Drawing not only expedites construction in all cases, but oftentimes construction is absolutely impossible without drawing. In order to the greatest expedition and economy, there must not only be professional draughtsmen to make the original drawings, but the workmen must know at least enough of the principles on which the drawings are made, to be able to work from them understandingly and without constant supervision.

CULTIVATION OF THE TASTE.

What has just been said of drawing refers to it only as a help in construction, regardless of whether the object made be beautiful or ugly. Now, there is no one who does not prefer the beautiful to the ugly, or what he thinks to be beautiful to what he thinks to be ugly. Beauty has a commercial value which cannot be easily overrated. Instruction for industrial purposes must, therefore, aim to cultivate the taste as it applies both to the form of the object and to its decoration. Though the latter adds nothing directly to the usefulness of an object, yet it often adds so much to its market value that almost everything now made receives more or less of ornament. The taste can be better developed by means of drawing than by any other one thing.

A refined and intelligent taste in respect of objects that appeal to the eye is next to impossible without some knowledge of drawing. One may like or dislike, but little more. There should be good taste, it may be observed, on the part of the consumer as well as producer. Indeed, it is a truism that the taste shown in the manufactures of a country never rises, except in special cases and for special reasons, above the taste of the people,—of the home consumers.

DANGER OF NARROW VIEWS.

But what is drawing? Is it something fixed and determinate, or something vague and nebulous, which each may define to suit himself? One may well be excused for asking such questions in this country, where he finds such divergent views held by persons who, having but slightly examined the subject and got a glimpse of one of its many aspects, nevertheless think they know all about it.

Drawing, when regarded in both, its artistic and industrial applications, resembles mathematics in comprehensiveness. It would be quite as reasonable for a person who had mastered arithmetic only to claim that he knew all about methematics and its applications, as for a person who had learned to draw from the solid only to claim that he knew all about drawing. From nothing eles does drawing suffer so much in this country, and will continue to suffer so much the next ten years, as from the very narrow views held by so many person who think they understand all about its scope, its practical and artistic applications, and its value as an educational discipline. It is to these persons that large numbers, who know nothing about drawing, look for leadership. When the blind lead the blind, there should be no ditches in the path; but in dealing with instruction in drawing, one has special need of good vision. There are dangerous pitfalls on all hands.

Let us consider some of the general characteristics of drawing. With these the details, which are too numerous to be considered on the present occasion, must all harmonize.

DRAWING TWO DIMENSIONS.

One of the first things which should be noticed is the great fact that all varieties of drawing may be reduced to two class: representation of only two dimensions—length and breadth; and representation of the three dimensions—length, breadth, and thickness. A clear understanding of the general difference between these two things will help one greatly towards a clear comprehension of the whole subject.

When only two dimensions are drawn, there can be no representation of thickness, of relief, of solidity. Consequently all perspective effects, all light and shade, and all color, when applied according to the principles of chiaroscuro, are out of the question. No devices for suggesting solidity, for the purpose of carrying the eye below the surface of the paper, are properly in order. Lights and darks may be indicated by half-tint, or flat tints, showing that the surface is raised or depressed in parts; and colors may be applied in flat tints, as is usually done for the decoration of woven fabrics, of flat walls and ceilings, and even in the representation of the human figure in stained-glass windows. In a word, when only two dimensions are drawn, all true pictorial effects, everything of the nature of chiaroscuro, are among the impossibilities. Hence the drawing of two dimensions compared with the drawing of the three dimensions, is a very simple affair; yet it is of almost endless application in the different industries.

It takes for its basis the figures and problems of plane geometry and their applications. Construction of every kind,—building, machinery, furniture, sail-making, and so forth,—requires a knowledge of such drawing. It is also in connection with the drawing of two dimensions that nearly all the principles of design, applied in determining the forms of objects, or their decoration, are best learned. Not only what should be the due proportions of objects, and what the principles to be observed in flat ornament, when only lines and conventionalized forms are used, but many of the principles which good taste require to be observed in relief decorations, can be taught in this connection. And right here it is that instruction in the great decorative styles of different ages and nations properly begins. Classic art can no more be neglected than classic literature.

When only two dimensions are represented, it is evident that flat copies, like prints, are the proper things; indeed they are often the only copies which are possible. Even when relief copies are used, they must be treated as though they were flat. The copies should be of the very best, since the development of the taste for the beautiful in the outline and proportion of the objects and in their decoration, is one of the prime ends to be sought in this kind of drawing. But the learner should by no means, be limited to drawing from copies; he should be often exercised in the production of original design, both for objects and ornament. He thus acquires facility in making intelligent applications of whatever principles he may have learned, and learns to draw and to design, at the same time. Indeed, original design is the best proof that one understands the principles of design, as original composition in the best proof that one understands the principles of grammar and rhetoric.

The very great industrial value of drawing two dimensions has now been shown in a general way. Its educational value is also very great Yet there are not a few persons, who, regarding themselves as specially wise in matters which pertain to drawing, cry down all drawing that does not carry the eye below the surface of the paper,—that does represent the three dimensions.

DRAWING THE THREE DIMENSIONS.

When we come to representing the three dimensions,—length, breadth, and thickness,—then perspective and and all the other effects of chiaroscuro are in order, or not, according as we desire simply a pictorial result, an end in itself, or to make a drawing for the guidance of