

very different thing from maintaining that it will explain everything; one might just as well search for a universal pill which will cure all the ills to which human flesh is heir.

W. D. H.

The Chemistry of Paints and Painting. By Sir A. Church. Fourth edition. Pp. ix+387. (London: Seeley, Service and Co., Ltd., 1915.) Price 7s. 6d. net.

THE facts that this is a fourth edition, and that the author has been before the world for more than fifty years as a student of the subject on which he writes, are sufficient reasons for welcoming it with respect. But the volume itself fully justifies its existence, and it is difficult, if not impossible, to suggest any change in it that would better fit it to serve the purpose for which it was originally issued. The temptation to use a material that facilitates or immediately improves one's work without due regard to its lasting qualities is always very strong, and especially is this the case with those who are so absorbed in the study and practice of pictorial art, that the scientific aspect of their work becomes distasteful to them. But it is not right to accept ignorantly the opinion of the salesman, however honest he may be, or to trust to a few superficial experiments made by one's self or one's friends. The author deals with painting grounds, vehicles, varnishes, pigments, methods, and results, giving just such details concerning them as the artist wishes, or ought to wish, to know.

The previous edition of the treatise was translated into German and edited by Prof. Ostwald, who added a few paragraphs. The author has incorporated the substance of these in the present edition, definitely indicating such paragraphs, and adding to their value by comments of his own. He gives, in short, the results of probably all those who are known to have systematically tested pigments for permanency, and usefully, and we think fairly, criticises the methods and results of these investigators. The preservation and restoration of pictures receive due attention, and throughout the volume the style of the author is such that a previous acquaintance with scientific principles and nomenclature is not necessary for the understanding of it.

Machine-shop Practice. By W. J. Kaup. Pp. xii+199. Second edition. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1914.) Price 5s. 6d. net.

IN this little book will be found descriptions of the hand- and machine-tools employed in an up-to-date workshop, together with clear instructions for their use. The author has desired to lead the pupil in the shop to think, and not merely to do. For this reason the why of each step or operation is emphasised as much as the how. The function of college workshops is to familiarise students with the working properties of the materials employed and with the tools in general use. Such information cannot be adequately obtained from any book, but a book may be very useful for the purpose of supplementing

the verbal explanations of the instructor. It is not easy to make other than mental notes in the course of workshop practice, and it is often inconvenient to pull a machine, or part of a machine, to pieces for the purpose of explanation.

The book before us will be found to be very helpful in such matters. Probably the most noteworthy feature in it is the clearness of the illustrations. Where most books of the kind contain merely half-tone illustrations of machines (generally from makers' catalogues), the author has given perspective line drawings, and has named the parts clearly on the drawings. These drawings will be found to be of much value, even when the machine installed in the students' workshop differs in detail from that in the book. Nomenclature is not so serious a barrier in this volume as in some American books. We can heartily commend this book to workshop instructors.

LETTERS TO THE EDITOR.

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The Age of the Earth.

WHILE reading through Dr. F. A. Lindemann's defence of Lord Kelvin's estimate of the age of the earth, I was reminded that in spite of the sympathetic spirit in which he always entered into any discussion, he would never allow the least doubt to be thrown on the correctness of his estimate of the earth's age. Yet it is open to several objections: he assumed that the solidified crust, as it was being formed, would sink toward the centre of the earth until it was solid throughout, whereas there can be no doubt about its core being so heavy that the crust material could not possibly sink. He also assumed a diminishing rate of cooling, whereas the greater portion of the earth's surface is covered by water the bottom temperature of which must have been practically constant for millions of years. He also cuts down the temperature in the earth's centre from 410,000° F., which it would be according to his assumption, to 7000° F.; whereby the available heat is reduced enormously. However, if radio-active processes can supply the earth's radiation losses there is no need to deal with the older question.

I notice that Dr. F. A. Lindemann draws the conclusion that the sun's radiation just compensates the amount lost by the earth, but this is not correct. The earth's loss is estimated from the known temperature gradient in the earth's crust; it is a net loss over and above any possible interchange of heat with the sun. Then, also, Dr. Lindemann limits the earth's age by the sun's age, but amongst the several possible sources of its heat supply he does not even mention the heat-producing power of a meteoric bombardment. Yet, as I have shown in my work, "Unity in Nature," in the chapter on matter (pp. 85-92), it is not at all unlikely in comparatively recent time the sun may have passed through a large cloud of heavy meteoric matter. One effect of a comparatively slight addition of heavy meteoric matter would have been to increase its density from, say, 1.00 to 1.38, and the other effect would have been to raise the sun's surface to such a high temperature that it would have evaporated and formed an atmosphere