TIN THROUGH THE AGES

AN EXPERIMENT IN MUSEUM SYNTHESIS

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A GALLERY in the National Museum of Wales at Cardiff is used exclusively for temporary exhibitions, of which there may be three or four in any one year. The present exhibition, "Tin through the Ages in Arts, Crafts, and Industry", was designed to dispel the notion that because we describe an inferior musical instrument as tinny, and dismiss something paltry and ill-conceived as a 'tin pot' affair, tin is therefore a metal of no importance. The subject-matter has been so treated as to demonstrate the connexion between a great variety of apparently unrelated things, with the view of discovering continuing threads in the story of human progress; this reverses the usual museum practice, which tends to emphasize the difference between groups of cognate objects and to confine synthesis to the material within a group.

A handbook* has been prepared to provide a running commentary to the gallery, but since it summarizes the story which each of the exhibits has to tell, without actually describing them, it will serve as an outline of man's indebtedness to one of the most useful of all metals, independently of the exhibition itself.

A gratifying feature of the exhibition has been the readiness with which (often in difficult circumstances) manufacturers have provided examples of their products and photographs of their plant. Half a dozen museums, too, have contributed material, and my own indebtedness to the Tin Research Institute is considerable.

The story begins with the minerals in which tin is present, and with comparisons between ancient and modern methods whereby they are isolated from their ores, but the major part of the exhibition is concerned with the utilization of the metal, its alloys and its compounds.

When man began to experiment with copper as a substitute for stone in the manufacture of weapons and tools, and realized that the presence of a certain other metal—we call it tin—produced something—we call it bronze—that although harder than copper alone was more easily cast and manipulated, he made a discovery which, by giving him better and more abundant implements, greatly accelerated the progress of civilization; and tin has played an important part in nearly every subsequent development that has tended to widen man's physical and intellectual horizons.

Strangely enough, the range of articles made from tin alone has always been limited. A few ancient objects of cast tin have been found in Egypt, while collapsible tubes for tooth-paste and wrappers for cheese are made of pure tin, but its importance has always depended mainly upon its capacity for extending the applications of other metals. It is an essential, and often the principal, constituent of many alloys in addition to those included under the general

name bronze: pewter, solder, printing metals, bearing metals, organ pipe metal, dental metals, and fusible alloys all owe their special characters in part or entirely to tin.

The Romans knew that a tin lining to vessels of copper or bronze made them more suitable as receptacles for food and water. This use of tin, which has continued throughout the ages and has been applied to iron and steel as well, depends upon its readiness to combine with other metals and its capacity for resisting corrosion, and it shows that the importance of the metal is not to be judged by the quantity that is used, for the coating of tin is exceedingly thin. In the common 'tin can', for example, the protective layer is no more than one ten thousandth of an inch in thickness, and all the advantages we derive from tinned foods (to mention only one kind of commodity that is put into tins) we owe to this extremely attenuated film of tin. That this thin film can be effective is even more surprising, when we realize the strains and stresses to which the tinplate is subjected in the machines that convert it into cans and in the plant that fills and seals them.

One exhibit shows that tin is the principal constituent of pewter, and specimens from Roman to recent times illustrate the way in which its different varieties have been cast, spun, or beaten into vessels for ornament and for use; another, entitled "Tin in Printing", illustrates the role of tin in printing metals, since the invention of movable types began to make knowledge the heritage of the multitude instead of the monopoly of the few.

It is tin which determines the properties of the varieties of solder; innumerable articles, affecting every phase of human life, are commercial possibilities because of the ease with which soldered joints can be made, and we owe the effective distribution of water, gas and electricity to the solder which ensures the continuity of the conducting elements. As with the other alloys, the past and present uses of solder are illustrated by specimens and photographs, and the metallurgical explanation of its behaviour is simply described with the aid of diagrams and photomicrographs.

Tin is an essential, although not usually an abundant, constituent in the so-called fusible metals. At one time they were curiosities, as when used for making spoons that melted in hot tea; later they found practical applications in the sprinklers which caused water to be sprayed in a room where a fire had developed, and nowadays they are employed in many engineering processes, as for example, in bending thin-walled tubes, like those for conveying oil and water in aeroplanes: the tube is filled with molten alloy, bent after the metal has solidified, and then immersed in hot water or in a steam bath so that the alloy can be melted and drained away.

Of outstanding interest is the part which tin has played in 'bearing metals', since the days when it was realized that the development of frictional heat in an engine was diminished by the introduction of a lining

* "Tin through the Ages, in Arts, Crafts and Industry", Handbook to a Temporary Exhibition, July-December 1941, by F. J. North, (National Museum of Wales, Cardiff). Pp. 38. 3d.

or bearing of bronze where one metal part moved in close contact with another. Later on, other alloys of tin provided still better bearing metals, and nowadays some of them contain more than 80 per cent of tin.

Many uses have been found for compounds of tin, as, for example, in producing rose tints for ceramic decoration, the white background for majolica and delft, the glaze of modern sanitary fittings, and the enamel of refrigerators, thus adapting to modern requirements a practice dating back at least to Babylonian times.

The foregoing notes show that a heterogeneous collection need not of necessity be haphazard, for with specimens ranging from part of a Roman pump to an electric kettle, and photographs ranging from Egyptian tomb-pictures to a pea-cannery, it is possible to complement the more usual kind of museum exhibit, based upon a desire to separate things which belong to different ages, or were put to different uses. This aspect of the exhibition can be illustrated by reference to one section only, that relating to bronze: approach from an archaeological point of view, leads to exhibits showing the kinds of implements that Bronze Age man could make, how they were related in time, and how they became more and more efficient, particularly in the direction of better fixture to their hafts: here the museum story usually ends, for iron superseded bronze, and Iron Age cultures demand consideration, and that there is any connexion between the palstave and a machine-component cast in bronze does not appear.

When, however, we add to the archaeological information what modern methods of examination have taught us about the properties of alloys, we realize that the improvements in early implements ran concurrently with man's increasing knowledge of the materials he used; we connect up the oldest of metallurgical practice with the newest of metallurgical theory and research, and in our stride we can take in all the things for which the varieties of bronze have been employed—bells and guns, statuary and friezes, measures and machine-parts, and even the wire cloth on which paper is made.

We find that although the modern foundryman

can deal with tons whereas his predecessor could only handle pounds, the principles on which he works are just the same. Bronze Age man discovered the principles of all the methods of casting that are used to-day, and learned to make metal reproductions of his moulds that could be used again and again, thus speeding up production and ensuring uniformity of results. Nowadays permanent moulds are made of steel, not bronze, and powerful machines force the molten metal into cavities more complicated than the old-time workers either needed or could have made; nowadays we call it die-casting, but the principle is the same, and so are the advantages claimed—speed of production and uniformity of result.

The experiment seems to have justified itself because the archaeologically minded visitor, caring little for modern machinery, has discovered that in his ancient bronzes he has the beginnings of a story that is still in the process of writing; and the engineer, not a whit interested in axes and palstaves, has found that when he tries out a new method for 'babbitting' a connecting rod, he is contributing to a story of which the opening chapters belong to a period so remote that they have to be reconstructed, not read.

An exhibition like this shows how arbitrary are the conventional dividing lines between cultural and academic studies on one hand, and science and industry on the other, and how unsubstantial are the lesser dividing lines within these groups. Material that one would expect to see in a 'trade show' is displayed in the same gallery, and often in the same case as the 'cultural' objects normally associated with a museum, but there is no apparent incongruity either in the arrangement of the specimens, or in the ideas they are intended to suggest.

Taking a dictionary definition of culture as "a state of intellectual and artistic development", it would seem that museums can do much to show culture what it owes to industry, and, by illustrating the methods and results of industrial research (not merely the products of industry), to show that industry is itself specialized culture, for as Pope once put it, all are, indeed, but parts of one stupendous whole.

EXHIBITION OF PHOTOGRAPHY

THE eighty-sixth annual exhibition of the Royal Photographic Society of Great Britain was opened at the Society's Galleries, 16 Princes Gate, S.W.7, on September 5, by the Right Hon. J. T. C. Moore-Brabazon, the Minister of Aircraft Production. This is the second exhibition that has been organized under war-time conditions, and it would be foolish to pretend that it has not suffered in any way.

The Pictorial Section is up to strength, and appears to have maintained its high peace-time standard of quality, and it is gratifying that even this year most of the Dominions and the United States are represented.

The Scientific Section unfortunately suffers from a marked absence of exhibits from abroad. Photography is much used in Great Britain for scientific and industrial purposes, but few examples seem to find their way to the exhibition. It is also regrettable that few university laboratories in the country carry out research directly related to photography, though

they certainly make use of it as a tool. In past years exhibits from abroad, such as the illustrations of ultra-high-speed photography of Edgerton and Germeshausen, and illustrations of the use of photography in research on cosmic rays and atomic particles, have been a feature of the Scientific Section. However, apart from these absentees, all branches of the section are represented by exhibits of high standard. There are examples of both low- and high-power photomicrography, the latter being illustrated by two striking examples of diatoms.

The number of exhibits illustrating the use of photography in medical work clearly shows the value of this application of photography. Many of the photographs taken for demonstration purposes are made during the course of surgical operations, and the operator is beset with many difficulties, such as obtaining sufficient light and suitable modelling to show up the desired features without interfering with the course of the operation. Other examples show