



The Restoration of a Bronze Plaque from Benin

By LESLIE R. LANGTON



In April 1967 the University Museum of Philadelphia sent me fragments of a Benin Bronze plaque (AF 2069) with a request that I restore it if possible.

When cast originally by the Benin craftsmen in the 15th-16th century, using the *cire-perdue* process, this was a very handsome plaque. It portrays a single male figure standing with hands raised to shoulder height, holding a short staff in his right hand and a three-pronged wand in his left. He is wearing a conical headdress of coral beads ending in the familiar bead tassels and a seven row coral bead necklace. The long orna-



Two bronze plaques from Benin in the British Museum: (left) a high-chested style; (right) a 19th century style.

mented dress flared at the ankles ending in short tassels.

The unusual feature of this plaque is the high chest of which there are few examples. A similar plaque in the British Museum collection is shown here.

Up to the end of the 19th century the University Museum plaque must have suffered considerably. The top right hand corner was missing from the apex of the headdress to the right hand. The left top corner was also missing from the top of the wand down to just above the left hand. The remainder of the plaque ended in a line

roughly from the left elbow down to the navel and back up to the right elbow. Fortunately there was sufficient of the edge to show the original proportions.

About 1890 several bronze plaques were cast at Benin in a very poor artistic style. Two such plaques in the British Museum collection show the skirt or trousers in a similar style to the lower part of this plaque. It seems certain that an African bronze caster of this period, who had technical skill but little traditional knowledge, decided to cast a new lower part of the body and legs for this plaque. Unfortunately he made his wax in



The University Museum plaque: (left to right) before restoration; the back showing 'burn-on' repair; the back of the upper section, the upper right arm bent in to the body; the top corners after treatment and before hard soldering.

the style of the casting of that time. He pressed the wax over the broken edge of the body, having an overlap of approximately 3.3 cm. He then applied a clay investment and carried out a very satisfactory 'burn-on' repair.

In the 20th century the plaque suffered further damage. The right forearm was broken off at the elbow. The right upper arm and shoulder was bent and very badly cracked. There was another fracture completely across the chest. The plaque was in three main pieces.

To determine the best method of restoration, we examined all the fragments very carefully under a microscope and carried out tests to ascertain the condition of the bronze.



The 15th-16th century bronze was in excellent condition consistent with its age, except for the area between the elbows and from 1 cm. above the fracture across the chest down to the 19th century casting. This area was extremely thin—1 mm. to 0.25 mm.—and in very poor condition, being partially mineralized and 'burnt', due most probably to overheating during the 'burn-on' casting of the skirt and legs, which was 3 mm. to 5 mm. thick and in excellent condition.

It can be seen that there were two masses of bronze of some weight, the face and arms at the top of the plaque, and the skirt and legs (the new work) at the bottom. These two masses had to be joined together but, as described above, the bronze



between them was in such poor condition that whatever method was used for repair the bronze itself would not support the weight of the upper and lower areas of the plaque.

Another consideration was that the interesting 'burn-on' addition and both the original and later cores should be preserved. This prevented the use of any form of backing material to give the weak areas the necessary strength.

The detailed examination revealed that the damage at the right shoulder was in fact another fragment (the fourth), as the bronze here had cracked right through and was only held in position by the core. The right upper arm was bent inwards by 5 degrees to the body.

Restoration

This had to be taken in stages. As in simple repairs, it is usually best to start with the largest fragment and fit what one can to it. The face and right shoulder fragment was first attempted. This was carefully flame annealed and the core removed from the damaged section. This allowed the smaller shoulder fragment to be removed. Hardwood forms were then carved to fit the inside and outside of the bronze at the area needing reshaping. Gentle but even pressure was applied with a "G" clamp. Working about a half degree at a time, constantly re-carving hardwood forms to suit, and annealing as required, the bent area was worked back to its original shape. Similar treatment was applied to the smaller shoulder fragment until the two fitted correctly. The edges of both fragments were then carefully filed to show a 'clean edge' of bronze and prepared for hard soldering. The two fragments were then set up on a brazing hearth, face downwards, as the hard soldering was to be attempted from the back. Johnson Matthey's "Silfos" was used as this hard solder has a reasonably low melting point, 750°C, and a characteristic of 'blobbing' and 'filling' rather than 'flowing.' It was essential that a strong joint should be obtained but that no solder should run through the joint and mar the intricate design on the front surface of the plaque.

A coal gas brazing torch was used to warm the two fragments evenly. Oxy-acetylene equipment with a very fine flame was used to carry out the actual hard soldering, work in which I was ably assisted by Mr. Tom Govier. By this technique the bronze was not overheated and the hard soldering was controlled at all times.

To help strengthen the joint where the bronze was weak the "Silfos" was built up over each side of the joint. This method was used satisfactorily in the 147 cm. of hard soldering completed on this restoration.

The right forearm, holding the staff, was the next fragment for consideration as this could now be accurately positioned. Unfortunately it was found to have only two points of contact with the main face fragment: 3 mm. at the elbow and 2 mm. at the side of the face. Even when hard soldered this would not be sufficient to hold the fragment safely if, as was hoped, this plaque could be used for demonstration purposes when restored.

Satisfactory results having been obtained

from the technique used for joining the fragments, it was now time to consider what method was to be used to reinforce them.

As mentioned previously, our examination showed a very weak area in the centre of the figure and now the right arm fragment needed support. It was finally decided to make up all the missing parts of the plaque in 3/16" bronze plate and hard solder all the edges together. In this way the weak areas would be 'bridged' and all the edges protected. The right hand fragment would be held firmly in its correct position to the face fragment and to the body at the hips. The cores would be visible from the reverse and the plaque restored to its original proportions.

Three-sixteenths inch bronze plate was obtained with a specification of Copper 88%, Tin 10%, Zinc 2%, the nearest to Benin Bronze on the market. This was roughed out to fit the right hand fragment.

The propeller and dot design was marked on the bronze, picking up from the existing design on the fragments. This pattern was then worked on the bronze plate with repoussé tools, but as repoussé causes the bronze plate to harden and spread, the design could not be worked right up to the joint with the original.

It should be explained that a repoussé tracer suitably ground will reproduce a line in bronze plate almost identical to a line made by a thin stick in beeswax. A centre punch slightly blunted will make a depression in bronze plate very similar to a pointed stick in beeswax. This was found the best method of reproducing a reasonable likeness to Benin workmanship.

The plate was then annealed and flattened and filed exactly to fit around the right hand fragment. It was then hard soldered as described previously. The edge from the top of the head-dress down to the side of the face was then filed accurately and also soldered. The pattern was picked up at the joints with repoussé tracer and punch. The left hand top corner was made up in the same way and hard soldered into position. This corner had no function of reinforcing a fragment, it was purely to complete the proportions of the plaque.

The remaining body fragment and legs were now prepared for hard soldering to the completed fragments. This was the most difficult part of the whole restoration, due to the poor condition of the bronze at the points of contact—the chest and



The back of the completely restored plaque, the face of which is shown on page 2.

at the waist. However, using the same technique as before satisfactory joins were obtained.

This central area now required reinforcing. More bronze plate was shaped to fit the body fragment and of sufficient size to complete the proportions of the plaque.

The pattern was worked in the same way as for the right arm. Due to the greater area there was an increase in expansion during this operation, making it more difficult to obtain a perfect fit over the entire length of the joint. Hard soldering was carried out as before, varying the heat to compensate for the various thicknesses in the bronze to be soldered.

The pattern was completed as previously described. Sections of the core which had been removed for this work were replaced with a suitable adhesive. An outline showing the correct position of the bottom of the dress and the feet was superimposed to give a better appreciation of the plaque as originally designed. Finally, all the made-up sections were coloured to suit the remaining fragments.

SUGGESTED READING

H. MARYON, *Metalwork and Enamelling*. Chapman and Hall, London, 1954.



LESLIE R. LANGTON joined the Department of Ethnography of the British Museum in 1935, working on storage, exhibition, and conservation. From 1939 to 1946 he served in the Ground Staff, R. A. F. Since 1946 he has built up the Conservation Section in the Department of Ethnography, in recent years specializing in the conservation of West African material. Here he is seen working on a carved wooden stool from the Cameroons. His particular interest is in the *cire-perdue* method of bronze casting. In 1951-52 he was seconded to the Nigerian Antiquities Service training African students in general museum techniques and helping Mr. Bernard Fagg in opening the Jos Museum. Mr. Langton received his M.B.E. in 1964.