

The excavation of an 18th-century salt-pan at St Monance, Fife

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ABSTRACT

The excavation of an 18th-century salt-pan threatened with coastal erosion is described.

INTRODUCTION (illus 1)

Salt-making has been an important industry in the Forth Valley since the 13th century, when locally abundant coal replaced peat and charcoal as the main fuel for boiling seawater. By the 1630s salt pans were a common sight along the south coast of Fife, usually sited near outcrops of coal (Lythe 1960, 51). The two industries became closely linked: dross (or 'pan coal'), previously discarded by the mines, was adequate for salt-making and the proximity of the coal-bearing seams to the coast kept transport costs to a minimum, giving the local industry a considerable advantage over that of Cheshire (Chaloner 1961, 65).

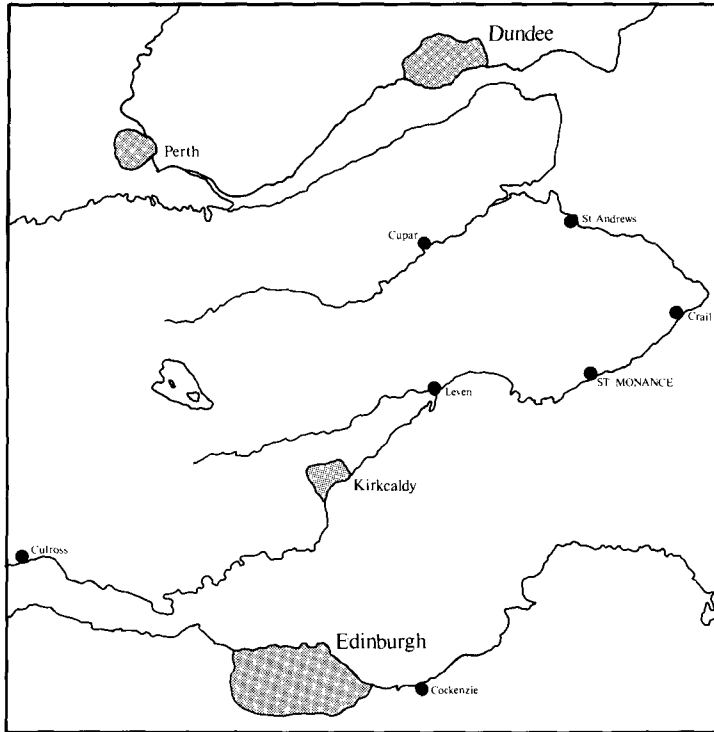
Unpredictable markets and the salt tax caused considerable problems but production continued for some time. Between 1772 and 1774 Sir John Anstruther erected nine pans at the newly established St Philip's saltworks on the edge of a low sea cliff, 0.5 km east of the fishing village of St Monance (Whatley 1984a, 37), now in the District of North-East Fife. A local mine, founded in 1771 by Anstruther and owned by the Newark Coal Company, provided the fuel (Douglas 1974, 211) and both coal and salt were exported via Pittenweem harbour, 3 km to the east (SAS 1978, 739).

In 1790 St Philip's was described as '... one of the neatest and best contrived salt-works upon the coast... ' and its produce among the best in Fife (SAS 1978, 745). However, although production between 1795 and 1798 was the sixth highest in Fife, only 13% of the works' output could be sold locally because of competition from recently established factories on Tayside. Following two uncertain decades the local industry received a crippling blow in 1823 when the duty on imported salt was lifted, thus allowing cheaper, high quality rock salt from Cheshire to flood the Scottish market. Most of the Fife works collapsed shortly after.

PHYSICAL BACKGROUND (illus 2)

The Carboniferous rocks of the Forth Valley are dominated by the Oil Shale Group, the series being well developed in East Fife. Accumulated deposits of sandstones, shales, fireclays, thin coals and limestones are exceptionally well displayed on the cliff adjacent to the excavation site. The blue/purple fireclays, which dip northwards below the panhouse, form the 'underseat' of the local coal measures (Geikie 1902, 350) although both strata have been eroded by periglacial activity. In

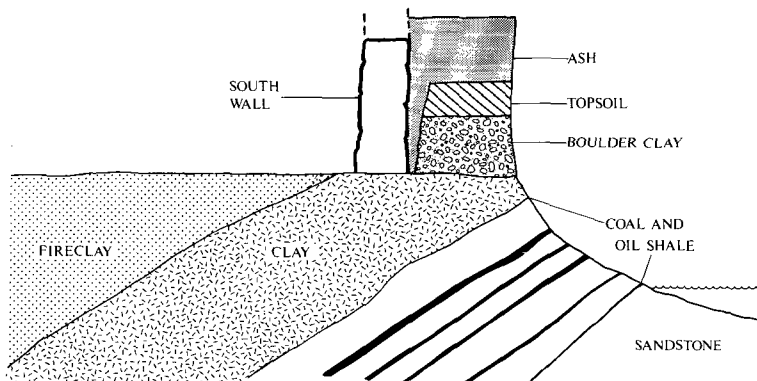
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ILLUS 1 St Monance: location

turn much of the glacial till and beach deposits were removed during the construction of the saltworks.

To the north of the saltern, below an earlier 50 ft (15.24 m) ledge, is the terrace of a 25 ft (7.62 m) raised beach (*ibid*, 314), upon whose summit stands a ruined windpump, the most conspicuous surviving element of the works.



ILLUS 2 Simplified section through the south wall of panhouse and underlying geology

EXCAVATION

The outlines of Sir John Anstruther's salterns still survived in 1985 although all nine were threatened by coastal erosion. Some had already suffered considerable damage and, before they deteriorated further, an excavation, funded by SDD (Ancient Monuments Inspectorate), was carried out on part of the industrial complex. Excavation was limited to the easternmost building (NGR: NO 533 018) whose south wall, undercut by the sea, was in imminent danger of collapse. The building's wall lines were all apparently intact, thus providing an opportunity to examine the complete ground plan of a panhouse. Before work commenced a small section of the St Monance to Pittenweem cliff-side path had to be re-routed, the new fence defining the northern limit of excavation. The site was covered with recently deposited builder's rubbish, up to 1.0 m deep in places, overlying sandstone fragments, pantiles, mortar, ash and soils of varying depths, derived from the destruction and robbing of the saltern's walls.

THE PANHOUSE (illus 3, 4, 5 & 6)

Most of the excavation area consisted of the panhouse itself, the forehouse and other ancillary structures being mostly beyond the limits of investigation. Internally three distinct phases of construction were identified although further alterations had probably been masked or destroyed by chemical corrosion and the intense heat of the salt-making process.

Phase 1

The panhouse measured 9.20 m square externally and 7.40 m inside, giving an area slightly less than that of a panhouse erected 60 years earlier on the Isle of Arran (Whatley 1982, 92). Topsoil and boulder clay had been cut by the foundation trench of the 1.10 m wide south wall but completely removed over most of the building's area, the 1.10 m wide east wall being laid directly on the underlying Carboniferous clay and the 1.30 m wide west wall cut into it. The north wall, still 1.10 m high, was only 700 mm wide but further investigation was impossible without demolishing adjacent



ILLUS 3 Panhouse, from the north

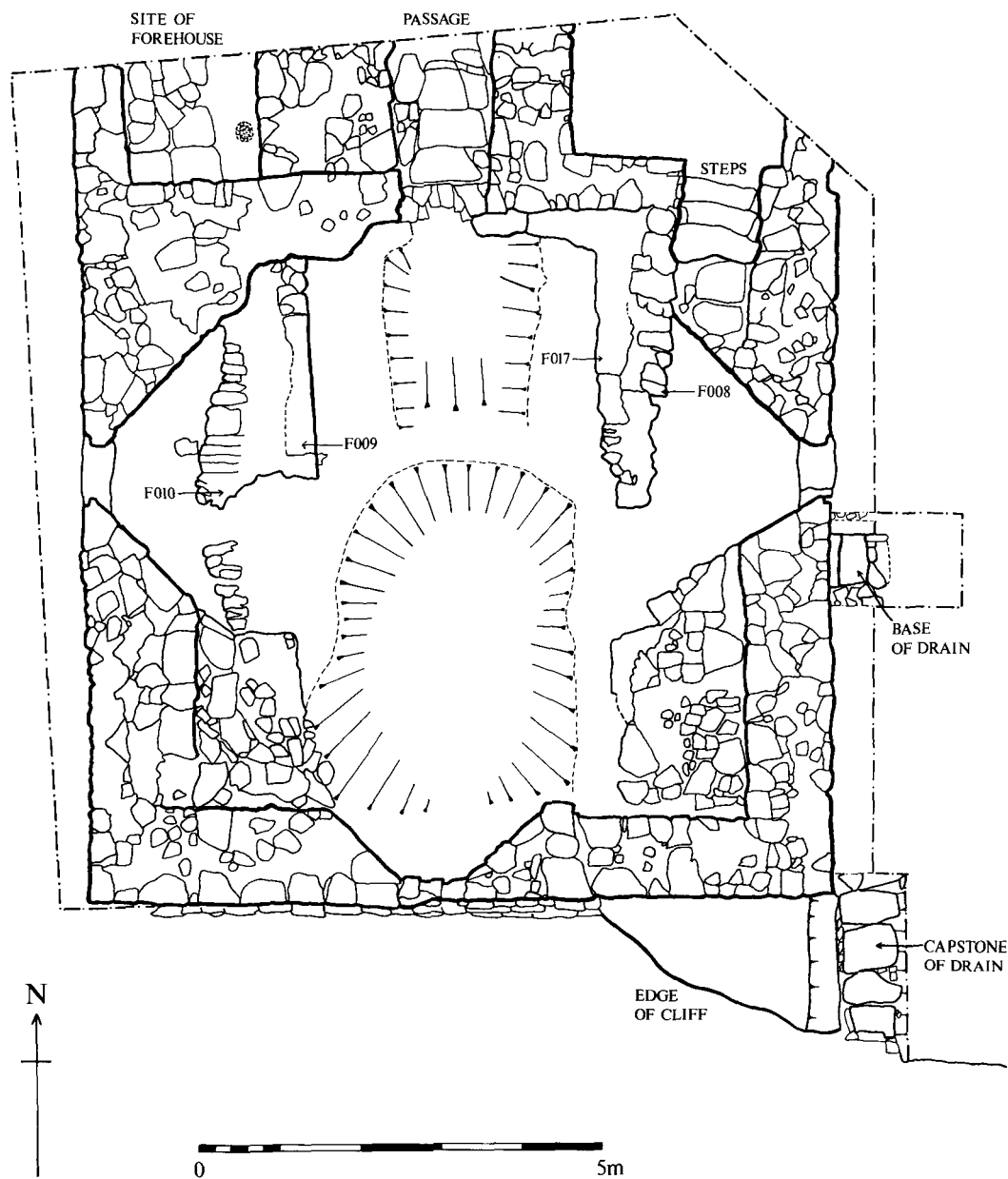


ILLUS 4 Panhouse, from the south-east; Phase 2 rake-hole in foreground

structures. The partially coursed and roughly faced walls were, apart from a few ironstone boulders, built entirely of Carboniferous sandstone. However, calcite leaching from its argillaceous matrix had reduced much of this stone to little more than soft white sand. Most of the repairs to the interior had been effected with common bricks rather than fireclay or sandstone. Fireclay occurs on the site but there is no record of its exploitation at St Monance although firebricks were manufactured at Kirkcaldy in 1714 (Douglas *et al* 1985, 30).

The panhouse interior may have been circular, according to masonry built into the internal angles and partially bonded into the outer walls, although the primary arrangement was masked somewhat by the disintegration of the stonework. The east and west walls were pierced by 640 mm wide openings with sandstone thresholds, bordered by the single surviving courses of jambs, each of which had a check on its outer face. These, and a less well defined gap in the south wall, opened into angled recesses that widened towards the interior. The compacted ash was evidently considered an adequate floor surface within these alcoves, similar material being used elsewhere for road surfacing at this time (Cross 1965, 87). In the centre of the north wall was an opening to a passage that widened from 900 mm at the furnace mouth to a maximum of 1.38 m, from where it had been secondarily narrowed on its east side. The floor, of neatly jointed sandstone flags set into yellow clay, was overlain by coal dust, indicating the route by which fuel was charged into the panhouse. Further evidence comprised large amounts of pancoal in disturbed levels to the immediate north of the building. Checks at the south end of the passage indicated that a shutter (probably of iron) had controlled the air flow below the pan and hence the temperature inside the furnace.

Dwarf walls on the east, north and west sides of the chamber's interior supported either the iron boiling-pan or a 'brander' (gridiron) upon which the pan sat. Each of these badly eroded 'pan-walls'



ILLUS 5 Phase 3 salt-pan

was built of local sandstone but the clay matrix of the east and west walls contrasted with the mortar-bonding of the south wall, suggesting they were not all contemporary.

Phase 2

Secondary dwarf walls, inside the originals, were built either for a smaller boiling pan (or brander) or as additional support for the pan and contents for, although these later walls were narrow

(600 mm on the east and west and 400 mm on the north and south sides), the gaps between them and their precursors were infilled with boulder clay, providing a wide base overall. Inevitably, all of these walls and the clay infilling had suffered badly in the high furnace temperatures.

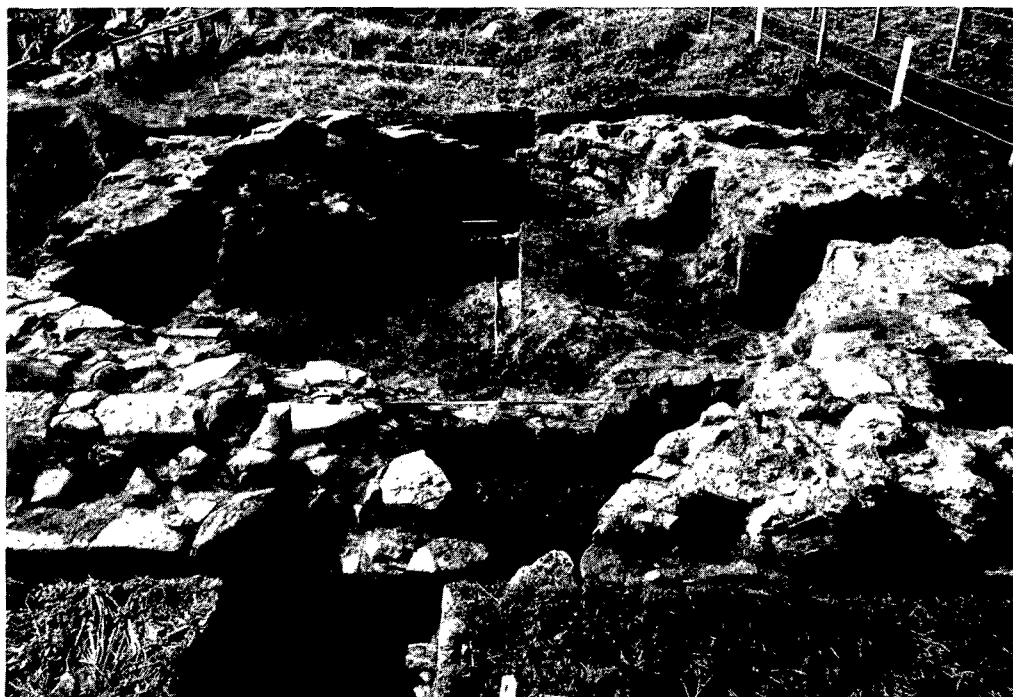
At the bottom of the Phase 2 east wall was a 350 mm wide channel with a flat sandstone base and sides of large fireclay bricks, which has been interpreted as a rake-hole. Fine ash near to the channel and deep deposits of ash within the adjacent splay are thought to be waste materials removed via this duct. Although there were similar deposits near the west wall, the masonry was too badly damaged to infer another rake-hole on that side of the building.

Repairs, even to the insides of the pan-walls, frequently utilized common bricks, some measure of protection being afforded by a thick layer of glaze derived from the salt-making process. Bricks were used more extensively at other salterns (Cross 1965, 87) but at St Monance none appeared to be primary to the works.

An intra-mural stair in the north-east corner of the panhouse, its three steps each comprising a single 900 mm wide and 200 to 220 mm deep sandstone block, was probably a secondary insertion. At its base, as elsewhere in the panhouse, there was no formal floor, merely compacted ash. At a later stage the area beyond the stair had been enclosed on its east side by a narrow wall abutting the building's north-east corner. The wall's full extent and its relationship with the forehouse could not, however, be established within the excavated area.

Phase 3

The Phase 2 north pan-wall remained in use during this period but the south wall had been demolished and either not replaced or destroyed by heat and/or the sea. Debris from earlier firings



ILLUS 6 Panhouse, from the east

was used to level a large hollow in the clay floor and to bed the new east and west pan-walls (F009 and F017) which were built of mortared standstone, ironstone and large firebricks. Lines of pitched stones (F008 and F010) revetted these walls but, like the walls themselves, they were badly eroded.

THE FOREHOUSE (illus 5)

The only part of the forehouse within the excavation area was a 1.6 m wide chamber, to the west of the entrance passage. The room's partially flagged floor was overlain with mortared rubble but whether this was a crude blocking or simply collapsed stonework is unclear. Similarly the function of a badly decayed wooden post in the room's corner remains unexplained.

DRAIN (illus 5)

The risk of explosion, resulting from a build up of steam through water seepage, was usually minimized by installing a drainage system around the perimeter of a saltern. At St Monance this was represented by a field drain, located in two small trenches to the east of the panhouse, measuring 500 to 600 mm wide externally, 270 to 300 mm wide inside and 350 to 500 mm deep, its flat capstones resting on sandstone rubble. On its base of undisturbed boulder clay was a 70 to 90 mm deep deposit of clayey silt, stained black by coal and ash.

WINDPUMP AND RESERVOIRS (illus 3)

On the 25 foot (7.62 m) raised beach behind the saltworks was the area's most prominent structure, the windpump which raised water from the reservoirs, or 'bucket-pots', to the panhouses. Visible in the cliff face, was a wood-lined channel which linked the pump with at least one of these reservoirs. Rock-cut checks for a sluice and an associated tidal channel survived in one such bucket-pot, c 30 m south of the excavated panhouse. At the Winton works, Cockenzie, there was one bucket-pot per salt-pan while at Culross there were five pans and only one reservoir (Whatley 1984b, 54). Further research is needed before such a ratio and the precise means by which water was transferred to the pans can be established for St Monance.

MATERIAL RECOVERED

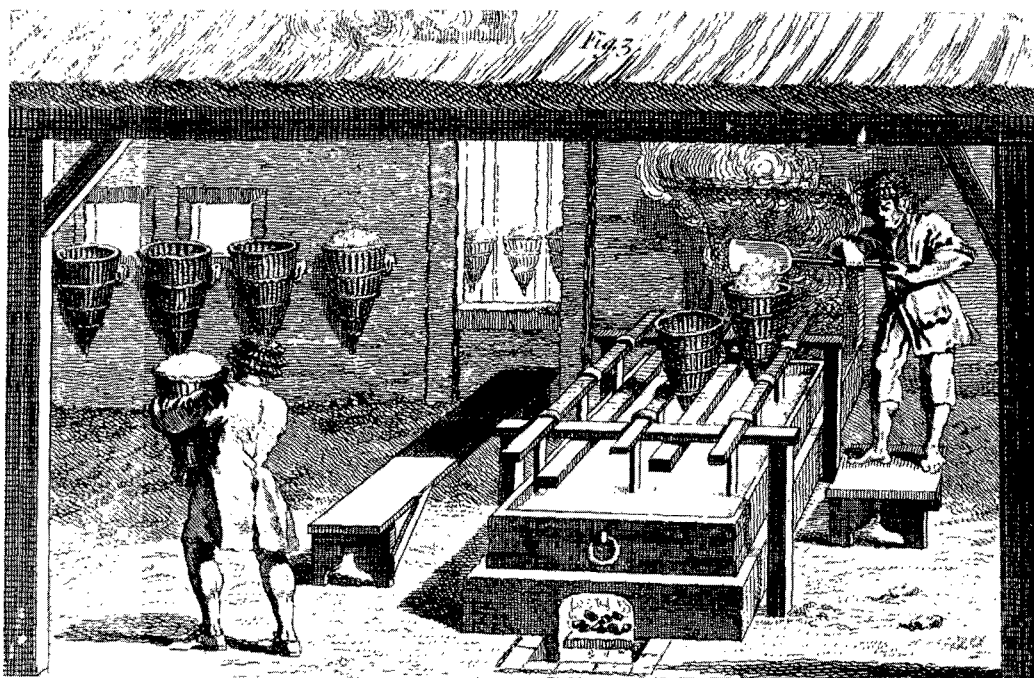
ARTEFACTS

Of the artefacts from levels pre-dating the works' demise, few were identifiable and none was datable. Some small pieces of iron may have come from a boiling pan but their size and degree of corrosion prevented positive identification.

Several fragments of firebricks were found although none was marked. One ?almost intact brick, in the debris used to raise the level of the panhouse floor, was 202 mm (8 in) wide, 125 mm (5 in) thick and had a broken length of 540 mm, suggesting original dimensions of: 24 × 8 × 5 ins. Terracotta-coloured common bricks were used extensively for Phase 2 and 3 repairs. None was marked and their places of manufacture are unknown although they were probably local, brick clay being common in raised beaches, especially the 50 foot (15.24 m) terrace, along the south coast of Fife (Geikie 1902, 351).

WASTE PRODUCTS

Considerable deposits of well-aerated material in the north-east sector of the panhouse were initially thought to be 'bitterns', calcium and magnesium salts drained from drying baskets (Taylor 1975, 16) (illus 7), or the solidified frothy scum formed when egg white or blood was added to remove impurities from the briny liquor prior to boiling (Brownrigg 1748, 57; Whatley 1984a, 10). Analysis,



ILLUS 7 18th-century salt-making (from Brownrigg 1748)

however, showed the material to comprise aragonite (calcium carbonate), ferrous sulphate, quartz crystals and clay minerals of varying composition, which are consistent with the products of 'padding' or even 'beiting'. 'Padding', or 'paidling', was a monthly operation whereby insoluble salts were removed from the pan sides; 'beiting' was a biennial process, when the pans were stripped down and repaired or even rebuilt (Whatley 1984a, 120).

DISCUSSION (illus 7)

The manufacture of salt is unlikely to have varied significantly among the numerous 18th-century works scattered around the Forth estuary. The size and layout of the excavated panhouse at St Monance are typical of such works and, although some details are missing, the mechanism of pumping seawater to the panhouses is unlikely to have differed radically from that used elsewhere.

The surviving heights of the walls and the relatively small amounts of adjacent rubble suggest that much of the masonry had been robbed, probably for the construction of nearby farms and houses. As expected, the interior of the panhouse had suffered badly from heat and chemical corrosion and was probably the subject of many more repairs than those identified during excavation. The dearth of metal artefacts suggested that the boiling pan and perhaps the brander(s) had been removed, either for reuse elsewhere or for scrap.

In a primitive 'sole pan' the pan rested directly on the dwarf walls and the coal was simply thrown on the ground below, whereas, in more sophisticated works, branders supported the pan at a higher level and the ashes collected in a pit. An illustration of a Cheshire saltworks (Rochester 1975, 53) shows coal being shovelled into a panhouse, c 1.2–1.5 m above floor level, a height consistent with that of a brander. Branders were in use at Leven by 1720 although sole pans were still the norm

elsewhere. By 1788 all three pans at St David's, near Inverkeithing, were supported on branders but only one was in use at Dysart in 1817 (Whatley 1984a, 20). If the boiling pan sat directly on the Phase 1 pan-walls at St Monance the pan would have measured c 6.5 m north/south by 4.8 m east/west (c 21 ft by 16 ft) and been larger than at any known contemporary works. Pans measuring 21 ft by 12 ft 6 in were found at Shields, Northumberland in the mid 18th century (Brownrigg 1748, 52); at Culross, Fife in 1795 pans of 21 ft by 11 ft 6 ins were recorded (Whatley 1984a, 22); while the 'normal' Scottish pan was 18 ft by 9 ft (Smout 1978, 14; Adams 1965, 155). It would, then, be reasonable to assume that branders were in use during Phase 1 at St Monance and it seems unlikely that this arrangement was later abandoned for a more primitive system.

Brownrigg (1748, 53) described a pan supported by 'brick work' at its four corners and by 'taplins' (round cast-iron pillars) in the centre and along the sides but no evidence of such structures was found during the excavation. In his account of a near-contemporary factory he describes 5 to 6 ft-wide walkways, between the boiling pan and the outer walls, from where the surface of the brine was skimmed and the salt raked off. At St Monance this platform was apparently reached via the steps in the north-east corner of the building.

No trace of a chimney survived. Whether it had been an internal structure, as at the earlier Arran saltworks (NR 972 513), or externally sited, as it was at Usan on Tayside, is unknown. However, the chimney was almost certainly on the south side of the panhouse but it has since succumbed to stone robbing and erosion. To the north was the charging passage while both the east and west splays allowed waste to be extracted from the furnace during Phase 2, at least, through a channel in the east pan-wall. A 400 mm deep hollow in the southern half of the panhouse floor may have been associated in some way with the chimney, perhaps for an increased draught, rather than with raking out ashes.

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