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A REPLY TO CYRIL STANLEY SMITH ON MAIL MAKING METHODS

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FIRST, I SHOULD LIKE to thank the editors and Dr. Cyril Stanley Smith for so generously inviting me to reply to Dr. Smith's most interesting article on mail¹ construction (*Technology and Culture*, I, 1 [Winter 1959/60], pp. 60-67).

It is now over six years since my first article on mail appeared and eight years since the work embodied in it was done. We have learned much since 1953 and are constantly having to rethink our theories about the possible techniques employed to make mail and the conditions under which it was produced.

I will start, therefore, by stating how the present thought about this subject differs from that first article published in the *Antiquaries Journal* for 1953. In the first place we no longer believe that the early draw plate was of the swage type. Instead we now believe that a draw plate of the multi-hole type was used—usually for producing half-round wires. Round wire, a sign of degeneracy in mail, was not generally used until very late—after 1500. By 1600 mail was in decline in Western Europe.

In the second place, we no longer believe that case hardening was used for mail, and it is of very great importance that Dr. Smith has found only soft iron with a little 'right through' steel in the late period. It must be remembered that the shock of a blow sufficient to penetrate a dense soft iron mail would probably put the man who received it out of action in any case, because mail is a yielding structure.

We still do not know when wire drawing started, but I would certainly not now say that 'the existence of mail in any civilization proves the use of wire drawing.' Roman mail, for instance, looks rather like oriental mail and is not, as far as can be seen, made with drawn wire.

In 1953 we were looking for the simplest possible way of producing mail, so it was suggested that wire was wound on a mandrel fixed in a handle. This is a rather inefficient process when flat or half-round wire is being coiled. It is now believed that this wire could have

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been coiled on a mandrel which passed through a hole in some metal structure. The flat of the wire would press against the metal surface near the hole, which would compel the wire to wind up on edge, and against a small ledge below the hole, which would compel the wire to wind tight, so that the free end of the wire did not have to be kept under tension as it was wound.²

In discussing Dr. Smith's article I should like to start by stressing two small but important points. The first is that oriental mail and mail from Western Europe cannot be lumped together and discussed together simply because they are both mail, any more than tweed and silk cloth can be lumped together and discussed together simply because they are both cloth. Even visual examination shows that oriental mail and mail from Western Europe are made from slightly different processes producing rather different results and that usually the oriental mail is inferior in quality. This inferiority is not only, or even mainly, in the construction of the individual rings but also in the build-up of the garment, shaping by increased and decreased rings usually being absent. In my studies I have confined myself more and more to Western Europe because we know more about the conditions under which mail was produced there and also because in any one garment from that region there is more to see.

The second point is that we still cannot date mail with any accuracy greater than within fifty years by examination of structure. Even then such dating is only based on intelligent guess work. It is typological dating, and, with this sort of material, typological dating can be, and often is, wildly inaccurate. Moreover, no one can as yet state with certainty the provenance of a piece of mail unless he has documentary evidence. But such evidence is very rare, for mail and mail makers moved great distances.

In spite of this, I should question some of Dr. Smith's dates on typological grounds, even though I have not been able to examine the pieces. Alternate rows of riveted and whole rings of flat or half-round wire section are usually taken to be fourteenth or very early fifteenth century or before. I would tentatively place Dr. Smith's specimen No. 4 before 1400. Whole rings of a rather more washer like form were used later (sixteenth century), but in conjunction with riveted rings of round wire of late type. Also, I doubt whether the coil of round wire, No. 14, is fourteenth century.

Dr. Smith differs with me on two main constructional points: wire drawing and the manufacture of whole rings. I have never believed, and I hope I have never suggested, that early wire was made from thick section rod which had been hot rolled. I agree that in Western Europe it was probably cut from thick sheet and then drawn to the desired section. However, I would not go so far as to say that rolling could not have been used at any stage. By 1400 mail making and wire production were large industries with mass production and much

division of labour. The work was done in what we should now call small factories with heavy machinery driven by water power. I should like to call Dr. Smith's attention to three sixteenth century illustrations.³ One shows a long wire being wound from one drum on to another and passing through a multi-hole draw plate fixed between them.⁴ The second shows a man drawing wire through a large multi-hole draw plate with large two-handed pliers.⁵ The third shows wire being wound on to a drum or roller of considerable diameter and great length which is being turned by a water wheel.⁶

In an article on a mail shirt to be published in the *Antiquaries Journal* (Spring 1960), William Reid's historical research⁷ shows that the mail factory of 1400 under discussion also contained heavy machinery driven by water power. It must be remembered that by 1400 all the skill required was certainly there; for instance, the mechanical clock with its trains of gear wheels had been in existence for at least one hundred years. It is easy for us, who live in the atomic age, to fall into the trap of regarding the craftsmen of the fourteenth, fifteenth, and sixteenth centuries as primitive. It is a trap we knew about but one into which most of us had fallen to a greater or lesser extent until Mr. Reid's recent research brought some new facts to light.

The question of the production of the solid or whole rings is a much greater problem. Small whole rings are found on the necks of shirts and capes, to contract the edge, which can be seen to have been made by punching or drilling a hole and then clipping or chopping round it. Brass whole rings are also employed on the borders of garments which appear to be of the same character as the iron whole rings in the same garment. These brass whole rings could not have been hammer welded. It was for these reasons that we assumed that iron whole rings in Western Europe were made by punching. We have known for some time that welded rings were used in oriental mail because the welding is often so badly done that its presence can be seen at once.

However, in Western European mail badly made welded rings have not so far been observed. Hammer welding is the natural way for a blacksmith to join an iron ring, but if we are to believe that welding was usually employed for these whole rings, and often they under 1 cm. in diameter, we have to find a process so sure that it never leaves obvious traces of a weld. It is true that the examples Dr. Smith shows, Figs. 1, 2 and 3, are of mail of the best period, when we can expect that poor rings would be discarded. The structure shown in Fig. 3 does not, as far as I can see, show a definite hammer weld. Such welds usually show in any case when corrosion has taken place. Dr. Smith does not seem too sure about it either, for he says on p. 61 "...for the streaks of slag or carbon segregation always run circumferentially. This is hardly surprising, for the manufacture of suitably matched punches and dies would call for precision of work-

manship beyond that of the armourer.” The second part of this argument we can discount, for if the armourer had wanted to make punches he certainly would have been able to. He was, after all, making quite complicated dies with his name and place of work on them in the negative for stamping the annular name rings to be included in the garment. These name rings were being produced by 1400. Shaped dies were also produced for stamping an armourer’s mark on the back of the rivets. These marks were often quite complicated and must have been carved in the die which was used to close the ring.

The real reason why punching of the whole rings is rather unlikely is that it is do wasteful of the sheet iron being punched. All the centres and outsides have to be returned, remelted, and reformed. The circumferential slag streaks could be the result of drifting a small hole in a thick piece of metal and then stretching the ring on a mandrel. I do not think this is a likely technique, but it is possible. I am much more inclined to think, with Dr. Smith, that the rings were welded, but at the moment I cannot be sure, and I do not think they were always welded. Perhaps some more sections would show a definite weld line. We should also have to make some rings ourselves, producing exactly the same results, and then section them before we knew the correct technique. I do not agree with Dr. Smith that the half-round section of the whole rings was produced by abrasion and not with a die. I have whole rings in my possession which have been clearly hammered into a die. In one case the wire was a little too thick and has been squeezed over the sides of the die, forming a T section. The use of files can be counted out, because when craftsmen have to make their own files they are not used more than necessary. The rings would probably be barreled in a rotating rumbler with abrasive. This was the method used for cleaning and polishing finished mail.

Nor can I agree with Dr. Smith when he says (p. 67) that he believes hand punches and sets were used. I feel as strongly now as I did when I was making mail in 1951-52 that the rivet hole must be drifted by a slow squeezing action and that the swaging of the rivet joint must be done by dies moving in relation to each other. As for the tools I suggested being more at home in a nineteenth century jeweler’s shop, I should expect to find most of the jeweler’s tools, apart from twist drills and gas torches, in the armourer’s shop—and a lot of other tools as well.

I should like to close by saying how valuable Dr. Smith’s work is. This is the first written reply and comment that has been made on my work, and answering it has been most stimulating. I hope more will be done, for Dr. Smith is so right when he says that other branches of metal work “sorely need critical examination on a metallographic basis.”

REFERENCES

¹ The word “mail” derives through the French *maille* and the Italian *maglia* from the Latin *macula* meaning the mesh of a net. It can thus stand on its own, and the popular phrase “chain mail” is quite incorrect. See “Chain Mail” by F. M. Kelly in *Apollo* (Nov. 1931), pp. 264-270. A footnote to p. 267, following a reference to “chain mail” as “a mere piece of modern pleonasm,” is as follows: “The term *chain-armour*, although unscholarly, is at least much less objectionable.”

² A. J. Arkell, *The Making of Mail in Omdurman*, Kush, Vol. IV. (1956), pp.83-5.

³ These illustrations of wire-drawing are to be found in Ake Meyerson, *Vapen Industrierna I Arboga* (Stockholm, 1939)

⁴ *Ibid.*, p. 140. A wiredrawer, sitting at a table, winds wire from a spindle on his left through a small block onto a spindle on his right. From a Nürnberg craft book of 1529.

⁵ *Ibid.*, p. 142. A wiredrawer, seated against a wall, draws wire through a large pierced plate set into a block of wood. He uses large two-hand pliers: dated 1533.

⁶ *Ibid.*, p. 143. A Dürer watercolor of a Nürnberg wire-drawing mill of c. 1510 signed and inscribed “trot zieh müll” (wire-drawing mill)

PP. 145-7 shows details of the mechanism of wire-drawing mills of c. 1750. These are taken from drawings made by R. Angerstein at Iserlohn and are probably of machinery used there in a form differing little from that of 300 years previously.

⁷ I am very much indebted to William Reid, of the Armouries of the Tower of London, for his help with this subject and for notes 1 and 3-6.