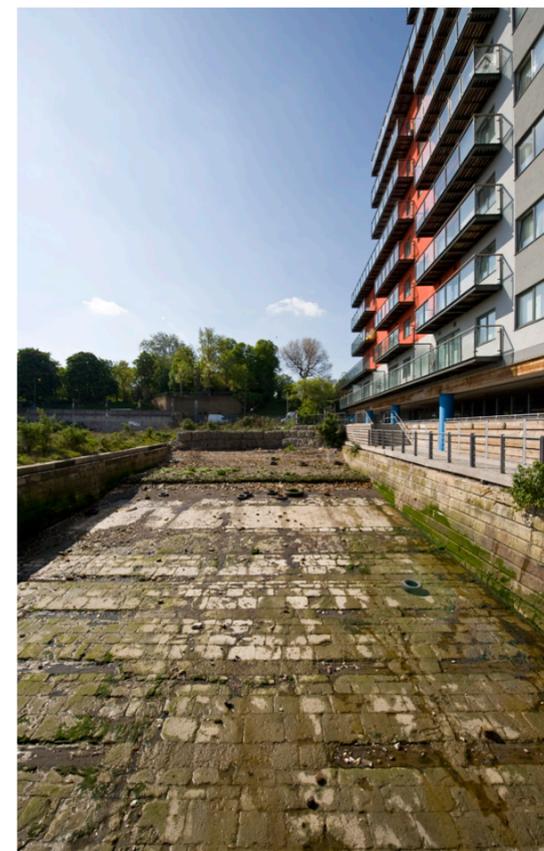
90. 2 Dock, 1838–41, section (above) and view from the north c.1969 (below)



91. 6 Slip, 1844–6, from the west, 1997



92. 5 Slip, 1855–6, from the south, 1997

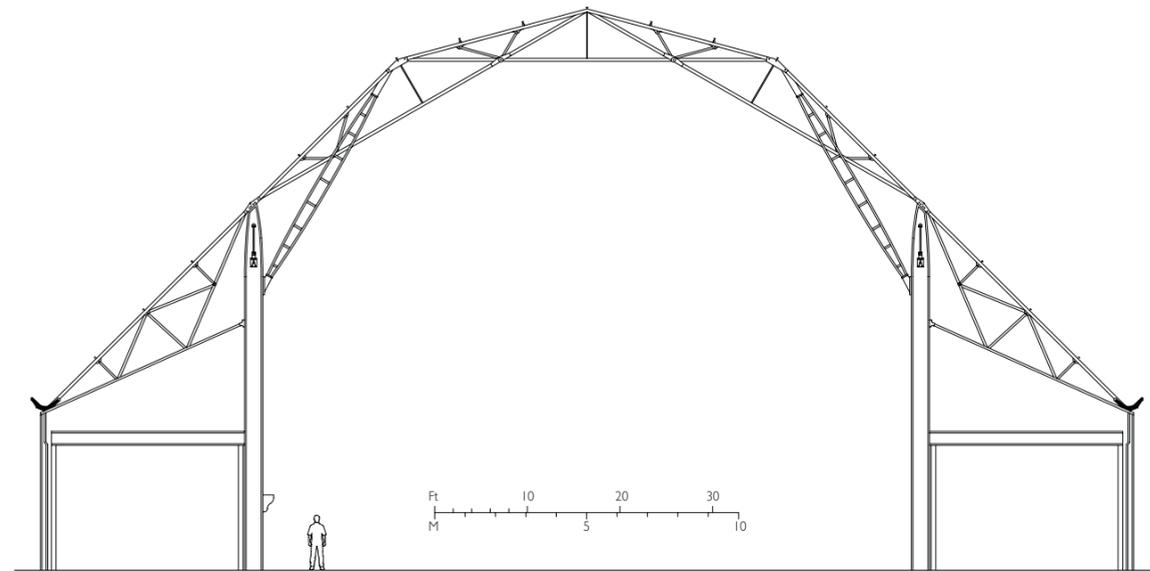


93. 6 Slip from the north in 2009

was lengthened, straightened and granite-lined (Ills 91, 93). As ships became bigger, the slips needed to support ever greater weights. Further west, a single slip (5 Slip) replaced a pair in 1855–6. This is granite-paved with stone-coped brick side walls (Ill. 92).⁴⁵ These slips saw a late return to use for shipbuilding in the 1970s and have since been preserved beside the housing blocks of Mast Quay.

Slip covers (demolished). After the Napoleonic Wars a new building type, the slip cover, appeared in the royal dockyards. Between 1814 and 1821 nearly all the state's shipbuilding slips and dry docks were, for the first time, given roofs, reflecting Continental precedent and lessons learned about the consequences of using unseasoned timber. Roofs kept ships free of rot and allowed timber to season during construction. (Sir) Robert Seppings, Surveyor to the Navy, saw the initiative through and took up ideas promulgated in 1812 by Bentham, who thought roofs would also provide a more factory-like working environment. Seppings designed trussed timber frames, some, as for the Woolwich slips, being simple king-post structures. Others, with wider spans up to about 100ft (30m), involved some structural ingenuity. The first roofs over the Woolwich dry docks appear to have been of a wide-span sub-type devised by William Hookey. Those over the three western slips were made or replaced on a larger scale in the late 1820s, in timber and on the Seppings pattern (see front endpapers, Ill. 99).⁴⁶

In 1844 Brandreth and the Royal Engineers under his command began to introduce to naval dockyards a new kind of iron-framed slip cover. Two contractors, Fox, Henderson & Co. and George Baker & Son, supplied these. Structural iron offered advantages in span, rigidity and fire-resistance. The first of these innovative wide-span roofs erected at Woolwich, in 1844–5, covered 6 Slip.



94. 6 Slip cover, typical cross section, 1845. *Dismantled*



95. Former 4 Slip cover, 1847–8, as re-erected in Chatham. Photographed 1997

Designed and fabricated by Fox, Henderson & Co., this measured 218ft by 118ft (66m by 36m) with a main span of 72ft (22m). The structure was close in form to Seppings's timber precursors and virtually identical to two slightly earlier slip covers put up at Pembroke Dockyard in 1844–5 (Ill. 94). I-section stanchions were linked by cast-iron arch girders with openwork webs. There was corrugated-iron cladding and a sprinkler system. The structure was moved in 1880 to Chatham Dockyard, where it was adapted as 8 Machine Shop; it still stands.⁴⁷

The second iron-framed slip cover at Woolwich was erected in 1847–8 over 4 Slip, west of the dry docks. Here Fox, Henderson & Co. introduced a new design, probably devised for the firm by Edward Cowper, wider in span, more robust and about double the price. This corrugated-iron-clad structure measured 310ft by 145ft (95m by 44m) and had a central clear span of 84ft (26m). In the construction of its frame it was a sophisticated and significant departure, using rigid framing or bracing through stiff joints (Ill. 95). Cast-iron framed aisles buttressed a tall nave with wrought-iron roof trusses that incorporated tapered openwork struts, perhaps the first such use of a component that was foreshadowed in the earlier Woolwich cover. Similar struts were used for major long-span roofs in railway stations (New Street, Birmingham, and Lime Street, Liverpool). This slip cover was also relocated in 1876 to Chatham, where it became a boiler-shop. It has recently been adapted to house a shopping mall, the Dockside Outlet Centre.⁴⁸



96. Former steam-factory area from the south-west, 2008

A last iron-framed slip cover, for 5 Slip, was erected in 1856–8 and extended in 1859–60. This was probably designed in-house by Col. Godfrey T. Greene, RE, Brandreth's successor, in a refinement of the Fox, Henderson & Co. type of a decade earlier, to provide taller aisles brought under a single roof. Made by Henry and Martin Grissell at the Regent's Canal Ironworks, it was 290ft (88m) long and spanned 142ft (43m) overall, with a centre span of 82ft (25m). A travelling crane was incorporated. After 1860 timber shipbuilding declined and the slip covers became redundant. This one was also moved to Chatham, where it was adapted as a factory and subsequently demolished.⁴⁹

Steam factory

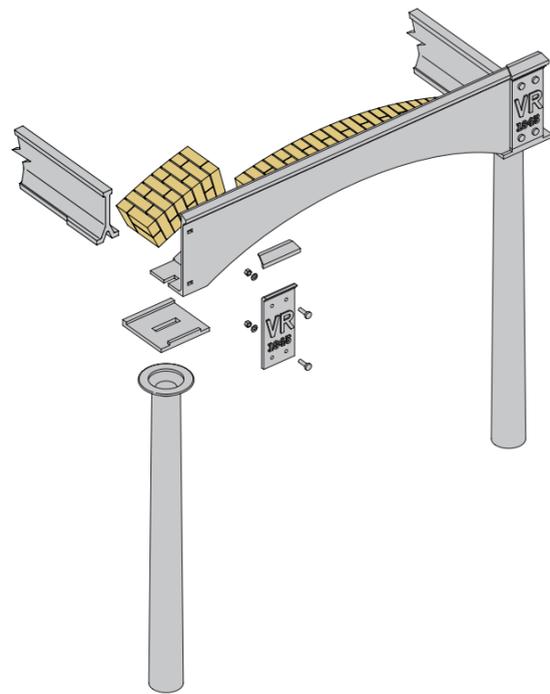
The growing importance of steamships gained new functional recognition from the Admiralty in 1835. All captains were called on to familiarize themselves with the engines, boilers and paddle wheels of their vessels, to help expedite maintenance and repairs, and Peter Ewart became Chief Engineer and Inspector of Machinery. These were decisive steps for Woolwich. The elderly Ewart had been an agent and engine erector for Boulton & Watt during that

firm's formative years in the 1790s. His naval appointment was to procure suitable engines, boiler parts and labour from outside suppliers, but growing dissatisfaction with the failure of private firms to deliver compelled him to bring matters in-house. He died in Woolwich in 1842, after an accident overseeing work on a large boiler. By the beginning of 1837 G. L. Taylor had, in his last work for the Admiralty, overseen the preparation of plans for buildings at Woolwich for the making and repairing of engines and boilers for steam vessels. This scheme for a steam-engine factory was significantly more ambitious than the abortive boiler-shop plan of 1831. The Woolwich steam factory was episodically built, from 1838 to 1847, a drawn-out development whose stages reflected growth in demand, diversification and problems with available space (Ils 75, 96). Design and construction were supervised by Denison, who transformed Taylor's somewhat inefficient plans to create an effective complex of buildings on a limited site. From 1841 Edwin Arthur Bernays had an important role as a clerk of the works. Building was carried out by Grissell & Peto and Peter Rolt.

The steam-factory project began in 1838 with a long range south of the mast-pond, then earmarked for conversion into another basin (see above). Denison designed

a longer (444ft/135m) block than Taylor had intended, to house fitting and erecting shops, a foundry and boiler-shops. He also made it taller, so that overhead travelling cranes could be introduced under wrought-iron trussed roofs, reordered the functions within and introduced communication between the various workshops. This building on the north side of the steam-factory site, of stock brick with sandstone dressings, was originally thirty-nine bays long. Its western two-thirds survive, facing Ruston Road. The only other components of Taylor's scheme to be built, also in 1838, were a freestanding engine-house, south of the east end of the workshops, and a smithery near the yard's western margin, presumably intended to function with the dry dock that had to be abandoned (see above).⁵⁰

Demand for the factory's services grew, so another range followed immediately, extending the engine-house westwards (and parallel with the earlier shops) to house smiths' shops for engine-making, a punching and shearing shop, a coppersmiths' shop and a boilersmiths' shop. There was a detached office to the east. Further development of the complex up to 1843 pushed onto the land procured in 1808–11 (Ill. 10). A steam-boiler factory extended south of the engine-house on a large L-plan. East of this a long narrow two-storey range ran south from the office. This contained additional offices and space for engineers'



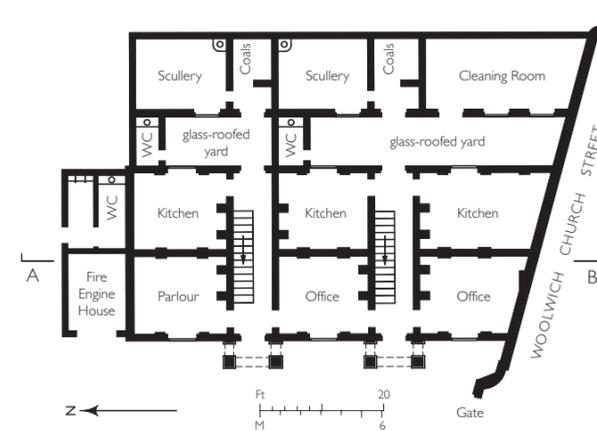
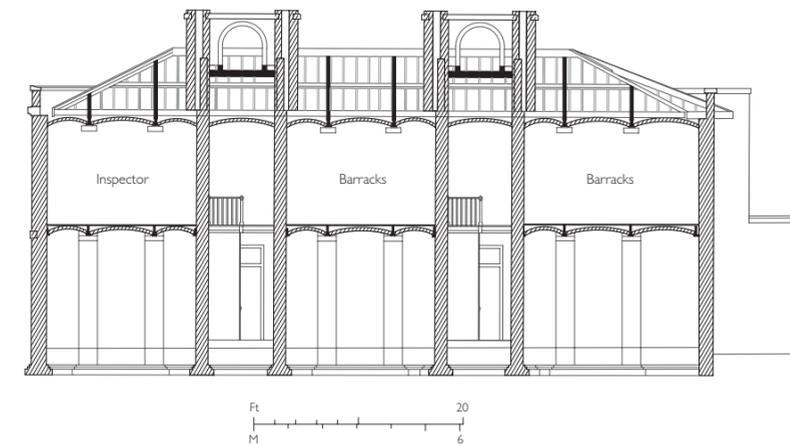
97. Engineers' stores, 1843, exploded perspective view of cast-iron components of lower-storey frame

stores. Sections of the latter's fire-resisting cast-iron frame remain in a clearing west of the entrance to the Woolwich Dockyard Industrial Estate. They include plates cast with 'VR 1843' from the front of the once part-open lower storey, used to store loam and coke (Ill. 97). Denison delegated the design of the 208ft(63m)-high octagonal chimney that still stands next to the boundary wall to a specialist chimney engineer, now anonymous. This, to vent all the yard's flues, was modelled on the latest equivalents in Midlands and Lancashire textile mills. Its panelled base has a bold stone cornice. Though otherwise sparingly detailed, and reduced in height to about 180ft (55m), this is the most evocative remnant of the steam factory. A comparably tall circular chimney, simultaneously erected near 5 Slip, was demolished in 1974.⁵¹

With these works and completion of the inner basin and dry dock in 1843 the factory was functionally integrated and thought whole. However, it remained inadequate for the available work and enhancements continued. In the last phase for which Denison was responsible, in 1844–5, the yard expanded to the south-west, adjacent to newly formed Albion Road (now Woolwich Church Street). Against the new boundary wall there rose a further rectangular range for a punching and shearing shop and pattern-makers' loft. This was accompanied by enlargement of the five-year-old inner smiths' range to its north.

To round things off there was a new site entrance, the West Gate, specific to the steam factory. A police station, police barracks and inspector's house (Ill. 98) controlled this from its east side. The dockyard had established its own police force in 1834 to counter corruption in the detection of theft and idleness. This had been subsumed into the Metropolitan Police in 1841 and in 1846 comprised a force of thirty-nine men, of whom twenty lived on site. The accommodation block is a dignified yellow-brick building with twin entrance porches and bridged chimneys. Within Denison made it even more robust and fire-resistant, with jack-arched ceilings and cast-iron roof trusses – the prevention of fires in the dockyard was an absolute priority.⁵²

During the financial year 1844/5 the steam factory repaired or refitted twenty-seven steamers and fitted seven boilers, figures that were exceeded in nine months during 1846, by which time 735 men were at work in the complex. The final phase of major improvements was effected in 1845–8 by Lt. Roger Stewart Beatson, RE, who came from Portsmouth in an exchange of posts with Denison. In 1846–7 Beatson oversaw the replacement of the inner parallel range with a substantial smithery, some two-thirds as long but twice as wide (240ft/73m by 75ft/23m). It had comparatively showy and symmetrical long elevations with relieving arches, gauged white-brick heads and sandstone dressings (Ill. 96). This, which stands, was designed to accommodate forty-eight smiths' hearths and five steam hammers, supplied by James Nasmyth, whose renowned invention had been adopted by Brandreth. Underground flues fed all the smoke to the great chimney. Coppersmiths' and brass founders' shops, a seven-by-five-bay block, also



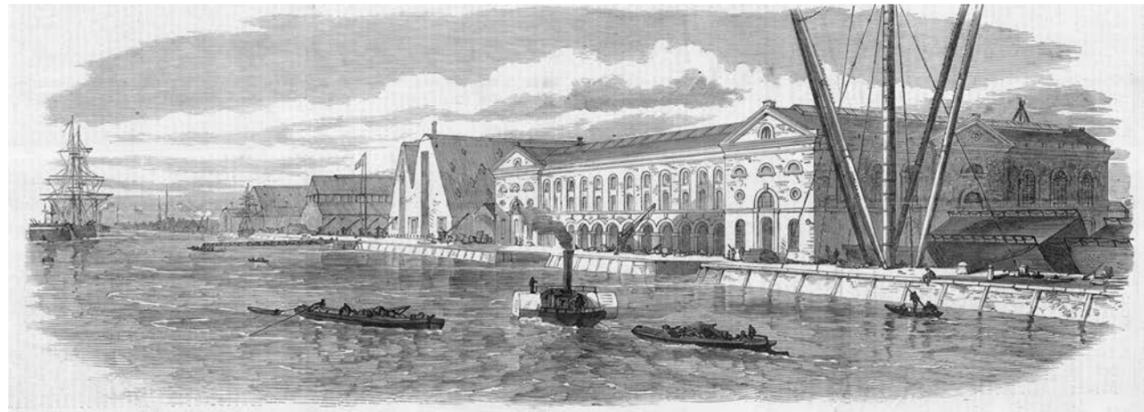
98. Police station, police barracks and inspector's house, 1844–5, ground plan and section

still extant, were built to the west at the same time. These buildings and the more northern range of 1838 form an island group, all joined together by subsequent infill, variously truncated and modified. Long runs of round-headed windows give architectural coherence, but the buildings have lost their machinery, internal party walls and original roofs; the smithery's roof had early wrought-iron trusses in twin spans, making for another fire-resisting structure.

Beatson was probably also responsible for the design of the school building that went up in 1848–9 on the west side of the steam-factory gate, facing the police station. The Woolwich Dockyard School for Apprentices had opened in 1844 in the wake of a dockyard education scheme that the Board of Admiralty had introduced the previous year. These specialist premises were for the teaching of marine engineering to apprentices drawn from all the royal dockyards' steam factories. This was the first establishment in the country devoted to training for

service in the steam navy and so was an important element in establishing Woolwich's reputation as a home for engineering expertise.⁵³ The school survives substantially as built. Like the police barracks, it is executed in yellow brick with stone dressings, but here there are subdued elements of a Gothic idiom that seem a decorous acknowledgement of the building's function. After the closure of the dockyard it served as offices, as did the former police station, before coming into co-operative society use in the 1920s.

A unique cast-iron-plate tram-road network of the 1840s, to facilitate the transfer of heavy components around the factory on trucks driven by steam-traction engines, was due to Bernays. By 1858 sections of this tram-road between the fitting and erecting shops, the smithery and engine-house and the coppersmiths' shop, had been glazed over for extra shop or storage space. The quality of the iron pavement meant that it found ready buyers at auction in 1870 after the dockyard closed.⁵⁴



99. Rigging house and engine store, 1850–1, with linking range of riggers' and sailmakers' workshops, 1856, and slip covers beyond. Engraving of 1869. *Demolished*

The Woolwich steam factory kept much of the navy in steam into the 1850s, undertaking virtually all naval steamship repair work (to the exclusion of private industry) and occasional new-build work, which was largely confined to the boiler-shop. The pioneering establishment stayed distinct, physically and culturally, from the rest of the dockyard: its employees entered at a different gate, worked under different conditions, were paid different rates and were presided over by a chief engineer, not the captain superintendent. The steam factory effectively accounts for the dockyard's enlargement from thirty-six acres to over fifty-six acres, its greatest extent, and for much of its surviving historic fabric.⁵⁵

Elsewhere in the dockyard other buildings went up during the busy 1840s, further reflections of the Admiralty's wish to see Woolwich rather than the private sector supply other naval dockyards. These included steam-powered and fire-resistant sawmills and another building for steam hammers, both near the dry docks. There was also, near the Clock House, a hydraulically operated chain-cable proving house and a substantial guard house and surgery block, as well as a Greek Revival weigh-bridge house. Cranes and capstans of various types and capacities enhanced the yard's handling capabilities, and giant masting sheerlegs served both inner and outer basins.

A final addition to the dockyard in this decade, with no permanent precedent, was a **gun battery** erected in 1847 at the dockyard's central landing place (Ill. 87). Of brick, granite-coped and fitted with gun carriages and platforms made in the Royal Arsenal, this battery was the focus of daily drill exercises by the dockyard's division of marines (see page 369) – there was a parade ground behind. It survives in heavily restored guise, reconstructed in 1976–7 to plans by Norman & Dawbarn, architects. It has a spectacle-plan layout comprising two stepped platforms, on which the guns could

swivel, behind low fort walls. Replacement wrought-iron gun carriages, for resited guns, were made by John Slough in 2005.⁵⁶

DECLINE, 1850–69

Throughout the 1850s and 1860s Woolwich Dockyard declined in significance, initially losing its primacy as the home of the steam navy, then, despite its recent revitalization, losing status as a shipbuilding facility. The establishment in the late 1840s of a larger and more strategically situated steam factory and basin at Portsmouth, a response to massive French developments at Cherbourg, at first eased and then superseded the steam-oriented workload at Woolwich. A third naval steam base, a huge integrated facility at Keyham, next to Plymouth Dockyard, followed in the early 1850s.

The Woolwich steam factory did remain important in the 1850s, but its peak of productivity had passed. Refitting work came to be largely confined to older paddle warships as the basins were too small to deal with a new generation of screw-propelled ships. During the Crimean War the steam factory was making boilers for supply to other yards; none of the fleet that returned in 1855 went to Woolwich. The subsequent introduction of steam reserve ships further underlined the limitations of Woolwich, there being no room there for these vessels. Too distant from the south-coast front line and too far up a congested river to serve as a maintenance base for a screw-steam navy that was reliant on regular docking and underwater hull repairs, the Woolwich steam factory fell increasingly redundant. Much of its last work was the fitting of screw propellers and engines into Deptford-built wooden-hulled steamships, a final revival of the centuries-old connection between the two yards.

Outside the steam factory, the enlarged docks and revamped slipways provided a basis for a renewed emphasis on construction rather than repair. Beginning in the 1840s with the construction of the *Trafalgar* and *Boscawen*, this reorientation sustained the yard through the 1850s and 1860s while the importance of the steam factory fell away. As the Anglo-French naval arms race intensified, those decades saw the launch at Woolwich of a number of screw-steam battleships, including the pioneering *Agamemnon* in 1852, and the conversion of wooden-hulled ships into ironclads, including the *Repulse* (1868).⁵⁷

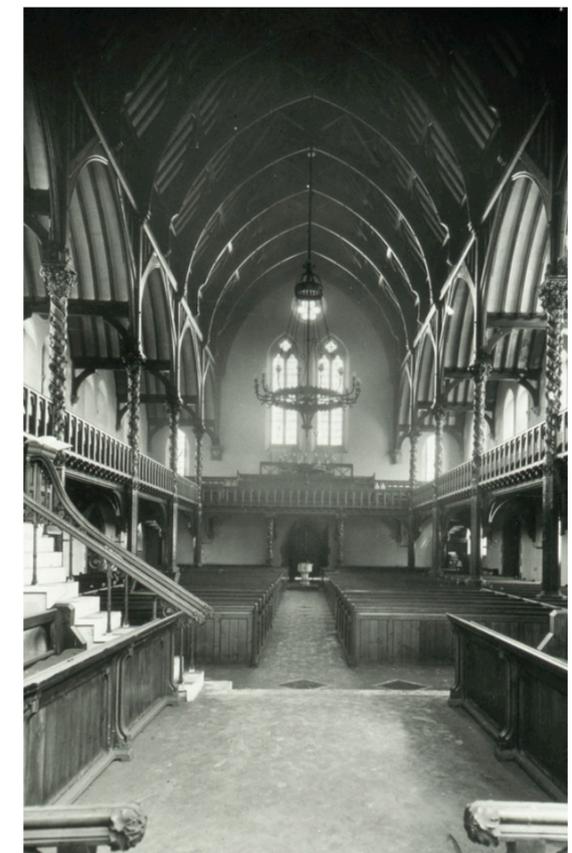
Building works that kept pace with these shifts were overseen by Bernays, Resident Engineer from 1850 to 1860. They included the last and largest slip cover of 1856–60 (see above). Rolling mills were established around 1850, and an armour-plate shop was enlarged as late as 1863. In 1850–1 substantial buildings were erected to either side of the mast-house on the north side of the inner basin, to provide a rigging house and an engine store, with gable-end pediments to the river (Ill. 99). These were linked in 1856 by the addition of a range on the north side of the mast-house to provide workshops for riggers and sailmakers. This was, deceptively, given an arcaded brick façade to the river, but it was otherwise a cast-iron framed structure, probably designed by Col. Greene. Like the contemporary cover to 5 Slip, it was an innovative trial of rigid framing via bolted connections, and a significant precursor of a building that has great renown in structural history, Greene's Sheerness Boat Store; all these were made at the Regent's Canal Ironworks. This building came to be used as the premises of the Albion Sugar Company before it was demolished in 1981–2. Also of 1856 was a single-storey cable shed near the river north of the Clock House. This later served as a covered parade for pensioners and stood into the 1970s. Its cast-iron frame was clad in corrugated iron profiled to resemble weatherboarding.⁵⁸

Dockyard Chapel (dismantled)

For more than 300 years no cause was found to build a place of worship inside the dockyard, though an upper-storey space had perhaps been adapted as a chapel prior to 1812. This changed in the context of post-Crimean military piety, with the dockyard's division of marines in mind (see page 369). The Dockyard Chapel was built in 1856–8 to designs by George Gilbert Scott. The building contract was attributed to Smith & Appleford in 1856, but they may not have carried out or completed the work, as in 1859 William Higgs was credited as the contractor. The chapel accommodated 1,200, not just the marines, but also dockyard officials and artisans. It was given an Early English Gothic exterior of polychrome brick, red with black bands, dressed with Bath stone (Ill. 100). There was a triple west entrance and an apse. Five aisle bays on each side were transversely gabled, and there was an octagonal bell turret to the north-east. The simple but capacious interior, galleried on three sides (Ill. 101), was daring and exceptional in an Anglican context and in Scott's



100. Dockyard Chapel, 1856–8, from the north-east. *Dismantled*



101. Dockyard Chapel, interior from the east, c.1930. *Dismantled*

ecclesiastical oeuvre for incorporating tall cast-iron columns, plain and octagonal at the base, rising to circular shafts moulded with Solomonic twists and foliage patterns, and topped with gilt-edged capitals. These were supplied by Scott's favourite ironworker, Francis Skidmore of Coventry, who was furnishing the famous ironwork to the Oxford Museum at just this time. The columns supported pointed timber arcades, and above them an abundant open-timber roof with scissor-brace trusses and cusped windbraces. The studded clerestories bore stencilled plaster. For Scott, secular medieval timber construction was worthy of imitation in an ecclesiastical context.⁵⁹

The chapel soon fell out of use. It was adapted as the successor to the Royal Arsenal's Ordnance Chapel in Plumstead Road from 1899 to 1923 and then there was another period of disuse until 1932–3. The building was then taken down and re-erected in a reduced form at Rochester Way, Eltham, where it was reconsecrated as the Church of St Barnabas. There it remains, its interior recast after bomb damage in 1944, Skidmore's columns concealed.⁶⁰

Closure

In the 1860s Woolwich lacked the facilities to build iron-clads, and such activity as there was in the dockyard could not disguise growing obsolescence. The opening in 1863 of a huge new steam yard at Chatham sounded the death knell for both Woolwich and Deptford. A select committee reported in 1864 that £10,000 might be saved annually by closing Woolwich, Deptford and Pembroke. The sale of Woolwich was a firm intention by 1865, but the winding up of operations took time. Indeed, the state dockyard was used in 1866 to rescue the failed launch of the privately built *Northumberland*. That event came just before the failure of Overend, Gurney and Co., the bank that was over-exposed to private shipbuilding on the Thames, the general demise of which immediately ensued. Notwithstanding, Deptford closed in early 1869; Woolwich was kept open long enough to fit out the last Deptford-built warship, *Thalia*, and closed finally on 1 October 1869. The dockyard's final working day was highly charged, with a black flag hoisted to the top of a chimney and the hanging in effigy of Hugh Culling Eardley Childers, First Lord of the Admiralty and an economy-minded reformer close to Gladstone, the Prime Minister and a local MP. Outside the yard, gangs of men paraded the streets, some waving skull-and-crossbones flags, others attempting to form a funeral procession. Heavy rain ended the demonstration, and though such scenes were little reported, the *Illustrated London News* did publish several views of the ancient establishment, which it thought 'must not be allowed to pass without notice'.⁶¹

There had been a gradual rundown of the workforce and 2,398 men had been discharged, bringing great distress and social upheaval to Woolwich. A few were offered employment in Chatham, but for many others emigration was the only alternative to unemployment and

pauperism. Through publicly backed schemes more than 1,500 Woolwich workers and their dependants set sail for Australia and Canada in 1869–70.⁶²

AFTER THE DOCKYARD

The closure of the dockyard brought with it the question of what to do with the fifty-six-acre site. *Matériel* was redistributed to other yards or auctioned off. There had been assurances that the land would be sold in small plots for private ownership, for, *inter alia*, development with houses. But the War Office's interest grew and, with competing claims, Sir William Tite oversaw the sale for the Admiralty. By late 1871 the War Office had secured everything west of 5 Slip, more than ninety per cent of the site, for use as a storage depot. A dividing wall was built, of which the southern stub remains, and the other four acres to the east were sold in 1872 in three lots to become Royal Dockyard Wharf, Parish Wharf (together now Mast Quay) and Mast Pond Wharf.⁶³

Woolwich Store

The War Office adapted the dockyard to form a military stores depot through its restructured Ordnance Stores Department, the headquarters of which were at the Royal Arsenal, where the Controller (later Commissary-General) to 1879 was Capt. (Sir) Henry William Gordon. From 1896 the successor Army Ordnance Department administered the site.⁶⁴

Haste and economy seem to have been governing factors in the yard's conversion into an adjunct to the Arsenal and a complement to other stores established at Deptford. Cleared of contents, most of the factories, workshops and sheds were well suited to housing various overflow stores from the Arsenal. The west end, incorporating the outer basin and dry dock, and the area behind the main gate, including the chapel and the late Commodore-Superintendent's house, were used as a supply reserve depot. Among the most imaginative adaptations was that of the two eastern dry docks (Nos 2 and 3) as bathing ponds, to hold at one time, respectively, 300 and 400 Royal Artillery soldiers. Slip covers were moved to Chatham and 4 Slip was used to store telegraph cables (Ill. 75). The two timber-framed slip covers at the west end (Nos 1 and 2) were adapted as carriage sheds.

Infilling of 3 Slip opened up a long wharf frontage for use in conjunction with a new railway network that spread through the yard. A branch line passed through a new tunnel under the road to link to the North Kent line, and thereby to the Arsenal. The railway, a substantial undertaking that required the demolition of fourteen houses, was begun in 1873 and seen through, in parts on a narrow gauge, by about 1880. It was designed by Maj. Peter Scratchley, RE, the Inspector of Works at the Arsenal who had overseen the installation of that site's narrow-gauge railway. The tunnel survives as a pedestrian subway.⁶⁵

No. 3 Dock reverted briefly to its former role in 1875–6 for the repair of the Brazilian man-of-war *Independencia*. The appearance of this immense turreted ironclad, which barely fitted in the dock, raised local hopes of a revival of shipbuilding. But, despite interest from a number of shipbuilders, the yard remained 'almost deserted'.⁶⁶

Open spaces gradually filled up with an assortment of sheds and warehouses, and activity ebbed and flowed with Britain's involvement in overseas wars. To give the army independence from contractors in the supply of hay for horse fodder, the south-west corner of the yard was covered with timber-framed store sheds, but only after a spectacular collapse of the first structures in 1878. Four years later immense quantities of hay accumulated faster than they could be compressed and shipped to Egypt for the mobilization against the Sudanese uprising. In the aftermath of this failure a hydraulic-powered hay-pressing and baling establishment was formed and a long single-storey shipping shed was built on the central riverfront. To either side of the eastern dry docks there were brick warehouses, for carriages and 'accoutrements'.⁶⁷

The place was once again anything but deserted when it came to equipping the expedition to South Africa for the Second Boer War: 'Night and day the military wagons thunder in and out the gates, day and night the steam tugs fuss busily to and from the transport pier, night and day the trains shriek, the trucks rumble along the rails, and the military shop assistants cord up package after package for the insatiable military customer'.⁶⁸ The whole site had become more densely built up than at any earlier point in its history, with numerous storage buildings filling unoccupied space, all connected by an intricate array of railway lines (Ill. 75). The quayside shipping shed and the covers of 1 and 2 Slips were replaced around 1900 with substantial three-storey and outwardly steel-framed buildings, that on the river with three taking-in bays. Internally, there were hydraulic lifts, goods chutes and Temperley Transporter Company electric conveyors. Similarly constructed workshops went up between the eastern dry docks (Ill. 90), and a two-storey block of offices for the Army Supply Corps was built at the south end of 1 Dock.⁶⁹

A three-storey submarine-telegraph store of 1904, south of 4 Slip, was the site's first ferro-concrete building, using the Hennebique system. There had been earlier experiments near by in London's commercial docks, only possible there, as in the former dockyard, because of exemption from the Building Acts. This warehouse has gone, but still standing at the centre of the Woolwich Dockyard Industrial Estate (east of the former steam factory near Woolwich Church Street) is another three-storey warehouse, completed in 1914 under the supervision of Col. N. H. Hemming, RE, that appears to use the same or a very similar reinforced-concrete system within its stock-brick walls (Ill. 96). Its concrete posts, beams and joists, in twelve by five bays, each about 15ft (4.6m) square, have neatly stop-chamfered arrises and there are shuttered-concrete floors and a flat roof; two dividing firewalls are of brick. Loading bays have been bricked up, but a wall crane survives towards the east end of the south

elevation. Near by, single-storey sheds were part of the establishment of the Woolwich Dockyard Industrial Estate in the late 1970s.⁷⁰

There were again high levels of activity during the First World War, when infilling of the inner basin permitted yet more building, for stores, offices and a dining-room for the many women now working on the site. Afterwards, when there were massive cutbacks at the Arsenal, many workers in the former dockyard were also discharged and surplus *matériel* was auctioned. Pressed by the Woolwich Chamber of Commerce, which wanted river frontages for private enterprise, the War Office decided to wind up the depot in 1924 and, with the Admiralty, which retained the freehold, put twenty-five acres of western parts of the site up for auction in 1926. They failed to attract a single buyer, so the land was divided into eleven lots and sold off gradually in 1927–30. Property further east remained in War Office use until the 1960s.⁷¹

Royal Arsenal Co-operative Society's Commonwealth Buildings

The largest buyer was the Royal Arsenal Co-operative Society. It took nine acres to the south-west, including part of the former steam factory, with frontages to Albion Road (now Woolwich Church Street) and Trinity Street (now Warspite Road). The burgeoning RACS had outgrown its accommodation elsewhere and wanted this land for the formation of a new dairy, laundry and tea warehouse, as well as for its works department. But first, with the site renamed Commonwealth Buildings, the opportunity was taken in March–April 1927 to hold the largest national co-operative exhibition ever staged. This was housed in four 'bright and attractive exhibition halls' fashioned 'as by a magician's wand' from 'unsightly buildings formerly used as Government stores'.⁷² The event attracted hundreds of thousands, and boosted RACS membership by 30,000. A further six acres with a river frontage was acquired, and conversions of numerous buildings were carried out under the supervision of the Society's architect, S. W. Ackroyd. This was all largely complete by 1932.⁷³

Entry to Commonwealth Buildings was from the old steam-factory gate, where the RACS installed new iron-work. The site's south-west corner and its sheds housed the laundry and works department. There were spaces for making and repairing motor vehicles, and tailors and boot-repairers had a workshop and warehouse in parts of the former steam factory next to the boundary wall. The former school on the gate's west side became a mortuary chapel for a funeral-furnishing establishment. From 1930 several other firms occupied the one-time nucleus of the steam factory, the former smithery and erecting-shop complex, and adapted it for light engineering and warehousing. Further north, the RACS erected assorted new sheds and workshops, while on the waterfront the three-storey metal-framed buildings over 1 and 2 Slips became butter, pharmacy and tea stores, and the adjacent quayside

range a grocery warehouse, with alterations to conform with the Building Acts.

Commonwealth Buildings developed rapidly as an important regional distribution centre. By 1937 the site employed 1,426 workers and housed twenty-one industries and departments. An abattoir opened that year was the first of its kind in Britain, based on an American design that placed the slaughter hall on an upper level to use gravity rather than manpower to move animal parts. In 1961 the funeral-furnishing department was enlarged, to plans by A. L. Foreman, the Society's architect, with a road-side showroom and large sheds to the west of the former school (Ill. 96). It subsequently spread to the former police barracks and other grounds to the east and continues as Co-operative Funeralcare. Other RACS operations were gradually run down and wound up as the co-operative movement was in retreat from the 1960s. By 1984 most of Commonwealth Buildings had been demolished. In 2001–2 two large sheds of lettable units were erected in the former steam-factory area to form the Kingside Industrial Estate. A McDonalds restaurant was proposed for the site's west end in 2012.⁷⁴

Albion Wharf

The former rigging-house complex of the 1850s saw use by the army's Inspection Department before 1928 when it was adapted as an invert, or brewers', sugar and glucose factory for Gillman and Spencer, Bermondsey cereal millers who formed the Albion Sugar Company. A large maize silo was added in 1962, and there were further improvements later that decade for what became Cargill-Albion Glucose Works. But operations closed in 1979 and the riverside buildings were cleared. To the west was Woolwich Wharf, where five single-storey sheds of 1946–8 built for Convoys Ltd, wharfingers and the first of the area's many multi-let light-industrial units, stood until the mid-1990s.⁷⁵

General Post Office Cable Depot

In the early 1880s the north-west corner of the former dockyard, where there was just a coal store, was ceded to the General Post Office for use as a submarine cable depot. The telegraph system, nationalized in 1870, had expanded rapidly and internationally. This site, adjacent to Siemens's Telegraph Works, and across and downriver from other cable factories, was well situated for storing telegraphic cable before it was taken out to sea. On a plot smaller than first envisaged, the west side of the wharf gained a large fifteen-by-six-bay brick shed in 1882–3 to cover four circular 36ft(11m)-diameter cast-iron tanks on 3ft(92cm)-thick concrete foundations. This, which survives, was designed by Edward George Rivers in the Office of Works and built by Kirk and Randall. Behind a blind arcade to Warspite Road a central row of cast-iron columns supported twin metal-trussed and louvred roofs. Cable was stored under water in the tanks before transfer to the state's cable-laying

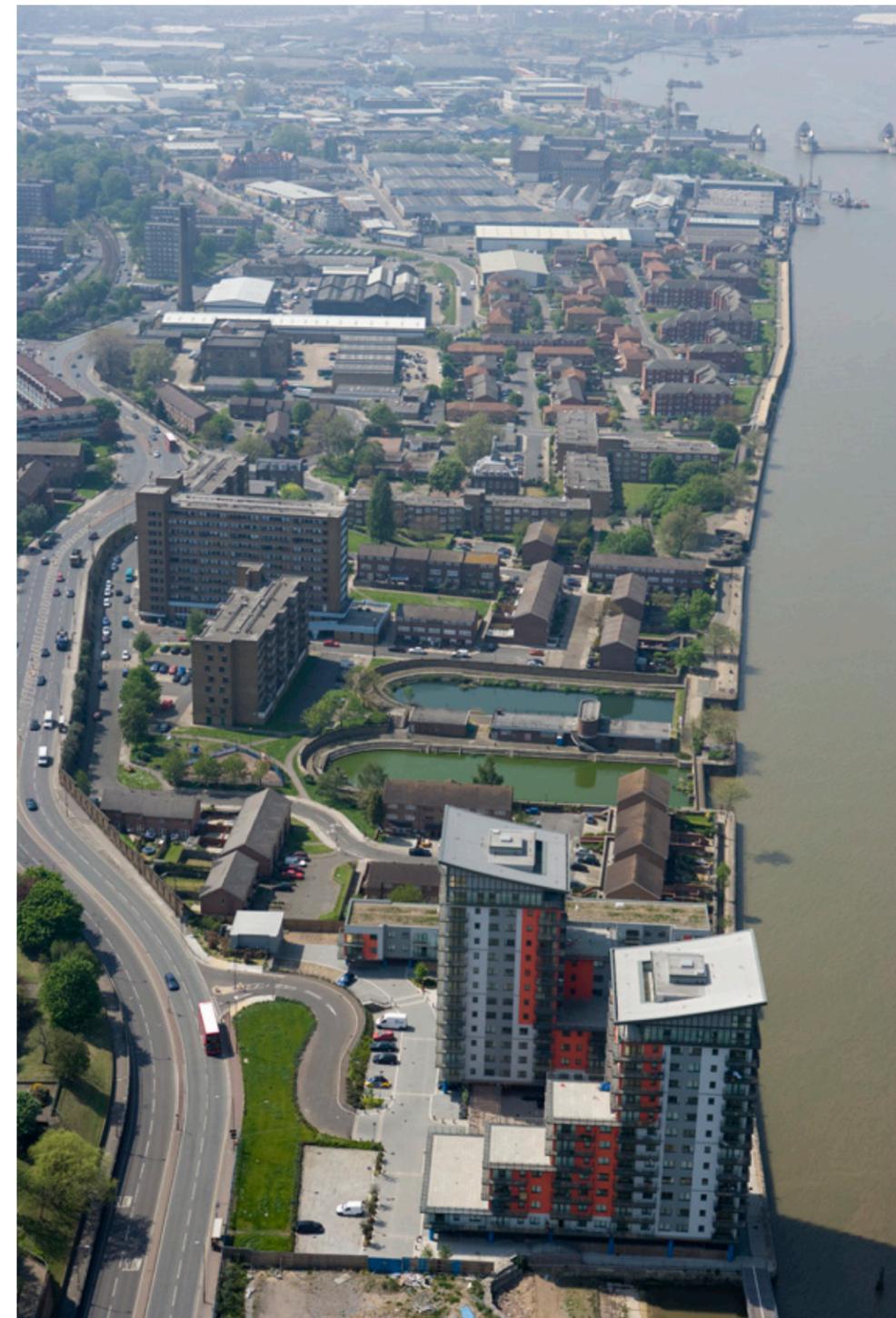
ships, the first of which was launched in 1883. There were ancillary buildings to the east, and another store was added on the south side of the site entrance in 1891, around when stairs were made down to a new causeway in front of the granite ashlar of the wharf's eastern part. A third tank-shed range went up in 1928, when W. Eve was the Office of Works' architect, Fairweather and Ranger the contractors. The south ends of the central and eastern shed ranges were rebuilt after war damage and the depot maintained its original use until the 1970s. It was then converted to provide lettable light-industrial units and retains the name Cable Depot.⁷⁶

Eastern wharves

The auction in 1872 of the four easternmost acres of the former dockyard led to redevelopment for private industrial and municipal uses. Royal Dockyard Wharf, to the west and taking in 5 and 6 Slips, was the largest plot, essentially the site that is now Mast Quay. Here G. E. Arnold & Co., timber and slate merchants, had possession by 1873 and built steam sawmills. Attractive roadside offices were added in 1886–7, with Percival Brown as architect. Eastern parts of the site had been let to other tenants by 1900 as St Andrew's Wharf and St Mary's Wharf, used as stone, manure and slate yards, and a van and bus yard, with a series of long low sheds. Among those who occupied and redeveloped these wharves were Thomas & Edge, the leading local building firm, here from 1915 until about 1968, and Stratford & Sons, barge builders, in the 1930s. From 1919 W. R. Cunis Ltd, dredger, tug and barge owners, had Arnold's site.⁷⁷

Further east, Parish Wharf was a narrow strip that was ceded to the Woolwich Local Board of Health in 1872 for public use, a move influenced by the fact that the dockyard's early eighteenth-century stable range on the south side of the mast-pond became the Admiralty Building, used as a ragged school, dispensary and, long since, a soup house or kitchen. This stood until the 1920s, when it was replaced by an ambulance station (see page 64). There was also a roadside house that had accommodated a 'compass observatory'.⁷⁸ The Board cleared the wharf and made it a rubbish depot, enhanced in 1891 with a six-cell dust destructor and a 130ft(40m)-tall chimney. The chimney was demolished in 1932 when the site was enlarged to the east, onto Mast Pond Wharf. That had previously been a slate wharf, then, from 1905, a depot for United Carlo Gatti, ice merchants, with the mast-pond overbuilt. The whole site became a coal depot for Cawood, Wharton & Co. in the 1930s, with plain roadside offices.

All these wharves and their slips had by 1968 been taken over by W. R. Cunis Ltd for the building and repairing of tugs, trawlers and coasters. From 1971 this was Cubow Ltd, a joint venture with Hay's Wharf Ltd. One slip was covered, for building sizeable vessels the like of which were not being made anywhere else on the Thames – remarkable, given the history of the site; the other was left open for repair work. Shipbuilding stopped around 1982,



102. Woolwich Dockyard area from the east, 2008

but there was a last brief revival of repair work here in the early 1990s.⁷⁹

Housing development since 1966

The War Office continued to occupy the parts of the dockyard that had not been sold in the 1870s and 1920s – all the land now between Mast Quay and Antelope Road along with the site of the Woolwich Dockyard Industrial Estate (Ill. 76). Use diminished as the Arsenal moved gradually towards the closure that was announced in 1963. A year later the Ministry of Defence accepted that this dockyard property could be cleared for disposal, and the Ministry of Housing and Local Government and local interests combined to promote redevelopment with council housing on what Christopher Mayhew, the local Labour MP, called ‘the finest possible housing site in London’.⁸⁰ Woolwich Borough Council felt a keen lack of land for keeping up its proud and productive tradition of house-building, a matter not simply of housing need but also of keeping the authority’s large Direct Labour Organization active. It was also felt important that the riverside should be accessible to the public. These twenty-three acres were duly sold to Greenwich Council in 1969, the south-west section set aside for industrial and commercial use.⁸¹

First schemes for the **Woolwich Dockyard Estate** in 1967–8 envisaged up to 900 dwellings in tall blocks to the south and lower maisonette blocks near the river. A few old buildings and the dry docks were given protection through listing and the site was otherwise cleared. The Clock House was to be a community centre, the nearby ‘gatehouse’ a pub (see page 98). A YMCA youth centre was erected on the site of the dockyard chapel, but multiple delays held back the rest of the project. First there were deliberations about the siting of the Thames Barrier. Once this was set to go further west in 1970, the council’s need for housing had become less pressing and, with new financing regulations, the costs of the dockyard scheme more problematic. A plan for collaborative redevelopment with the Taylor Woodrow Property Co. was advanced, proposing many fewer houses and some office blocks, but by the end of 1971 the council had taken the project back into its own hands, the priority shifting back towards housing.⁸²

John M. Moore, the council’s Chief Architect, prepared a new ‘master scheme’ in 1972 for the whole site. This still included one office block and projected 377 homes, with two twelve-storey slab blocks and sixty-eight houses. It included sheltered housing for the elderly, for whom there would also be a clubhouse, alongside a day nursery and an adult training centre for the disabled, as well as the community centre and the YMCA. The dry docks were to be recast as an aquatic centre for diving, canoeing and fishing, with a riverside promenade and pedestrianization of the dockyard’s railway tunnel. It was all, John Cartwright, the Council Leader, claimed, a ‘shining example of municipal enterprise’.⁸³

In similar enlightened spirit and through the support of two councillors, Derek Penfold and Dave Ramsey, who

faced down reservations about cost, archaeologists were admitted in 1972–3 for pioneering excavations of a post-medieval industrial site, led by Terence Courtney. There were further delays. The council was now legally obliged to put the building work out to competitive tender, but no developers were interested because of the combination of slow-moving government approval processes and high inflation. Special permission had to be gained to go ahead through direct labour, though the council’s workforce had now shrunk to half the size it had been in the 1960s. Moore and his team substantially rejigged the plans for the estate in 1973–4, omitting offices, and the building of 403 new dwellings was carried out in 1974–80 (Ill. 102), with Elsie Sargent as the lead job architect and Norman & Dawbarn as consulting engineers. One twelve-storey block, St Domingo House, with 100 flats, was flanked at right angles by eight- and nine-storey blocks, Plantagenet House and Sovereign House, with forty-nine and fifty-eight flats respectively. There were also some two- and three-storey houses. The community buildings and sheltered housing were grouped to the west near Antelope Road – the new streets and buildings were named after ships built at the dockyard. The South-East London Aquatic Centre opened in 1979, with new perimeter walls around the flooded dry docks, for safety, and, between them, a clubhouse, of jauntier design than anything else on the estate, used in part for the storage of canoes. The estate’s taller buildings, faced with yellow stock brick, are severe and blocky. Lower ones are scarcely less so for the neo-vernacular gesture of some tile-hanging (Ill. 87). Short plain rows of brown-brick houses have pitched roofs.⁸⁴

The riverside walk was decorated with mosaics in 1984–6 in a project led by the National Elfrida Rathbone Society through an arts workshop based at the Clock House Community Centre. A second foot tunnel that had been formed under Woolwich Church Street to provide safer access to shops on Kingsman Parade was enhanced in 2000 with mosaic murals and informative and illustrative panels about the dockyard’s history. This was done by the Greenwich Mural Workshop, with Stephen Lobb as the senior artist, working with Cardwell Primary School. In the same year the floodwall at the north-east corner of the housing estate was bridged for westwards continuation of the riverside walk. The sculptural white-coated steel footbridge, ‘linkbridge 2000’, which includes a viewing platform, was a publicly funded Millennium Commission Lottery project. It was commissioned by Sustrans, designed by Gerry Judah and built by Code-Arc Ltd with Ingealtoir, structural engineers.⁸⁵

On the east side of the dry docks **Maud Cashmore Way**, named for one of the founders of the Home for Mothers and Babies (see pages 379), was formed in 1989–90, a cul-de-sac with twenty-three brick-clad timber-framed houses in small terraces, developed by Walter Llewellyn & Sons Ltd (Llewellyn Homes). Another twelve houses were added to the south in 1997 by the Calford Seaden Partnership for the London and Quadrant Housing Trust.⁸⁶



103. Mast Quay, 2004–6. Photographed 2009

Riverside lands west of Antelope Road were cleared of industry and warehousing, and in 1996–9 Fairview Estates (Housing) Ltd, later Fairview New Homes plc, laid out and built up **Spindle Close**, **Ruston Road** and **Harlinger Street** (Ill. 96). The neo-vernacular varicoloured-brick housing centres on a U-plan block of flats called Riverhope Mansions. This and six smaller blocks provide 335 flats between which there are 136 terraced houses, all of two to four storeys. The first phase, the houses along Spindle Close, was for housing-association tenure, maintained by Greenwich Council as part of the Woolwich Dockyard Estate. To the south-west, between Ruston Road and Warspite Road, two big blank sheds were put up in 1999–2000; these have commercial tenants and, since 2010, incorporate a Metropolitan Police patrol base.⁸⁷

There were plans in the 1990s for the former dockyard’s easternmost wharves to be redeveloped as a residential complex that would have included a nursing home and a hotel. Instead the Comer Homes Group, through a Guernsey-based company called Mast Quay Developments Ltd, gained permission for a luxury housing project. The first phase was built as **Mast Quay** in 2004–6. This was designed by Nigel Upchurch Associates, architects, and Lancsville Construction Ltd was the main building

contractor (Ills 93, 102). It provided 158 apartments in two fourteen-storey towers and a two- and three-storey western range, all with red- and two-tone grey-panel facing and raking monopitch roofs – an upmarket Thames-side idiom that is characteristic of its decade. The blocks stand on blue stilts above car parking, in part a precaution against flooding. Nos 5 and 6 Slips are left open, crossed by the extended riverside walkway. To the east, Mast Pond Wharf is a vacant site in 2012 for which the same developers propose 218 more apartments in two further towers, to step up to twenty-two storeys to the east. Yet another tower block of sixteen storeys is also projected for Albany Homes. Mast Pond Wharf Ltd with Alan Camp Architects have plans to replace the former Aquatic Centre between the listed dry docks, which anglers continue to use.⁸⁸

West of Woolwich Dockyard including the Siemens Works

The parish of Woolwich includes a block of riverside land to the west of the former naval dockyard, now bounded by Warspite Road to the east, the Woolwich Road to the south, and a strip of park that has displaced

Harden's Manor Way to the west (Ills 76, 105). This was open marsh north of farmed fields and in manorial ownership in the late eighteenth century, held from John Bowater and farmed by John Tappy and then Samuel Hardin. On both sides there were 'manor way' paths to the river, that to the east leading to a 'sand wharf' for the trans-shipping of materials taken from the hillsides further south. In 1806–7, after the elder Hardin's death, and as the Bowater estate unravelled, leases were granted for the development of parts of this property. Thomas Clark, a timber merchant, took two acres for a wharf west of the sand wharf, but he was quickly displaced by John Long, who was now exploiting the sand and chalk pits on the site of the Morris Walk Estate and in Charlton parish. Long took the whole eight-acre river frontage. At the same time the Woolwich Road frontage was beginning to be developed as part of what was known as New Charlton (see below).⁸⁹

RIVERSIDE WHARVES

Long began making a road along the south side of his riverside property in 1808–9. Called Marsh Street (now Bowater Road), it turned at right angles to lead to a new river landing at what is now the west end of the Mellish Industrial Estate. A few small houses were built along the road, but that kind of development was not its main purpose.⁹⁰ Long and his business partner's widow, Sarah Blight, launched a scheme for a new ferry, to cross to a point in the Plaistow marshes, a speculation that is difficult to fathom – this was remote from any likely development. The Woolwich Ferry Company gained an Act in 1811 when its other proprietors included the Wilson family, Charlton's principal landowners, and several Woolwich entrepreneurs and landholders, including Richard and William Powis, John Cook, William Limbery and Joseph Meads Madkins, who was Long's attorney and the company's clerk. The ferry began to ply in 1812, with a ferry house on the east side of the landing that doubled up as the Marquis of Wellington public house, but the company rapidly fell into dissent and disarray. Shareholders abandoned it and Madkins was deposed in 1814; a year later he was in debtors' prison. By the end of the decade it was scarcely a going concern, though it was not formally wound up until 1844 after its entitlement to property via Long's transactions with the Bowater Estate had come into question.⁹¹

The sand wharf had become known alternately as Hardin(g)'s or Trinity Wharf, its western part as Long's Wharf, where there was a house and office. Long had drained the marsh and in 1828, the year he died, was building a straight river embankment between Trinity Street (renamed Warspite Road in 1937) and the ferry landing. The land behind was in use as a brickfield. A few years later the original wharf was reshaped for the westwards extension of the dockyard and the formation of Trinity Stairs (see above). Soon after the demise of the ferry and

its ferry house, Joseph Harrington, who held the manorial lands, built the United Service Tavern on the west side of Trinity Stairs, where he also put up a landing, Charlton Pier, in 1849. An old warship, the *Warspite*, was moored here and used by the Marine Society to house and train poor boys, 200 to 300 at a time. The embanked frontage to the west as far back as what became Harrington Road (later Way) was divided in three as Trinity Wharf, Rigby's Wharf and Ferry Wharf. The unembanked frontage west of what had become Ferry Road housed a steam-driven factory for making rockets from 1848. This was put up by Hale and Richbell, but stood only until the area was taken for the Siemens works. The Marine Society acquired a small river frontage at the far north-west corner of the parish and in 1861 built a small top-lit swimming-bath, designed by G. A. Young, architect. There was also a house and, later, a boat store. The *Warspite* was destroyed by fire in 1876. The baths were vacant by 1908 but not demolished until the 1940s.⁹²

Trinity Wharf was a coal wharf in the later nineteenth century. A short row of maisonette flats of 1886 stood south of the tavern, which was demolished around 1900. In 1902 the wharf was sold and J. Watt Torrance & Co., of Glasgow, established sawmills and a bottle-crate factory. A large brick shed was immediately built and it seems it still stands, much altered. The adjoining office block was added in 1914–16. The sawmills continued through the 1950s. Latterly, up to 2009, Trinity Wharf was occupied by Pisani Ltd, marble suppliers. The nineteenth-century stone-coped brick river wall here and further west is concealed behind steel campshedding.⁹³

The adjoining wharf to the west, occupied in the 1850s by J. and C. Rigby, Westminster builders, had reverted to being called Long's Wharf by 1872 when a lease was taken by Henry Castle & Sons' ship-breaking company. From beginnings in 1838 in Rotherhithe this firm had moved to Vauxhall and Charlton before adding this wharf to what had become the leading ship-breaking business on the Thames. Numerous wooden naval ships were taken apart here. The wharf was enlarged westwards and given some small sheds in 1875. These were replaced with Hennebique-system reinforced-concrete structures in 1912–14, but, save for cranes, the wharf was kept largely open for the laying out of old timbers, including ornamental figureheads. It was said to have one of the largest stocks of timber on the river. Garden furniture was made, including for the grounds of Buckingham Palace for Queen Victoria's Golden Jubilee in 1887. Teak was supplied to the Arsenal, copper was salvaged and other timbers were sawn up and sold as logs for fuel; their copper residue produced beautifully coloured flames. Castles gave up Long's Wharf in 1938 and the site became a tarmac plant for Cawood, Wharton & Co.⁹⁴

The greater part of what had been Ferry Wharf became Warspite Wharf in 1883 when White Palmer & Co. established spice mills here. A narrow frontage to the east was Kent Wharf, used by the London and Colonial Wool Cleaning Company in the 1880s, and the old Ferry Road had been built over as Holland Wharf. By 1900 this was all

densely built up for the spice mills, which continued into the 1950s.⁹⁵

Long's Wharf and Warspite Wharf were unified in the early 1970s for A. W. Mellish Ltd, rice millers, then about to lose their premises in central Woolwich. This led to the formation of the Mellish Industrial Estate, lettable units, the largest part of which is a range of four sheds that presents a brick face to the river. Since 2009 the estate has also incorporated Trinity Wharf; it includes a large number of artists' studios and a climbing wall.⁹⁶

SIEMENS BROTHERS' TELEGRAPH AND TELEPHONE WORKS

For more than a century the area to the west of Woolwich Dockyard was predominantly shaped by one company, Siemens Brothers. It was as Siemens and Halske that in 1863 the firm relocated a five-year-old submarine-cable business from Millbank, Westminster, to the north-west corner of Woolwich, adjoining the Marine Society's baths (Ill. 105). Karl Wilhelm Siemens had come from Prussia to England in 1843 as a young man to develop initiatives and inventions in electrical engineering that he devised with Werner, his elder brother. Werner founded Siemens and Halske in Berlin, invented a method of insulating telegraph wires with gutta-percha and began laying cables in the 1850s. Karl Wilhelm became a naturalized British subject in 1859, changing his name to William. He was the firm's London agent and then a partner in an independent English subsidiary of the Berlin operation, for which J. S. Newall & Company made cable. The down-river Thames had seen significant experiments and developments in submarine-cable making since the late 1830s, including those for the first attempts to span the Atlantic, in particular at Enderby's Wharf in Greenwich. In 1859 William Thomas Henley moved from Greenwich to establish an important cable factory at North Woolwich.

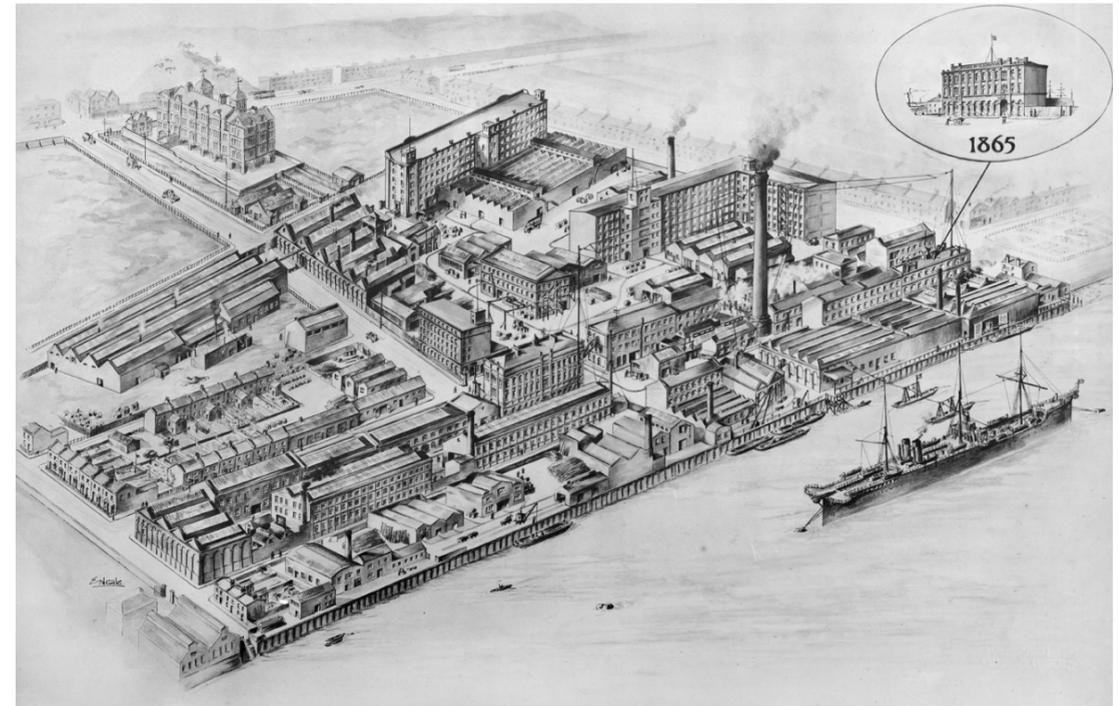
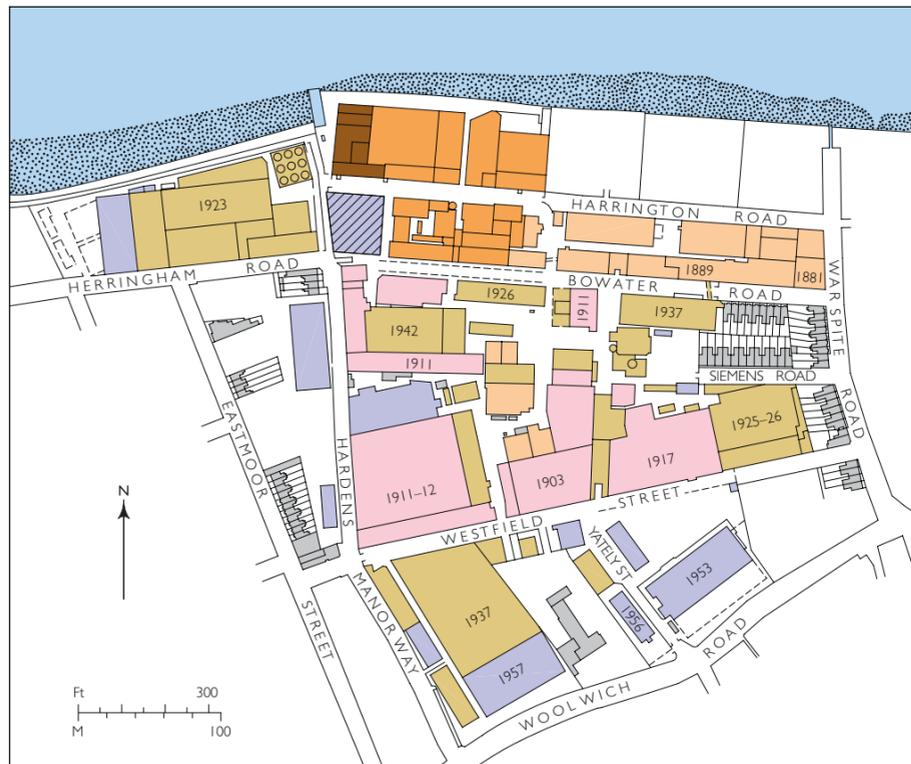
William Siemens's move to larger premises in Woolwich in 1863 allowed his firm to begin to make its own cable. In 1865 the London company reformed as Siemens Brothers (Werner, William and a younger brother, another Karl; William alone was in England). It was an ambitious venture and an immediate success. With global reach, this was the first German multinational in Britain and profits soared. One of the biggest early Siemens cable-laying projects, undertaken jointly by the London and Berlin firms in 1869–71, was the Indo-European telegraph from Prussia to Tehran, comprising most of the line that linked England to India. The Woolwich factory became independently responsible for such work from 1873 with the making and laying of the Platino-Brasiliera cable, to extend links between South America and England.⁹⁷

These contracts occasioned major expansions of the works. The workforce swelled from a permanent core of 300 in 1871 (with a few Germans in supervisory and mid-level positions) to 634 in 1874, when there was a further

temporary workforce of more than 2,000. The original building was a modest single-storey range fronted by a landing stage to permit direct loading into cable-laying vessels. A three-storey block had been added on its south side in 1865. The works almost tripled in size in 1870–4 to cover about four acres, eastwards along the river as far as the line of Ferry Road, and to the south across an extension of Harrington Road as far as Marsh (Bowater) Road (Ills 104, 105, 106, 107). The ground was covered with mostly low-slung, top-lit and louvred brick sheds within which cable was spun, tested, sheathed and coiled into sixteen 36ft(11m)-diameter iron tanks. There were also engine- and boiler-houses, offices, landing sheds and secondary workshops for making telegraphic implements. Jackson and Shaw of Westminster were the builders in 1871–2, and Ball and Gammon of Lambeth in 1873–4. The southern block included two- to four-storey workshops and warehouses for the refinement and storage of India rubber and gutta-percha, as well as galleried ranges where metal cores were covered, dried, tested and stored. The southernmost range of this block survives (Ill. 108), much altered and decayed, its east section an addition of the 1890s. The western part housed a gutta-percha masticating shop, the central and eastern parts rubber cleaning, mixing and core covering. There is also still a three-storey former core-tanks building of 1873 to the west.⁹⁸

The cable for the Platino-Brasiliera contract was initially transported by chartered steamship, but the loss of two vessels prompted Siemens Brothers to launch their own cable-laying vessel in 1874. The *Faraday*, designed in part by William Siemens and named in tribute to a former associate, was capable of stowing 1,500 miles (2,400km) of cable. It was said to be 'one of the ugliest vessels afloat'.⁹⁹ The company's fortunes fluctuated through the later 1870s, but stabilized into profitability by 1880 when the firm became Siemens Bros & Co. Ltd. William withdrew from close involvement after 1880, turning to the exploration of electrical-engineering interests apart from telegraphy. Among many initiatives that opened up new fields for his firm was electric-arc steelmaking, which he demonstrated to the Iron and Steel Institute at the Woolwich works in 1881. Knighted in 1883, he died the same year, leaving the firm under the chairmanship of Werner. Control of the English company stayed in the family thereafter through their cousin's son, Alexander Siemens.¹⁰⁰

Siemens Brothers took a new 99-year lease from 1881 of its existing Woolwich property and all the rest of the land between Harrington Road and Bowater Road east to Trinity Street – Warspite, Long's and Trinity wharves blocked riverside expansion. By 1884 the company was producing an average of one major Atlantic cable every year. It established itself as the industry leader, and submarine-cable manufacturing remained overwhelmingly dominant at the Woolwich works into the 1890s. But there were also other products, reflecting the breadth of William Siemens's ventures. In 1881–2 an imposing three-storey and thirteen-bay office and showroom block went up at the centre of Bowater Road's north side with a two-storey



104 (above left). Northern parts of the former factory from the south-west, 2008

105 (below left). Plan showing phases of development, 1863 to 1958

106. Bird's-eye view from the north drawn by E. Neale, 1928, showing the works with Maryon Park School in the distance

107. Distant view of the works from the south, showing New Charlton and Maryon Park School in the middle distance, c.1900



108. Siemens factory range of 1871–3 on north side of Bowater Road, originally a gutta-percha masticating workshop. In 2010

workshop range to its east that housed dynamo shops and milling machinery and, further east backing onto Trinity Street, a chemical department. John Grover of New North Road was the builder, as he was of an eastwards extension of the workshops in 1889. This was then linked to the Trinity Street block by a taller workshop block and, to the rear along Harrington Road, armouring and lead-sheathing workshops were added in 1898–9, when John Mowlem & Co. were the builders (Ills 104–7, 109, 110). The eastern parts of this complex survive; western buildings were replaced in the early 1990s. The firm also began to colonize portions of open land further south with some short-lived packing sheds. Steam power was replaced (except for heating) around 1892 when an electricity generating ‘central station’, said to be the first of its kind for the electric driving of a factory, was formed on the south side of Harrington Road in a building close to the core-tanks block. This also provided electric



109. Siemens factory from the south-west between Bowater Road and Harrington Road, showing buildings of the 1880s and 1890s in c.1925. Demolished

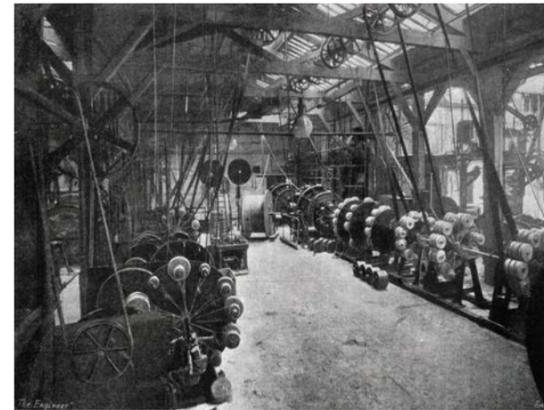
lighting for the site, the buildings of which were linked by electric tramways. (Siemens had built and from 1881 operated the world’s first electric tram system in Berlin.) The Woolwich complex had become a ‘long, grim reach of masonry’.¹⁰¹

Siemens probably accounted for a third of total British electrical and telegraphic production when it laid its last Atlantic cable in 1894; by 1900 the world’s telegraph system was considered complete bar the closing of gaps. But in 1891 Siemens had laid the first British submarine telephone cable. The firm was well positioned to divert its energies into new fields of activity and there was substantial further growth of the Woolwich works. Siemens Road had been laid out across the open field south of the works in the 1880s, and the Bowater Estate followed with Westfield Street and Yateley Street in 1898 and 1901 when the west end of Bowater Road was taken into Siemens’s premises and closed to the public with a gate in front of the office block. Further long Bowater leases that ran from 1897 and 1901 gave Siemens all the land on the west side of the northern part of Yateley Street (between Bowater Road and Westfield Street). This was not much developed at first, save with scattered small sheds and a larger ‘line-department’ building of 1903 at the south-east corner. Here batteries, telegraph and telephone-line material were produced in low sheds, outwardly of arcaded brick, internally steel framed. An electrically driven overhead telpther system conveyed light materials and equipment between the wharf and the line department on ‘long clanking journeys’.¹⁰²

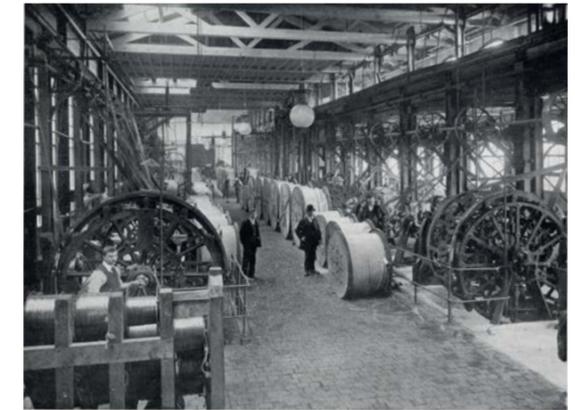
In 1904–5 Siemens’s dynamo and motor department moved to Stafford and the eastern block of buildings between Bowater Road and Harrington Road was converted for the production of paper-insulated cable and related components – there was growing demand for lead-cased paper cables and insulated wires for telephone, telegraph, electric-light and power lines (Ill. 111). Cables were made in the range fronting Bowater Road, which now incorporated a steel-framed gallery fitted with vertically mounted core-making machines. The west end of the site between Bowater Road and Harrington Road was reconfigured to manufacture equipment such as galvanometers and Morse-telegraph and laboratory instruments.¹⁰³

Significant further building did not come until 1910, when large blocks on the west side between Westfield Street and Bowater Road and new offices, central on the south side of Bowater Road, started to sprawl across the site’s south-west quadrilateral (Ills 105, 106). As the submarine-cable business receded, access to the river became less significant.

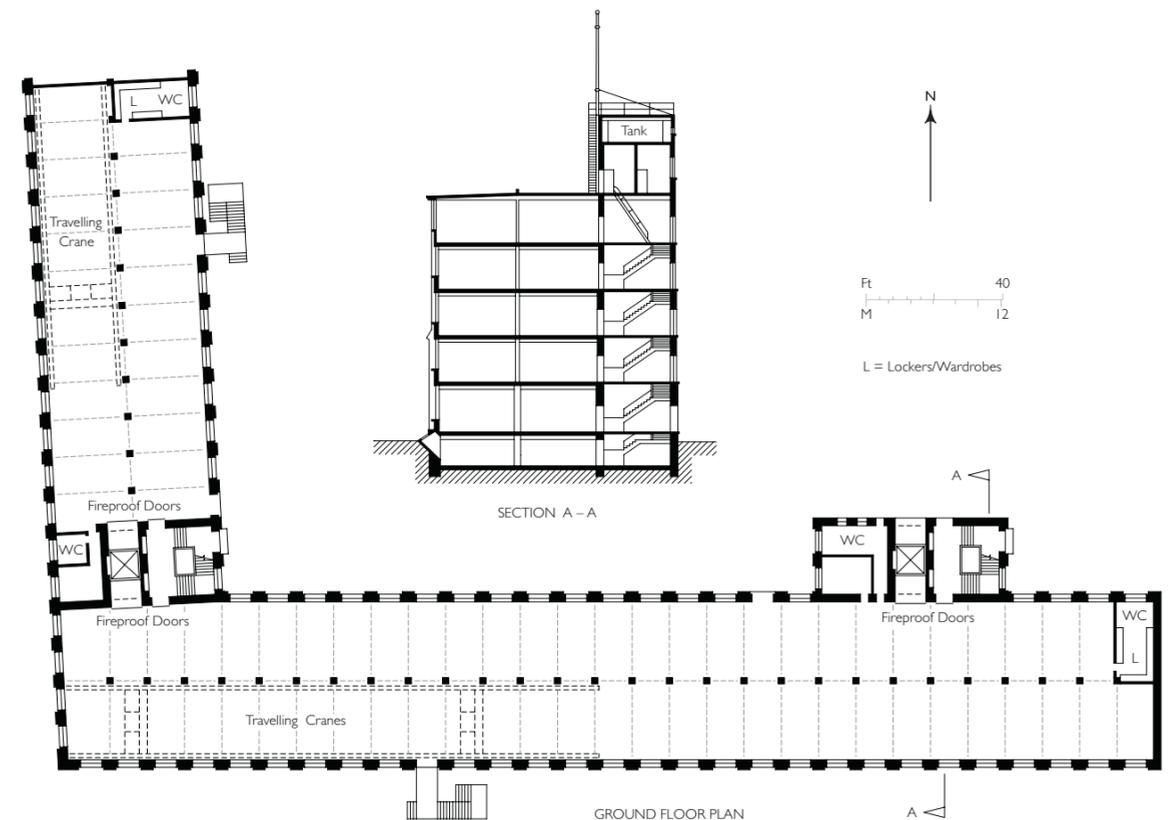
Among these additions, to the north-west, were the rubber shops (now 37 Bowater Road and 3–4 Faraday Way), a factory for making rubber-coated copper-wire cable (Ills 104, 112). This vast five-storey and basement L-plan building, which survives substantially as built, was one of London’s largest factories when new. It marked not just a shift up in the site’s scale of building, but also the adoption of new structural technologies. Its



110. Cable workshop in 1899



111. Stranding workshop for making electric-light and power-line cables, in range of 1889 on north side of Bowater Road, 1906



112. Rubber-coated copper-wire cable factory, 1910–11

arrangements were devised by W. Dieselhorst, Siemens's general-works manager, and the building was designed by Herbert and Helland, in-house architects, probably working with F. Southey, a civil engineer who later became the company's architect. The building contractors were Holland & Hannen. Externally, a pier-and-panel Fletton-brick shell broke the historicizing mould of earlier buildings. A reinforced-concrete interior and flat roof on the Kahn system made it possible for almost half the wall surfaces to be given over to steel casement windows. Five-ton capacity electric travelling cranes served the ground floors of both ranges, and three-ply Ruberoid covered the roofs. Within, raw rubber for the insulation and waterproofing of copper wires and cables was prepared. External staircases were made by the Lion Foundry Co. of Kirkintilloch.¹⁰⁴

The same parties were probably responsible for the contemporary offices, a five-storey flat-roofed building, soon given attics and latterly designated 17–21 Bowater Road (Ill. 104), as they were for another large building to the south in 1911–12, again using the Kahn system. This was a five-storey telephone-equipment factory behind which there extended a huge steel-framed single-storey engineering shed (Ill. 106). The tall range was axially divided on each floor by a single row of helicoidally reinforced columns that carried the structural beams and slab floors. Up to this point Siemens Brothers had relied on Siemens and Halske's research in Germany in the development of automatic telephone exchanges. But this building included a laboratory and experimental rooms for a newly recruited staff of telephone engineers; hereafter Siemens Brothers forged its own path, taking out the first British telephone-exchange related patent in 1913. As for the assembly of telephones, many of those employed were women.¹⁰⁵

In 1914 Alexander Siemens remained chairman of Siemens Brothers and the managing director was another German, George von Chauvin. The firm was obliged to distance itself from its roots after the outbreak of war, and two years later (following the 'Trading with the Enemy Act') the British state expropriated the company's controlling German interest. In the face of heightened if not hysterical local feeling the remaining two-dozen German employees were suspended on full pay. Otherwise the company continued its work unfettered, most of it on direct or indirect government contract or for allied states. Submarine-cable manufacturing all but ceased in 1916 as telephone equipment, particularly field-telephone cable, became the most important wartime product. Demand was high and the war years saw the erection of a number of low sheds for workshops and stores, in particular as major extensions to the line department, sheathing shop and battery shop.¹⁰⁶

During the inter-war period telephone-apparatus and cable making prevailed at the Woolwich works, though submarine-cable making was revived. In 1923 a range of tall single-storey buildings was put up on reclaimed riverside marshland to the west of the original works, in Charlton,

for the making of armoured power cables. Designed by Southey, this prominent building was comparatively ornamental, with polychromatic brickwork and pedimental gables. A five-storey junction-box factory, extant as 25 Bowater Road, went up on the south side of Bowater Road in 1925–6, similar in form to the factory buildings of 1911–12, with J. Humphreys of Knightsbridge as builders. In the same years there were also substantial enlargements of the battery department, to the east between Siemens Road and Westfield Street, and of the telephone factory to the west. In 1930 Siemens introduced the 'neophone', replacing the 'candlestick' form with one that became ubiquitous for decades – a semi-pyramidal black Bakelite base with a circular dial and a cradle on top for a bracket-shaped handset. To start with these were made exclusively at Woolwich.¹⁰⁷

There was further major building in 1937. A two-storey reinforced-concrete cable shop (also still standing) was built by Griggs & Sons, of Victoria Street, on the south side of Bowater Road east of the offices, its elevations articulated by chamfered piers. An extensive multi-roofed single-storey machine shop was also added, taking the works south of Westfield Street near Harden's Manor Way. Laboratories and experimental workshops were unified, and garages and bicycle sheds were built for a workforce that had grown to more than 9,000 on a site that now covered thirty-five acres. There was also corporate restructuring. Most of the submarine-cable work was transferred to Submarine Cables Ltd at Greenwich, a new company co-owned by Siemens Brothers and the Telegraph Construction & Maintenance Co. Ltd (Telcon). Siemens Brothers had revived commercial and technical arrangements with Siemens and Halske, but in 1939, as war with Germany loomed, these were terminated and the shareholdings of each company in the other blocked.¹⁰⁸

The Siemens works suffered heavily in the German air attacks of the Second World War. There was serious damage on twenty-seven occasions, beginning with a daylight raid on 7 September 1940 and culminating with targeted rocket and flying-bomb attacks in 1944. The assaults destroyed several buildings, including the earliest block of 1865 to the north-west. But work continued, with a workforce of about 7,000 staying to fill the state's needs for telephone and power cables. The factory had its own operations room where the position of enemy aircraft was plotted, and there were on-site air-raid shelters. Special wartime work included the Clyde Loop, two 5-mile (8km) lengths of submarine 'sweep' cable designed to create a magnetic field sufficiently intense to explode magnetic bombs and open up a channel in the Clyde. From 1942 the works were also the site of the design and manufacture of a high-pressure submarine pipe for pumping petrol under the sea, an adaptation of submarine-cable expertise. Following exhaustive covert experiments, the 3in.(7.6cm)-diameter HAIS 'cable' (its acronym from Arthur Hartley, chief engineer of the Anglo-Iranian Oil Company, Anglo-Iranian and

Siemens) was laid across the English Channel in August 1944 as part of operation PLUTO (Pipeline Under the Ocean). For this work the rubber-cable factory was enlarged in 1942, with a five-storey north-east wing and low sheds that took a direct hit in 1944.¹⁰⁹

After the war Siemens began to look elsewhere for new productive capacity. The Woolwich works were damaged and in parts outmoded, and there were also local labour shortages. Some production lines, including batteries and cable accessories, relocated to north-east England. Woolwich concentrated on telecommunication and engineering apparatus, and, in diminishing degrees, cables. In 1946–7 an instrument factory and marine radio school (34 Bowater Road) for training in the use of radar and radio equipment was built in a joint venture by Siemens Brothers with Metropolitan Vickers Electrical Co. Ltd. Woolwich was preferred to Manchester for this because traffic on the Thames and numerous adjoining buildings provided ample radar reflections. A three-storey red-brick block (still extant) was built on a bombsite on Harden's Manor Way, between Harrington Road and Bowater Road. There was further building in the 1950s, particularly to the south around Yateley Street and along the Woolwich Road (Ill. 105). To the east a large single-storey brick-faced workers' canteen of 1953 was built, with Oscar Faber as constructional engineers; latterly this has been used as a self-storage warehouse. Across Yateley Street a similar but smaller building was erected at right angles in 1956 as a labour and welfare centre for Siemens workers. Both these buildings recycled materials from the site's air-raid shelters. Further west, near Harden's Manor Way, the machine shop of 1937 was extended to the south in 1957 as a rack-wiring factory, another low brick-faced building that survives as a warehouse. The works were also extended further into Charlton near the river, for making super-tension oil-filled cables.¹¹⁰

Siemens Brothers had undergone fundamental corporate change, first through a final disentanglement from its German roots, and then in 1954 when Associated Electrical Industries (AEI) Group, formed by gradual amalgamation, took over the whole company. Under this umbrella Siemens Edison Swan Ltd was created in 1957. Despite rationalization and further investment, including the concentration at Woolwich of the wider company's super-tension cable department and the building in 1962 of a high-voltage laboratory, the layout and age of much of the Woolwich works stood in the way of new production methods. By 1967, when AEI was taken over by the General Electric Company (GEC), the Woolwich factory was principally engaged in making electro-mechanical Strowger telephone exchanges for the Post Office. Faced with the phasing out of such exchanges and unwilling to invest in modernization, GEC, led by Sir Arnold Weinstock in a closely guarded decision, closed the Woolwich works in early 1968. The gradual rundown of the Royal Arsenal, which had closed as a factory the preceding year, had made AEI the largest employer in Woolwich with around 6,000 jobs. Losing these was a devastating blow.¹¹¹

Westminster Industrial Estate

Soon after the closure of the AEI factory negotiations opened with the Westminster Construction Company for the sale of the site for redevelopment as a lettable trading estate. This had been arranged by 1971. The Greater London Council bought the complex and leased it to the Co-operative Insurance Society. Development was undertaken on the Co-op's behalf through what had become Westminster Bunting Ltd with Douglas, Marriott, Worby and Robinson as architects. Siemens's buildings were largely retained around Bowater Road and near the Woolwich Road, the larger ones as flatted factories. At the time this was seen as exemplary reuse of industrial buildings. There were also clearances and large standard single-storey sheds were put up in the 1970s between Westfield Street and a new road to the north called Faraday Way. More recent use includes artists' studios. A Greenwich Council masterplan of 2012 envisages the replacement of many of these sheds with housing, also introducing a Greenwich University Technical College to the south-west.¹¹²

Thames Barrier area

The north-west corner of the Siemens site was cleared from 1972 for works associated with the Thames Flood Barrier, constructed by the Greater London Council in 1974–84. The Barrier and its main buildings lie outside Woolwich, but ancillary structures at the east end of a public riverside park that are in Woolwich include a disused ticket office and river landing stage, a café and information centre, and a visitors' learning centre; a tented rotunda-like building has been demolished. Close by, on the south side of Unity Way, a telecommunications mast stands almost exactly where a tall chimney that served the Siemens works stood until 1969 (Ill. 104).¹¹³

NEW CHARLTON

The Woolwich Road south of the former Siemens works was a residential area in the nineteenth century. In 1807–8, when John Bowater was imprisoned for debt, fourteen acres of 'marsh' on the north side of what was then called the Greenwich and Woolwich Lower Road (turnpiked in 1818) passed to George Henry Harrington. There had been earlier development across the road in Charlton parish, thanks to which the place was already known as New Charlton. Harrington granted long leases of large roadside plots to James Harris and Stephen Sallett, local builders, and to others, including Thomas Whitby, a Chislehurst miller, who built a house. Glen Mohr Cottage, a good-sized villa on the site of Maryon Park School, may also have been built at this time. Bowater's daughter, Georgiana Mercote, and her husband, Joseph Harrington, lived there in the 1840s, and the elderly Harrington was again



113. Former Lord Howick public house (right), 1895–6, and Howick Mansions, twelve flats and four shops at 823–833 Woolwich Road, 1898. From the south in 2011

resident around 1870. In the early 1890s it was a clubhouse with a bowling alley.¹¹⁴

By the 1840s this northern part of New Charlton was densely but incoherently built up (Ills 10, 107). There were small groups of alluringly named houses – Charlton Vale and Elysium Cottage to the west, Eden Place to the east. These had large gardens, but bucolic identities were belied by cramped courts of small houses, even some back-to-backs, stitched in behind. The main developer here in the late 1840s was William Bowles, who was presumably building to rent to artisans employed in the dockyard's steam factory. At the Trinity Street (Warspite Road) corner the **Lord Howick public house** had appeared in the 1830s with a large garden and skittle alley. It was rebuilt in 1895–6 for Meux's Brewery through the landlord, Alfred Saunders (Ill. 113). H. L. Holloway of Deptford built the tall three-storey and attics establishment. Damage from an explosion in 1929 necessitated some reconstruction, and the pilastered ground floor was recast in 1937–8 by J. E. Evans, a Plumstead builder. The pub continues as Clancys.¹¹⁵

Round the corner on the west side of Trinity Street was Trinity Cottages, a mean early nineteenth-century terrace, pulled down as dangerous in 1875–6. At its south end was a beerhouse, known as the Lord Derby by the early 1850s when further houses were going up. Another row of small houses was built further north in 1878–80 and the earlier group was replaced in 1885–6 as 11–20 Trinity Street, mostly maisonette flats, with eight more such flats further south. Behind Trinity Street on and around Bowater Road there was scattered early housing, supplemented in the early 1880s on Bowater Road and, with a long row of thirty dwellings, mostly maisonette flats, on Siemens Road. When Yateley Street and Westfield Street were formed in 1898 and 1901, the London County Council insisted that no more houses should be built. Those already in the area

came to be engulfed by the Siemens factory, where many occupants worked.

The **Derby Arms public house** was rebuilt in a neo-Georgian brick mode in 1938–9 for Truman, Hanbury and Co., to plans by W. G. Ingram, Son and Archer, architects, with H. and J. Taylor of Hither Green as builders. It survives as St Clair's. The houses on and behind what had become Warspite Road were demolished as slums in the late 1950s and 1960s.¹¹⁶

The Woolwich Road had been widened and its hinterland renewed in the years around 1900. The houses near Harden's Manor Way and east of Yateley Street were all cleared, making way for the enlargement of Siemens premises. Further east, next to the Lord Howick, the pub's proprietor, Alfred Saunders, built **Howick Mansions (823–833 Woolwich Road)** in 1898, again with H. L. Holloway as his builders (Ill. 113). This is the sole survival of the area's humble late nineteenth-century tenemental domestic architecture and is an unusual and interesting development in its own right. The symmetrical façade has central and outer gables with polychromatic brick patterning and a panel with an 'S' monogram (presumably for Saunders). The building combines flats and shops and was reportedly built with concrete floors. In a two-storey and basements range there are twelve 'mansions', four with shops. First occupants worked both at Siemens and at the dockyard depot.¹¹⁷

The site to the west of Howick Mansions was developed in 1906–7 by Frederick Saunders. He built a stable-yard with a blacksmith's shop that was recast as a garage in the years around 1920 and then improved with motor showrooms in 1931–3 for what became Saunders Transport Ltd. These premises were cleared in the late 1960s for 821 Woolwich Road, a single-storey and basement brick range of offices that now accommodates a community-health facility.¹¹⁸



114. Holborn College (formerly Maryon Park School), 1894–6, enlarged 1909–10 and 1914–15. From the south-west in 2010

Maryon Park School (now Holborn College)

Local population growth prompted the School Board for London to take the Glen Mohr Cottage site in 1894 for the building of Maryon Park School. The name derived from the former Hanging Wood and Charlton sandpits land to the south that had been given to the London County Council in 1891 for a park named after the Charlton landowners, the Maryon Wilson family. The catchment, largely working class and associated with the Siemens works, was densely housed, most of it outside the parish of Woolwich. The school was built in 1894–6 to plans by the Board's architect, T. J. Bailey, with Kirk and Randall as builders (Ills 106, 107, 114). At the outset it comprised just the southern classroom range and a central triple-decked hall block (for infants below boys below girls) with more classrooms on the east side, built on arches to create a covered play area. The original capacity was 789 (309 infants, 240 boys and 240 girls). Foundations were laid for northward extension to make the whole symmetrical, as was usual with board schools. The layout, polychromatic brick elevations and overall architectural form are typical of Bailey's work, though this is rather more blockish than many of his schools. Internally the building has steel girders and Homan's hollow-brick fire-proof floors. The infants' playground was to the south, with a play shed to the west. To the south-east there was a three-storey building for a cookery and laundry

centre under a schoolkeeper's house. Because entrance to the site from the busy road proved dangerous, land was acquired to permit access from Westfield Street through the older children's playgrounds.

Extension to Bailey's plans duly ensued, in two phases, first in 1909–10 when the main block was completed, again by Kirk and Randall, with a second ogee-capped staircase turret and six more east-side classrooms, taking the capacity up to 1,035. Further enlargement followed in 1914–15, with F. J. Gorham of Greenwich as the builder of the northern cross range. This fails to carry through the symmetry and does not project to the west like its forerunner. It provided seven more classrooms above another covered play area. The overall capacity did not increase this time, as the LCC, the School Board's successor, insisted that the children should be less densely packed in.

In the 1950s the school mixed primary and secondary accommodation before becoming Charlton Secondary School and gaining hut-like additions in the playgrounds. The Woolwich Road was again widened, most recently in the 1980s when the schoolkeeper's house was demolished. By then the Inner London Education Authority had made the school a further-education college. It has continued as such, but as Holborn College, a private institution established to prepare international students for London University law exams. In 2012 Greenwich Council acquired the premises for a return to use as a primary school.¹¹⁹