# FROM PILCHARDS TO POLARIS

BY

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*Some random notes on Devonport Dockyard, the growth and demise of its Engineering Department.*

*The Author retired as a Senior Draughtsman in January of this year after more than 48 years' service in Devonport Dockyard, 36 of which were spent in the Drawing Office which included 22 years on Yard Machinery work.*

## A Brief History of 'Dock'

It was pilchards that determined the destiny of Devonport Dockyard.

In Elizabethan times, when a site for a dockyard was under consideration, the claims of Falmouth were strong. It was nearer the mouth of the Channel, and in other respects appeared more suitable as a naval port. But Devonport had its pilchard fisheries, bringing in a rich return in cash—and cash was important for any development.

Money for fortifications in those days came not from the Treasury but from the people of the district. Drake and Hawkins, both Plymouth merchants, realized the great advantage of the pilchard trade, since pilchards were extensively used for victualling ships, and they accordingly had the pilchard-curing industry brought to Plymouth.

This settled the question of the location of the dockyard. A tax was levied on pilchards and yielded £5,000, to be spent on building new defences and other works in the area.

Raleigh also supported the Plymouth project, pointing out to Queen Elizabeth I that the Hamoaze was suitable 'for a great design in a small space'.

In the reign of Charles I, Saltash was selected as a site for a new Government dock, but the idea had to be abandoned because of strong objections from its inhabitants.

By 1668, however, the establishment was still almost negligible; so much so, in fact, that all the officers and men lived on board a hulk in the port.

Resulting from an inspection by William III, of a site near Point Froward (near South Camber), Parliament voted £2m towards the cost of the scheme, work on which commenced on 2nd September, 1691. In the following year the dock and basin were completed. The first house at Dock (later Devonport) was built in 1700, but most of the workers travelled from Plymouth every day.

St. Nicholas's Island (Drake's Island) was fortified in 1702 to protect the young dockyard. There was remarkable and rapid growth in the 18th Century—the gun wharf (Morice Yard) being built in 1725, and two further docks in 1736 and 1762. By 1730 the population of Dock had risen to 3,300 and rose again during the next century to 23,700—Plymouth's population having only increased from 8,000 to 16,000 in the same period.

Saboteurs and incendiaries were active at this time and there were many fires in ships in the dockyard, including the *Amphibion* which 'blew up' in 1796 with the loss of 200 lives.

**The Origin of the Royal Dockyard**

William IV was a frequent visitor to Dock; and the 'Temple' on Bunker's Hill, South Yard, commemorates the visit of George III. The inscription reads: 'This building was erected in the year 1822 to perpetuate the recollection of the visit of His Majesty George III of blessed and glorious memory and of His Majesty's admiration of the rock on which it stands and the scene around'. In 1790 he opened the Royal Dock and saw a naval review in which 100 'men of war' participated.

Although the Dockyard was busy it had, like others, its labour troubles. In 1780 there was serious dissatisfaction among the men, who objected to the introduction of task work, and for three months riots were frequent. However, war with France in 1793 brought a great increase of work and stirring times followed. Nelson's prizes were brought into Dock, including the great *San Josef*, which Nelson himself came over to command after her refit. The end of the French war brought not only great rejoicing but its inevitable aftermath was desperate unemployment, and 7,000 people received alms at the Church door.

The situation was relieved by the continued growth of the docks, by the building of a new Victualling Yard at Devils Point, and, most particularly, by the work on the breakwater. This project was begun in 1810, took 28 years to complete, cost £1½m and used 4½ million tons of limestone.

**The Emergence of the Engineering Department**

The Engineering Department does not appear to have emerged until the Keyham Steam Yard or North Yard was built; the layout work commenced in 1844 and the buildings work in 1846, when records show a T. W. Miller, Esq., in charge of the Department. It is presumed that it was then that the Engineering Department assumed responsibility for the Ropery, built at South Yard in 1814, which was one of the longest buildings in the world. The Ropery was destroyed by enemy action in 1941, and was not replaced, the requirement for rope having diminished so that it could be met from commercial sources.

**The 'Steam Yard'**

Keyham Steam Yard was opened on 7th October, 1853, and the tunnel between Keyham and South Yards, which took a year to complete, was opened in 1856.

With the building of Keyham Yard the hub of the Engineering Department was established at the Quadrangle, the workshops being on three sides of an open space about 780 ft × 350 ft, the west side adjacent No. 3 Basin having North and South Stores straddling an office block.

The Iron Foundry was finished in 1856, complete with its two huge landmark stacks. The Boiler Shop, on the north side of the Quadrangle, was a single-bay building only and 'balanced' a similar building on the south side—both being opened in 1857. The southern building housed the Erecting Shop at the west end—about 178 ft long—while a similar length in the remainder was used as a turnery with a fitting shop over it. The offices in the west wing of the Quadrangle also housed the Drawing Office.

All the buildings, which still form the main Engineering 'Factory', are of massive construction in dressed limestone, with granite archways, copings, etc., and were designed to last a thousand years. Below the ground level, and built first, the cells for the prisoners who did the heavy labour still remain. It is said that the first above-ground buildings were the corner towers for the warders in charge of the prisoners. A small force of masons provided the skilled labour.

A small fitting shop—about 150 ft × 50 ft—north of the Foundry on the east side of the Quadrangle was opened in 1855 and appears to have been the first workshop specifically built for the Engineering Department.

By this time a T. Trickett, Esq., was Head of the Department, holding the post from 1854–62.

The 'Compound' Boiler Houses at the N.E. and S.E. corners of the Quadrangle were completed in 1855 and derived their names from the compound expansion beam engines in adjacent buildings, to which they supplied steam. Machines in the turnery and the boiler shop were driven from shafting, carried in underground tunnels, connected to the beam engines.

The precise order in which workshops to absorb the Quadrangle space were built is not known—but there is a record of a gun mounting store being built about 1885 on the northern portion of the site later used for the Torpedo Tube Shop.

By the early part of the present century the existing Erecting Shop, Torpedo Tube Shop, Light Fitting Shop, Coppersmiths Shop, Patternmakers Shop had all been built, and the Foundry had been extended. Only a roadway east to west through the Quadrangle remained of the hitherto open space.

With the use of electricity for industrial purposes, short lengths of overhead line shafting, each driven by large D.C. motors displaced the underground shafting. Electric carbon-arc lamps also superseded the earlier gas fittings for lighting the workshops.

**'Manager, Engineering Department'**

During the intervening period the Department was managed by 'Chief Engineers' including Chief Engineer C. N. Beaton (1879–85), D. Robb, Esq., Inspector of Machinery (1885–90) and R. H. Andres, Esq., (1902–07). Engineer Rear Admiral W. L. Wishard held the office from 1907–09. In December 1905 the powers of *de facto* Manager were conferred on the Chief Constructor and Chief Engineer who were designated to be Manager, Constructive Department and Manager, Engineering Department.

Some idea of the growth of the Department is given by the total numbers of industrial workpeople borne in the years 1856, 1946 and 1963, which are:

1856— 557
1946—4,046
1963—4,060

A Departmental peak occurred in 1957 when there were 4,362 men in the Department.

The first welding centre was set up in 1909 by adapting the ground floor of No. 1 Compound Engine House, the first floor being converted to a dining hall, and, later to the M.E.D. Conference Room. It is worthy of mention that the oscillating rocker beams of the former engines passed through an opening in the floor of this room.

The Heavy Turnery was established about 1907 and the Fitting Shop over the eastern part of turnery removed a few years later.

**The First 50 Years**

The first 50 years of the Department's existence were a mixture of busy and slack periods. Many sets of steam reciprocating engines and associated boilers were built complete, for some of the ships which began life on the slipways at the south yard. There were many discharges in the first decade of 1900's.

Coke braziers for heating the workshops were gradually replaced by 15 lb/sq in. steam-heated radiators, fed by steam from the two 'compound' boiler houses.

Apart from direct production facilities, provision was squeezed in somehow for supporting aides, e.g., a leather shop for maintaining driving belts and preparing plunger washers for hydraulic pumps, etc., which were important for heavy gunmountings; a bottle test shop (for rumbling and testing containers and reservoirs for compressed air or gases) due to the introduction of compressed air as a motive force, e.g., for torpedoes; a lagging shop and even a laundry for washing overalls.

In addition, a considerable area was occupied as an auxiliary machinery demonstration room for the R.N. Engineering College, Keyham. The training of engineer students had been linked with the Dockyard through the Engineering Dept. since 1880 when the R.N.E. College was opened—more as a 'hostel' than a college—as an official Training School for engineer students. The history of the Engineering Branch of the Navy, so directly linked to Keyham College, Devonport Dockyard School, and the Engineering Department, is a subject in itself. It is, however, worth remarking that among those ex-fourth-year apprentices on the roll of honour destroyed in the 'blitz' were the names of two Engineers-in-Chief of the Fleet and some 37 Engineer Rear-Admirals or Managers of Engineering Departments in H.M. Dockyards.

**The 20th Century**

The advent of the internal combustion engine called for refitting facilities and these were squeezed in at east end of the Erecting Shop, which catered for submarine engines; and the north end of the Light Fitting Shop for motor boat engines and other small types.

The first workshop built for the Engineering Department outside the confines of the Quadrangle was the Turbine Shop, opened in 1913 and adjacent to the east side of No. 5 Basin. This shop was equipped with a 100-ton electric overhead travelling crane in each of two bays and the original scheme was that the bulky direct-expansion direct-drive Parsons turbines should be lifted from

ships in No. 5 Basin by the 160-ton cantilever crane and lowered through the roof of the workshop.

Developments in the Gunnery world also required facilities and a Range-finder Shop was built at south end of No. 1 Wharf—adjacent to Moon Cove, in the early 1920's. The building, however, soon became outgrown and was replaced by a larger Rangefinder House at No. 3 Wharf about 1935, (later adapted as an Apprentices Training Centre).

**The First World War**

The record of achievement by the Department in the 1914–18 war is the only complete example of detailed history kept as such and must be read as a separate study. It covers construction, repair and salvage.

By the end of First World War in 1918 the role of the Engineering Factory was changing from one of manufacturing, installing, salvaging and maintaining ships' machinery to one of repair and maintenance only.

Engineer Captain W. H. James, R.N., was Manager from 1911-19. It is a pertinent comment on the value of engineer officers, engineering and the Royal Dockyards, that his services throughout World War I never merited any Honour or Decoration.

**Inter-War Period**

The last reciprocating engines were built not for the Navy but for outside commerce; to offset the effects of the depression Devonport was entrusted to build two oil tankers the *Olna* and *Nassa* for the Anglo-Saxon Oil Co. The two sets of engines were manufactured complete by the Factory in the 1921–22 period. Of triple-expansion design, the L.P. cylinder being about 50 in. diameter, the engines were erected at the west end of the Erecting Shop and 'turned over' by compressed air.

Although the 1920–30 period presented many large tasks, including the completion of the cruiser, H.M.S. *Frobisher*, the minelayer, H.M.S. *Adventure*, and immense modernization schemes for the aircraft carriers H.M.S. *Argus*, *Furious*, *Glorious* and *Courageous*, the Department took its share of the effects of the depressions in 1923 and 1927. Whole entries of highly trained ex-apprentices were discharged on redundancy and were obliged to accept such menial jobs as road repairers, railway porters, insurance agents and undertakers' bearers. However, to shed light in this dark period, the carbon-arc system was replaced by the then modern incandescent gas-filled bulb type.

The Turbine Shop, referred to earlier, had been arranged to steam-test, the units, after refit, from Yarrow boilers sited in an adjacent boiler house and the set-up included the necessary condenser installation, etc.

In fact, only one set of turbines was built in the shop, the remainder of the work here being refit only. The *Adventure*, a minelayer built in the Yard, was engined by a set of Parsons turbines, made up from rotor forgings redundant from the cruiser *Emerald* whose construction was stopped at the end of the 1914–18 war. The profiles of these turbine blades for the various stages were machined on specially adapted milling machines from stock of the appropriate root sizes. This work was largely done by apprentices—the Department having become apprentice-training conscious. A chargeman (Mr. E. E. Smith—later Engineer Assistant, Yard Machinery) was appointed to co-ordinate this training in 1922. The *Adventure* turbines were steamed in the shop in 1923.

During most of the 1930's the Department was managed by Engineer Rear-Admiral H. S. Brockman, C.B., A.D.C., who held the chair from 1934–41, and was probably the most popular of the 25 Managers. This outstanding officer and sportsman left his mark not only on the Factory, in reorganizing its

layout, but also in the formation of the M.E.D. Sports Club and in acquiring and founding the Civil Service Sports Club at Beacon Park.

This decade saw a rapid transition from overhead line-shaft drives for machines in the Factory, to self-contained individual A.C. motor drives, the use of A.C. for industrial use being in its comparative infancy. The Department was responsible for the installation of machinery in the many sloops built at the Yard in this period. Just prior to the outbreak of hostilities in 1939 the Department had a new commitment: the equipping of the workshops of the R.N. Air Stations at Yeovilton and St. Merryn, also the procurement of such equipment for Donibristle, Arbroath and Crail in Scotland.

**The Second World War**

In common with the other Yard Departments, the Engineering Department had some tough consignments to meet during the second World War, but despite the loss of their entire homes and possessions by many of its employees, and other hardships, a high level of morale was maintained and completion dates kept. Many 'A' and 'T' Class submarines were built in the Yard at this time and the propulsion machinery for these was installed by the Engineering Department.

In 1940/41 an internal combustion engine repair depot was established at Harrowbeer, some 9 miles remote from the 'dockyard target area' to deal with the engines for the ever increasing numbers of motor boats, motor torpedo boats, etc. A further measure of dispersal was the setting up of workshops in a City school (the scholars having been evacuated to Cornwall), including Nissen huts in the adjacent playground.

The origin of the 'Temporary' Fitting Shop, South Yard, is obscure, but it may well be that this is a survival of the 'engineering' aspect of the Dockyard before the building of Keyham Yard.

**Post-War Development**

It will be appreciated from what has been said that the 'squeezing in' of new facilities to meet new developments was bringing increasing pressure on the 'seams' of the Quadrangle Block. These seams were inelastic, being of dressed limestone.

The preparation of a Post-War Development Plan in 1943, following extensive damage by enemy action two years earlier, gave the officers of the Department an opportunity to think and scheme realistically. Anything more than minor extension to the Quadrangle was impracticable and it was therefore decided to try and get rid of anything not strictly necessary to this area, e.g., the laundry and the pattern shop (fire risk) from the Quadrangle, and to re-provide them in what is now called Goschen Yard. Similarly, the Bottle Testing Shop, Leather Shop, Testing House, etc. were to be moved. In addition, 5 buildings to meet the requirements of the Gunnery Section were mooted: a large shop to deal with mountings and a smaller one to deal with equipment; an optical shop; a P.I.P. (Preservation, Inspection and Packaging) Shop and a Gunmounting Store; all these were projected to be built in the Fore Street area, to relieve the Torpedo Tube Shop, G.M. Stores North Yard and Ocean Quay.

Before the plan could be implemented, the first buildings Nos. 1 and 2 G.E. shops being completed in 1955/6, pressure in the Quadrangle was relieved by removing the small I.C.E. Section to the north of No. 5 Basin and absorbing the R.N.E.C. Workshop (vacated when the R.N.E. College transferred to Manadon), but the necessity to institute a Refrigeration Section and better facilities for apprentice training restored the position to *status quo*!

In a further endeavour to make the utmost use of valuable Quadrangle space, a scheme was prepared while Engineer Rear-Admiral C.R.P. Bennett, C.B.E. was Manager (1950–54) to extend the workshops over the roadways and rearrange certain ones to better advantage. The opening of the G.E. Shops rendered the Rangefinder Shop at No. 3 wharf redundant, and the first move therefore was to resite the Apprentices Training Centre at No. 3 Wharf.

Reconsideration of the Goschen Street Laundry scheme showed that the capital outlay could not be justified by the estimated savings and all the laundry work was placed with a contractor in the City. The vacated space was immediately earmarked for 'a Pipe Cleaning and Phosphating Workshop', one of the many new requirements now arising so frequently with the development of new techniques and technologies. A workshop for testing and repairing remote control machinery has been set up within the Quadrangle boundary, but much still remains to be done to relieve the congestion which prevents the adoption of certain improvements, e.g., the segregation of ferrous from non-ferrous coppersmiths' work.

**Modernization/New Facilities**

In order to try to assess the whole problem of the best use of production resources within the Quadrangle, specialist consultants were employed for a year. As a result a scheme was accepted for rearrangement of the factory facilities within the Quadrangle to meet the increasing complexity of its many tasks, and it was hoped that when completed, in 1973, the Factory would prove suitable for many decades ahead. The Rationalization of Trades and Workshops following the reorganization of Departments and the Functionalization of Management will probably entail a revision of the scheme.

The radiator heating system has been replaced by a 100 lb/sq in. 'radiant panel' scheme, fed from 4—12,500 lb/hr boilers in No. 2 Compound Boiler House.

The P.I.P. Shop has been occupied for some years now and the Weapon Equipment Store was completed mid-1964.

The unsuitable and inadequate I.C.E. shop at No. 5 Basin has been replaced by a purpose-designed building, opened at Goschen Yard in 1963 by the Admiral Superintendent, Vice-Admiral G. D. A. Gregory, C.B., D.S.O.

The Turbine Shop has been adapted for the refitting of pump and turbine ends of turbo driven auxiliaries; and to avoid deferment of completion dates through breakdown of units when re-installed on board, H.P. steam testing facilities are provided, fed by an oil-fired boiler of 10,000 lb/hr capacity at 850 lb/sq in. and 950 degrees F. Arrangements have also been made for the refitting of certain gas turbine elements in the Turbine Shop.

Great emphasis was placed by Captain J. G. Little, R.N., O.B.E., (Manager, 1962–64), on quality and reliability, which necessarily call for improved environmental conditions for the miscellaneous types of task. Schemes for the segregation of 'dust protected' and 'dust restricted' areas are being implemented in a phased programme. Captain Little also introduced a 'clean refit' routine to control dirt in ships under refit.

**The Drawing Office**

The Engineering Department's Drawing Office, consisting, in the 1800's of a few draughtsmen plus some 'mechanics on drawing duties', was moved from the Quadrangle offices, abreast No. 3 Basin, to the new office—about 180 ft × 26 ft—in 1910, when the Central Office Block was built. Later the staff overflowed to Burton's Building in Fore Street which housed the Diesel and Yard Machinery Sections, and the W.E. Shop, where a purpose-designed office accommodated the Weapons Section.

**Disintegration/Functionalization**

Captain P. Carter, R.N., was appointed Manager at the end of 1964 for a 5-year term and succeeded in getting the £300,000 Factory Modernization Scheme off the ground. With the progressive reorganization of the Dockyard, however, the Engineering Department's responsibilities were reduced. First, in the spring of 1967, the Drawing Office (less Yard Machinery Section) was absorbed in the Design Division of the Planning Department and rehoused in the new Central Office Block—Stage I, adjacent to the Albert Gate. Late in 1967, the Weapon Equipment commitment was taken over by the Electrical Department, and in September, 1967, the Yard Machinery element, including the DO Section, became an integral part of the new Yard Services Department.

The Engineering Department finally lost its identity on 7th October, 1968, with the amalgamation of MCD, MED and EEM to form the Production Department. Captain Carter, the last MED, headed the Shops Division of the new Department for a short while, until 18th November when he was appointed Yard Services Manager in succession to Mr. H. L. Denman, who had transferred to Bath as Assistant Director (Shore), DGD & M Department.

Mr. L. Kirkpatrick, O.B.E., R.C.N.C., was the first Production Manager and was succeeded by Mr. F. W. Matthews, M.R.I.N.A., R.C.N.C., so that after more than a century the responsibility for 'Engineering' within the Dockyard has reverted to a Constructive officer.

**Conclusion**

It is, perhaps, typical of the little understood Engineer that very little history has survived and that no formal, regular effort has been made to record or publicise the life of the Department. Probably this is because the Department was too busy, too overloaded, to do so. This brief account is therefore incomplete and inadequate; but it does at least bear witness to the quiet, effective, but largely unrecognized way in which the Engineering Department met its many, varied, and changing commitments—often under the most difficult conditions—during 122 years of history.