THE CYLINDRICAL NAILS OF THE "KYRENIA"
One too early technical sprout

First of all I wish to thank Prof. Steffy for all the supplementary information which has made my work possible.

So far as we actually know, the KYRENIA merchantman was the only one of ancient times to use metal (copper) nails as a general and essential element of union for the planks and frames. All other wrecks show the use of treenails for this purpose; only those of warships show also the metal (bronze) nailing.

But there is also one other important detail about these copper nails: they have a cylindrical shaft with a point; a form which is usual in our time, but unique in antiquity. From what we know, no other similar nails have been found. All metal nails of ancient times, whether they be of copper, bronze or iron, have a square section and tapered form.

From our point of view it is difficult to understand why this form for nails has been used unchanged for such a long time, considering its many disadvantages:

1. Its long and thin point made it difficult to be hammered directly into the wood, specially if this was hard and the nails were of copper or bronze.

2. Its long, tapered form could cause the wood to split easily.
3. Therefore, its use required mostly the drilling of a hole in the wood first, and then using the nail hammered down together with a split treenail.
4. The production of this square section and long tapered form was expensive.

Considering this last point, when comparing production costs, we are not comparing forged nails with those made of wire, as produced today, but the difference in price of forged cylindrical as opposed to square, tapered ones. This we can only do by reference to documents concerning the forging of iron nails, as this was done during the last centuries. As to how this would differ with the method of producing the older bronze or copper ones, we may only conjecture, since we have insufficient data. The mass production of forged iron nails, as this was achieved for centuries at Ripoll (Province of Gerona, Spain), for example, required first, the iron ore to be mined to obtain the iron oxide powder which was then reduced to iron within a furnace. The resulting incandescent spongy iron mass was then hammered, reheated and hammered again several times until the correct density and maleability of the iron was achieved. In the water driven hammer mills near Ripoll wrought iron was produced in the form of rods for the nail manufacturers.

Therefore, we know that the basic material for their production was rod, which was forged to get the tapered shaft and point, cut to the correct length and finished with the head. For us now it is clear that it would have been cheaper to heat only the ends of the piece and to forge the point and the head, rather than to heat the whole piece in order to produce a completely tapered form. With the last nails forged at these mills, about 1800 AD, it is to be seen that they got slowly to this idea, as some, mostly the long ones, have only the point tapered, but the shaft being square, is parallel.

For copper and bronze the conditions are somewhat different. Copper and bronze can be hardened only by hammering until cold. Therefore the copper and bronze nails needed a general forging to achieve uniform hardness, but again the round or square parallel forging of the shaft would have been cheaper if the material blanks were rods, that We do not know.

So much for the technical considerations of the production of nails.

The fact is, cylindrical copper nails have been used generally on this ship wrecked near Kyrenia but there is no evidence of a later use. We do not know why, but we shall try to follow the thinking of these ancients who build with them. The investigation of the wreck has revealed that these nails are of different diameters, 7 to 10 mm. This and the circumstance known from many other wrecks, that the diameter of the holes, drilled in the wood, changed with the whetting of the tools, obliged them to use splitt treenails similar to those used with the tapered ones. This was an important handicap. There was a long experience with tapered square nails and treenails of the adequate quality and size. The tapered nail was put in a split treenail of about the same diameter as the hole, could easily be introduced and then hammered in. The necessary force of the blows would slowly increase with the thickness of the nail and a strong union could be achieved. With the cylindrical ones the split treenail had to be thinner or of softer wood, as the thickness of the nail would be evident from the beginning. On the other side the fastening would have been more uniform all over the length of the bore. But in this special case of a union of a plank and a frame, this was not important, as the thickness of the frame was much more than that of the plank and the strength of the fastening of the treenail

within the interior half of the frame was secondary, as the nail was clenched. As long as the technical possibilities could not produce cylindrical nails of uniform diameter nor the corresponding holes, there was no possibility of eliminating treenails, getting a cheaper, stronger and tight union with less man hours. Even if the nails were not clenched, the cylindrical ones would hold better than the tapered.

These advantages could not be evident at those times and therefore the change was not worthwhile.

If we contrast the qualities of the square tapered and the cylindrical nails in those times, the result is only:

SQUARE TAPERED	CYLINDRICAL
- Easier to hammer in with a treenail	- Less bending of the stronger nail
- Treenails of the diameter of the bore easy to control	- Stronger point for clenching
	- More uniform pressure on the surrounding-wood: Less splitting

Cost of production?

From this we see that, for the special use on planks and frames, the advantages were not so important in those times as to induce a change from the usual way to produce and to use nails.

There is now the question:

Were these cylindrical nails an experiment by some shipyard for the construction or for the repair of a ship?

If we look at the problem as a repair, many things change. First, there is the possibility that the copper nails could be hammered into the water softened old treenails. This would reduce the work about one half, as it was not necessary to:

— drive the old treenails out, with danger of damage to the planks.
— produce new treenails of the many different diameters.
— fix the less worn with wedges
— drill bigger holes where those in the planks were damaged.

It could be that, just for hammering them into the softened treenails, it was necessary to have a stronger point and shaft to resist bending, and that it was also convenient to use cylindrical ones, to get uniform pressure on the wood of the planks, reducing the danger of splitting. Considering the surely higher cost of the copper nails, only such a repair would justify economically their use instead of the habitual treenails.

The repair of an old treenail, putting a new one through its center, if it is not enough to hammer a wedge into it, is usual. We know that it was done also in antiquity because we have found these reinforced treenails at the Perduto wreck, off the southern part of Corsica. Normally, this new treenail is cylindrical or a little conical with a short point and is smeared with fat to be hammered in. Could it be that this was the basic idea for the cylindrical copper nails? Since a copper peg could not swell in the water like a new dry treenail, it was necessary to have a head at one end and to clench it at the other.

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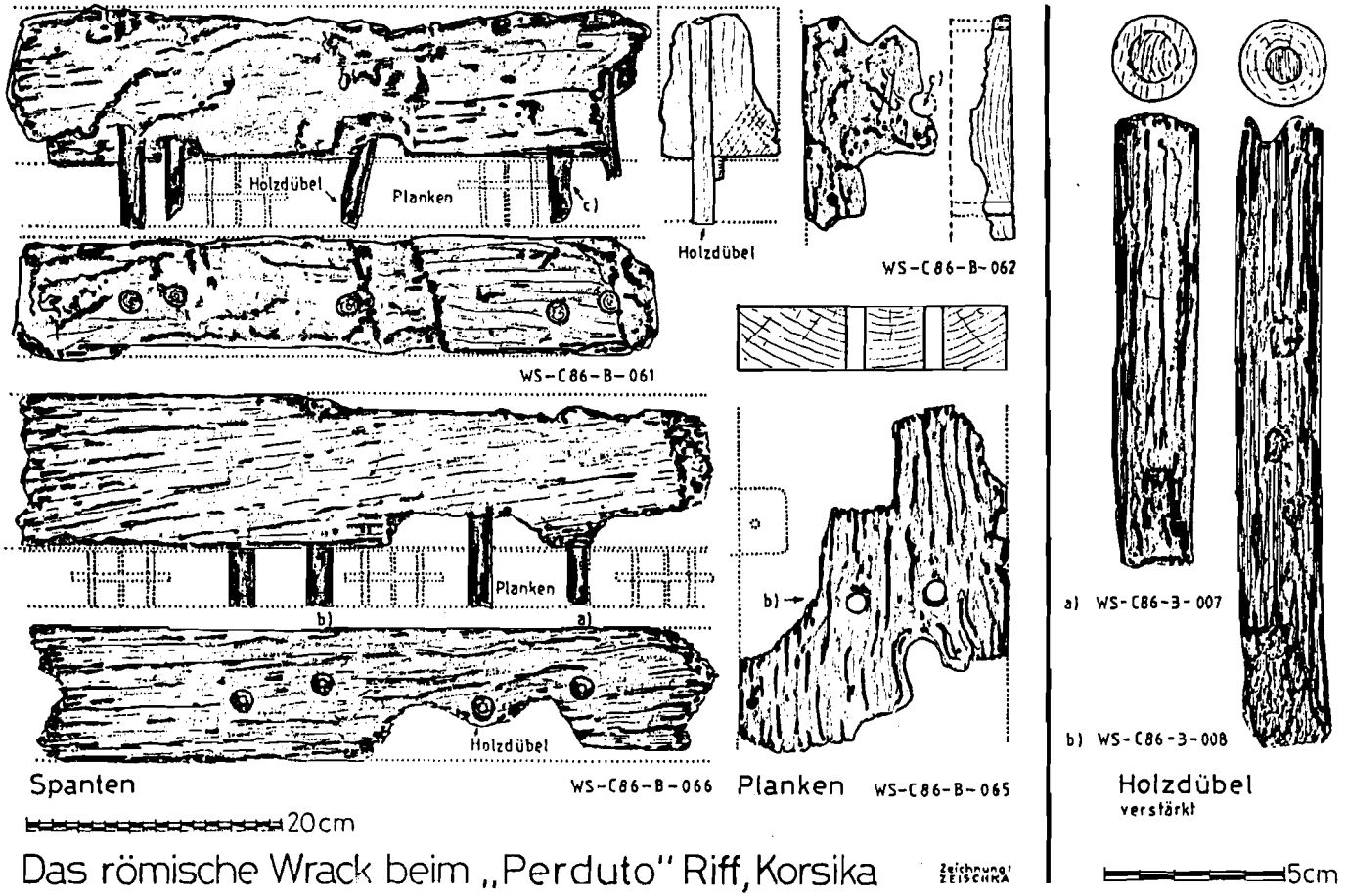

Das römische Wrack beim „Perduto" Riff, Korsika

Zeichnung: ZEISCHKA