

THE COPPER ORE TRADE OF SOUTH WEST ENGLAND IN THE NINETEENTH CENTURY

by Peter H. Stanier

The founders have depots in the principal ports of Cornwall and Devonshire, "where the ore is stored. It is transported to Swansea in vessels of 100 to 50 tons, which draw very little water, so that they can discharge their cargoes at all states of the tide in the yards of the companies, which are nearly all situated on the edge of the river."¹

FOLLOWING a long history of non-ferrous mining in South-West England, it was the hundred years beginning in the late eighteenth century that witnessed the greatest activity, coinciding with industrial growth in the country as a whole. In terms of volume of output and trade, copper ore represented the most significant of these minerals during the nineteenth century. Although there was some development in the sixteenth century, the real boom in copper mining began in the late eighteenth century. For a time, expansion was curtailed by competition from Thomas Williams' Parys Mine on Anglesey, but with the turn of the century output began to rise steadily. 56,000 tons of ore were produced in 1800, and between 1830 and 1850, output averaged 140,000-150,000 tons per year. 1856 saw the peak of 206,177 tons for Devon and Cornwall, after which date output dropped away very rapidly as a result of increasing foreign competition; within 30 years the figure was below 20,000 tons, and by the end of the century, virtually extinct.

Copper required large amounts of coal for the smelting and refining processes and, apart from one small exception at Hayle between 1758 and c. 1820, it was deemed more economical to ship the ores up the Bristol Channel to the source of fuel. Although there had been earlier smelters at Bristol and the Wye Valley,² the principal nineteenth century smelters were sited on the South Wales coalfield, centred on Swansea, with others at Llanelly, Neath and Port Talbot.³ Much work has been focused on the and smelting industries,⁴ and therefore attention is drawn here to this little known but equally important coastal trade in copper ore which was the vital link in a major industry during the time of Britain's industrial development.

Copper has been mined along a belt reaching the whole length of Cornwall and far into Devon where deposits become more scattered. Nowhere in these two counties is far from the sea and so a large number of ports and small quays were utilized by the ore trade.

Although tin is perhaps the most famous metal of Cornwall and Devon (for it was worked in prehistoric times and still is today), it was mined in much smaller quantities. In addition, the smelting was much simpler than for copper, requiring less fuel which

enabled it to be smelted locally, the end product, 'white tin' in the form of ingots, was less bulky and so shipments to the tin plate works of South Wales were far outnumbered by those of copper ore in the same direction. Another mineral, lead, was shipped as ore around the coast to local smelting houses, notably at Devoran and Par; other lead ores also found their way to smelters in South Wales.

As production rose and the copper mines deepened, further development was not possible without beam engines, employed mainly for pumping, and increasing amounts of coals for these engines were shipped from South Wales, the nearest source. Thus, an important two-way trade was established, with copper ores in one direction and coal for the mines in return. This was not a bad arrangement, for as William

Pryce remarked: It is a circumstance of some importance . . . that as the numerous fire engines employ a large fleet of colliers to supply their demands, so the back carriage of the ore is by no means so considerable as it would otherwise be.⁵ The smelting ports were responsible for the shipment of most of the coals for the mine engines. Swansea was the main port of this trade and in 1820 it was said that 80 per cent of the coal shipped left in ore boats.⁶

It would appear that a regular mining trade was already established by the early eighteenth century, for in 1720 at least 40 sail of ships were said to be engaged carrying copper ore from the South West to Bristol and South Wales.⁷ In 1799, John Vivian estimated that some 8,000-10,000 tons of shipping was constantly involved in this trade.⁸ Thus the trade was responsible for creation of a large volume of shipping, and vessels engaged on this trade became known collectively as the 'Welsh Fleet'. As a measure of the importance attached to these ships, it had long been felt that one advantage was that 'a constant uniform nursery for seamen is easily and cheaply preserved, as our quota of additional support of the trade, navigation and security of these kingdoms'.⁹ In 1824, 109 vessels (9,407 tons) with perhaps 500 seamen, were said to be employed regularly on the copper ore and coal trade with Swansea,¹⁰ the principal smelting port. Thirty years later, Symons estimated this trade 'must require upwards of 150 vessels of from 80 to 150 tons burthen and find employment for from 600 to 800 seamen'.¹¹ This represented 17,250 tons of shipping, on average, and in 1858, some 20,000 tons of shipping (c. 1,200 men) were said to be engaged from Swansea.¹² This was at a time when the copper ore trade was at its peak, but both the above figures were estimates for Swansea alone, and unfortunately none of these accounted for the whole of the trade.

An inspection of the weekly shipping movements reported in the local press in both Cornwall and South Wales¹³ is enough to show that a large number of vessels was engaged. But it is clear that not all voyages were reported and calculations of the yearly volume of traffic fell well short of what might be expected. Nevertheless, in the absence of any other source, these reports do at least indicate the vessels engaged regularly, and some movements can be traced. There are no tonnages and cargoes are only sometimes mentioned, although it can be assumed that those returning from Wales were carrying coal and that those returning from non-smelting ports, such as

Cardiff and Newport, were less likely to be directly engaged on the copper trade. In the absence of adequate shipping figures, it is only possible to make a rough estimate based on the recorded output figures of copper ore. Thus, by using an average of 100 tons per voyage, it will be seen that the volume of traffic up-channel each year would be in the region as follows:

<i>Year</i>	<i>Voyages</i>	<i>Year</i>	<i>Voyages</i>
1800	560	1845	1,625
1805	823	1855	1,952
1815	1,075	1865	1,594
1825	1,506	1875	5 ii
1835		1885	347

The scarcity of figures for shipments of copper ores from the South West is all too evident, and the only recorded figures for the import of these into a smelting port are for Neath, from 1862 to 1880 (see table i). These unfortunately only cover the trade's period of rapid decline, and it must be realized that shipments to Neath represent only about 20 per cent of the whole trade. The great number of shipping ports can be seen, and the figures reflect the dominance of Devoran, Hayle, Portreath, Looe and the Tamar (Morwellham and Calstock) at this date.

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The practice of selling most Cornish copper ores at weekly 'ticketings' is well known,¹⁴ whereby ores of different qualities were separated into 'parcels' of seldom over 200 tons each; they were then sampled and bid for by the smelters' resident agents. These agents purchased a well-balanced quality of ores often from a variety of mines, according to their masters' requirements (it was more successful to smelt ores of different quality together). The lowest price paid for ores was another factor determining the number and location of mines dealt with. The wide area of purchases of one copper company is shown by the 16 ports of shipment for Sweetland Tuttle & Co., at Neath. This, table 2, regrettably again only covers the period of decline in the years 1858 to 1877.

Responsibility for shipping off the ores lay in the hands of the smelters' agents, who in many cases also had to supervise the carriage of the ore to the ports. In the early years, transport to the coast was by mule or packhorse, and the practices of their owners gave rise to much concern and complaint among the agents. But by the mid nineteenth century most of the main mining ports and the mines themselves were served by either canal or railway.¹⁵ The agents had to ensure that adequate amounts of ore were shipped according to the level of stocks in Wales. This was especially so in the autumn 'so that ample provision has been made against the storms of winter'.¹⁰ Their task was not made easier, for at first the copper companies took stock in winter, which in no way helped themselves nor the shipping trade, for 'If stock-taking

TABLE I
South-Western ports shipping ores to Neath, 1862-1880

	Hayle	Portreath	Point (Truro)	Looe	Tamar	Par (+ Fowey)	Penzance	St Ives	Dart- mouth	Teign- mouth	Barn- staple	St Agnes	Total from South West: (tons)	t (
1862*	1,137(15)	4,161 (44)	1,783 (17)	2,529 (27)	5,802(61)	1,037(13)	453 (7)	339 (4)	4i6 (7)	130(1)	192 (4)	25(i)	16,994(201)	t
1863	3,644(43)	8,523 (76)	3,327(25)	4,541 (46)	8,725 (82)	851 (9)	847(11)	559(8)	7H (13)	5o(i)	124(3)	5o(i)	31,955(318)	'
1864	3,250(35)	7,650(63)	4,207(38)	5,207 (52)	6,556(61)	i,458(i9)	912(10)	602 (7)	365 (5)	185 (2)	119(2)	150(1)	30,616(288)	(
1865	5,902(53)	6,503 (60)	4,253 (34)	5,084(48)	6,744 (63)	1,390(14)	1,127(11)	—	108 (i)	107(1)	50(1)	—	31,268(286)	f
3866	6,368(55)	2,863 (23)	5,655 (46)	5,322(49)	5,608(51)	93° (9)	579(5)	130(1)	20-2(2)	—	—	—	27,657(24-1)	^
1867*	2,831(21)	910(8)	1,960(18)	2,137(19)	3,399(3o)	205 (2)	400 (4)	—	—	130(1)	158 (4)	—	12,130(107)	t
1868	—	—	—	—	—	—	—	—	—	—	—	—	—	t
1869	6,273 (50)	774 (6)	2,945 (26)	4,912(41)	4,242(35)	344(3)	766 (5)	—	—	—	110(2)	—	20,416(169)	t
1870	6,891 (52)	i,39i(u)	4,656(38)	2,342(19)	5,570(43)	75(i)	618 (4)	—	—	—	—	—	21,653(169)	o
1871	4,669(33)	447(3)	3,319(29)	1,467(15)	2,315(21)	570 (4)	623 (5)	360(2)	—	—	—	—	13,770(112)	o
1872	3,960(33)	5o(i)	2,043 (17)	2,358(i9)	2,160(16)	—	704 (5)	—	—	—	—	—	11,275(91)	c
1873	3,158(28)	72(i)	1,824(18)	2,736(21)	3,169(23)	—	250(3)	—	—	—	—	—	11,209(94)	£
1874	2,411 (25)	90(1)	890 (12)	3,235(23)	1,768(14)	—	277(3)	—	—	—	—	—	8,671 (78)	s
1875	1,528(16)	38i(3)	1,226 (12)	4,135(3o)	3,259(22)	109(1)	220 (1)	—	—	—	—	—	10,858(85)	?
1876	1,672(14)	1,288 (10)	1,432 (13)	1,816(15)	3,407(24)	84(1)	276 (3)	—	—	—	—	—	9,975 (80)	h
1877	1,182(12)	1,257(10)	972 (8)	2,347(i9)	3,385(23)	170(1)	214 (2)	—	—	—	—	—	9,686(76)	h
1878	i,597(i3)	697(5)	—	1,528(12)	3,220(21)	490 (3)	525 (4)	—	—	—	—	—	8,057(58)	tr
1879	1,509(14)	517(4)	—	1,282(9)	i,544(ii)	190(1)	179 (2)	—	—	—	—	—	5,221 (41)	2
1880	1,241 (12)	190 (2)	130(1)	600 (5)	i,395(i2)	220 (2)	45 (1)	—	—	—	—	—	3,821(35)	r

Source: &R.O., Neath Harbour Records, 1862-80.

* Half Year only.

Recorded voyages in brackets.

occurred in summer instead of winter there would be much less risk of any of the old stock not being shipped soon enough.¹⁷ As the winter months progressed there was increasing urgency to ship off old stocks. Not only were there these difficulties of shipping in winter, but old and new stocks had to be kept separate in the ships' holds if shipped at the same time.¹⁸ This was the case for Pascoe Grenfell & Sons until they altered their method of stock-taking in March 1831.¹⁹ To save the expense of storage of ores at Swansea where space was limited, the copper companies often retained ores in the Cornish ports at their own convenience when stock-taking.

Because stocks of ore could vary considerably, it was the responsibility of the agent to make sure that the correct number of vessels was chartered, and when so, that the ores were ready for shipment. It would seem that all was not always well, as for example in the late 1830s when stocks of several companies' ores at Devoran and Point could be very low. Indeed, captains were frequently concerned that parcels of ore were not present for shipment at John Freeman & Copper Co.'s ore plots. This was because of delays in despatch from the mines, and consequently, vessels therefore had to wait several extra days or even sail away part-loaded.²⁰ In the Restronguet river, vessels might load at different quays according to stocks available, and, for example, in September 1837, Thomas Quick, master of the *Minerva*, wrote to Henry Grylls (agent of J. Freeman & Copper Co.) from Point:

The carriers say Freeman's ore is all that they'd ordered. There is no more in then apart from 70-5 tons without what was purchased on Thursday last. We are ready for loading if you'd oblige 'Minerva' to let her go to Narabo to take in about 50-60 tons to make up our cargo. . . . A vessel took 60 tons about a week ago, and if it hadn't, it would now make up our cargo. If we went to Narabo today, then we should finish loading tomorrow.²¹

This shows how stocks could fluctuate considerably; the ports could be 'overflowing' in some months and virtually empty soon after. In addition to the smelters' agents who supervised shipments, at some ports there was a number of merchants who also acted as shippers for the copper ore trade.

With few exceptions, the smelters preferred to leave the risky business of ship-owning to others. But although the coastal shipping industry remained independent of mining and smelting interests, nevertheless the influence of the Welsh smelters on the trade was strongly felt and often resented. One bone of discontent was that the smelters bought and shipped copper ores measured at 21 cwt per ton to allow for 'waste', while ores from abroad were measured at 20 cwt. This evil was recognized in the late eighteenth century by Pryce, who added that ore wet by rain was allowed a further overweight measure 'according to reason and conscience', but was 'more than ten times equivalent for all the wet and waste they can seriously pretend to suffer'.²² Thus, in effect, a 150 ton cargo actually weighed 7 1/2 tons more, although freight was only paid on the first weight.

TABLE 2

Shipments of copper ore to Sweetland Tuttle & Co., Neath, 1858-77.

	Mor-wellham Charles-(Tamar) town	Looe	Devoran	Hayle	Port- reath	St Ives	Par	Pen- zance	Forth- leven	St Agnes	St Germans	Teign- mouth	Totnes	Barn- staple	Total (tons)	
1858	523(4)	—	544(6)	243(2)	—	—	117(1)	—	—	—	—	—	—	—	1,427(13)	
1859	1,308(13)	706(9)	2,880(33)	1,937(21)	—	168(2)	469(6)	—	240(4)	—	—	—	—	—	7,708(88)	
1860	2,155(23)	1,241(16)	2,406(25)	2,850(26)	—	51(1)	680(8)	—	96(2)	—	—	—	—	—	9,479(101)	
1861	2,361(23)	1,088(11)	2,188(23)	3,025(27)	162(2)	—	555(5)	744(8)	386(5)	23(1)	57(i)	157(2)	—	67(1)	10,746(109)	
1862	2,645(28)	1,177(13)	2,267(22)	2,093(18)	678(8)	209(3)	219(4)	—	272(3)	—	139(3)	438(6)	258(2)	244(4)	32(1)	10,671(115)
1863	2,403(24)	1,462(17)	2,211(19)	1,999(25)	767(8)	99(3)	139(2)	—	173(2)	30(1)	49(1)	—	50(1)	240(5)	—	7,622(108)
1864	2,063(18)	1,547(18)	3,119(26)	1,265(16)	468(7)	308(5)	206(3)	—	39(i)	—	—	—	—	41(1)	29(1)	9,085(96)
1865	2,200(19)	1,502(14)	2,231(18)	2,182(24)	82(1)	235(3)	70(1)	—	63(1)	—	Newquay	—	—	—	—	8,565(81)
1866	1,359(i3)	1,411(13)	2,222(19)	1,818(18)	—	239(3)	—	—	—	—	—	—	—	—	—	7,049(66)
1867	1,568(14)	1,462(14)	1,553(14)	2,290(17)	—	39(1)	—	138(1)	79(2)	—	—	—	—	—	52(1)	7,181(64)
1868	1,567(12)	1,433(i2)	1,419(18)	1,974(i5)	—	—	—	—	75(i)	—	—	—	—	—	—	6,468 (58)
1869	1,978(15)	2,137(17)	2,074(19)	1,682(14)	—	—	—	—	—	—	50(1)	—	—	—	—	7,92i (66)
1870	2,316(19)	1,505(12)	1,329(12)	1,527(12)	—	—	—	—	—	—	—	—	—	—	—	6,677(55)
1871	2,402(19)	1,689(17)	1,105(14)	1,381(13)	—	—	—	—	—	—	—	—	—	—	—	6,577(63)
1872	1,742(13)	1,472(13)	773(7)	1,383(12)	—	—	—	—	—	—	—	—	—	—	—	5,370(45)
1873	2,557(19)	1,239(10)	1,024(11)	1,288(13)	—	—	—	—	—	—	—	—	—	—	—	6,108(53)
1874	1,620(12)	1,420(13)	728(9)	1,006(11)	—	—	—	—	—	—	—	—	—	—	—	4,774(45)
1875	2,590(17)	1,905(16)	902(10)	1,098(9)	—	—	—	—	—	—	—	—	—	—	—	6,495(52)
1876	2,425(17)	1,010(10)	1,182(12)	980(9)	—	—	—	—	—	—	—	—	—	—	—	5,597(48)
1877	1,073(8)	965(8)	704(6)	475(4)	—	—	—	—	—	—	—	—	—	—	—	3,217(26)

Source: Cornwall R.O., DDX. 254. Copper Ore Shipment Book,

Voyages in brackets.

It is clear that freight rates were controlled and kept low by the major copper smelting companies. The other companies tended to follow the lead of the two major smelters, Vivian & Sons and Williams Foster & Co. Rates were still negotiable with the captains, but they could have had little real say, except in winter when shipping was scarcer. The average 'summer freight' for the early nineteenth century was 4s. (20p) per ton from most South Western ports to Wales, but after 1840 this even tended towards 3s. 6d. (17.5p) per ton. The low freight rates on this coastal trade may be contrasted with the higher rates on long distance hauls from abroad, which on occasion were known to fluctuate widely.²³ It is clear that the trade could not stand a lower rate, for momentarily in the summer of 1837, ores were carried at 3s. (15p) per ton which brought strong reaction, and fears were expressed that this reduction would drive vessels from the trade. A higher rate was soon restored.²⁴ In winter 'many of the shipowners would rather lay by their vessels for 2 or 3 months than take ores at this season of the year at 4/- [2Op] per ton'.²⁵ And rates as high as 6s. (30p) per ton were offered in winter from the exposed north coast ports of Portreath and Trevaunance.

Most smelters had their own coal pits and later in the century some of the larger firms carried on a coal business in the South West, where they rented quays for this purpose at mining ports such as Devoran, Looe and Calstock. This enabled them to insist that vessels carrying their ores should return with their own coal also. Not all masters liked to agree to such a 'coal clause' with the smelters' shipper and on occasions this led to serious hold-ups until such vessels could be found. At Looe, for example, valuable quay space was taken up by ores awaiting shipment, and until matters were remedied it was not unusual to see large heaps of ore at the front of the quay, barring entry for all other ores to a large vacant space behind. This abuse was so felt that a new system of charging for quay space was introduced.²⁶

Although the smelters paid freight and wharfage charges, these were included alongside smelting costs in the 'returning charge' of some 55s. (£2-75) per ton which was deducted from the price finally paid to the miners for their ores.²⁷ There had always been a certain secrecy over the true cost of smelting, and this was a cause of great suspicion.

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The ships were the really important link in the copper industry ever since organized mining and smelting was begun in the South West and Wales by the Mines Royal Co. in the sixteenth century. Vessels were then small, cargoes averaging c. 30 tons, a typical entry in the Port Books for St Ives on 19th March 1708 being: 'in the *Dove* of St Ives George Hicks master for Bristoll Nehemiah Champion in 32 tuns of Copper Oar'.²⁸ As mining increased, vessels steadily became larger, averaging 60 tons by the end of the eighteenth century, and 100 tons for most of the nineteenth century.

A large but varying number of individual vessels is indicated by the rather limited information contained in the weekly shipping list of the *Cambrian, Royal Cornwall*

Gazette and *West Briton* newspapers. Although in 1824 there were said to be 106 vessels which 'usually trade to and from Swansea with copper ore and coal', no distinction was made between these two trades.²⁹ However, a close examination of the more frequent copper ore vessels in the weekly shipping lists reveals a 'hard-core' of perhaps as little as 20 traders to the same port. This is surprising, but it was the same in later years at Neath, and it can be concluded that although a large number of ships was involved each year, a much smaller number was in constant regular employment between the same ports.

Most of the ships were owned in the South West. In 1824 there were 27 Swansea-owned vessels out of the 106 engaged on the coal and copper trades, but those from the ports of Devon and Cornwall were dominant. Four years later, when there were 115 ships, the Swansea share had apparently increased to 34.³⁰ But the figures in table 3 based on the more regular vessels would seem to contradict these high numbers. Similarly, one must question Evans who states that in 1857 there were about 35 Swansea-owned ships on the copper ore trade, 'plying mainly between Swansea and the coast of Cornwall'.³¹ It is more likely that many of the Swansea vessels were engaged in the transport of Irish ore, and the foreign ore trade which was at that time increasing.

TABLE 3
Home ports for frequent ships, 1825-63

	1825	1835	1845	1855	1863*
Bideford	1	—	—	2	—
Dartmouth	—	1	—	—	—
Falmouth	4	7	5	4	—
Fowey	6	4	4	7	2
Hayle	—	—	3	8	3
Looe	—	1	1	1	1
Padstow	3	1	2	3	1
Penzance	1	—	1	—	1
Plymouth	1	1	2	—	5
St Ives	14	19	20	7	2
Truro	2	6	9	9	3
Swansea	6	6	5	2	1
Llanelly	3	7	3	4	—
Neath	—	—	—	—	i
"Others	3	3	2	3	—
	44	56	57	50	20

Sources: Customs Registers, Lloyds Registers, Neath Harbour Records.

* Neath only

That a great majority of the more important regular traders were registered and owned in the South West is clearly demonstrated by the Neath Harbour Records.

Only occasionally were other vessels employed, probably obtaining a back-freight after a single voyage. This is seen in table 4, for 1863, the first complete year of the records.

TABLE 4

Neath 1863. 124 copper ore ships (323 voyages) registered at:

St Ives	27	Padstow	6	Falmouth	1
Plymouth	17	Swansea	4	Teignmouth	1
Fowey	18	Dartmouth	2	Liverpool	1
Hayle	H	Barnstaple	2	Beaumaris	1
Penzance	7	Newport	2	Caernarvon	1
Truro	8	London	2	Londonderry ⁷	1

Source: Neath Harbour Records, 1863.

Note: Of the 124 copper ore ships in this year, only 20 may be said to have been 'regular' traders between the South West and Neath. (This is calculated on five voyages or more per annum.)

Contrary to expectation, rather than integrating their enterprises, the Welsh smelters kept largely out of the coastal trade. However, there were some shipowners among them, including Nevill & Co. of Llanelly, and John Vivian & Sons who owned the schooner *Henry* (74 tons) and brigantine *Dove* at Swansea and Port Talbot respectively, and later, the steamships *Augusta* and *Morfa*. Most vessels on the ore trade were owned in the South West, and Customs House Registers give details which were often complex on account of ownership being divided into 64 shares. The registers show how coasting ships were owned by merchants in the ports from which they traded, although many were owned by the master, or shared between the master and a small group of locals. St Ives was an important provider of ships for the copper ore trade, and here investment was confined mainly to small family shipowners, captain-owners, widows and a variety of tradesmen in the town. Especially earlier in the century, there were shareholders in these ships from South Wales, reflecting the close ties which the coal and copper ore trades brought to the shipping industry. The larger shipowners in the South West tended to be involved in deep-sea or other coastal trades, but there were some who had interests in the mining trade and operated vessels almost exclusively in this area. Harvey & Co., the principal mine merchants and foundrymen of Hayle, had several ships which carried copper ores fairly regularly, although they were mainly employed for transporting machinery from the foundry and returning with coal cargoes. Throughout the century, they rank high among the regular traders between Havle and South Wales.

The trade was dominated by brigs until well into the first part of the nineteenth century. In 1824, out of 107 vessels said to be regularly employed between Swansea and the South West, 63 were still described as brigs.³² Of the remainder, there were 26 schooners and 18 sloops. Brigs at this time averaged 100 registered tons, while the

schooners were then smaller at 70-80 tons. But the number and size of schooners on the ore trade steadily rose at the expense of the brig, and so by the 1850s and 1860s the two-masted schooner of 150 tons or less was the principal rig employed on the copper ore trade.

TABLE 5
Types of frequent copper ore ships

	Year	Brigs	Brigantines	Schooners	Sloops	Total
1805	33		21	7	61	
1815	28		1?	6	51	
1825	20		19	5	44	
1835	ii	1	40	4	56	
1845	9	3	41	4	57	
1855	1	6	40	3	50	
1863*		2	17	1	20	

Sources: *West Briton* and *Royal Cornwall Gazette*, based on minimum of three voyages per annum, and Neath Harbour Records, based on five voyages or above.

* Neath only.

The nature of many mining ports dictated the maximum size for copper ore ships. Small vessels of under 150 tons, with a shallow draught, were not only well suited to tidal ports such as Devoran which was notorious for its increasing silting problems, but they could also reach the up-river smelters' ore yards at Swansea. Delays as a result of neap tides were also felt on the Neath River, so much so that, for example, when the *Industry* was held by the Customs authorities at Neath in 1824 (for sailing from Truro without necessary documents) she was allowed to proceed up-river to the Crown Copper Works 'before the tides fall off', although not to discharge until authorized.³³ There was never any improvement scheme up-river at Neath, and the last major up-river works at Neath Abbey (Mines Royal Co.) closed in 1861.

The finer schooners on the ore trade were represented by such vessels as the *Mary Simmons*, dating from 1860. She was built at Padstow for R. T. Michell and others of Devoran and for her time was large on the trade, being registered at no tons with a length of 836, while she had a capacity of 165 tons. There were three sister ships, the *Mary Hannah*, *Morfa Mawr* and *Tremenhere*, and together these vessels carried considerable quantities of copper ore and coals trading from their home port and others in the South West to South Wales.

Average passage times varied considerably according to wind conditions, but 24 hours from Hayle to Swansea (120 miles) would have been considered good. Occasionally a fast time was worthy of note in the local press, and, for example, in February 1855, the *Alma* (master, Spray) 'made her passage in eleven hours' from Pembrey to Hayle (125 miles).³⁴ She had left Hayle for Pembrey on January 26th, so in this case

had made the round trip in eight days, including discharge and loading in South Wales. From the south coast ports round to Plymouth, three days' passage was possible, but with the rounding of Land's End, this usually meant that one leg either way would be against the wind. Of the 18 voyages made by the schooner *Mary Simmons*, mainly between her home port of Devoran and the South Welsh ports of Neath and Llanelly in 1863, average passage time was four days, while return time was three days (see table 6). Average complete voyage times for that year are calculated as follows:

Passage to South Wales	Passage to Cornwall	Time in port at Devoran	Time in port in South Wales
4 days	3 days	5 days	7 days

Total voyage time therefore averaged 19 days, including time spent in port. During the year some 2,610 tons of copper ore and 2,970 tons of coal were carried. This compares with the record of *the Julia* which at the same time made 15 voyages (one in ballast) from Portreath to her home port of Neath, carrying a total of 1,516 tons of ore and 2,270 tons of coal.³⁵

In port at Swansea, many delays occurred in waiting for a vacant berth, but once there, the ships could be rapidly discharged. For example, it was said that a 130 ton vessel arriving at one company's quay at 5 a.m. could be discharged by 3 p.m., at a rate of c. 13 tons per hour.³⁶ In the mining ports, a loading rate of 50 to 60 tons per day was the norm for most of the century. Hatches were small on all sailing vessels and so little mechanization in loading or discharging was possible.

Particularly rich ores were sometimes loaded in casks for shipment. For example, in 1831, two tons of native copper from Perran St George Mine were shipped from Trevaunance in this manner.³⁷ Otherwise, ores were shipped in bulk, but those of different quality or from a different source could be kept separate in the ship's hold when directed by the smelter or agent for any reason. This could be achieved in a single hold by using a sail or sand placed between the ores in question.³⁸ Different ores were to be distinguished on the Bill of Lading, clearly marked, for example 'No. 1' and 'No. 2' ores. Often, as long as this was complied with, the smelters preferred ores of different quality to be mixed in the hold although they had been kept in separate 'hutches' at the loading port.

Traditionally the mineral trade was said to be a fair weather one. In October 1585, "when ships were far smaller, it was stressed that ores must be taken to the place of shipment (St Ives) in the summer, 'for men will not deale nowe in the wynter tyme, unlesse it be very faire wether'.³⁹ This vulnerability to weather was the one major weakness in the link between the mines and smelting works about which little could be done. In fact, in 1782, Thomas Williams had threatened to ship large stocks of Anglesey ores to Swansea during the winter because of the difficulties in shipping ore from West Cornwall.⁴⁰ Although by the nineteenth century vessels were larger and sturdier than before, it was still the dead-weight in their holds that made the mineral ships particularly vulnerable in heavy weather.

TABLE 6
Voyages of Mary Simmons', no reg. tons, in 1863

Voyage		Days
i	Dep. Jan.. 5 Devoran to Llanelly and return	22
2	Jan. 27 Devoran to Neath and return	21
3	Feb. 17 Devoran to Llanelly and return	13
4	Mar. 2 Devoran to Pembrey to Llanelly &	21
5	Mar. 23 Devoran to Llanelly and return	16
6	Apr. 8 Devoran to Llanelly and return	20
7	Apr. 28 Devoran to Neath and return	17
8	May 15 Devoran to Pembrey to Llanelly &	14
9	May 29 Devoran to Llanelly and return	17
10	Jne 15 Devoran to Neath and return	14
ii	Jne 29 Devoran Arr. Jly 8 Llanelly	
	II V 15 Llanelly Jly 18 Devoran	26
12	II V 25 Devoran Jly 30 Pembrey	
	Aug. 9 Pembrey Aug. ii Devoran	20
13	Aug. 14 Devoran Aug. 17 Neath	
	Aug. 22 Neath Aug. 25 Devoran	17
14	Aug. 31 Devoran Sep. 3 Llanelly	
	Sep. 18 Llanelly Sep. 23 Devoran	30
15	Sep. 30 Devoran Oct. 5 Neath	
	Oct. ii Neath Oct. 14 Devoran	21
16	Oct. 21 Devoran Oct. 30 Llanelly	
	Nov. 13 Llanelly Nov. 15 Hayle	31
17	Nov. 21 Hayle Nov. 24 Neath	
	Nov. 30 Neath Dec. 7 Devoran	24
18	Dec. 15 Devoran Dec. 18 Neath	
	Dec. 21 Neath Dec. 24 Devoran	c. 16

Source: Cornwall R. O., Merchant Shipping Records, 1648.

The winter season was most marked in the coal trades, for the frequent storms and lack of a remunerative return cargo to make a voyage worthwhile were said to have driven many colliers off the seas during winter. But although in general it may be said that the trade was 'seasonal', evidence suggests that this was by no means always the case, and that in some years the winter months were more active than was normally credited. For example, by the fact that in January 1846, it was reported at Hayle that 'above 40 sail of vessels remain in port by means of *the gales*', it would appear that there were still many vessels risking the weather and trading in this season.⁴¹

It was not only in Cornwall that shipping might be held up. The Bristol Channel, like a great funnel open to the prevailing winds from the South West, meant that it was often far more difficult for sailing vessels to leave the Welsh ports with return cargoes of coal for the South West. Vessels could be windbound in the Welsh ports for some time. For example, in February 1834, a large number of the 'Welsh Fleet'

entered Hayle, some of them having been up-channel for 14 weeks.⁴² The fact that contrary winds, rather than gales, could detain the 'Welsh Fleet' up-channel for several weeks, could lead to a serious shortage of coal; in 1853, a scarcity of coals was felt at Penzance after vessels had been held up for over three months, and the quay 'presented quite a desolate aspect in the absence of colliers'.⁴³

Sudden gales did considerable damage to coastal shipping. For example, fears were expressed at the time for the *Mary* which left Trevaunance for Swansea early in February 1831, just two hours before a severe gale got up from the north west, lasting for 12 hours.⁴⁴ The vessel was unharmed, however, but the *Skylark* was lost in the same gale with ores for the Crown Copper Co.⁴⁵

The pattern of the copper ore and coal trades necessitated the rounding of a long and inhospitable coastline, including the Lizard and Land's End. Once around these hazards, vessels bound for Wales were faced with long stretches of the north coasts of Cornwall and Devon which were exposed and without shelter. Indeed, between St Ives Bay and Bideford Bay, the Camel estuary at Padstow affords the only natural harbour of shelter, and yet at low tide the Doom Bar makes entry more hazardous. Although this was not peculiar to the copper ore trade (the Bristol Channel has always been a busy waterway), it was nevertheless a significant factor, for there was no alternative route.

Once a voyage was under way, the skills of masters experienced with trading around this coast were drawn upon to the full. There was the danger of 'missing stays' when close to the shore, thus putting the vessel into a hazardous position, and this was the cause of many a wreck. Captain John Daniel had a narrow escape while running before an increasing gale from Neath to St Ives. While reefing off Trevoze Head, the main boom jibed and snapped in two, the outer part dashing through the bulwarks causing the ship to spring a leak. It was a matter of pumping or sinking, and the ship's sides were awash when she finally sank at the entrance to St Ives harbour. At low tide, holes were bored to drain the vessel and then blocked up so that she could be refloated on the new tide. Indeed, a lucky escape.⁴⁶ This account was not untypical, for in the summer of 1844 the schooner *Pendarves* had a similar narrow escape in a north-westerly gale when bound from Devoran to Port Talbot with copper ore. She arrived at Swansea with lost bulwarks, boats and other gear, when the South Welsh coast was said to be strewn with wrecks.⁴⁷

Continued use of vessels on the copper ore trade had its dangers, for the corroding action of the copper on iron bolts in the planking below the waterline was something to be constantly watched. Captain John Daniel records a lucky escape for his own ship in the 1860s when lying aground at low tide on the beach at St Ives with a cargo of copper ore, a passing fisherman chanced to find water pouring from such an eaten-away bolt hole.⁴⁸ Others were less fortunate and many losses to shipping in apparently calm conditions may be due to this cause. Further, ore in bulk tended to block pumps when most needed in such an emergency. Shippers were well aware of the dangers of employing old vessels on this trade and despite frequent checks some

cargoes were still lost. On the other hand, a well maintained vessel could have a long lifetime on the trade despite all these problems, and the Devoran schooner *Elizabeth Ann* was 74 years old when she was finally wrecked on Llanelly Bar in March 1885.⁴⁹

IV

Since 1831 there had been a steamer service from Hayle to several Bristol Channel ports, reflecting the importance of Hayle as a port serving both mining and its associated industries. Passengers and general goods were carried, for the main line railway did not reach Cornwall until 1859. But for less valuable bulk cargoes the steamship was late to appear in the South West. In contrast, over half the vessels on the coal trade between the North East and London were steamships by 1865. There were some steam colliers employed in the South West in the second half of the century, notably by Harvey & Co. of Hayle and D. W. Bain of Portreath. The smelters and coal factors John Vivian & Sons owned the *Augusta* which was the first steamship to enter Portreath, causing great interest when she 'came in in good style' from Llanelly with coal in June 1851.⁵⁰ She was also reported sailing to Hayle and Point in the following years. The firm also owned the 379-ton steamship *Morfa*, built in 1862.

One of the main advantages of the steamship over the sailing ship was that the length of a voyage under sail could vary considerably according to wind and tides, whereas steaming time could be guaranteed, barring breakdowns, and many more voyages could be achieved each year. However, no great improvement could be made about the number of days spent in harbour while facilities remained poor. The owners of the *Augusta* in 1858 considered some 42 voyages of seven days to be in order:⁵¹ perhaps optimistic, and certainly no return cargo of copper ore could have been envisaged. In 1858, the *Augusta* had a large crew of ten, while the typical schooner of the time had a crew of five or six, and if hard pressed as in later years, could even be managed by three on a short voyage. With high expenses for wages and fuel, a fast turn-around was essential for the steamship. But the mining ports were not altogether suitable, being often small and inconvenient, shallow and drying out at low tide. The small schooners, with their lower working costs, could better tolerate the low freights on the ore trade, and as long as a regular supply of ores could be achieved cheaply for the Welsh smelters, the duration of each voyage was immaterial.

During the late 1860s and early 1870s, a small group of larger, three-masted schooners was taken off other trades and employed here. For a few years, up to half a dozen voyages were made from Hayle to Neath in excess of 200 tons, and in two instances this was as high as 300 tons. These ships also took similar cargoes from other ports, notably Looe and Morwellham. By this time, production of copper ore was falling rapidly and the trade was in decline, heading for total collapse: within 20 years output fell by 75 per cent. The coal trade, however, did not fall like that of the copper ore. Although there was little other industry and no large domestic population in the region, mining coals remained an important part of this trade, for the decline of

copper coincided with an increase, if temporary, in the output of tin. But with the reduction of copper ore shipments, there now remained little or no backfreight to South Wales, and many vessels sailed in ballast. Indeed, at Hayle in the 1880s the export of ballast (shipped from Lelant Quay) was greater than copper ore. At this period, coal imports were making a recovery and the following figures demonstrate the very wide gap now existing between the two former complementary trades:

PORT OF HAYLE

Year	<i>Imports (tons)</i>		<i>Exports (tons)</i>	
	<i>Coal</i>		<i>Copper Ore</i>	<i>Ballast</i>
1878	78,310		9,119	11,177
1882	103,435		7,725	12,147
1887	111,356		6,004	9,570

Source: Cornwall R.O., Harvey Papers, D.D.H. 71.

The situation was further aggravated by a depression of freight generally which resulted in an excessive supply of tonnage, and the copper ore fleet from St Ives remained largely out of work. In the early 1860s, for example, the two schooners *Auspicious* and *Marys* were laid up for six months in the winter, for infrequent cargoes did not justify the risks of keeping a ship at sea during that period. Nevertheless, both managed a dozen voyages to South Wales in the summer months.⁵²

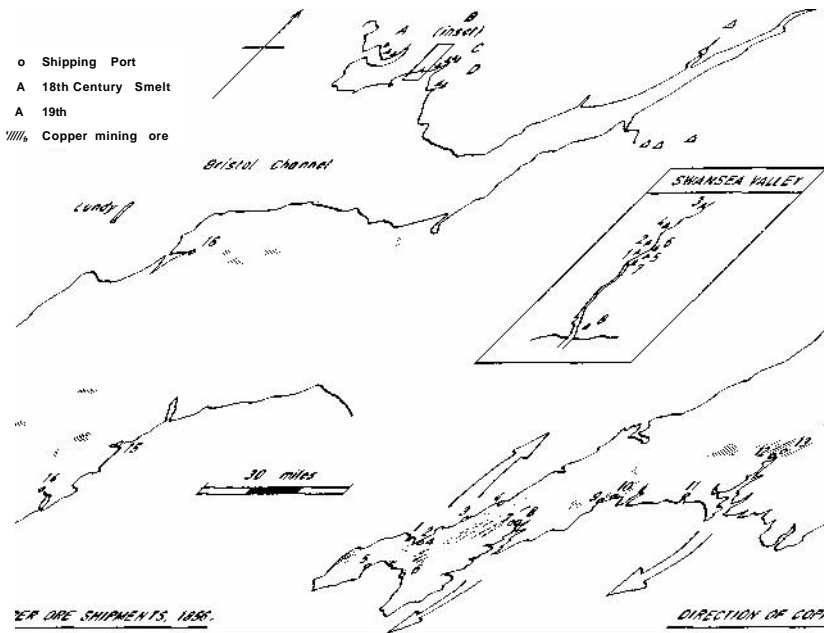
The decline of copper mining in Devon and Cornwall was rapid. In 1880 recorded sales were down to 40,311 tons of copper ore, and ten years later they had been further reduced to 11,309 tons. There were now only a few copper mines, of which Devon Great Consols produced 4,368 tons of low-grade ore. But by now, as with several other mines, arsenic had become more valuable than copper.⁵³ In the last year of the century, output of copper ore was 6,200 tons, which represented scarcely one voyage a week from the whole of the South West. Devon Great Consols finally closed in 1903, and in the far west Levant Mine continued for a few years as the main producer, but here copper was now a by-product of tin. Elsewhere, any further small output of copper ore was also very much secondary to the more valuable tin.

As time progressed many former copper ore schooners were laid-up at Hayle, where the old Copperhouse Canal served for this purpose and soon became known locally as 'Rotten Row'. Throughout the history of the trade, and especially during the important years of the nineteenth century, such small sailing coasters had been a key link of the copper industry and were responsible for the carriage of many thousands of tons of copper ore.⁵⁴

NOTES

1. C. Tomlinson, *Cyclopaedia of Useful Arts*, (1868), vol. I, 427-8.
2. See J. Day, *Bristol Brass: A History of the Industry*, (1973), and R. Jenkins, 'Copper works at Redbrook and Bristol', *Trans. Bristol & Glos. Arch. Soc.*, 63 (1942), 145-67.
3. For example, G. Francis, *The Smelting of Copper in the Swansea District*, (2nd ed. 1881), M. Phillips, *The Copper Industry in the Port Talbot District*, 1935), and R. O. Roberts, 'The development and decline of the non-ferrous metal smelting industries in South Wales', *Trans. of the Hon. Soc. of Cymmrodorion* (1956), 78-115.
4. For the mining, see D. B. Barton, *A History of Copper Mining in Cornwall and Devon* (2nd ed. 1968).
5. W. Pryce, *Mineralogia Cornubiensis* (1778), 277.
6. Roberts, *op. cit.*
7. 'A Farther State of the Case relating to the Brass Manufacturers' (c. 1720), British Museum 8223, 3,e(96).
8. Report from the Committee appointed to enquire into the State of the Copper Mines and Copper Trade of this Kingdom. 1799 (journal of House of Commons, vol. 54, 520).
9. Pryce, *op. cit.*, ch. x.
10. Swansea Tide Tables, 1824.
11. J. Symons, 'The industrial capacities of South Wales', *Cambrian Journal*, 1(1854), 317.
12. Tomlinson, *op. cit.*, 442.
13. These are the *West Briton*, *Royal Cornwall Gazette* and *Cambrian*.
14. For example, as described by Pryce.
15. Hayle: Hayle Railway, 1837-
Portreath: Portreath Tramroad, 1812-c. 1870
Hayle Railway Branch, 1837-1936
Devoran: Redruth & Chasewater Railway, 1826-1917
Par: Par Canal, c. 1830-c. 1855
Par Tramway, 1855-
Looe: Liskeard & Looe Union Canal, 1828-c.1860
Liskeard & Caradon Railway, 1844-1917.
Calstock: East Cornwall Mineral Railway, 1867-
Morwellham: Tavistock Canal, 1817-73
Devon Great Consols Railway, 1858-1902.
16. Royal Institution of Cornwall (hereafter R.I.C.), HJ.1.14, letter A.JenkintoJ.to B.Jenkins, 4 Sept. 1830.
17. R.I.C., HJ.1.21, letter A. Jenkin to. B.Jenkins, 27 Nov. 1847.
18. R.I.C., HJ.1.14, to Thos. Roberts, Portreath, 13 May 1830.
19. R.I.C., HJ.1.14, instructions to shippers at Devoran, Trevaunance and Hayle, 4 March 1831.
20. Cornwall Record Office (hereafter C.R.O.), AD 126 (2).
21. *Ibid.*, Narabo was one of the quays upstream, at Devoran.
22. Pryce, *op. cit.*, 290.
23. For example, from Callao, Peru, freights were known to vary between £1, 16s. (£1-80) and £3,5s (£3.25) per ton within a short period. (J. Percy, *Metallurgy: the art of extracting metals from their ores and adapting them to various purposes of manufacture*, (1861), 497).
24. C.R.O., AD 126/2/2, letters from ships' masters to H. Grylls.
25. R.I.C., HJ.i.15, A.Jenkins to P. Grenfell & Co., 22 Oct. 1831.
26. Looe Harbour Commissions (L.H.C.) Letter Book, to E. Geach, 6 Dec. 1856.
27. R. Symons, *A Geographical Dictionary, or Gazetteer of the County of Cornwall*, (1884), 230.
28. Public Record Office (P.R.O.), E.190, Exch. Q.R. Port Book, 1068/11.

29. Swansea Tide Table, 1824, 39-43.
30. Swansea Tide Table, 1828, 40-3.
31. D. O. Evans, 'The non-ferrous metallurgical industries of South Wales', *Trans. Hon. Soc. of Cymmrodorion* (1929-30), 21.
32. Swansea Tide Table, 1824.
33. H.M. Customs, London, 73/259. Neath Coast waiter to Board, 29 Apr. 1824.
34. Royal Cornwall Gazette, 2 Feb. 1855.
35. Glamorgan Record Office (G.R.O.), Neath Harbour Records.
36. Tomlinson, *op. tit.*, 428.
37. R.I.C., HJ.i.15, letter to J. B.Jenkins, 11 Oct. 1831. There was an instance in 1813 when native copper from Wheal Gorland was shipped in fish casks. (A. K. H. Jenkin, *Mines & Miners of Cornwall*, vol. VI, *Around Gwennap*, 1963, 13).
38. R.I.C., HJ.i.18. A. Jenkin suggested this to William Pease at Par, for rich and poor ores from Fowey Consols; letter 30 Nov. 1838.
39. Letter, John Otes to Wm. Carnsewe, 27 Oct. 1585, quoted by Grant-Francis, 17.
40. J. R. Harris, *The Copper King*, (1964), 44.
41. *Royal Cornwall Gazette*.
42. Diary of Capt. T. Short, quoted by A. K. H. Jenkin, *The Cornish Miner* (2nd ed. 1948), 120.
43. *Cornish Telegraph*, 19 Jan. 1853.
44. R.I.C., HJ.i.14 Letter to P. Grenfell & Co., 5 Feb. 1831.
45. R.I.C., HJ.i.14, letter to B.Jenkins, 12 Feb. 1831.
46. J. Daniel *Autobiography of Lookout* (1902), 97-9.
47. *West Briton*, 9 Aug. 1844.
48. Daniel, *op. tit.*, 94.
49. Truro Customs Register of Ships, entry dated 27 March 1885.
50. *West Briton*, 27 June 1851.
51. Glamorgan Record Office, D/DGV/6A, 'Coal Book', 140-1.
52. C.R.O., Merchant Shipping Records, 800 and 899.
53. See J. C. Goodridge, 'Devon Great Consols: a study of Victorian mining enterprise', *Trans. Devonshire Assoc.*, XCVI (1964), 228-68.
54. I wish to acknowledge the help of the staff at the Royal Institution of Cornwall, and the Cornwall Record Office, both at Truro; the Glamorgan Record Office, Cardiff; the library of H.M. Customs, London; and the Looe Harbour Commissioners. I am also especially grateful to Angus Buchanan, Clive Carter, and finally Robin Craig who offered helpful criticism of the first draft of this paper.



Main Shipping ports:

- | | |
|-------------|-----------------------|
| St Ives | 9 Charlestown |
| Hayle | 10 Par |
| Portreath | 11 Looe |
| Trevaunance | 12 Calstock |
| Penzance | 13 Morwellham |
| Porthleven | 14 Totnes (Dartmouth) |
| Devoran | 15 Teignmouth |
| Point | 16 Barnstaple |

Main Copper Smelters:

- | | |
|--|--------------------------------------|
| <i>A Llanelly</i> | <i>C Neath</i> |
| Llanelly: Nevill Druce & Co. * Spitty: | Neath Abbey: Mines Royal Co. |
| English and Australian Copper Co. | Crown: Crown Copper Co. |
| Pembrey: Mason & Elkington | Red Jacket: Frederick Bankart & Sons |
| | Briton Ferry: Briton Ferry Co. |
| | (Sweetland Tuttle & Co., 1860-77) |
| <i>B Swansea</i> | |
| 1 Hafod: John Vivian & Sons V | |
| 2 Morfa: Williams Foster & Co. -V | <i>D Port Talbot</i> |
| 3 Rose: Williams Foster & Co. | Taibach: John Vivian & Sons |
| 4 Landore: Williams Foster & Co. | Cwm Avon: English Copper Co. |
| 5 Middle Bank: Pascoe Grenfell & Sons 71 | |
| 6 Upper Bank: Pascoe Grenfell & Sons ,< | |
| 7 Wliiterock: John Freeman Copper Co. | |
| 8 Port Tennant: Charles Lambert | |