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The armament from the *Batavia*

1. Two composite guns

Jeremy N. Green

Department of Maritime Archaeology, Western Australian Museum, Finnerty Street, Fremantle, Western Australia 6160

Introduction

During the four seasons of excavation on the wreck site of the *Batavia* (Green, 1975), a remarkable cross-section of material was recovered. At present, this material has been, or is being treated at the Western Australian Museum Conservation Laboratory. Because of the large quantity of material, it will require many years of study before it will be possible to publish a comprehensive report. Fortunately the opportunity to do this is guaranteed under the terms of the Australian Netherlands Agreement on Old Dutch Shipwrecks (Bolton, 1977). In this Agreement the Netherlands Government, as successors to the Vereenigde Oostindische Compagnie (VOC), transferred all their rights to the wreck, to the Australian Government, who in turn nominated the Western Australian Museum as the repository for the main reference collection.

Part of the collection from the *Batavia* includes the armament and associated equipment from the ship. This clearly defined group may be divided into: ship's guns; shot, gunnery accessories; small-arms; small-arm ammunition; and incendiaries.

It is hoped eventually to publish all these various groups as time and space permit. Since recent research has concentrated on the guns, and in particular two very unusual composite guns, these are the first to be dealt with.

The guns

When the wreck site was first discovered in 1963, a sketch plan was made, showing the distribution of the guns and anchors (Edwards, 1966). Subsequent investigation showed some inaccuracies and omissions, but for a sketch plan, it was still remarkably accurate. The plan shows the relative position of all of the guns, prior to the lifting carried out by the first and subsequent expeditions. In 1973, an accurate plan of the site was made, showing the disposition of the remaining guns (Baker & Green, 1976). By comparing the two plans, it is possible to correct the errors and obtain a reasonably accurate estimate of the location of the guns that had been previously raised. The plan, Fig. 1, shows a total of 21 iron pieces, five bronze and two composite.

Initially it was thought that some guns were missing, since normally one would expect an even pairing. However, the odd number of iron and bronze guns were found from documentary sources, to be the result of salvage work by Commander Francisco Pelsaert in 1629, on his return to the wreck site. Pelsaert records in his journal (KA 1010, Algemeen Rijksarchief).

'September 17. . . a piece of the front of the ship was broken off and thrown half on the shallows, there also were lying two pieces of cannon, one of bronze and one of iron, fallen from their mounts.'

October 5. . . went to the wreck of the fore ship in order to get a bronze piece of cannon and one of iron, which were hanging on the wreck, and towards night, we got the bronze cannon loose and have brought it to the island.

October 9. . . sent the boat to the wreck to get the other iron piece of cannon, which they have brought towards evening!' (Drake Brockman & Drok, 1963.)

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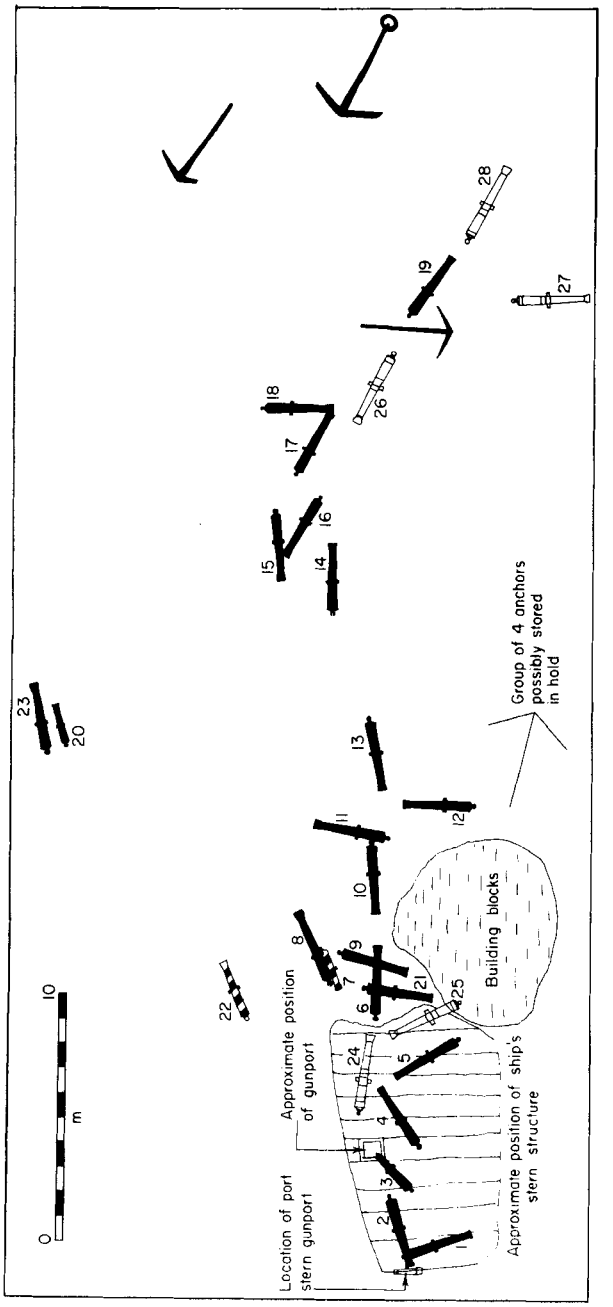

Figure 1. Plan of the guns on the wreck site showing their relationship to major wreck features.

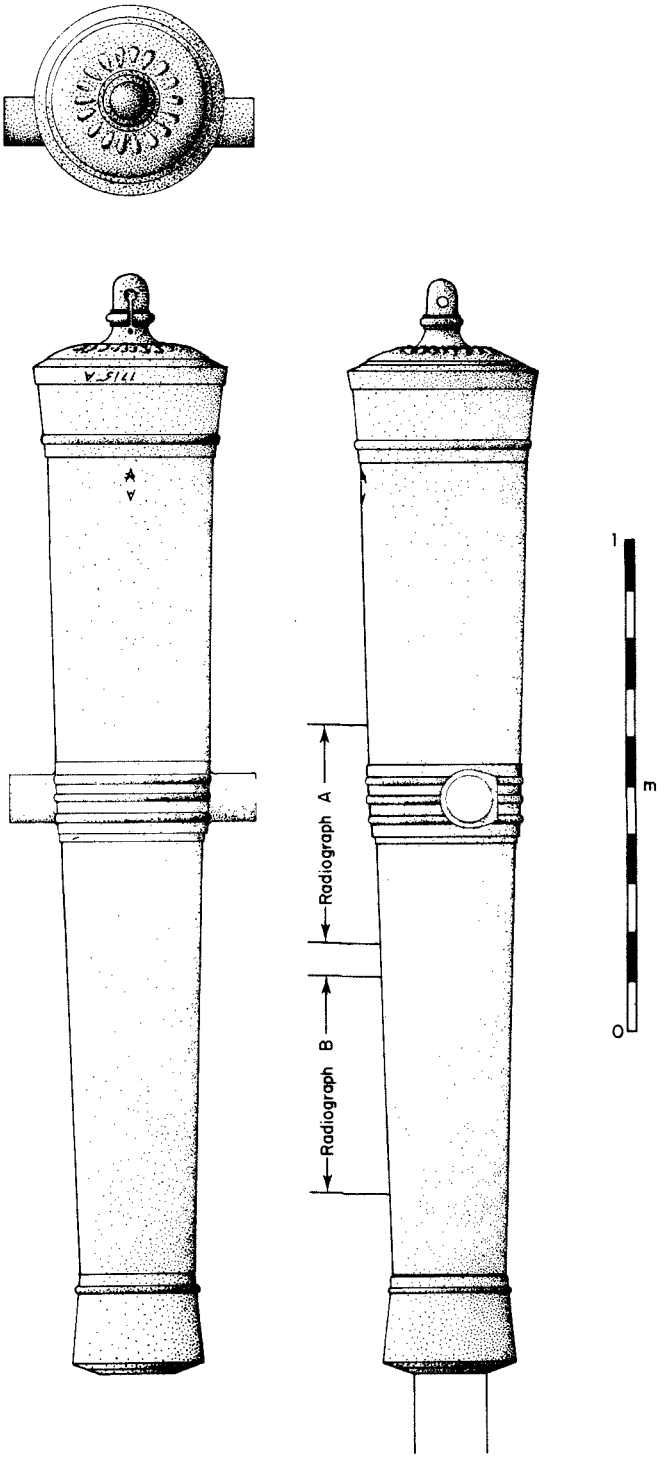

Figure 2. Gun external.

Thus, the original complement of guns on board the *Batavia* was 22 iron, six bronze and two composite. This corresponds closely with the regulations of the VOC in 1630 given in Van Dam (1701:63), that the largest ships would be armed with 24 strong iron guns, six bronze guns and two *mignons*. Furthermore, the positions of the guns on the site, almost certainly indicates their approximate disposition on the ship. Thus, there were four bronze pieces in the bow, and two bronze and two composite pieces in the stern. Since we know that the ship heeled over on her port side, after she was wrecked, a single long line of guns may be assumed to be the result of the starboard pieces falling onto the port side, after the ship heeled over and broke up.

The composite guns

The two guns, which are the subject of this paper, are Nos 7 and 22 in Fig. 1. Gun No. 7 has been registered as BAT 3642 and was raised by the Museum in 1973. Gun No. 22, BAT 3641, was recovered in 1963, by the first person to dive on the site (M. Cramer). This gun, since it was recovered before the enactment of the Western Australian Legislation (Crawford, 1977), is now owned by the finder.

The guns appear to be identical and are remarkable in their external appearance, Fig. 2, being 2·284 m long with a bore of 0·147 m, and a single reinforce. What makes these guns unusual, is the fact that they initially appeared to be made-up of rolled copper sheet, with the breech, chase-girdle, and muzzle made of copper mouldings. The trunnions are also copper and appear to be soldered to the chase-girdle. Three astragals on the chase-girdle and single astragals on the breech and muzzle, make up the simple mouldings. The AVOC monogram inscribed on the first reinforce, together with the figures 1715A (its weight in Amsterdam pounds) on the base-ring, are the only other semi-decorative features. Two bronze pommel-shaped objects were found on the wreck site near to these pieces. These were clearly part of the cascabel, the iron attachments having corroded away, causing them to drop off. The cascabels, have a touch-hole which explains its absence on the vent-field.

BAT 3642 was of particular interest as it had a hole (0·10 m diameter) in the chase. This hole was almost certainly caused by damage at the time of the wreck; the gun was found trapped under the iron gun No. 8, with the cascabel of iron gun No. 9 up against the hole (Fig. 1). While, or after, the ship broke up, the chase of the composite gun was forced against the cascabel of gun No. 9 by gun No. 8. The hole consisted of a tear in the copper sheeting, revealing underneath, lead sheeting and below this iron bands. The iron bands appeared to be spaced with lead washers and below this more lead sheeting could be seen. As it was far from clear exactly how the gun was constructed, it was decided to investigate this construction.

Investigations

Radiography

In order to determine more about the structure, without having to resort to destructive measures, a series of radiographs were made of the gun. A one-curie radioactive cobalt 60 source was placed on two points in the bore of the gun and two sheets of Agfa Gevert D7 X-Ray film were placed on the outside surface, opposite these sources, one near the trunnions, A; the other on the chase, B. The source-to-film distance in A was 0·27 m and the exposure 27 min; the other distance B was 0·16 and exposure 6 min. Figure 3 shows the resulting radiographs. The three pale vertical lines (Fig. 3A), represent the position of the three astragals, the darker band to the left marks the end of the reinforcement and the start of the chase. Four dark circles 0·011 m in diameter, (the lower right being rather feint) represent some sort of symmetrical hole system. The two longitudinal pale lines (0·175 m apart) represent some form of thickening or lead strip. Figure 3B, shows the radiograph of the chase, with five vertical bands corresponding to the lead washers at 0·065 m intervals. Two similar horizontal lines correspond to the two on Fig. 3A; in this case, however, because the chase has a smaller radius, the lines appear closer together (0·135 m). This tantalizing information, showed that the gun was more complex than at first thought, and it seemed even more important to determine its method of construction.

Sectioning

It was finally resolved that the only possible

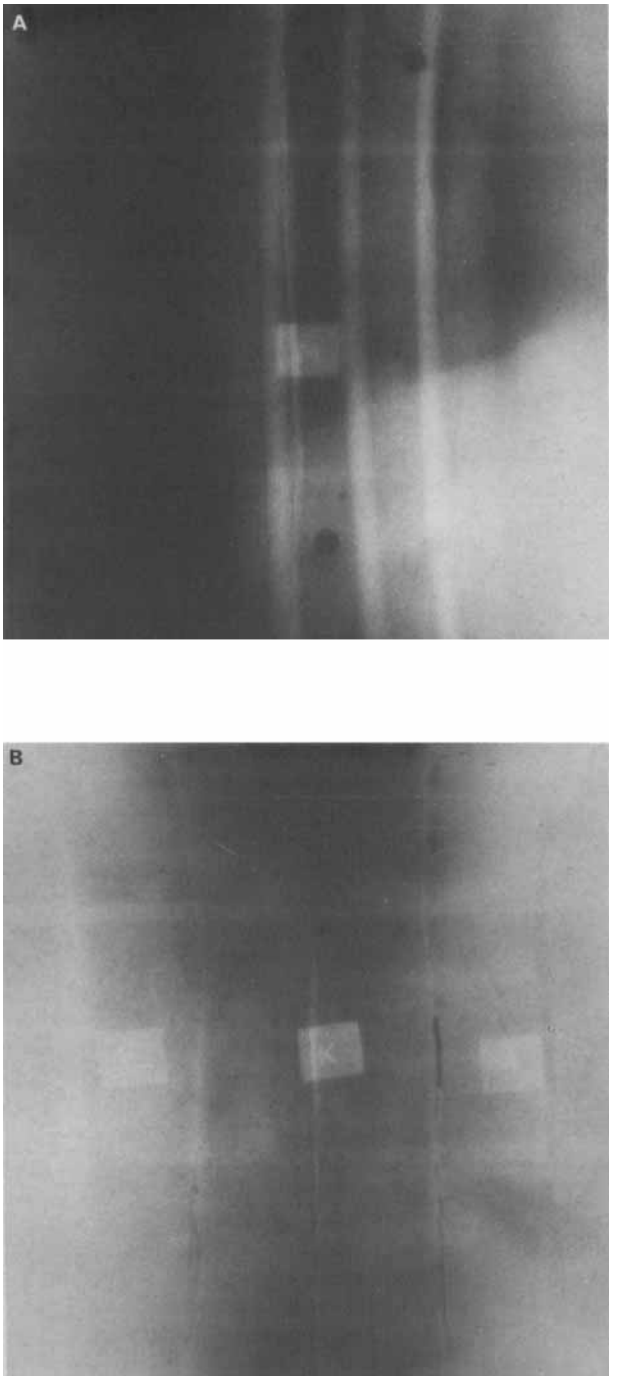

Figure 3. Radiographs of gun: A at trunnions; B at chase.

way of discovering how the piece was constructed, was to section it. Another consideration which prompted this approach, was that it was important to determine the extent of the corrosion under the copper sheeting, and thus the conservation requirements.

The other alternative, of dismantling the gun by removing the copper sheeting, and working through the gun layer by layer, was thought to be likely to cause irreparable damage. The sectioning approach seemed more flexible, since, one could study the section and then display it, or replace it, and repair the gun.

A metal frame was built to fit over the gun. This consisted of two parallel rails, on which a small wheeled carriage could run freely, parallel to the axis of the cannon. An angle grinder, with a 0·35 m diameter disc, was mounted in a vertical position on the carriage. Adjusting screws on the base of the frame, allowed the depth of cut to be controlled. The whole assembly was set up so that the blade of the angle grinder cut a straight line down the middle of the gun, Fig. 4. The best type of grinding disc for this work was found to be that used for concrete cutting. A variac transformer controlled the radial velocity within the limits specified for the disc.

It was decided to cut out a wedge-shaped slice, which would include the damaged section of the chase. It took 80 hours work with the grinder to cut through and remove the wedge.

The construction

Examination of the walls of the cut section showed the extremely unusual construction quite clearly Fig. 5. Below the copper outer skin were 30 iron bands. Starting at the muzzle, the first band was 0·24 m thick, then there were 10 bands about 0·16 m thick, then 6 bands 0·32 m thick, and finally 12 bands about 0·56 m thick. The bands were all about 0·6 m wide. Two small iron fillets, one lateral between bands 17 and 18 and the other vertical between

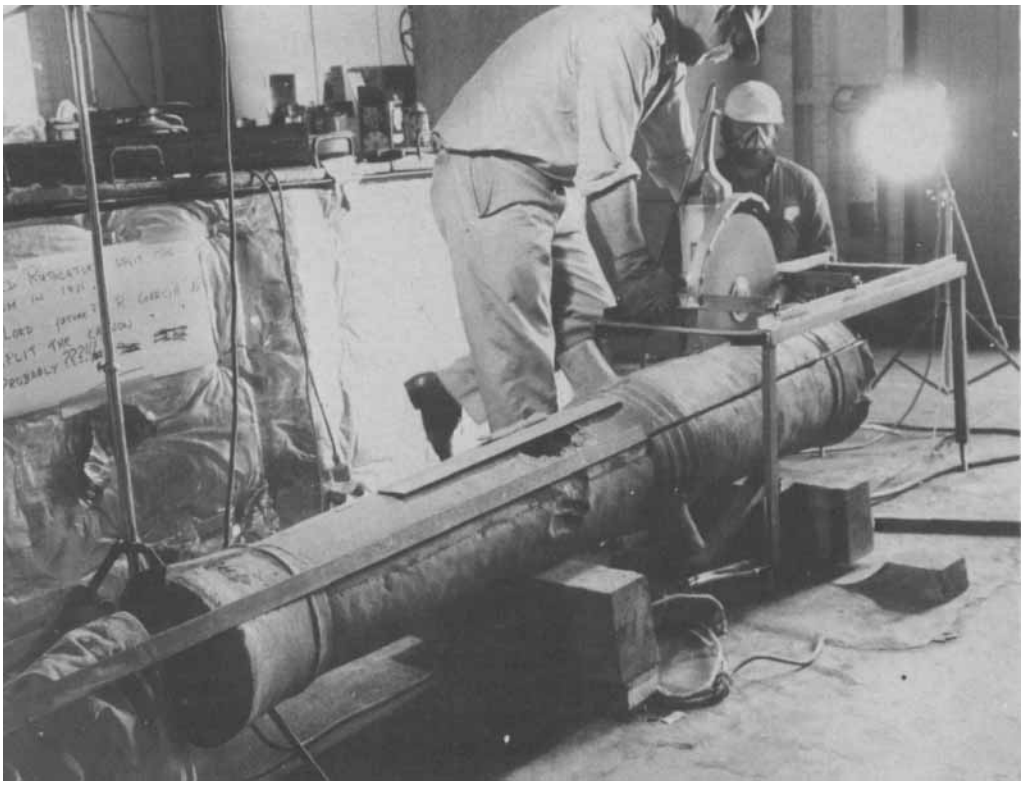

Figure 4. Cutting the gun.

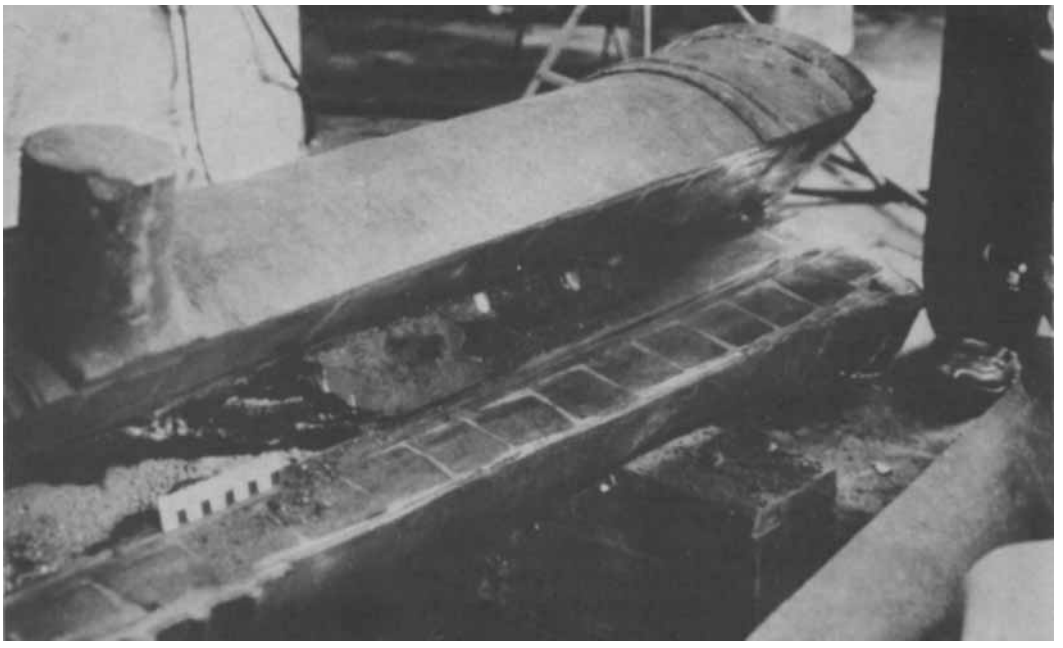

Figure 5. View of gun after cutting section.

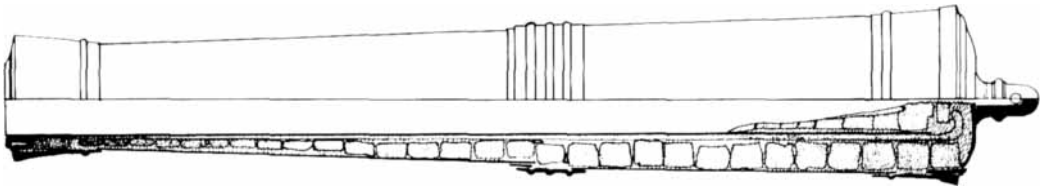

Figure 6. Section of the wall of the gun: black = copper or bronze; dotted = steel; diagonal hatching = lead solder.

band 18 and 19, were noted close to the trunnions. The bands were moulded into the lead, which had obviously been poured in molten, to fill the volume between the copper skin and an iron layer about 0·8 m thick below. Below this iron was the copper sheeting of the bore; for details see Fig. 6. The gun was chambered; the chamber was about 0·4 m long with a complex construction. Corrosion had occurred in the chamber so that its exact construction is not clearly defined. A detailed drawing, Fig. 7, shows this, with a tentative reconstruction of how the cascabel and touch hole system were arranged, and the approximate outline of the chamber. The cascabel was originally attached to an iron screw, and it seems likely that this could be screwed out of the gun by inserting a bar in the hole in the cascabel. The cascabel was cast onto the iron screw, and a hole was drilled down the centre to form the touch-hole channel. A small screw thread at the very end of cascabel allowed the end to be sealed off.

By chance, the cutting revealed that what appeared to be an iron tube, was, in fact, split. Comparison with the X-ray photographs indicated that these were a series of six iron bars, forming a tube. Closer examination of the moulding around the trunnions, showed that the four circles on the X-ray (Fig. 3A), corresponded to four copper patches, covering some sort of hole. These were repeated on both sides

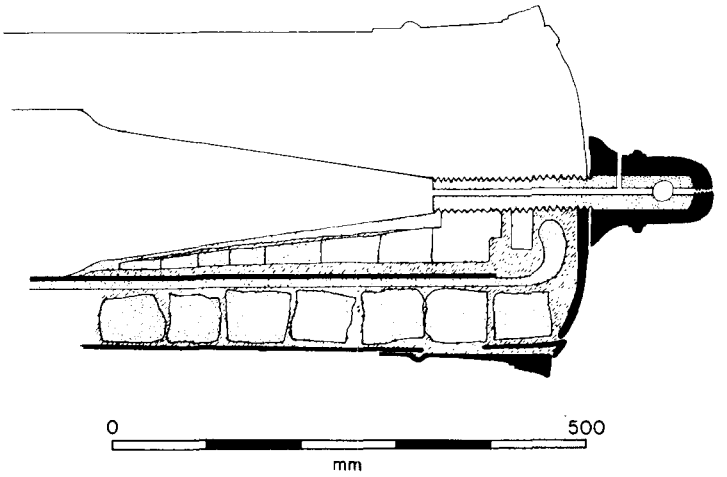

Figure 7. Detail of breech.

of the moulding and appear to be some sort of pinning mechanism. The darker image was due to the absense of lead.

A chemical analysis of the non-ferrous metal showed that the copper sheeting was 98·85% Cu (by titration) with trace elements 0·25% Sn, 0·01% Zn, 0·275% Pb and 0·05% Fe (determined by atomic absorption). The lead turned out to be solder, with 69·8% Pb (gravimetric analysis) and 28·0% Sn, 0·01% Zn, 0·26% Cu and 0·05% Fe (determined by atomic absorption). The cascabel was bronze, 71·9% Cu, 24·3% Pb, 3·05% Sn, 0·3% Zn and 0·14% Fe (determined by atomic absorption).

It seems, therefore that the gun was constructed in the following manner. A copper sheet for the bore was formed over some form of mandrill. Onto this were mounted six flat iron staves which were held in place with the wrought iron bands. The chamber was fitted into the end of the piece, and the staves hammered over to lock it into place. Iron pins were mounted around the trunnions, and the trunnions attached in some (at present) unknown way. The outer copper sheathing was fitted around the gun, using the pins to locate and centre the ironwork. Presumably the whole was covered in clay, up ended (breech up) and heated. The molten solder was then poured into the top until the whole was filled up. The breech–moulding disk was then soldered into place, the clay and mandrill removed.

Conclusions

As stated by Van Dam (1701), the VOC specified in 1630, two *mignons* as part of the armament of *retourschepen.* Therefore, these two composite guns were possibly *mignons,* however, they do not correspond to the specification for minions given by 17th century writers on artillery. In particular, Norton (1628) describes a minion weighing 1200 lb, with a bore of 3·25 in (0·075 m) and firing a 3·75 lb shot. The composite guns from the *Batavia* had a bore of 0·147 m and would have fired an iron shot of about 18 lb! It should also be noted that the four large bronze guns from the site had similar bore to the composite guns, but were almost twice their weight.

Since the composite guns had a chamber, they may possibly have been a type of perier. Norton (1628), one of the few 17th century English writers to describe this type of gun this period, states: 'Most foreigne *Canon Periors* are Chambered, being eyther taper or belbored in their Chambers.' Since the chambers were tapered it is possible that they were 'periors firing murthering' (Norton) shot, no stone shot having been found on the wreck site. This would also explain their light weight in comparison with ordnance of a similar calibre. Norton states that 'for the *Canon Perior,* 80 pound of Mettall for every pound weight of their Stone shot'. I think here Norton may have been confused, since the stone shot corresponding to an

18 lb iron shot is 5 lb, giving a total weight of 400 lb for the piece. He may have meant 80 lb of metal for every pound of iron shot giving 1440 lb, which would seem more realistic.

The curious method of construction of these guns may be similar to that described in a patent issued in 1633 to Bartlet Cornelis Smidt of Amsterdam. This patent describes the founding of a gun, 'made of various metals, of which the chase and the chamber (which is made in the manner of *steenstucken* (perior)) is made of iron welded together by heating and hammering (forging) and thus united into one piece of iron, and subsequently covered with copper and other metals and ornated and the chase is (like cast guns) bored smooth, so it can easily be handled both aboard and ashore, but is still powerful and resistant and can be used with sharp projectiles (murdering shot?) without any danger of exploding or fraying, although these guns are only about half the weight of ordinary guns and hence were manoeuverable' (Doorman, 1940: G 348). However, the piece in question was only 4 ft long, weighing 230 lb and unfortunately the calibre was not specified. The patent also specifies that Smidt would have to make two more guns firing a six-pound iron shot and two of three-pound iron shot, before he would be allowed the patent. There was also an earlier patent in 1627 for a gun made of various unspecified metals. This patent mentions that guns of 6, 12 and 24 lb iron shot were to be made (Doorman, 1940: G 274).

These composite guns therefore are extremely unusual, appearing to be perrie, constructed partially in the manner of the old 16th century wrought iron gun, but cast into a lead-solder matrix with a copper sheath.

Acknowledgements

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French Summary

L'armement du *Batavia*. 1. Deux canons composites

J. GREEN

Suivant la fouille du *Batavia*, l'étude de l'armement, de même que celle d'autres artefacts, est commencée. Les premiers objets étudiés sont deux canons composites construits d'une manière assez inaccoutumée. Cette étude présente aussi l'appareil utilisé pour examiner les méthodes de fabrication.