

Date	Event	Detail	Source
c.1675	Plunger pump	Samuel Morland patented (175) a plunger pump capable of raising great quantities of water	JTS 7/34
1689	Blasting	Thomas Epsley is said to have introduced blasting with black powder to the Cornish mines – a year later he is recorded in the Breage burial register – apparently a victim of his own invention	Rowe p 9
1698	Savery	Thomas Savery patented an engine for raising water by the impellent force of fire. Patent extended by act of parliament to run until 1733. At a trial of the engine in 1706 'the steam was very strong and tore the engine to pieces'. There are legends of this engine being used at Wheal Vor (Breage) but this is doubted by Barton & Stewart	Stewart p 18 Rowe p 7
1698	Coal tax	Import tax on seaborne coal introduced	Stewart p 39
1709	Coalbrookdale	Abraham Darby made cast iron in a small blast furnace using coke as the fuel (derived from coal) at Coalbrookdale. This allowed mass production of cast iron – continued casting iron (including making of first iron bridge, first railway engine and AGAs) until 2017	JTS3 p 25
1712	Newcomen engine	First documented use for pumping at Dudley Castle colliery, Staffordshire, 21 inch cylinder. Newcomen never patented his engine but worked within Savery's wide ranging patent. X section drawing. Drawing p48 Stewart	Barton p 15 Rolt&Allen p 46 Stewart p 26 Barton p 17
1714	Water driven pumps	Coster and Coster patent in 1714 for a pumping system for mines – used an ingenious water driven chain and rag engine to drive pumps of 'mettall cilinders and bored elemes'	Stewart p 12
1716	Early engine	The first engine in Cornwall was possibly erected at Wheal Vor (Breage) and worked for about four years. Pole puts this engine at c.1714 and Rolt&Allen at 1710-14. Rowe says Wheal Vor ceased working in 1715 'after an apparently unsuccessful attempt to use an early Savery or Newcomen engin'	Stewart p 33 Pole p 12 Rolt&Allen p 44 Rowe p 186
1720	Newcomen engine	Early use in Cornwall at Wheal Fortune, Ludgvan. 47" cyl, pumping from 30 fathom in 15" pitwork – some have argued this was not built until 1746. Pole claims first 'fire engine' at Wheal Vor (Breage) c.1714	Stewart p 35 Stewart p 36 Pole p 12
1720s	Cast iron	Cast iron starts to replace brass for cylinders – Coalbrookdale start casting iron cyls in 1722	Stewart p 158
1723	Water driven pumps	Marquis copper mine (Devon) used a 'water engine' driven by an overshot waterwheel to drain the mine. Waterwheel-driven pumps mentioned as early as 1480	Stewart p 7 Stewart p 9
1726	Waterworks	In 1726 a Newcomen engine was erected at York Buildings waterworks in London	Rolt&Allen p 80
1727	Newcomen engine	In 1727 fifteen years after the first atmospheric engine only five engines recorded in Cornwall	Barton p 16
1729	Newcomen dies	London	(Davey; 12-13)

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1730s	Pump pipe	Rise in demand at Coalbrookdale in the 1730s for cast iron pipe probably marks the transition from bored wood to iron. However, in Bjorling 'In the year 1798, we still found them boring out wood pumps in Cornwall'	Stewart p 158 Stewart p 161
1733	Newcomen engine	Savery patent expires	
1741	Newcomen engines	Only three Newcomen engines said to be working in Cornwall in 1741	Rowe p 7
1741	Coal import	Import levy on seaborne coal of 50% – exemption for Cornish mines after lobbying of parliament (this was by a drawback or reclaiming of the duty) NB Barton says this happened in 1739	Barton p 18 Rowe p 43 Pole p 15
1740s	Manufacture	Most cylinders made by the Coalbrookdale company who maintained an agent in Truro. Stewart lists 16 cylinders supplied to Cornwall between 1744 and 1768, 40"-70" made by Coalbrookdale. They also made cast iron pipe	Barton p 19 Stewart p 52 JTS3 p 25
1752	Stannary Parliament Stannery Courts Coinage Towns	The last stannary parliament held in Helston (wiki says Truro). There were also stannary courts which tried miners instead of the usual legal system. In return, duty had to be paid on all tin at designated coinage towns where the tin blocks were stamped to show that the duty had been paid. In medieval times the coinage towns were Liskeard, Lostwithiel, Truro and Helston – Penzance was added in 1663, Calstock and Hayle after this.	Rowe p 46 Guthrie p 88 Rowe p 13
1755	CCC	Cornish Copper Co founded in 1755 in Camborne, moved to Hayle in 1758	Guthrie p122
1758	Timeline	Nelson born	
1760	Coal	Coal landed in Cornwall cost 15s ton	Barton p 20
1762	Boiler	Samson Swaine erects a boiler made of stone (granite) at a mine near Wheal Weeth – a block from such a boiler is reputedly on display at East Pool mine	Stewart p 56
1769	Smeaton	Smeaton computed the duty of fifteen engines in the Newcastle-on-Tyne district, and found the average duty to be 5 millions of foot lbs. per bushel or 84 lbs. of coal	(Davey; 12-13)
1769	Watt	Watt patent (913) granted for 14 years. The patent specifies a separate condenser, evacuated by pump.	Stewart p78
1770	Smeaton observation	Smeaton made note of eighteen large engines in Cornwall, eight of which had cylinders from 60 to 70 in. diameter	(Davey; 12-13)
1770	Boilers	The Haystack boiler (copper then wrought iron) is largely replaced by the wagon boiler (rectangular shape with rounded top) c. 5psi	Barton p115
1774	Cylinder boring	In 1774 John Wilkinson patented a machine for boring iron cannon from solid casting (this technique continued until the end of smooth-bore cannon). Shortly after this he invented a machine for accurately boring cast iron engine cylinders. He made many cylinders for Bolton & Watt at his Bersham works – including the early Cornish engines at Wheal Busy and Ting Tang	Stewart p82

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1775	Engine	Smeaton engine at Chacewater 72" built by Carron Co	Barton pp 21-22
1775	Watt	Boulton & Watt patent extended to 1800 by act of parliament – covered separate condenser and use of steam as the driving force B&W charged $\frac{1}{3}$ cost of coal saved by their engine	Barton p 22 Stewart p 82
1775	Newcomen engine	One of the last Newcomen engines erected in Cornwall at Dolcoath in 1775. 45" cyl. Erected by John Budge. The iron pumps were supplied by John Jones Co Bristol and Dale Co. By the 1770s at least 78 engines had been erected in Cornwall	Stewart p 50 Stewart p72
1775	Depression	In 1775 only 18 of the 40 engines in Cornwall were being worked	Rowe p 72
1776	Watt	First Watt engine in Cornwall ordered by Ting Tang (Gwennap) 52"	Barton p 22
1779	Harvey's Foundry	Established in Hayle by John Harvey. Woolf was superintendent from 1816. By 1880 Harvey's were the only surviving main engine maker in Cornwall. Closed 1903	Barton p 142
1779	Whim	Newcomen engine adapted for rotative motion but had a 'prodigious appetite for coal'	JTS3 p 27
1780	Pickard rotary	James Pickard patent (1263) on rotary engine using a crank and flywheel	
1781	Hornblower	Two cylinder compound engine patent. Steam passed from the first, larger cyl to the second, smaller cyl. Was more successful in rotary engines	Barton p 25 Pole p 30
1781	Watt rotary	Watt patents (1306) planet-and-sun gearing on flywheel for his rotary engine (two revs per engine cycle) to circumvent the Pickard patent of 1780	EB
1782	Watt rotary	Watt patents (1321) double acting engine (push and pull) this required solid connection to the beam as opposed to chain. Expansive working also included (although at very low pressure)	EB JTS3 p 27
1783	Newcomen engine	By 1783 only one Newcomen engine left working in Cornwall. Coal consumption was said to be 'massive'. Newcomen engines continued in coal mines where coal was effectively free until the late 19 th or even early 20 th century	Barton p 23 Stewart p 39
1784	Iron	Henry Cort patented 'puddling', a process to produce wrought iron from cast iron using coal as the fuel	JTS3 p 26
1784	Whim engine	The first whim engine in Cornwall (a B&W @ Wheal Maid) this had sun-and-planet gearing instead of the simple crank which was usual after 1794 – drawing p 188. Previously horse whim was usual – Wheal Harrier in Camborne was still drawing ore to surface by horse whim in 1858. Round hemp rope until iron chains around 1820; wire rope about 1860	Barton p 185 Barton p 191
1784	Watt rotary	Watt patent (1432) parallel motion (aka 3 bar motion) for cyl to beam connection – also a steam carriage	EB

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1785	Watt furnace	Watt patent (1485) for improved furnace	
1786	Plunger pump	Boulton & Watt were using plunger pumps on a limited scale in Cornwall from 1786	Stewart p 162
1787	Transport	Harvey's foundry acquired their first ship <i>Providence</i> for transporting castings and raw materials. 23 ships owned by them are listed up to <i>Frank</i> 1844	Vale pp 333-335
1788	Watt rotary	Watt designs centrifugal governor	EB
1790	Watt	Watt designs pressure gauge	EB
1790	Bull	Ex-Watt engineer designed engine with cylinder over shaft – no proper beam. In 1790 court ruled this was piracy and ordered halt to production. Not as efficient as conventional beam and wore more quickly	Barton p 25 Barton p 105
1791	Engine manufacture	First known complete engine built in Cornwall (a Bull at Harvey's) – previously cylinders were made out of county. By 1830 the Cornish 'big three the equal of any foundry'. Previously engines were made at: Neath Abbey, Soho Birmingham (B&W), Carron Scotland and Coalbrookdale	Barton p 148 Guthrie p 121
1791	Perran Foundry	The foundry was set up on the site of a tin smelting works (Perran Wharf on the Fal) by Robert Were Fox and John Williams of Scorrier to supply machinery to the Gwennap copper mines.	Wiki Barton p 153
1792	Neath Abbey Ironworks	In 1792 the Perran owners also leased the Neath Abbey Ironworks in Wales which was founded c.1785	Barton p 153
1792	Hornblower Wherry Mine	In 1792 a Hornblower (2 cyl compound) engine was installed at the Wherry Mine in Penzance	Stewart p 128
1792	Harvey's	Harvey's build their first 'steam pump – probably a Newcomen'	Guthrie p 124
1790s	Inverted engine	Inverted engine introduced	Barton p 30
1790s	Beam	Cast iron starts to replace log (wood) beam for engines	Barton p 30
1798	Timeline	HMS <i>Colossus</i> wrecked on Scilly	
1798	Hornblower rotary	1798 Hornblower takes out a patent for a rotary engine	Stewart p 130
1800	Watt	The Boulton & Watt patent expires	Barton p 27
	Engine manufacture	From 1800 the majority of pumping engines in Cornwall were built by the 'big three': CCC, Harvey's & Perran	Guthrie p 122
1801	Foundry	Holman Bros of Camborne established	Barton p 162
	Engines	In 1801 there were about 80 engines at work in Cornwall – all but three were pumping. The majority were B&W	Barton p 252
1801	Locomotive	Trevithick's road locomotive built in 1801 with parts made by Harvey's	Guthrie p 122

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1801->	Bucket pump Plunger pump	Replacement of bucket pump by plunger pumps begins (but see 1786). In 1827 Farey published plan of pitwork showing all bucket pumps. Windbore about 7.5ft long, clack pieces also 7.5ft long. Working barrel 2ft longer than bucket stroke. Common pipes (rising main) were 9ft long with 3" broad flanges. Note shorter rising mains are known but rare. 'The windbore may be 6 or 8ft long' In 1801 Lean replaced bucket pumps with plunger 'wherever practical' at Crenver and Oatfield. Pole in 1844 describes the pump column at Wheal Vor where there were four bucket pumps and nine plunger pumps in a rise of 219 fathoms	Barton p 30 Farey p 217 Farey p 221 Stewart p 162 Pole p 119
1803	Boiler	Woolf patent on sectional cast-iron boiler – they proved troublesome and disappeared about 1825	Barton p 116
1805	Timeline	Battle of Trafalgar	
>1810	Copper	From 1801 to 1810 Cornwall produced over 65% of the world's copper. By 1861-1870 this had fallen to 10%, and was 3% in the following decade (see table below)	Rowe p 128
1810	Duty	Reporting of engine performance begins – monthly publication continues for almost a century. Duty measured as pounds of water raised 1ft by a bushel of coal	Barton p 32 Barton p 28
1811	Boiler	Woolf cast iron boiler advertised	Barton p 33
1811	Engine	Two 90" engines for Consols made at Neath Abbey – at the time the largest engines in the world	Barton p 41
1812	Boiler	Wagon boilers largely replaced by cylindrical boilers in Cornwall. Single flue introduced by Trevithick – first built by Holmans in 1812 and became known as the Cornish boiler – in almost universal use in Cornwall by 1830s	Barton p 115 Guthrie p 122
1812	Wheal Vor	Wheal Vor tin mine reopened after long closure. Up to 1812 most pumping engines were in copper rather than tin mines – exceptions were Wherry Mine and Ding Dong.	Rowe p 188
1818	Foundry	In 1818 the Perran Foundry known as Foxes & Perran Foundry Co, and Neath as Foxes & Neath Abbey Co	Barton p 154
1824	Boilers	Woolf cast iron boilers installed at Wheel Alfred driving his 2 cyl compound engine, alongside Trevithick's Cornish boiler driving a single 90". No clear winner in duty but unreliability of Woolf boilers led to their abandonment	Barton p 44
1824 ish	Engine improvement	Groce at Wheel Hope (Gwinear) insulated pipe and cylinders improving duty	Barton p 45
1820	Copperhouse foundry	Copper house foundry begins making engines. Set up by the Cornish Copper Company. In 1841-2 supplied parts for Clifton suspension bridge. Closed 1869	Barton p 151
1820s	Engines	Many 2 cyl compounds altered to singles	Barton p 47
	Harvey's Foundry	Harvey's so busy they have to share work with Neath Abbey Ironworks in Wales	Barton p 157
	Foundry	1820s St Austell Foundry established	Barton p 159

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1827	Foundry	Charlestown Foundry established	Barton p 162
1830	Engines	By 1830 single acting engines had largely replaced double acting engines for pumping	Barton p 107
1830	Foundry	Harveys have 52 draught horses for moving machinery	Barton p 123
1830	Perran	Perran foundry making complete engines after 1830	Barton p 154
1832?	Engine duty	The Austen 80" at Fowey Consols provokes controversy by reporting 125m duty (first past 100m) – normal duty for this engine under 100m	Barton p 49
1830s	Waterworks	By the 1830s Cornish engine duty figures were exciting interest upcountry. In 1837 Thomas Wichsteed Engineer to East London Waterworks came to Cornwall to investigate. An 80" pumping engine was purchased. Subsequently many engines were built esp. in period 1860-70 by Harvey's for London waterworks Drawing p 260	Barton p 258
1834	Foundry	Nicholas Holman leaves Camborne and sets up foundry at St Just – set up a branch Foundry at Penzance in 1840	Barton p 162
1838	Engines	About 250 engines at work in Cornwall	Barton p 252
1838	Tin coinage	The Tin Duties Act (1838) abolishes the system of duty on refined tin (called tin coinage) payable to the Duchy of Cornwall – this had been in force since at least 1156 – but applied only to tin (not copper)	Wiki Guthrie p 88
1839	Compound engines	Compound (2 cyl) engines reappear	Barton p 52
	Engine	Taylor's engine drawing in 1870 Perran catalogue – but built 1840	Barton p 55
1840s	Perran	Perran builds a 64" engine for Vauxhall Waterworks	Barton p 154
1841	Engine - compound	Sims patented combined cylinder compound engine about 55 built – few if any after 1849. Required taller engine house	Barton p 108
1842	Man engine	A total of 16 man engines in Cornwall – introduced from overseas starting about 1842 at Tresavean	Barton p 212
1844	Boiler	Lancashire boiler patented (two fire tubes v one in Cornish). This type popular outside Cornwall - some in Cornwall by 1880 but never displaced the Cornish boiler in Cornwall.	Barton p 117
1846	Pump rods	First recorded use of wrought iron for pump rods (usually pine). Rods 8" diameter – suffers from failure of couplings	Barton p 95
1850	Pumping	By 1850 double acting engine abandoned – single cylinder with steam acting on top of piston. Pitwork is by now all plunger pumps every 20-30 fathom. Bottom pump only is still the old bucket or lift pump Diagram of bucket and plunger pumps	Barton p 88 Barton p 91
	Pumps	Usually cast iron 9ft long, diameter 6" to 20", diameter increases towards the top of the shaft. Pumps lined with slips of wood or occasionally bronze. Buffalo or rhino hide used for the clacks. Pine used for pump rods is usually imported.	Barton p 92

Date	Event	Detail	Source
1850->	Boilers	Boiler explosions occurring periodically. Engine men blamed by owners but enquiry in 1870s concludes that corrosion and operating pressures were the main cause	Barton p 116
1850->	Engines	Engines and machinery moved frequently from mine to mine especially in the later 19 th C	Barton p 118
1850s	Perran	Perran Foundry name changes to William's & Perran Foundry Co about 1850	Barton p 154
1850s	Copper	The value of copper mined in Cornwall in the 1850s is about twice that of tin. It is estimated that three out of four miners in Cornwall are employed in copper mining	Rowe p 305
1856	Duty	Bushel replaced by cwt in duty calculation	Barton p 59
1850s	Duty	Decline in reported duty of engines probably to avoid breakages and because of declining coal quality	Barton p 60->
1850s	Boiler pressure	Boilers run at about 40lb in ² experiments with higher pressures not successful	Barton p 63
1856	Mild steel	Invention of the Bessemer process introduces mild steel	JTS3 p 28
1857	Strike	First recorded strike in the Cornish mining industry at Balleswidden due to cuts in wages	Rowe p 311
1858	Foundry	Perran advertises a boiler wagon for sale capable of carrying 40 tons	Barton p 123
1860s	Depression	Depression in Cornish mining. Trade in used engines and exporting engines develops in Cornwall	Barton p 64
1860s	Foundry	Hayle foundry have their own boats for moving engines with strengthened hatches and hold bottoms. Increasing use of the railway to move engines	Barton p 124
	Whims	Wire rope first used for winding about 1860	Barton p 195
1862	Inverted engine	Last inverted engine built in Cornwall (continued elsewhere until the end of the century)	Barton p 108
1865	Engines	554 Engines recorded working in Cornwall	Barton p 252
1866	Copper	Copper slump/depression = hard times for Cornish miners	Rowe p 310
1866	Emigration	Estimated that 'no less than 5000 Cornish miners' had emigrated in 1866 in search of work	Rowe p 319
1868	Engine	80" engine drawing 1868	Barton p 77
1867	Copperhouse Foundry	Passes into the control of Harvey's and closed two years later in 1869.	Barton p 157
1870s	Waterworks	90" engine sold for waterworks use	Barton p 71
	Steel ropes	From 1870s onwards steel capstan ropes come into use	Barton p 233
1873	Engines	Last big engines 90" & 85" for Cornwall by Perran Foundry	Barton p 71
1870s	Depression	Mines closing and engines idle. Rock bottom prices for second hand engines. Cornish foundries on short time	Barton p 72
1879	Perran	Perran foundry closed	Barton p 159
1880s	Foundry	Increasing use of traction engines to move machinery	Barton p 130
1890s	Depression	Pitwork often left in deeper parts of mine. Buyers for larger engines but below 50" scrapped wholesale	Barton p 76
1903	Harveys	Harveys foundry at Hayle closed	
1906	Pumps	First use of electric pumps at Tywarnhaile Mine near Porthtowan	Barton p 79

Date	Event	Detail	Source
1909	Duty	Engine duty reporting ends	Barton p 79
1913	Engine	Last big Cornish engine built in the county – 36” by Charlestown Foundry	Barton p 80
1919	Man engine	Man engine failure at Levant - 31 killed and 11 serious injuries	Barton p 218