AN INVESTIGATION OF ONE OF THE TWO BRONZE GUNS FROM CARRONADE ISLAND, WESTERN AUSTRALIA

by

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A. Introduction

In a recent publication by K.G. McIntyre (1977), it has been suggested that two bronze guns discovered on Carronade Island in 1916 are Portuguese, but cast in Seville, Spain in the late 15th or early 16th century, (p. 82).

One of these guns is at present on loan from the Royal Australian Navy at Garden Island, Sydney, to the Western Australian Museum and is on display at the Fremantle Museum, Fremantle, Western Australia. As a result of the interest in this gun and the above suggestions, a study of it has been carried out by this author to try and identify its date and origin. This paper deals with the investigation and analysis of the gun and its history.

B. The History of the Guns

In July 1916, during a visit by HMAS *Encounter* to Napier Broome Bay, two small brass guns were discovered by Commander C.W. Stevens, RAN and Surgeon Lieutenant W. Roberts, RAN, on a small un-named island. The two guns were found upright "....approximately 25 paces from the water's edge, we saw the two carronades protruding through the sand 2/3rds of each being exposed so that they were easily lifted out. They were..... 6 feet apart and certainly had the appearance of leading marks .... a large number of the ship's company landed the next day, shifted sand over practically the whole area for a considerable depth. The only other object found was a small portion of a brass bound chest. You can imagine the disappointment of the matelots who had visions of buried treasure". Letter to Mr. Allen from W. Roberts (18.8.1933).

The guns were subsequently presented to the Garden Island Dockyard in Sydney by the finders. Since, at the time, these guns were erroneously thought to be carronades, the island on which they had been found was named Carronade Island.

A number of individuals over the years have examined these guns and many misconceptions and inaccuracies have crept into their history.

To give a brief resumé of this history: Captain J.J. Robins, in the 1930s described them as possibly part of the armament of a Spanish or Portuguese caravel wrecked nearby. Robins described the decoration as a double knot, which he suggested was the badge of Seville. He claimed a gun factory was established there in the 16th century by Rey Carlos de Esparque (sic), possibly he meant España . Sir John Kirwan suggested that the badge was a Portuguese crown and the gun was of the late 15th or early 16th century. Chris Halls, in the late 1940s, believed the badge to be the Rose and Crown of Portugal. These details were published by Lind, (1968).

Jack-Hinton was the first to suggest that the guns may have been of Indonesian origin, (letter from Dr. Jack-Hinton to Professor J. Mulvaney, 24.4.1968). In response to an enquiry by Scott Sledge of the Western Australian Museum of the Spanish Embassy in Canberra (20.4.1979), the Director of the Naval Museum in Madrid states: 'It is very unlikely that the cannon was manufactured in Seville in 1520 as it has the ducal crown (Portuguese rose and crown) on the first reinforce depict (sic). Therefore, it would be more likely to think that the markings are imperfect copies of European cannons and this one to be Asian" (30.5.1979). This translation (made in Canberra) in factadds to the confusion, since in the original letter of Scott Sledge to the Embassy, Sledge mentions the Portuguese rose and crown. In the actual letter from the Director of the Naval Museum José Ma Zumalácarregui Calvo to the Spanish Ambassador Excmo. Sr. D. Carlos Fernández-Shaw (12.5.1979), no mention is made of a Portuguese rose and crown. *"La carona ducal que adorna el primer cuerpo ó refuerzo hace totalmente improbable la suposición que fuera fundido en Sevilla en 1520".*

To a similar enquiry by Scott Sledge to the Portuguese Embassy (11.5.1979) came the reply: "that according to the Military Museum in Lisbon, from the simple observation of the drawing submitted, it is presumed that the above cannon is not of Portuguese manufacture". (19.6.1979).

Mr. J.P. Puype of the Nederlandse Scheepvaart Museum suggested in a letter to this author (27.6.1979): "The cannon from Napier Broome Bay is, in my view, most certainly one of these 18th century Indonesian pieces of European form. You saw yourself that we have several similar items in

our collection".

C. Gun No. 1.

Gun No.1, Fig.1., at present on display at the Western Australian Museum, Fremantle, is a bronze gun commonly known as a swivel gun. It is 1094mm long with a bore of about 46mm. It has a single dolphin (the second is broken off and missing), on the first reinforce is an emblem of some sorts surmounted by a crown and surrounded by a pair of wings (?) Fig.2., the vent is surrounded by a decorative flower and has a copper insert, the gun has a plain cascabel button. The gun is very worn, the emblem and decorative features being completely obscure in some places. Four unusual features about the gun are:

1. The piece is very badly honeycombed, and the bore near muzzel has heavy scarring. Fig.3.

2. The trunnions are very crudely made in relation to the rest of the gun Fig.4., and appear much less worn. The trunnions are not a regular cylinder, and show signs of rough sawing or filing.

3. There are a series of 20 small iron plates showing on the surface of the gun (15mm by 1mm), Fig.5. These are possibly some form of chaplet system used to support a core which forms the bore in the casting of the piece. They appear in 5 sets of four.

4. The surface where the dolphin has been broken off is very worn, Fig.6.

From the above, it was considered that the trunnions may have been repaired, since they appear to be of quite different workmanship and that the "chaplet" system was some form of support for a core. It was, therefore, decided to conduct a chemical analysis of small samples from the trunnions and the main part of the gun and also X-ray the gun to investigate the "chaplet" system.

D. Physical Analysis

1. Chemical

The chemical analysis was carried out in Perth by Analabs (Report

No. 82.0.01.21273) using spectrophotometric methods for copper, and an atomic absorption spectroscopy for the other elements.

The results of the analysis of the four samples, two from the barrel and one from each trunnion are given in Table below:

TABLE: Chemical composition of Carronade Island Gun samples and maximum and minimum of Vienna Survey

	Cu%	Zn%	As%	Sn%	Sb%	Pb%	Fe%
Barrel 1	79.9	1.37	0.14	6.70	0.005	6.78	0.26
Barrel 2	85.5	1.42	0.16	6.50	0.006	7.91	0.44
R. Trunnion	79.3	0.07	0.14	10.6	0.003	9.02	0.10
L. Trunnion	79.8	0.08	0.15	10.7	0.004	8.90	0.18
Vienna Max.	95	0.18	N/A	14	0.18	4.90	0.18
Vienna Min.	84	0.00	N/A	2	0.01	0.10	0.01

Thus, it can be seen that there is a clear difference in the barrel samples and the trunnion samples. This is most noticeable in the Zinc 1.4%/0.07%, Tin 6.6%/10.6% and Iron 0.3%/0.15%.

2. X-ray

Five X-rays of the gun were taken, Fig.7., including: the muzzle; chase; trunnions; and breech; together with a second exposure of the breech with the gun rotated through 90°. The muzzle (1-2), shows a darkening just behind the muzzle astragals and fillets. This flaw is thought to be a cavity in the body of the gun. Towards the breech in this view can be seen the first of the iron core supports in the centre of the bore with a little further on, one of the two lateral supports. In the next view (2-3) these four supports can be seen again more clearly on the left of the view. In the middle of this view are a number of dark spots indicating an increasing density of casting flaws. On the right near the second reinforce astragal and fillets, is the next iron core support. In the next view (3-4) the dolphin and second reinforce can be seen, although the trunnions are not obvious. To the right, the flaws are increasing in size (up to 5mm). In the last view (4-5) the vastly increased flawing is noticed, one in particular is 10mm

in diameter. At the cascabel button, (somewhat darkened because of the reduced thickness), almost 50% of the button volume is flawed. A reduction in the bore diameter can be seen near the breech. In the other view of the breech (with the gun rotated 90^{o}), the touch-hole or vent is seen on the lower side of the X-ray. The increased density of flaws in this view have also moved to the lower part, indicating that they lie in the area of the decoration.

The X-ray analysis was carried out by Engineering X-ray Laboratories, Perth, using a Cobalt 60 radioactive source on one side of the gun and the X-ray sensitive paper on the other.

E. Discussion

1. The trunnions are clearly not of the same material as the main part of the gun, nor are they of the same workmanship. It is suggested, tentatively, that at some point in the life of the gun, the two trunnions and the one dolphin were somehow broken off. Subsequently, a new set of trunnions was attached to the gun, using relatively crude workmanship. The dolphin was not replaced as it served more of a decorative purpose on this size of gun.

2. The X-ray analysis also showed that the bore of the gun was very worn. At the vent the bore is 43mm, this bore enlarges slowly to 50mm, some 110mm from the vent and then continues uniformily 50mm in diameter to the muzzle. The slight increase in the muzzle bore diameter on the X-rays relative to the true bore of 46mm is due to perspective effects in the X-ray photography. This bore enlargement indicates that the gun had been fired many times, and the shot passing up the bore had slowly worn away the metal. It is unlikely that the breech of the bore was chambered or tapered as was common with the perrier.

3. The copper insert in the vent is another late tradition. Iron is generally found in the worn vents of 17th century guns; the worn vent being drilled and tapped-out and an iron insert screwed in. The coppering of worn vents was a common practice in the 18th century although when it started is not exactly certain.

4. With any bronze gun that has been in the sea for any length of time, the iron chaplet system is usually completely corroded away. This is due to the intense electrolytic action between bronze and iron in seawater. Since the iron on this gun shows no sign of electrolytic corrosion, it may be assumed that the gun has not been in the sea for any length of time.

5. The X-ray analysis showed that the gun is extremely honeycombed. The honeycombing may be seen on the worn surface of the gun as small holes, but the radiographs show large bubbles up to 10mm in diameter. The cascabel button shows the extremes of this effect. These cavities caused by casting shrinkage,indicate poor bronze-casting technology, and that the gun was cast breech down. Honeycombing was extremely dangerous, since burning material lodged in the cavities caused accidents on reloading, and is frequently referred to in early texts.

6. The X-rays also show that the "chaplets" extend through the metal to the bore and thus certainly were part of a bore-plug support in the mould. Normal European practice for large bronze guns was to have a ring of iron (chaplets) at the breech with four or so spikes radiating from this to the gun-mould surface. The ring then supported and centred the pottery plug which served as the bore of the gun. In the late 17th and early 18th century this system was replaced by casting the gun solid and then drilling the bore out using machinery. The chaplet system used here is unusual for ordnance, although an example of a bronze 42pdr gun cast in 1769 for Sultan Ranafa Achmet Najm ed-Deen of Palembang, Sumatra (Blackmore, 1976, No.235), has a similar multiple chaplet system; in this case eleven chaplets, Wignall (1973), Plate 7., (see here, Fig.8). It is possible that Wignall may infact be wrong in his interpretation, and that the chaplet system does not have a circular ring at the bore (as he suggests), but infact it simply has bars going from the outer surface of the mould, through the gun and into the core. This seems to be the case in the Carronade Island gun, as no evidence is seen of an iron ring close to the bore and connected to the bars, although it is possible that this is now missing due to the enlargement of the bore (see above). Unfortunately, in the position where a chaplet ring support would still survive, the

X-rays are indistinct and it is not absolutely clear if they exist.

7. Comparison of chemical analysis of bronze guns to identify European regional gun foundries has recently been used successfully in Austria and Germany, Riederer (1977). In this analysis,154 bronze guns from the Heeresgeschichtlichen Museum in Vienna were analysed. The guns came from Austria, Germany, Italy, France, Denmark, Netherlands, Spain, Russia and Turkey (with a few examples from China and Japan); the author was able to show how small chemical composition ratio changes corresponded to particular regions where the guns were cast. The Carronade Island gun analysis shows a striking difference to the 154 European analyses. The Carronade Island gun has a lead composition of 7-9% where as the average lead for the Vienna survey is about 2%, the highest value being 4.25%. Similarly, the antimony composition for the Carronade Island gun is low at 0.004%, where as in the Vienna survey the lowest European composition is 0.01% and on average about 0.2%. Table 1. shows the approximate percentages (maxiumum and minimum) for the Vienna survey.

It may,therefore, be argued that the composition of the Carronade Island gun indicates a non-European origin.

8. Little has been published on Southeast Asian guns, although Shariffuddin (1969) and Harrison (1969) have attempted to make a typology of Brunei guns, and Manguin (1976) has described a number of Asian pieces existing in Museum collections in Asia and Europe. With these sources,and a few catalogues of guns in European museums: Blackmore (1976), Christensen (1971), Kaestlin (1963), Petersen (1969), etc., it has not been possible to find an exact parallel to this gun and in particular its decoration. It is unfortunate that the decoration on the 1st reinforce is so badly worn. Whilst there can be no doubt that there is a crown, the decoration below and between the wings is far from clear. On close examination, it is hard to visualise a rose, as has been suggested. It has been suggested, (Crawford in correspondence), that this may be two birds with wings outstreched facing each other. This seems a little more acceptable, but still far from conclusive. Until another similar, but clearer decoration is found, or an illustration found somewhere which will throw further light on the subject, the exact significance of this decoration has to be

considered uncertain.

9. European swivel guns in the 16th century tended to be breech loading, made of either wrought iron, cast bronze with a wrought iron breech, or cast bronze. In the Mediterranean these were known as versos, Guilmartin (1974). Examples of these have been found on Armada wrecks: *Girona*, a cast bronze *esmeril*, Steñuit (1971); *La Trinidad Valencera*, bronze with a wrought iron breech, Martin (1975). In the 17th century, swivel guns became very rare, there being very few examples on shipwrecks of European vessels. For example, amongst an extensive armament on the wreck of the Portuguese ship *Sacramento* (1668) in Brazil, no swivel guns were found, (de Mello, 1977 and 1979). However, on the wreck of the Portuguese vessel *Santo Antônio de Tanná* (1697) two bronze breech loading swivel guns were found, one dated 1673 with acanthus leaves and the Arms of Portugal, Kirkman (1972), Fig.5.

By the late 17th and early 18th century, cast bronze breech loading swivel guns became very common on shipwrecks of European vessels, but gradually by the mid 18th century the breech loading gun appears to have been replaced by the muzzle loading gun, which itself continued intothe 19th century. It should be noted, though, that muzzle loading swivel guns have been found on one early 18th century wrecksite of the V.O.C. ship *Zuytdorp* (1713), Playford (1959).

Thus, the general indication here, is that this type of short muzzle loading bronze swivel gun, if of European origin, would tend to date from the second half of the 18th century.

10. In the *Catalogo do Museu da Artilharia*, Lisbon, only one gun No.6 from the *7a Secção* vaguely resembles the gun from Carronade Island. This *Peça de tiro de sinal* is 680mm long, so somewhat shorter, although with the general shape, but no the same decoration. The piece dates from 1782. Examination of drawings in the catalogue does not indicate any general trends, except that Portuguese guns in the early period tended to be large with two sets of two lifting rings rather than dolphins and a tendency to have dolphin cascabels. Generally, these guns are decorated with the Portuguese Arms and/or the amillary sphere.

11. There is a wealth of evidence that Macassan trepangers used and carried guns on their visits to northern Australian waters, Macknight (1969 and 1976), Uren (1940). A number of small portable guns have been found in and around the north-western coast of Australia. A Dutch East India Company bronze swivel gun was even found on the northern Barrier Reef area, and now resides in the City of Maryborough in Queensland. A number of these guns are clearly of Southeast Asian origin and are described as *Lantukas* Shariffuddin (1969).

F. Conclusions

From the above discussion, the general conclusion is that the evidence indicates this gun is a Southeast Asian copy of a European type swivel gun. As the central decoration is not clear, the significance of it and the crown and wings is uncertain. However, the decoration on the gun has no known associations with Portuguese or Spanish guns. The weight of evidence indicates that it is of a late 18th century date rather than 16th century. Since a number of other bronze swivel guns have been found in the northern islands and coasts of Australia, many clearly of Southeast Asian origin and associated with 18th and 19th century Macassan trepangers, it is thought that this gun belongs to a similar source. This is supported by the obvious age of piece and the crude repair work.

It would be of great value to investigate the second Carronade Island gun in detail to see if it is of similar construction.

G. Acknowledgements

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FIGURE CAPTIONS

Figure 1. Gun No.1. (2) 5A and 14A

Figure 2. Decoration on 1st reinforce (1) 7A

Figure 3. Scarring of bore (1) 29A

Figure 4. Detail of trunnions (2) 32A

Figure 5. Iron plate (1) 13A

Figure 6. Broken dolphin (1) 16A or (2) 30

Figure 7. X-ray radiographs

Figure 8. Wignall's drawing of the Palembang chaplet system.

BIBLIOGRAPHY

ANON

Catalogo do Museu da Artilharia
Lisbo, Portugal.

BLACKMORE, H.J. 1976

The Armouries of the Tower of London: 1. Ordnance.
H.M.S.O. London

CHRISTENSEN, E. (trans.) 1971

The Cannon Ball. The Tøjhusmuseum, (Royal Danish Arsenal Museum).
Tøjhusmuseum, Copenhagen.

GUILMARTIN, J.F. 1974

Gunpowder and galleys: changing technology and Mediterranean warfare at sea in the sixteenth century.
Cambridge University Press, Cambridge.

HARRISON, T. 1969

Brunei Cannon : their role in Southeast Asia, (1400-1900AD).
Brunei Museum Journal. 1.1:94-118.

KAESTLIN, J.P. 1963

Catalogue of the Museum of Artillery in the Rotunda at Woolwich, Part 1. Ordnance.
H.M.S.O., Manchester.

KIRKMAN, J. 1972

A Portuguese Wreck off Mombasa, Kenya.
International Journal Nautical Archaeology, 1:153-156.

LIND, L. 1968

Garden Island Cannon Upset History.
Garden Island Magazine, May 1968.

MACKNIGHT, C.C.(ed) 1969

The farthest coast; a selection of writings relating to the history of the northern coast of Australia.
Melbourne University Press, Melbourne.

MACKNIGHT, C.C. 1976

The voyage to Marege; Macassan trepangers in northern Australia.
Melbourne University Press, Melbourne.

MANGUIN, P.Y. 1976

L'artillerie légère Nousantarienne a propos de siz canons conservés dans des collections Portugaises.
Arts Asiatiques, 32:233-254.

MARTIN, C. 1975

Full Fathom Five; wrecks of the Spanish Armada.
Chatto and Windus, London.

McINTYRE, K.G. 1977

The Secret Discovery of Australia- Portuguese ventures 200 years before Captain Cook.
Souvenir Press, South Australia.

MELLO, U.P. de 1977

O galeão *Sacramento* (1668), um náufragio do século XVIIe os resultados de uma pesquisa de arqueologia submarina na Bahia (Brasil).
Navigator (Rio de Janero), 13:7-42.

MELLO, U.P. de 1979 The shipwreck of the galleon *Sacramento* 1668 off Brazil. *International Journal Nautical Archaeology*, 8.3:211-224.

RIEDERER, J. 1977 Die Zusammensetzung der bronzegeschütze des Heeresgeschichtlichen Museum im Wiener Arsenal. *Berliner Beituage zur Archäometsie* 2:27-40.

PETERSON, M. 1969 *History under the sea.* Smithsonian Inst. Washington.

PLAYFORD, P. 1959 The wreck of the *Zuytdorp* on the Western Australian coast in 1712. *J. Proc W.A. History Society* 5.5:5-41.

SHARIFFUDDIN, P.M. 1969 Brunei Cannon. *Brunei Museum Journal* 1.1:72-93.

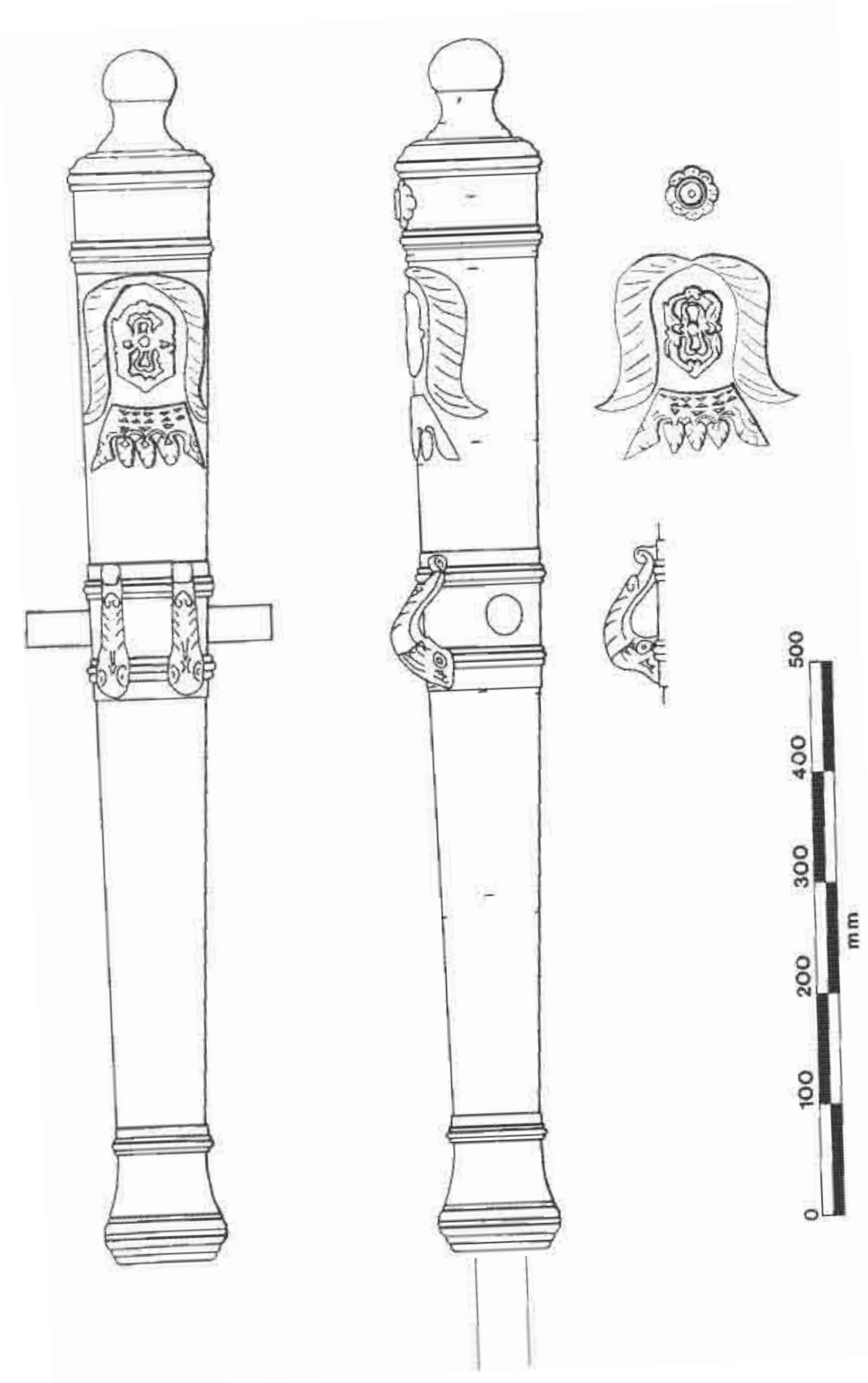
STÉNUIT, R. 1971 *Les Tresors de l'armada.* Albin Michel, Paris.

UREN, M. 1940 *Sailormen's Ghosts.* Melbourne.

VALLE, G.H. do 1963 Marcas de Funditores Portugueses de Artilharia do seculo XVI. *Revista de Artilharia, Lisboa.*

VALLE, H. do 1962 Nomenclatura das Bocas de fogo Portugueses do Seculo XVI. *Revista de Artilharia*, 439-440:381-390.

WIGNALL, S. 1973 The crown piece and its relationship to the development of 16th/18th century cast bronze ordnance. In N.C. Flemming: *Science Diving International, Proceedings of the 3rd Scientific Symposium of CMAS*, B.S.A.C., Andover.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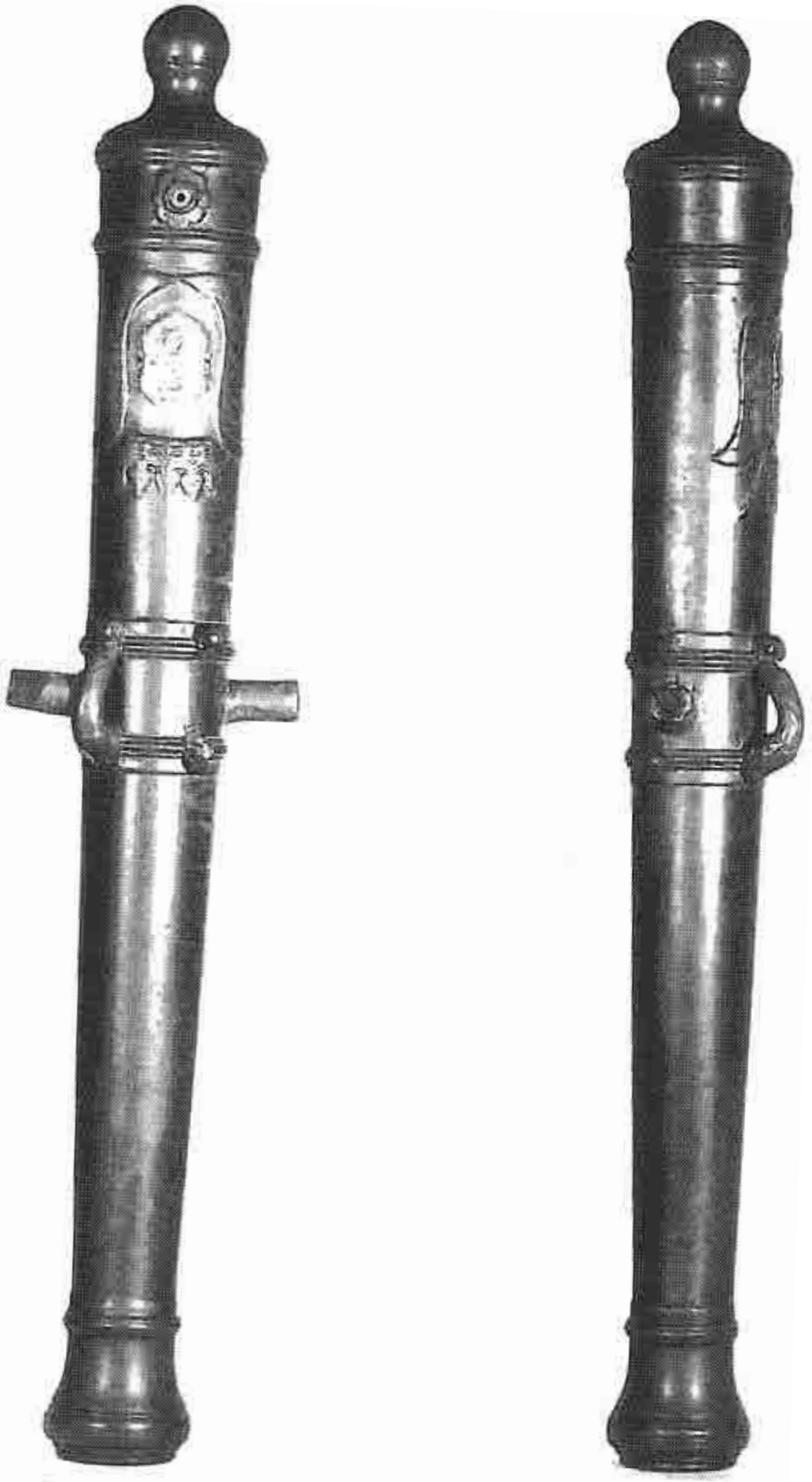
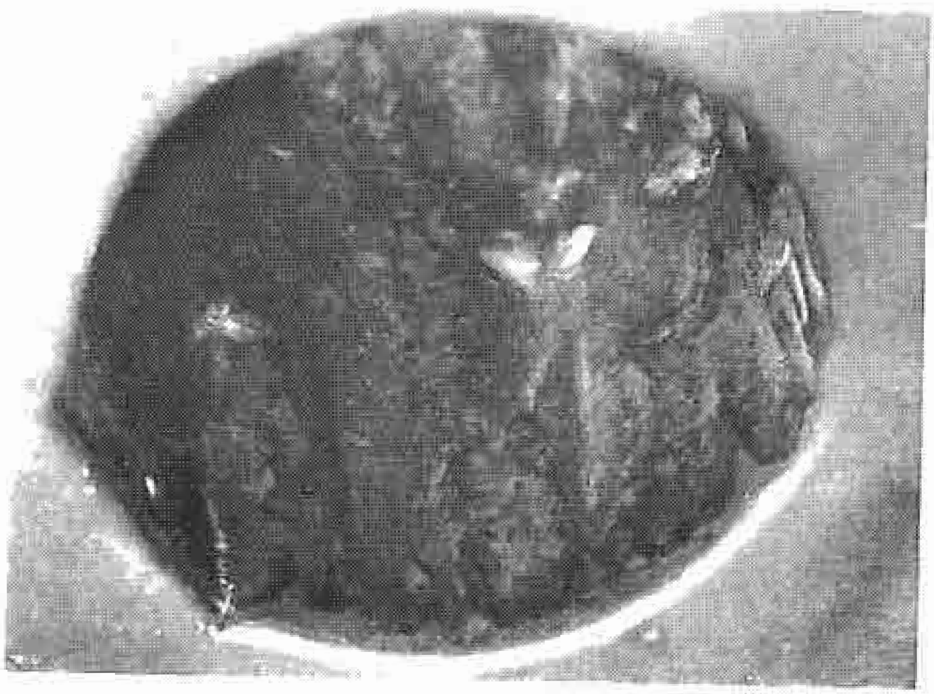


Fig.1. Gun No.1



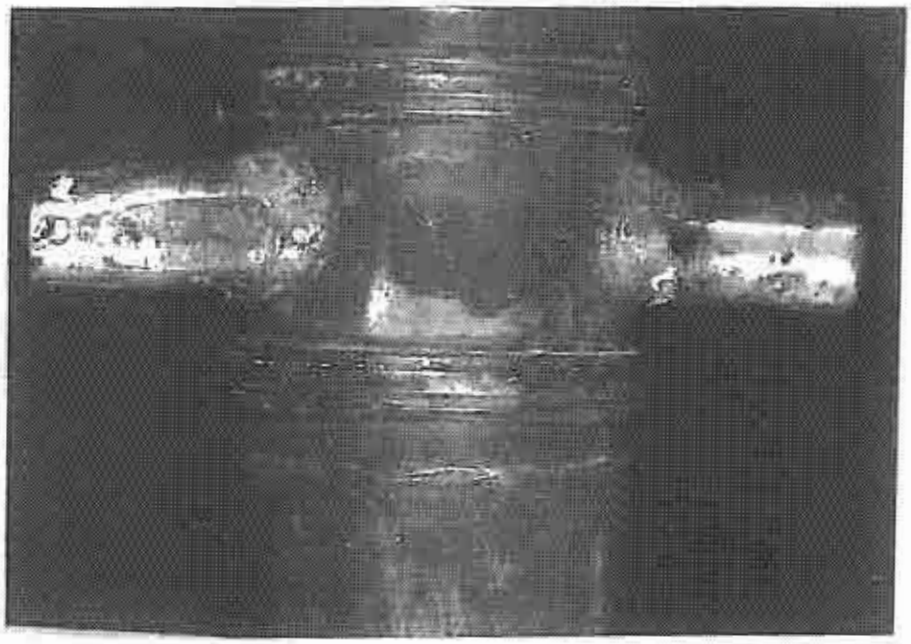


Fig.4. Detail of trunnions

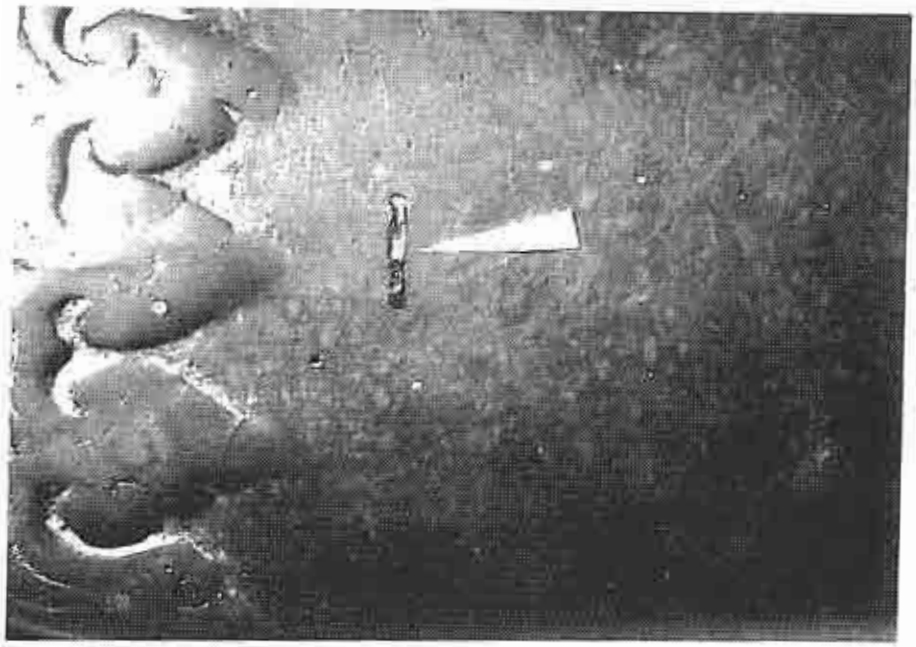


Fig.5. Iron plate

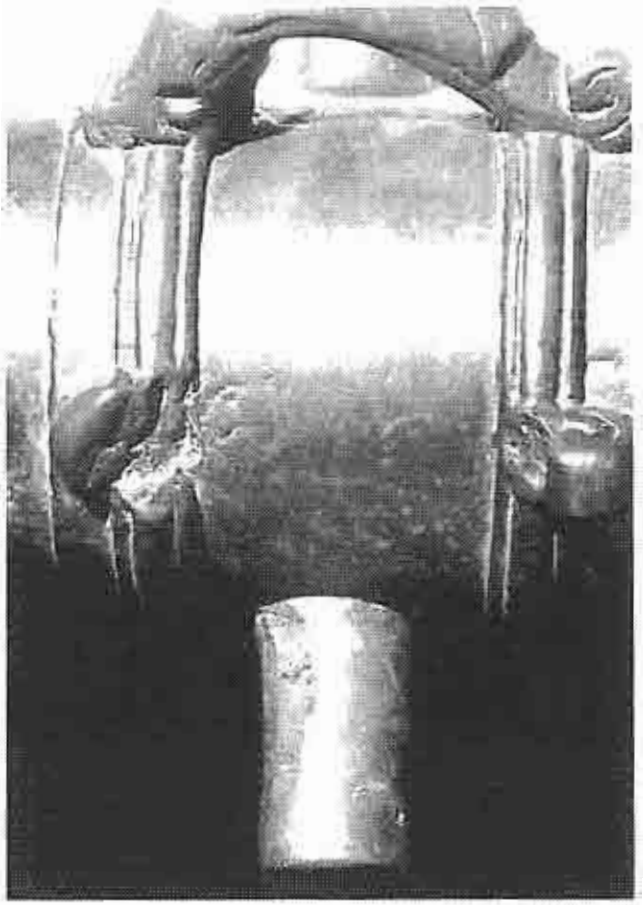


Fig. 6. Broken dolphon

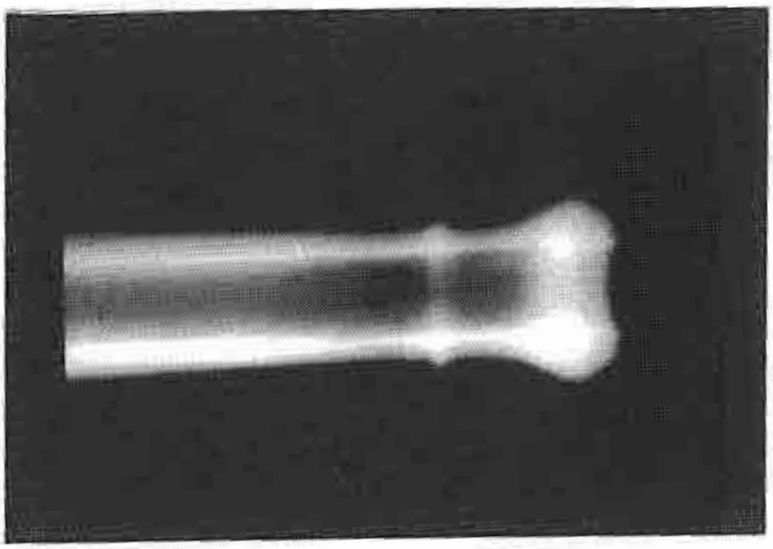


Fig.7. X-ray radiographs 1-2

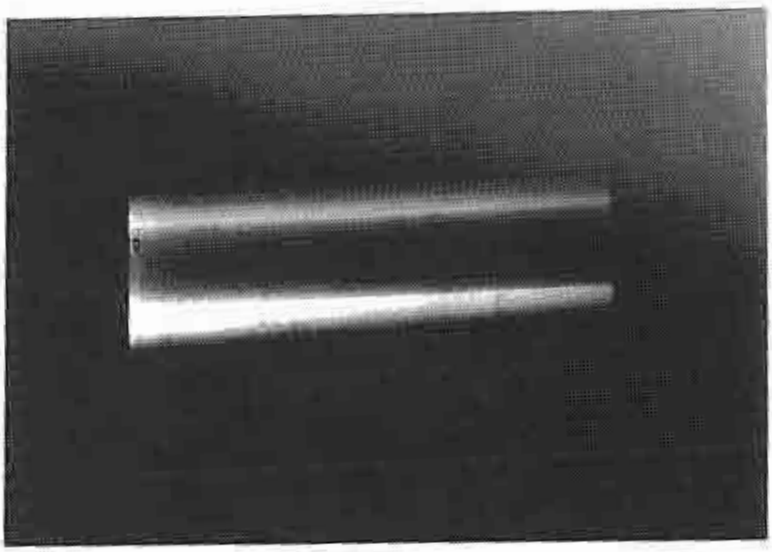


Fig.7. X-ray radiographs 2-3

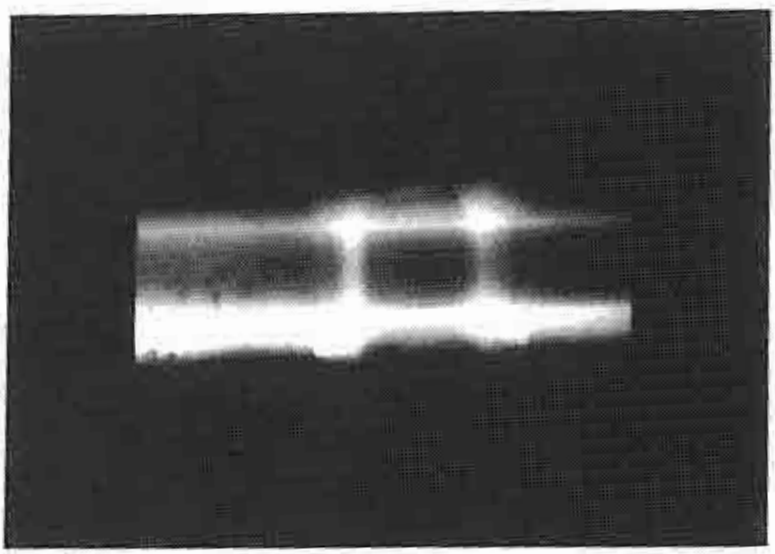


Fig.7. X-ray radiographs 3-4

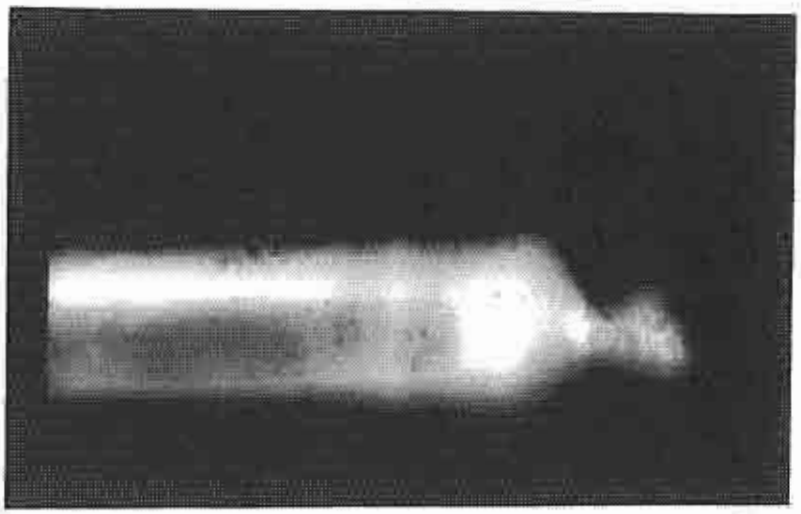


Fig. 7. X-ray radiographs 4-5 Vent up

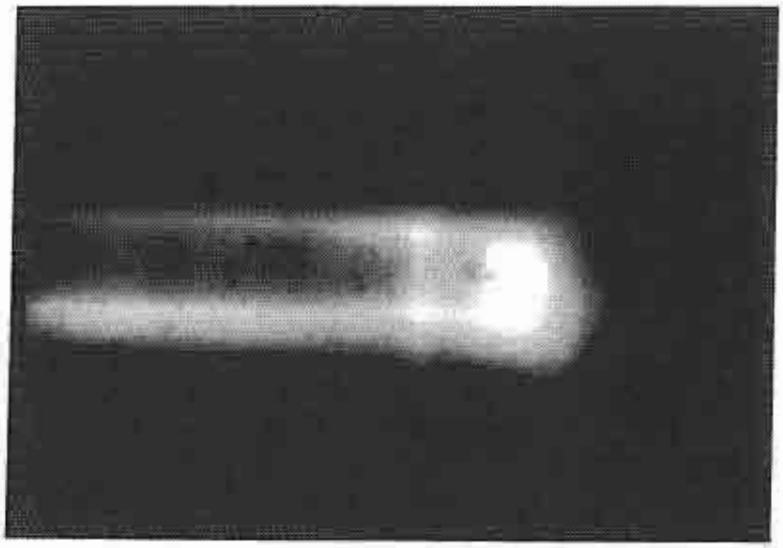


Fig.7. X-ray radiographs 4-5 Vent central

Fig.8. Wignall's drawing of the Palembang chaplet system.