THE DETECTION OF FRAUDULENT COPPER NEEDLES

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Since the discovery of a number of long, slender, copper needles in the famous Temple Mound of Le Flore County, Oklahoma, there have appeared a number of imitations to meet the demand of collectors. These fraudulent pieces are quite common among collections. One large collection contained over thirty, and almost every collector has a specimen, or has had an opportunity to purchase one. The price which is usually charged is from seventy-five cents to two dollars.

The specimens studied for this paper were from the collection of E. W. Stephens. Because of their light green-colored corrosion, he doubted their authenticity immediately after their purchase, about two years ago. Copper, which corrodes naturally in the soil, has a deep green color while the fraudulent needles are a much paler green.

The specimens were first measured and found to be from nine to eleven inches in length. The diameter of each, when measured with a micrometer, was found to be exactly the same, one hundred sixty-thousandths of an inch. This corresponds within two one-thousandths of an inch to number six gauge wire in the B. and S. scale. This diameter was found to be exactly the same throughout the entire length except for approximately one-half inch on each end which had been ground or hammered to a blunt point.

The needles were cleaned for a portion of their length by washing with dilute aqua regia which left a bright clean surface. After this treatment, they were studied under a microscope for any characteristics which might reveal their past history. The first thing noticed was a number of parallel striations extending in perfectly straight lines, the entire length of the needle. Such striations are easily observed on copper wire of heavy gauge which has been drawn through a die in the process of manufacture.

Also observed were a number of broad, shallow scratches such as would be made by scraping the insulation from high tension insulated wire.

The ends of the "artifacts" were not all exactly alike. One needle had abruptly tapered points which were hollow at the tips. This piece had been plainly hammered to a point. The marks from hammering were somewhat obliterated by a subsequent grinding, but were still visible under the magnifying glass. A study of the other two needles showed that they had been ground to a finer point than the first and there were no hollow tips.

The Indians who used native copper had their source of supply from the deposits in Northern Michigan and Isle Royal. This copper is practically one hundred per cent pure except for any occluded impurities. Copper, used in making electrical wire, is as nearly pure as it is possible to make. Because of this it was decided not to attempt any analysis of the specimens to try to distinguish them on the basis of the composition of the copper itself. A comparative study of the crystalline structure of native and refined copper was beyond the scope of this investigation.

Conclusive evidence of the nature of the corrosion on the fraudulent pieces was obtained by a quantitative chemical analysis. The corrosion was scraped from the needles, dissolved and analyzed. It was found to contain thirty-six per cent cupric chloride, the remainder being accounted for as water of hydration, dirt, and copper. There was no evidence whatsoever of copper carbonate which is the corrosion deposited by natural processes.

By the action of weak acids in the soil, and carbonic acid in rain water, copper exposed to the elements attains a deep green color due to the formation of a coating of *verdigris*, a hydrated or basic copper carbonate. This process is very slow under natural conditions and many years are required to give a thick, tight-clinging coating. Because of this it is only natural to suspect that whoever was making these artifacts should have some quicker method. The composition of the corrosion gave evidence that it had been put on electrolytically. The coating was somewhat flaky, of a lighter color, and there were frequent air spaces beneath the flakes such as form from polarization of an electrode.

The fraudulent needles were artificially corroded by making them the positive electrode in an electrolytic cell. To overcome the fact that copper chloride is very soluble in water and would dissolve as fast as it was deposited, the electrodes were probably placed close together and contact effected by merely splashing muriatic acid over them while they were connected to some source of direct current. Such an experiment can be carried out by any high school student of physics.

These observations lead to but one conclusion. Some enterprising dealer in relics conceived the idea of attempting to satisfy the demand for the fine Temple Mound needles by making imitations. Copper wire, about number six gauge was stripped free of insulation, then cut into lengths of about ten inches, straightened, the extremities pointed by hammering and grinding. Then without any attempt to cover the striations by hammering, such as would result from the work of the aboriginal coppersmiths, the "needles" were electrically corroded.

As a final warning to anyone who might be tempted to buy copper needles from Oklahoma, beware of a light green flaky or crystalline corrosion appearing on perfectly round pieces of uniform diameter. Only by educating the persons who collect relics can the makers of fraudulent artifacts be put out of business.