Arms, munitions and artillery equipment*

from a shipwreck of the early 1590s

J P Puype

A wreck (*Scheurrak SO1*) of a ship which foundered in December 1593 near the island of Texel in the Netherlands has yielded a range of artillery equipment. The gun carriages have already been published (Puype 2000). In this paper I shall examine the other items.

Research and resulting publications on the armament of ships during the 16th century mainly concentrate on cannon and only fairly recently has interest developed in other arms and war material such as hand firearms, swords, armour, men's clothing and other equipment, such as cannon shot of all types, artillery tools and implements used in pyrotechnic warfare (incendiary projectiles, etc.). The main impetus for the research of naval ordnance started with the recovery of objects from the ships of the Armada of 1588. Increasing activity in underwater archaeology since the 1960s has resulted in much new research which necessitated revisions of earlier publications. Isolated finds of 16th-century wrecks in the Mediterranean and in the western hemisphere also led to a number of publications and revisions of existing knowledge or at least stimulated academic research. The recovery since the 1970s of a vast number of artefacts from the *Mary Rose* of 1544 has led to vigorous new research as well, especially in the field of ordnance, other weapons and ammunition. Much exciting new knowledge has been gained, and is still coming to light.

The finds from the Texel wreck form only a small part of this larger picture. It must be admitted that in many cases they will only confirm what has already been deduced on the basis of other finds elsewhere, which is still important in itself, but they also reveal a number of previously unknown facts. It is hoped that these will contribute to advancing knowledge of what ships could use in combat at sea in a period before standardization of equipment developed. It is emphasized that this article is a preliminary report of what has been found so far on the Texel wreck, intended to focus the attention of arms historians on these relatively early finds.

Research on the wreck is still going on. The authority responsible for the excavation, the Netherlands Institute for Ship and Underwater Archaeology, or *ROB/NISA*, will, it is hoped, within a foreseeable time publish official reports on what has been found. I am therefore very grateful to *ROB/NISA* not only for giving me permission to issue this preliminary report, but also for providing photographs, slides, drawings and written records, and for allowing me to inspect and analyse the finds. The few sketches accompanying this article are mine and do not purport to be archaeological drawings, they are more artist impressions and not to scale. All photographs are published by courtesy of *ROB/NISA* and, except when noted otherwise, made by its photographers. All inventory numbers should be understood as to be prefixed by 'SO 1', the official designation of the wreck site.

Artillery equipment

1 Linstock

The linstock was a tool used by a gunner to ignite the priming powder in the vent or touch-hole of a gun and so, in turn, ignite the main charge to drive out the shot. In principle the linstock consisted of a short wooden stick at one end of which a smouldering piece of matchcord was affixed. The word linstock may derive from the German *Luntenstock* (literally 'matchstick'), but is in my view more likely to have come into the English language from its Dutch equivalent *lontstok*.

An important inscribed and dated find on the wreck is just such a linstock (inv. no. 23222). It is of wood, so far unidentified (figures 1 and 2). It is similar to the fairly large number of linstocks found on the *Mary Rose*, with which it shares the match-holder shaped as a crocodile-like head, the moulding behind it and a pair of similar mouldings on either side of the grip (Miller & Schlecht 1983: 666). On the linstock from the Texel wreck these mouldings are almost globular and carved overall as so-called turk's head knots. The outline of the grip is spindle-shaped and in cross-section it is polygonal. Its centre is encircled by

**This paper was given at a seminar held at the Armourers and Brasiers Company of London on 26 March 2001.*

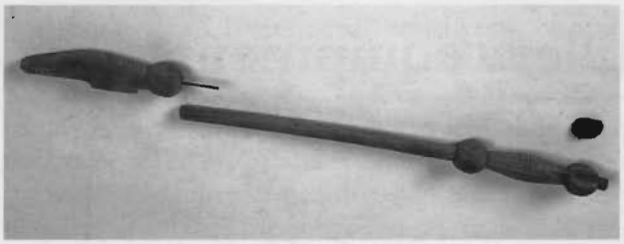

Figure 1 Linstock (Inv.No. 23222). The match-holder, in the shape of a crocodile's head, has separated from the remainder and a piece from the knob closing off the handle is chipped off. Photograph by Hans de Lijser.

Figure 2 Linstock (inv. no. 23222). Close-up of the grip. Note the inscription. Photograph by Hans de Lijser

a narrow group of incised mouldings. A number of the grip facets is longitudinally carved with text lines in Dutch of a poem, which roughly translates as follows:

> The evening and the morning are not alike, The morning takes care of things which the evening does not, If the evening would care as the morning does, Many a man would ride instead of going on foot.

Excitingly, a further line underneath states 'By me, Cornelis Clasoon van Block Dick FFFF Anno 1590'.[1] In itself it is not surprising to find a text on a gunner's tool such as a linstock. Indeed, a number of contemporary examples of gunner's tools that still survive, for instance priming horns, are known with similar texts, and many of them, too, are dated. However, dated gunner's tools from shipwrecks are very rare.

ROB/NISA undertook a search into the identity of Cornelis Clasoon – this spelling is a variant of the forms 'Claaszoon', 'Claeszoon' or 'Claesz' – and traced an act of 1590 in which a number of seamen give an account of the seizure of their ship by the English. One of them was a certain Cornelis Claesz of Westerblokker, a village near the town of Hoorn in what is now the province of North-Holland. The 'Block Dick' on the linstock refers to Blokdijk, a hamlet under Westerblokker. Considering the fact that only a few people must have lived there and that in the 1590 act Claesz calls himself a *'bosschieter'*, the ancient Dutch term for gunner, *ROB/NISA*'s conclusion that he must have been the same as the owner of the linstock of the 1593 wreck is not too fanciful (Manders 1998: 77).

The fact, however, that a Cornelis Claesz only two years earlier published in Amsterdam a Dutch translation of a German handbook of gunnery entitled *Der Bussen Meesterije* (The art of the gun)[2], is too interesting not to be mentioned in addition (figure 3). In fact it would be most surprising indeed if this Cornelis Claesz were *not* the same person as the owner of the linstock dated 1590 and the *bosschieter* mentioned in the act of the same year.

2 Cartridge prickers/ vent reamers

Cartidge prickers were used by the gunner to pierce the cartridge after it had been inserted in the bore of the gun and fully pushed home (not rammed as this could rupture the cartridge and prove dangerous) until it rested against the rear end of the powder chamber.

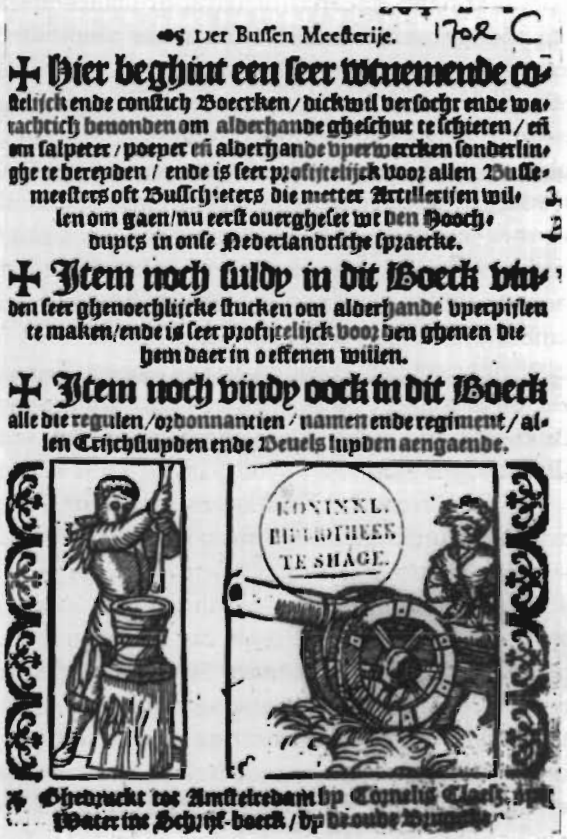

Figure 3 Title page of Cornelis Claesz, Der Bussen Meesterije [The art of the gun] *published in Amsterdam in 1588. Photograph by J P Puype from the example in the Royal Library, The Hague, shelf mark 1702 C 60.*

To make an aperture in the cartridge, the gunner would insert the pricker into the vent and press it downward with some force. To ensure that the paper, canvas, parchment or sometimes vellum was penetrated, the point of the pricker was spirally wound so that if necessary a few additional turns could make the penetration. The powder in the cartridge was thus accessible to the spark from the priming powder when that was ignited by the gunner's linstock. The priming powder was poured into the vent from a priming horn, when loading was completed and the gun ready to fire. If the cartridge was loaded and there was some time interval until the shot was inserted, the gunner would not immediately retract the pricker, but leave it standing in the vent and thereby hold the cartridge in a fixed position so as to prevent it from dislocating itself by sliding forward when the ship was rolling. Immediately after the shot had been placed against the charge, the gunner would remove the pricker. To prevent the shot, in turn, from rolling out of the bore, a wad was rammed against it.

Cartridge prickers also functioned as *vent reamers*, i.e., devices to clean out vents that had become clogged. Although steel prickers for this purpose are known to have existed – they would have been much stronger than brass ones – brass ones had the advantage of not producing sparks accidentally and so are more common.

The prickers/reamers of the Texel wreck are interesting since they have the exact form of the ones found on wrecks of Dutch East Indiamen from the 17th and 18th centuries. Thus this type of pricker/reamer could already have been in use on Dutch ships generally before the big commerce companies came into existence (the East India Company in 1602 and the West India Company in 1621).[3] As stated before, the prickers/reamers are brass and consist of a thin rod (3–4 mm in diameter, or less according to the size of the vent it was destined for), the top end of which is bent to assume the form of a transverse cracknel-shaped handle. The other end is spirally wound for a short distance and terminates in a point.

Four recovered specimens have been analysed (see figure 4). Three of them are bent and have therefore lost their original shape. The single straight one measures 267 mm overall. A fifth one, the rod again bent at a sharp angle, is illustrated in figure 5.

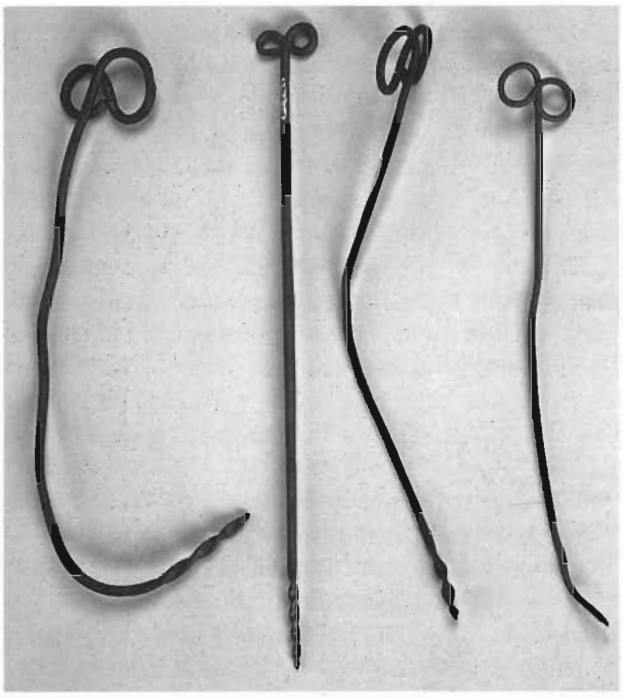

Figure 4 Four cartridge prickers/vent reamers. The two specimens on the right are numbered 14245 and 90001 respectively; the inventory numbers of the others were not noted. Photograph by Hans de Lijser.

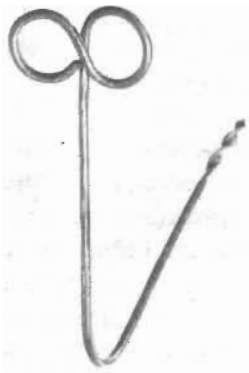

Figure 5 Cartridge pricker/vent reamer. Inv. no. unknown. Photograph by Hans de Lijser.

3 Loading tools

Several loading implements, generally meaning tools to load powder cartridges, shot and wads in the barrel and/or to extract these objects if necessary, or to extract the remains of spent cartridges, have been recovered, but a lot more are now undergoing conservation treatment and are not yet available for analysis. Quite a surprising find among them was inv. no. 24024, the wooden base for a ladle (thus in itself incomplete because the scoop is missing), but fitted to a complete pole almost six feet in length. Although the base has holes made by nails around its foremost

cylindrical part, it is possible that the crew of the ship might have removed the scoop so as to use the tool as a rammer.

It should be noted in passing that ladles were intended to load *complete* cartridges, i.e., vellum cylinders or 'bags' containing the required amount of blackpowder for one shot, and not loose powder. This is indicated by the ladle scoop's typical longitudinal shape and by the fact that it forms a half-cylinder. The cartridge is brought home by inserting it into the barrel until it stops against the rear end of the powder chamber and then by turning the scoop 180° and extracting it from the barrel, the cartridge will be left behind.

I have only been able to analyse and measure the following ladles (or rammers) and/or scoops:

1 Inv. no. 24024. Turned oak base (copper or brass scoop missing), diameter 75 mm, total length 113 mm, cylindrical at first, developing into a tapering baluster followed by a wide bulbous moulding encircled by a central groove. Into the base of the moulding is mounted a cylindrical pole of ash, diameter 39 mm. Overall length including the base for the scoop is 1.81 m (figure 6).

Note: The object described above could easily have been a rammer but the cylindrical part of the base has holes made by nails all around it. These are evidence for the fact that a scoop was fitted once. The largest diameter of the base, 75 mm, suggests that this ladle served a 4-pounder gun.

2 Inv. no. 10001. Ladle without pole. Turned oak base with brass scoop attached. The wooden base is cylindrical at first, diameter about 53 mm, then tapers slightly off towards the rear end, which terminates in two bulbous circular mouldings of decreasing diameters. The base is longitudinally penetrated in the centre by a bored-out hole (diameter 22 mm) for the pole. To the cylindrical front end of the base is nailed (by means of about ten copper nails all round, in a single row) a wide, flat copper collar forming part of a semi-cylindrical scoop of sheet copper in *two* layers, total thickness over 4 mm, but made from one plate which was folded around the upper straight edges of the scoop. These edges have rounded corners at the front. The total length of the scoop is 312 mm, the greatest width is 57 mm. The scoop is broken in two (see figure 7).

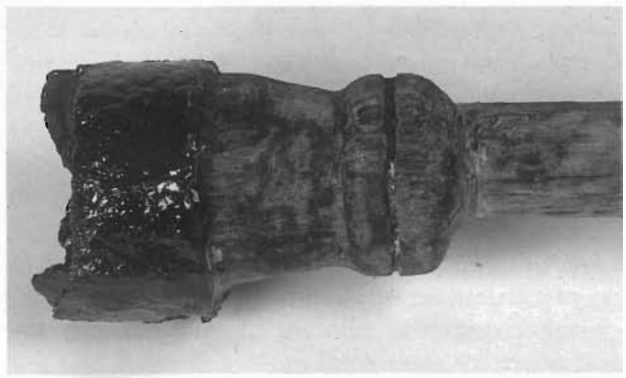

Figure 6 Rammer (or ladle without scoop) with complete pole attached, total length 1.81 m. The head as shown is 113 mm long. Its front face is damaged. Inv. no. 24024. Photograph by ROB/NISA.

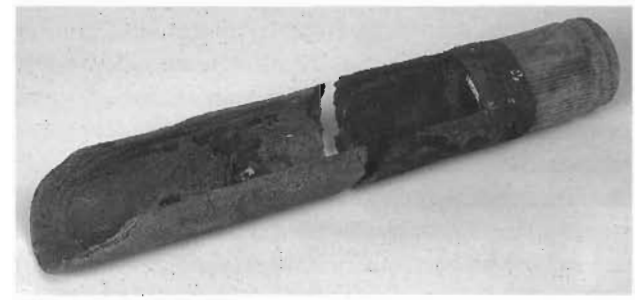

Figure 7 Ladle scoop with wooden base for attachment (inv. no. 10001). Sheet copper, folded into two layers, it is broken into two pieces. Photograph by Hans de Lijser.

Note: The difference in shape of the base compared with that of inv. no. 24024 will be noticed as well as the smaller calibre for which this ladle was obviously intended, i.e., a one-pounder gun.

3 Inv. no. 52101. Ladle without pole. Similar in shape to no. 2. Scoop with a very porous overall surface and heavily affected by bronze disease resulting in it having grown into almost twice the thickness of scoop no. 2. The total length of the scoop is 305 mm, the greatest width between 75 and 80 mm.

Note: Judged by its measurements, this scoop would have been intended for use with a 4-pounder gun.

Cannon shot and other projectiles

1 Solid cast-iron shot

Some cannon balls have been recovered, but I do not know how many and, besides, many are still on the wreck site. Of six examples available for measurement, three had a diameter of 76 mm. One of these is numbered 32648, the other two both carry the number 32781. One has a rather thick casting flash all around the middle, showing it was cast in two halves as usual,

on the other the casting separation is less visible, but it is difficult to tell whether any sprue had been filed away. The latter is unlikely, since at sea, where gun firing at very close range was the rule, a cannon ball wobbling in flight may not have mattered too much. Besides, the the shot was always under size in comparison with the calibre of the barrel so it would not fly in a straight line anyway. The diameter of 76 mm means a shot of 4 pounds, Dutch measurement. The other three shot (inv. nos 32655, 32565 and 32763) have diameters of 73, 67 and 64 mm respectively, corresponding with calibres of 3 to 4 pounds for the first two and 2 pounds for the last one. (Note that five shot have received the number 32763, and two the number 32565, of different types and weights, see below.)

2 Massive cast-iron shot with lead casing

I have identified one such shot (inv. no. not noted). It has a diameter of 64 mm, meaning that it was intended to be fired from a 2-pounder cannon. Its core is apparently of massive cast iron, although I have a suspicion, unconfirmed so far, that it may in turn contain an even smaller lead core. The lead casing is 5 mm thick.

Note: Quite a number of shot of similar composite construction have been recovered from the *Mary Rose*. Although they are the subject of some speculation, no-one has yet come up with a convincing answer, to my knowledge, as to why one would wish to give an iron shot of a certain size so much more weight than if made of iron throughout. Perhaps this construction would give the projectile more kinetic mass than a plain cast-iron shot would have. It is unlikely, in view of the danger of the cannon bursting, that the gunner would use the heavier powder charge theoretically needed for such a projectile.

3 Spiked shot

Spiked shot were used to damage the sails and rigging and also the lighter upper works of the opposing ship. One 17th-century source makes the interesting observation that the protruding ends were often bound with rope by the cautious gunners lest the bore of the cannon be damaged![4] And, indeed, most if not all spiked shot of the wreck was, when found, still bound with rope.

I have named these shot 'spiked' because they are penetrated in the centre by a massive nail protruding on either side, i.e., with a blunted head on one end and a point on the other. Normally, one finds references to 'crossbar shot', i.e., a massive ball penetrated by an iron rod, but the type found on the Texel wreck seems to be a version of crossbar shot only rarely encountered, although they have been preserved in some Swedish collections. Crossbar shot should of course not be confused with the well-known 'bar shot' which in principle consisted of two shot mounted on either end of a bar. Indeed, bar shot were also recovered from the wreck and they will be dealt with below. The spiked shot from the wreck come in two versions and in various calibres.

The cast-iron spiked shot recovered are spherical, cast as usual in two halves and massive, but in each half a channel of half the thickness of the nail exists. The nails are of wrought iron and of square section. Since some of the spike heads seemed to show evidence of hammer blows having been applied, I was initially tempted to think that the shot might first have been cast in a mould, leaving a channel to receive the nail, and that the nails would have been driven in afterwards, maybe even much later, i.e., on board. However, no spiked shot were recovered without their spikes, nor were any separate spikes for that matter. Besides, driving a wrought-iron spike into a solidified cold cast-iron shot would certainly have split it in two. Spiked shot must have been made in one go, i.e., when the shot was cast. Since the melting point of wrought iron (the spike) is much higher than that of cast iron (the shot), a spike placed in the shot mould before casting would retain its form and not melt. Because I have, unfortunately, not been able to measure the diameter of the nails carefully and relate this measurement to the sizes of shot, it is too early to say whether one type of nail was used for every calibre of shot, or larger shot had correspondingly larger nails. The former is possible for a number of shot of lesser calibre from the wreck have relatively large spikes.

The spiked shot (figure 8 shows three examples) come in seven sizes: 56 mm, corresponding to a calibre of 1 pound, 61 and 62 mm (2-pounds), 71 and 73 mm (3 pounds) and 75 and 77 mm (4 pounds):

56 mm: Inv. no. 32763. Its spike is relatively thick at 25 mm underneath the head. It looks as if this particular projectile is *entirely* (i.e. both the shot and the spike) made of wrought iron.

61 mm: Inv. no. 32763. One measures 62 mm in diameter. From a second one, the top end of the spike is gone and there is a corresponding hole in the shot. The preserved pointed end is 2.3 mm thick

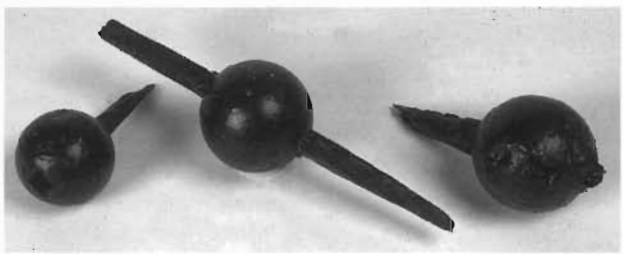

Figure 8 Spiked shot of different sizes (nos of left and right examples unknown). The one in the middle (inv. no. 32781) is complete , the calibre of the shot 71 mm and the total length of the spike 275 mm. Photograph by Hans de Lijser

where it emerges from the shot and it measures 63 mm in overall length. A third one has the remnants of the spike on one side only.

71 mm: Inv. no. 32781. The top end of the spike is not tapering and there is no protruding head.

73 mm: Inv. no. 32659.

75 mm: Inv. no. 35066. The total length of the spike is 283 mm.

77 mm: Inv. no. 32565. Another one of this size which is also numbered 32763, has a rather thin spike.

Note: A further seven examples of spiked shot, apparently of the larger variety (71 or 77 mm), as well as two smaller ones were also observed. Almost all are apparently still unnumbered. No measurements could be taken. However, one fragment of a spiked shot (inv. no. 92656) upsets all our measuring and theories. It has a shot diameter of 90 mm, corresponding to a gun bored to fire 6-pound shot. Only the pointed end of its spike – 100 mm long – is preserved.

4 Bar shot

Bar shot, too, were used to damage the enemy's rigging and upper hull works. They were shaped like dumb-bells and their ends which, although always of circular section and in the calibre size of the gun they were supposed to be fired from, could take various forms, mostly disks, balls (spheres) or half balls (hemi-spheres). Blackmore (1976: 191) has illustrated all these forms.

With one exception all the bar shot from the Texel wreck are incomplete. The interesting fact is that they are apparently composite, in that the ends are of lead and the connecting bar, judging from the single complete example so far recovered, of wrought iron. Unfortunately, we could neither measure this specimen nor note down its inventory number.

The wreck's bar shot come in two sizes: about 62 and about 75 mm, which corresponds to calibres of 2 and 3 or 4 pounds. Interestingly, each calibre is of different construction, see A and B below.

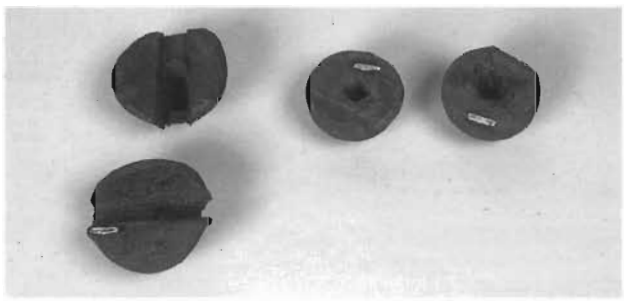

Figure 9 Lead bar shot-halves of different sizes and construction. Inv. nos unknown. Photograph by Hans de Lijser.

The bar shot (figure 9) come in various forms of construction:

A Half balls, the flat base of which receives the connecting bar in the centre. There are seven examples with a base diameter of 61–64 mm: inv. nos 23025, 32279 (2 examples with this same number), 32586, 32763, 32764, 32781. Most of these have a diameter of 62 mm, but inv. no. 32781 is 61 mm, and inv. no. 32764 is 64 mm. Two examples (both numbered 32780) have base diameters of 75 and 72 mm respectively.

Note: Inv. no. 23025 has next to the square hole intended to receive the bar a smaller triangular hole with the remains of iron in it (figure 10). This is the remains of the end of the bar, which was given a bend in order to secure an adequate attachment in the mass of the lead half-ball. It can be assumed that all other lead half-balls mentioned above were affixed in the same manner, but on them the bar, if bent at all, does not emerge from the base and consequently does not show itself. A similar construction has been observed on several lead bar shot recovered from the *Mary Rose*.

B Half balls, a pair of which would be joined into one full sphere and receiving the bar *in the plane of the base*. These, in turn, are of differing construction among themselves:

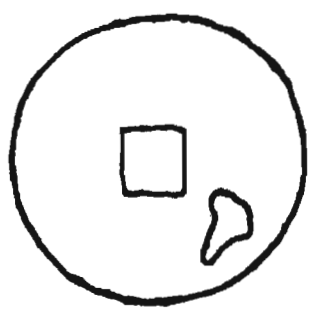

Figure 10 Lead bar shot (no. 23025), diameter 620 mm, plan view of the flat face. From the irregular hole in the face emerges the curved end of the connecting-bar. Drawing by J P Puype.

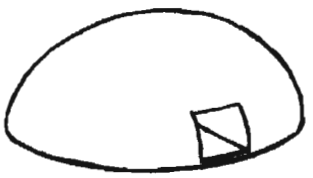

Figure 11 Lead bar shot half (no. 27025). The square hole is, apparently, for the connecting bar, but the true reason for this offset position is not known. Drawing by J P Puype.

B-1: *The hole for the bar is in one half only*
There are 2 examples of diameter 75 mm, both numbered 27025.

Note: Neither of these specimens is complete. This means that it is not possible to interpret the construction conclusively. The connecting bar seems to be inserted into only one half of the sphere, so this half would be lighter than the other half, which would result in serious offsetting of the weight. If this were the case, the intention could have been to make the projectile rotate in flight. The hole for the bar on one example is almost square, 18 mm immediately above the base, and 19 mm high (figure 11).

B-2: *A hole for the bar is found in both halves*
Only one example has been recovered (inv. no. 33605), diameter 75 mm. Its base has a rectangular groove across the centre with a depth of 6 mm. This means that the other half would have a groove of equal depth and that when the halves were joined together into one sphere, the grooves would form a central hole to receive the bar.

Note: It should be noticed that the groove runs across the entire base, so in theory we could also be dealing with part of a spiked shot, i.e., a ball penetrated by an iron spike (figure 12).

5 Case shot

A number of case or canister shot have also been recovered from the Texel wreck. At the time of preparing this article, at least three complete ones have been analysed and fragments of six others, all incomplete, have been viewed. They are wooden, in two longitudinal halves, the flat faces of which are hollowed out. When joined together the two channels would form a nearly circular cavity in which were put stone pellets and/or musket shot. In joined form, the whole case forms a cylinder in the calibre size of the gun which was supposed to fire it. The two halves are thought to have been held together by strings of rope or some other material, closely bound in a groove encircling either end of the case (figures 13-15). A lot of filling material for these cases has been found on the wreck, and some

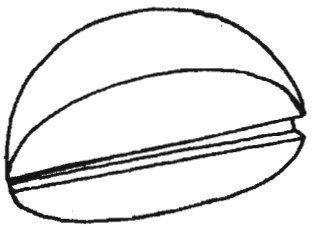

Figure 12 Lead bar shot half (no. 33605). The central groove in the face will be noticed. The other half would also have this groove. When put together, the central groove in the combined halves would be square in section and provide space for the (wrought-iron) connecting bar. This construction might also have been conceived for a spiked shot. Drawing by J P. Puype.

cases were still filled on recovery. Case shot were used solely as anti-personnel rounds and, as one 18th-century source stated, '...such projectiles penetrate everywhere and do great harm among the enemy's men' (Van der Tollen 17[34]: 397). Although various forms of such 'evil shot' are known to have existed (Puype 1990: 19–20), the Texel wreck so far has produced only wooden case shot of the type so described.

The three complete ones mentioned before are:

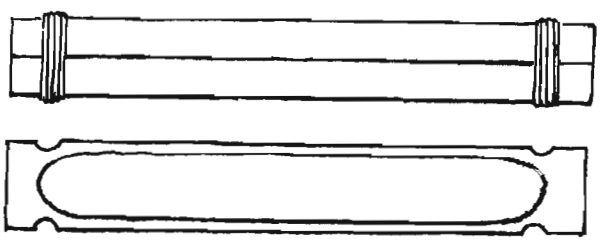

Figure 13 Case (or canister) shot (no. 14249). Overall length about 300 mm. Top: the two halves seen from the side, joined together and secured by rope or flattened flax bound in the grooves. Below: the interior side of one wooden half, seen from above and showing the wide, hollowed-out bed for the fillings. Drawing by J P Puype.

Figure 14 Case shot, the halves joined (inv. no. unknown). Photograph by ROB/NISA.

Figure 15 Case shot, the case halves lying side by side, one of them filled with lead shot for this photograph. Inv. no. unknown. Photograph by Hans de Lijser.

1 Inv. no. 14249. Overall length about 300 mm, outside diameter: not measured.
2 Inv. no. 14245. Overall length 314 mm, outside diameter: 65 mm at one end and 62 mm at the other; probably intended for a 2-pounder gun
3 Inv. no. 32612. Overall length 262 mm, outside diameter: 75 mm; probably intended for a 3-pounder gun.

6 Case shot fillings

Fillings for the case shot consist of pebbles, fragments of stone or iron, nails and lead or iron shot or a mixture of these elements. Much material of this kind was found at the site. A number of cases still contained their original fillings. Large numbers of pebbles (mostly flint) of small but various sizes were recovered, as were large numbers of shot. The flint comes both in rounded pebble form and in angular fragments. The shot comes in various sizes as well, with diameters ranging between 100 and 170 mm. A substantial number of the lead balls still have their casting sprue on them, which indicates that they were not intended to be fired from pistols or muskets, for they would need to be smoothed to make efficient handgun shot, or they had not yet been made ready for use. As far as the iron shot are concerned, these were found in large quantities as well, of musket size (diameter approximately 17 mm) and as hailshot or buckshot (diameter measuring between 3 and 6 mm). Considering the quite enormous quantities of the fillings as described, it is possible that not all were intended to be used for case shot, but also for powder cartridges, thereby creating projectiles which the Dutch called *quaed scherp* or 'evil shot' (Puype 1990: 19, referring to Witsen 1690: 457, 589).

Portable firearms & accessories

1 Calivers

Quite a number of portable firearms, albeit in a fragmentary state, have been discovered on the wreck. They have all been brought to the surface and are now undergoing conservation. Some groups have been found clogged together and may either have been part of the ship's cargo or belonged to the ship's armament and were stored in a chest.

1 Inv. no. 32278: part of a matchlock caliver of 'petronel' shape, forestock (including barrel) and butt broken off. Rectangular lockplate recess. Octagonal barrel, bore diameter about 20 mm, barrel tang 90 mm. Total length 500 mm (figure 16).
2 Inv. nos unknown (one of them inv. no. 23222?): 2 petronels as above, but complete. Measurements unknown (figures 17 to 19). One of them has a mark carved in the base of the butt (figure 19).
3 Inv. no. 14128: fragment of a forestock without barrel, maybe for caliver no. 14207 (see no. 4) or else for a carbine-sized pistol. Total length 360 mm.
4 No number: fragment of a forestock with part of an octagonal barrel, possibly belonging to, or similar to, inv. no. 14128 (see no. 3). Bore diameter about 14 mm.
5 Inv. no. 14207: butt and lock section of a matchlock caliver, the butt with cheek-piece and with a clearly defined thumb hollow in front of the butt. Rectangular lockplate recess. No barrel, but with foliate carving on either side of the barrel-tang cavity (figures 20 and 21).
6 Inv. no. 14243: fragment of the breech of a musket-barrel including the breech-plug. Octogonal throughout, overall length 450 mm, bore diameter: over 20 mm. The breech-plug, which can be unscrewed, has the typical triangular cavity on one side to provide space for the ignition fire of the vent when it ran down the vent channel to ignite the main charge inside the barrel.

Note: These gun fragments are the only ones from about 20 that have been recovered to have been examined so far. It is thus too early to be certain about the size of the personal armament on the ship. Calivers (*roers* in Dutch) were light muskets and this name appears in the 1590s. At the time of the shipwreck, 1593, calivers were sometimes still known by their older name of arquebus or harquebus. In Holland, from about 1650 onwards, the word *roer* would generally be used to denote flintlock guns, but before

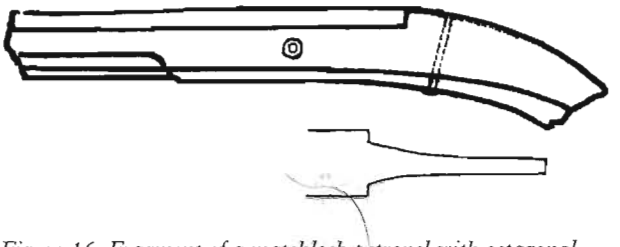

Figure 16 Fragment of a matchlock petronel with octagonal barrel (inv. no. 32278). Total length about 500 mm. The position of the tang-screw, entering from underneath, will be noticed, as will be the recess for the head of the single lock-screw. Below: detail of the barrel-tang in plan view. Drawing by J P Puype.

Figure 17 Two almost complete petronels before conservation still attached to each other by the almost petrified combination of mud, sand, metal and organic matter after centuries of immersion in the seabed. Inv. nos and measurements unknown. Photograph by ROB/NISA.

Figure 18 Close-up of the transition between the stock and the butt of one of the petronels shown in figure 17. Telltale for this type of gun is the substantial bevel or chamfer in the lower corners of the part shown. This was done to make this part narrower so as to enable the shooter to better grip it with his right hand. Photograph by ROB/NISA.

Figure 19 Close-up of the face of the butt of the petronel gun in figure 18. The typical incised mark, perhaps a personal mark of the shooter/owner of the gun, will be noticed. Photograph by ROB/NISA.

Figure 20 Fragment of a matchlock caliver or musket. The cheek-piece to the right face of the butt as well as the foliate carving flanking the barrel tang will be noticed. Total length is 365 mm. Drawing by J P Puype.

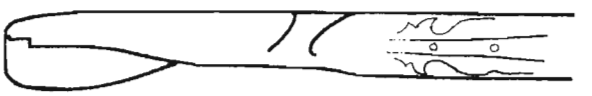

Figure 21 The butt of the gun in figure 20, seen from the rear right quarter. Photograph by Hans de Lijser.

that it would mean a light matchlock gun, in fact so light that the shooter did not need a separate support or musket-rest (Dutch: *furket*) to fire it. It is suspected that all the aforementioned guns and gun parts were matchlock calivers, except for no.6 (inv. no. 14243) which with its large-size bore was either a musket or a caliver with a heavy barrel of large bore. No. 5 (inv. no. 14207) is interesting because of the cheek-piece to its butt, a detail normally found on the angular butts of contemporary German hunting guns. None of the guns found has evidence of sideplates, but recessed fields for circular washers are found on the left sides opposite of the lockplate cavities.

The petronels

The most interesting finds among this group are the three matchlock petronels mentioned under nos 1 and 2 above. Petronels were calivers characterized by a substantial butt the strong downward curve of which was intended to be held against the shooter's breast (*poitrine* in French) when he fired it. That part of the butt intended to be pressed against the breast was indeed at right angles to the barrel of the gun! Contemporary illustrations also seem to suggest, however, that some shooters held the butt in their right fist at some distance from their breast. Historical evidence so far has indicated that petronels were used from the 1560s until the 1590s, mainly in northwestern Europe and in France. The curved butt may, or may not, be related to the similar butts of contemporary Spanish muskets and harquebuses/calivers, although these were not quite so strongly curved. Most petronels preserved in historical collections are deluxe firearms fitted with wheellocks, but the more mundane ones like the examples from the Texel wreck, were destined for military use and fitted with matchlocks. A small number of the last-mentioned category can be found in collections originally formed from arsenal stock, for instance the *Rüstkammer* in Emden, now part of the Ostfriesisches Landesmuseum (on the petronel see Hoff (1969: 98–101)).

Interestingly, the so-called Alderney wreck, which probably went down in 1592, had among its many recovered arms also two guns called 'harquebuses' (McElvogue 2000: 204–5). I am absolutely convinced that these were also petronels, for the neck of the butts not only curve downwards very strongly, but the lower corners have the same excessive bevelling as on the three examples from the Texel wreck.

2 Accessories

Accessories to firearms should have been manifold, but apparently no powder or priming flasks, bullet pouches, musketeers' bandoleers or the typical tools used by shooters (touch-hole prickers, worms, bullet moulds, etc.), or forks for musket-rests, have been recovered. The only objects that I have actually inspected are ten containers or powder measures of the type used by musketeers and slung in twelves or a lesser number from a shoulder bandoleer. Each contained the right amount of powder for one charge. They were made either of brass or of wood, the brass ones would often be wrapped in leather so as to avoid the musketeer revealing himself by the sound of his containers clanking against each other. Besides the large-bore barrel fragment (inv. no. 14243) mentioned before, the presence of these containers suggest that the Texel wreck had muskets among its personal armament on board. All containers from the Texel wreck are made of sheet brass and there is no evidence of their ever having been wrapped in leather. Most musket bandoleers preserved in collections have a lesser number of containers, but twelve was the rule, hence their contemporary nickname of the 'Twelve Apostles'.

The inventory numbers of the containers are 14614, 23067, 24037, 24194, 32516, 32518, 32534, 32706, 37103, 37147.

They are all about the same size. Typical is inv. no. 32518, which is tapering overall, length 85 mm (one of the others measures 80 mm), with a diameter of 12 mm at the top and of 30 mm at the base. The latter is closed off at the base by a flat plate soldered to the body and closed at the top by a removable lid. The latter has the profile of a college student's hat, but the top plate is oval when seen in plan (27 mm long and 15 mm wide) and is pierced with a small hole at either end. Soldered to the underside of the plate is a tapering cap of 13 mm length which fits snugly over the top of the container. The two aforementioned holes in the lid served as guides for narrow suspension cords passing through them and which prevented the lid getting lost. Two brazed-on loops located opposite each other on the upper half were intended to affix the cords (in wooden containers, these loops would be piercings in a raised belt carved from the same piece of wood the container was made from). Strangely, the container under discussion (inv. no. 32518) does not have these securing-loops (figures 22 and 23).

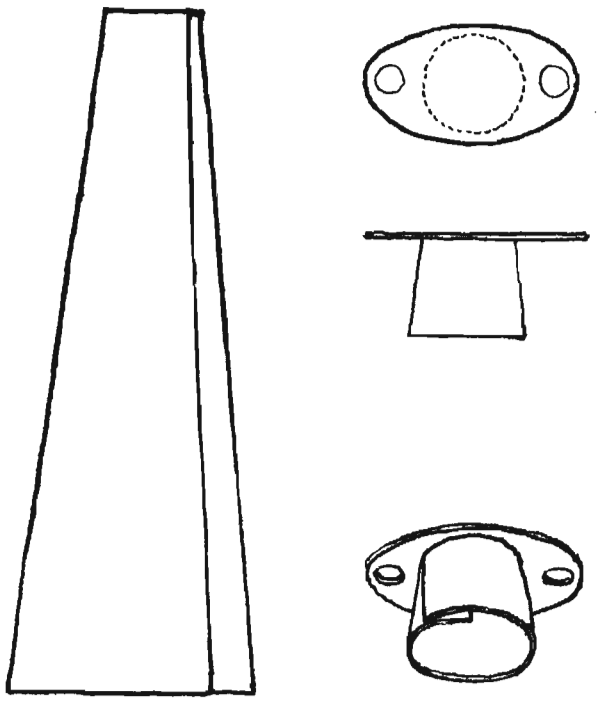

Figure 22 Powder container or 'charge' for a musketeer's bandoleer (inv. no. 32528), with close-ups of the lid (right). No securing-loops for suspension-cords have been attached to this container. Sheet brass; note the crude construction. Total length of the container is 85 mm. Drawing by J P Puype.

An general appraisal of the Texel wreck and its armament

For a merchantman the Texel wreck was relatively heavily armed. As I have mentioned in my former contribution (Puype 2000: 106), the ship carried a cargo of corn presumed from the Baltic. However, it is common knowledge among maritime historians that ships negotiating the Baltic were only lightly armed, if at all, and that if an emergency might arise they would sail in convoy (Manders 1998:79). However, there is some evidence[5] that the ship must have been regularly in contact with the Mediterranean and since ships who went to that area were commonly well armed, the presence of so relatively many arms and munitions on board the Texel wreck may be explained. Like some conclusions and speculations in the rest of the article, this appraisal should be regarded as provisional, because only a number of the artefacts recovered have been analysed. It is hoped nevertheless that the remarks made by me as an arms historian, not as an archaeologist or a historian, may evoke interest among the readers.

Figure 23 Three powder containers. The ones to the left and in the middle are complete in that they have the loops for the suspension-cords soldered to their bodies. The example on the right is that shown in figure 22. Photograph by ROB/NISA.

Postscript

At the time when this article went to press, Dr Maarleveld informed me that, by and large, all artefacts have now been recovered from the wreck and that what is left on the seabed are the remains of the ship's structure. Almost all the arms and munitions came from the vicinity of the gunroom, but much of it is hidden in a large concretion suspected to contain, *inter alia*, two further cannon, (possibly) edged weapons and a lot of ammunition. It is intended that the ship's structure will be lifted, and the hull eventually put on display, in the future, provided that the financial means and the space become available. Mr Manders, in addition, informed me that during the summer of 2001, the following additional artefacts relating to arms and gunnery have been recovered and are now, or will soon be, undergoing conservation: more fragments of linstocks, a flexible rammer (i.e., one with a handle of rope), a relatively large number of long wooden poles (a number of which are certainly pike-shafts) found in the rear of the vessel and a leather mitten thought to have been used by a gunner (used for pressing on the gun's vent immediately after the shot was fired to prevent the acid powder gases from escaping there and wearing out the vent too quickly). Having read the typescript, Mr Manders added that contrary to what is stated in the article each artefact does bear an inventory number.

Acknowledgements

I am most grateful to Dr Thijs J Maarleveld who is, among his many other duties at NISA (Netherlands Institute of Ship and Under Water Archaeology),

responsible for the SO 1 project, and who gave me every possible support in the preparation of this article. Dr Maarleveld also allowed a substantial number of new slides to be made by Mr Hans de Lijser, photographer from Delft. In preparing this article I was supported by Dr Martijn R Manders, research assistant at the institution, who supplied lots of information on the wreck and its objects and allowed me the free use of the text of his contribution *Raadsels rond een gezonken oostzeevaarder* mentioned in the References.

Notes

1 The Dutch text goes as follows: *Die avent en die muierghen zyn niet even goet / den moerghen moet sorghen dat den avent niet en doet / soude den avent sorghen als den morghen doet / daer souer menigh ryen die nu gaen tefoet,* and, further below: *bymy Cornelis Clasoon van Block Dick / ffff anno 1590.* Transcription and explanation of this text is given by Manders (1998: 76–7). Worthy of note is that the carver has used gothic 'black' print letters in this text.

2 The Hague, Koninklijke Bibliotheek (Royal Library), shelf mark 1702 C 60: 1. Small 8vo 63 p. The colophon on p. 63 reads: *Ghedruckt tot Amstelredam / by Cornelis Claesz. / woonende by de oude Brugge opt water / int Schrijfboeck, Anno. M.D. / LXXXVIII.* This is the earliest-known printed Dutch handbook on gunnery. The title-page mentions that it is translated from the 'high-German language'. As yet I have been unable to establish which German source was used.

3 As it happens, a brass pricker with a spirally-wound point, but exceptionally with a handle formed as a large circle, was recovered from the wreck of the Dutch Eastindiaman *Vliegenthart*, which sank in 1735. Information kindly supplied by Mr A J van der Horst of the Nederlands Scheepvaartmuseum, Amsterdam.

4 In the index of the 1690 edition of N Witsen's *Architectura navalis et regimen nauticum*, the most famous Dutch work on the building and operation of ships, the lemma *Kruis-scherp* ('crossbar shot') informs us that such shot is '...often bound [with rope] so as not to graze [the inside of the bore]'.

5 An earthen jar of Mediterranean type was recovered as well as, among coin-weights in a wooden box, a two-crusado coin (dated 1584). A most spectacular Mediterranean object is a large brass trumpet engraved LISSANDRO MILANESE FECIT GENUA 1589. Although this instrument may have been used as a signal trumpet, it is sophisticated enough to have been used to perform Renaissance music. It is the only southern European trumpet from any shipwreck to have survived. Other 16th-century trumpets preserved in museums are all related to Nuremberg. See Van der Heide (1994).

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