or reading. The speaker then summarized the educational advantages of drawing, as follows: I. It brings into active use certain faculties and powers of the mind, which can be reached to an equal extent in no other way. For example: correct ideas of proportion and scales are developed, the graphic memory is improved, accuracy in observing is promoted, the powers of description are increased. Although drawing is a universal language, yet few are able to use it. II. Drawing facilitates the acquirement of the simple elements of education. For example: spelling demands a power of remembering the look of words, since in English the sound is not always a trustworthy guide. The improvement of the graphic memory will aid in learning to spell. Again: a child may be taught to draw before it is possible or desirable that he should learn to write. The pen is the worst of drawing-tools, and should not be the first to be put into the hands of children. The earlier use of simpler drawing instruments will facilitate learning to write. Again: drawing teaches the arithmetic of space, as figuring teaches the arithmetic of numbers. There is no reason why the child should be taught one and not the other. The arithmetic of space may be taught as soon as a child can use a ruler and can understand something of drawing to scale. Furthermore, facts which in figures make no appeal to the mind can be readily grasped by means of drawing, especially if these are made by the pupils themselves. In all these ways drawing actually improves the mind's capacity for learning other subjects.

As a rule, the teaching of drawing is in a very backward state; for art teachers, so called, as a rule are poor teachers, and the whole instruction in this branch has been hampered by the prevalent belief that no one should learn drawing who has not a special talent for it. Then, too, collective methods of teaching have not been properly developed. To accomplish the last-named object, it is essential that the members of the class be so arranged that each one can have approximately the same view of the object to be drawn. Object-drawing is the most difficult branch of the subject to be taught collectively, but it can be done. For good class-teaching of object-drawing, three vital principles must be observed: (*a*) the object must be a large one, that all can easily see; (*b*) all members of the class must obtain approximately the same view of the object; (*c*) the teacher must be acquainted with class management and with the subject, and able to demonstrate principles and methods with ability and enthusiasm.

Mr. Ablett then presented the pedagogic aim of drawing in the different grades. In Class 1 it is, (1) to develop accurate observation, (2) to connect writing and drawing, (3) to ward off color-blindness, (4) to cultivate the perceptions, (5) to teach outline-drawing from real objects which present no difficulties in foreshortening; in Class 2, (1) to call attention to the difference between the real and apparent forms of simple objects and curves, (2) to cultivate the graphic memory, (3) by the dictated drawing to insure a knowledge of art terms and give facility in working from verbal instructions; in Class 3, to teach the leading principles of drawing in outline from the things of every-day life; in Class 4, to develop a useful power in drawing from rounded objects (plants and casts) that will serve as a stepping-stone between drawing from simple objects and drawing from the antique; in Class 5, to give a knowledge of shading from real things (this will assist the pupil materially in acquiring the principles of painting, should he ever want to do so); in Class 6, to enable those who have passed through the preceding classes to begin the study of the higher branches of art.

From the character of the discussion that followed Mr. Ablett's excellent paper, it is easy to see that the English schoolmasters are far behind our own, so far as understanding and appreciating drawing are concerned.

## CASE SCHOOL OF APPLIED SCIENCE.

LEONARD CASE, the founder of Case School of Applied Science, was one of the few wealthy men who continue in after-life the literary and scientific work begun in college. Inheriting a large estate, he was relieved from the necessity of turning his acquirements to account in making a living, but he was nevertheless a lifelong student. He was one of a group of young men, who, under the leadership of the famous Dr. Kirtland, formed the Cleveland Natural History Society, and accomplished such excellent work, as is shown by their publications, and by the large collections now in the rooms of the society.

In general literature he was a careful student, and he was a writer of marked ability. His natural tastes, however, led him to give most attention to mathematics and natural science.

Prizing education and culture, he determined to do what he could for their advancement. His first gift to Cleveland, in pursuance of this idea, was Case Library, — a splendidly equipped and endowed institution, and, by the courtesy of its trustees, a valuable adjunct to the School of Applied Science. The magnitude of this public benefaction was, however, far surpassed by his later and more munificent gift for the school.

His deep interest in his favorite studies led him to desire that others should have an opportunity to pursue them under even more favorable conditions than he himself had enjoyed, and to that end he determined to found and endow a scientific school of high grade.

On Feb. 24, 1876, he executed a trust deed, setting apart certain lands to endow a scientific school in the city of Cleveland. In the trust deed he directed the trustee, Henry G. Abbey, "to cause to be formed and regularly incorporated under the laws of Ohio, an institution of learning, to be called the 'Case School of Applied Science,' and located in said city of Cleveland, in which shall be taught, by competent professors and teachers, mathematics, physics, engineering (mechanical and civil), chemistry, economic geology, mining and metallurgy, natural history, drawing, and modern languages. . . . And without intending to make it a condition or limitation of this conveyance, or any binding restriction upon the power of such trustees, the said grantor does hereby recommend to them to hold said property without alienation, and apply the rents, issues, and profits thereof to the uses and purposes above, and that the expenditures for such institution be not permitted to exceed the annual income derived from said property."

The value of the property thus dedicated to the cause of scientific education was about a million and a half dollars. It consists of real estate, a considerable part of which is centrally located in the city. One parcel is the City Hall Block, including both the building and the land; another is an entire block of land cornering on the City Square; and still others, of blocks of land less centrally located. The trustees have followed the recommendation of the donor, and have adopted the policy of leasing the land, so that a secure and increasing income to the school is assured.

After the death of Mr. Case, Jan. 6, 1880, the school was incorporated, and in 1881 instruction was begun in the old Case homestead near the City Square. The addition of new departments of instruction, and the rapid accumulation of apparatus and appliances for the laboratories and class-rooms, soon rendered more ample accommodations necessary. An admirable site was procured for the school on Euclid Avenue, opposite Wade Park; a commodious building was erected from designs by John Eisenman; and in the fall of 1885 the school took possession of its new quarters.

On Wednesday, Oct. 27, 1886, the new building and all of the valuable collections it contained were destroyed by fire. The trustees and faculty of Adelbert College generously offered rooms for the use of the school in a dormitory building standing very near Case School, and recitations and lectures were resumed on the following Monday, work having been suspended but three days. A temporary laboratory was erected for immediate use, instruments and apparatus were procured for the class-rooms and laboratories, and the work of the classes proceeded with comparatively little interruption.

The school is greatly indebted to the well-known mechanicians, Warner & Swasey, the Brush Electric Light Co., and several citizens of Cleveland, for valuable assistance in refitting the laboratories, and in replacing the library and the collections in geology, mineralogy, etc.

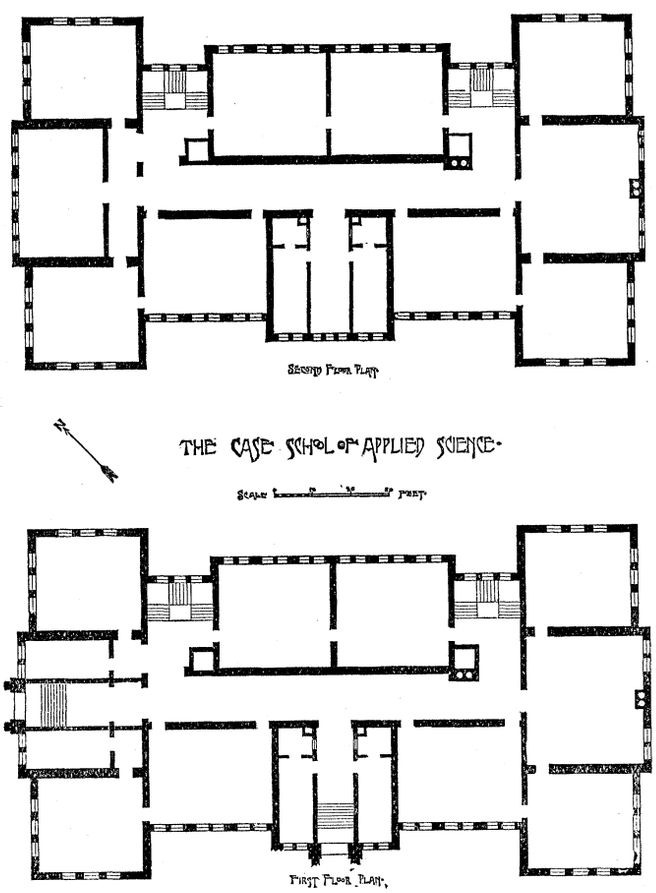
Meanwhile the reconstruction of the burned building was pushed as rapidly as possible. The trustees, with characteristic Western energy, ordered its reconstruction before the fire was entirely extinguished, and the contractor began work while some of the stones were still too hot to handle.

The building, as left by the fire, consisted of bare walls, badly

broken, with some of the dormers and gables still standing in a damaged condition. Upon inspection it was found necessary to take down all above the main cornice, and about half of the walls. The material of the walls below the cornice was found to be in such good condition that all of this work was replaced according to the original design, except the tower. The entrance to the tower, not being badly damaged, was taken down, and replaced with only a slight alteration in the roof. The tower and every thing above the plancier of the main cornice are of different design from the corresponding parts of the original building. Before any new work proceeded, the board of trustees, in connection with their architect, Clarence O. Arey, discussed each point, so as to obviate as far as possible the defects that had been found in the former building.

The outside walls of the building are a combination of rock-faced ashlar and brick backing, except in the dormers, which are of solid stone. The stone used is Amherst, O., sandstone. All of the partition walls are of brick. The floors were formerly of wood, but are now to be thoroughly fire-proof, — of iron girders and tile arches. The roof was formerly of light timbers close together. Now it is built of heavy timber, according to the 'slow-burning' method of construction, and is slated with Maine slate. The flashings and gutters are all of copper. The ridge-rolls, and front and under faces of the upper mouldings of the cornice, are of galvanized iron. This is used only where it is easily replaced or very little exposed. The tower is now temporarily roofed with a flat, pitched roof at the top of the stone-work, and only part of the carving shown in the drawing is completed.

A general view of the reconstructed building is shown in the accompanying illustration. It has a ground plan 161 by 92 feet, and




consists of three stories besides the basement and attic. The basement is arranged for heavy machinery, laboratories, and workshops. The remainder of the building is designed for class-rooms, drawing-rooms, and cabinets for collections, etc. The boiler-room is outside of the walls of the building, to avoid danger from fire or explosion. The chemical laboratory, which also contains the furnaces for assaying, is in a separate building. Every precaution has been taken not only to render the building fire-proof, but to keep fire entirely out of it.

The educational interests of the school have been carefully attended to. The school is well organized, and is supplied with a strong corps of professors.

The preparation required for admission is such as is given by the best high schools and academies. The studies pursued in the school consist principally of modern languages, mathematics, natural history, natural science, and engineering. The school provides courses leading to the degree of bachelor of science (B.S.) in civil engineering, mechanical engineering, mining engineering, electrical engineering, physics, and chemistry. While advanced theory occupies an important place in all of the courses, the methods of instruction incline decidedly towards the practical. Laboratory, shop, and field work are prominent features of the various courses.

Original investigations both by professors and students are constantly in progress in the various departments, and some of the published results are valuable contributions to the advancement of science. Just at the present time scientific men are deeply interested in some investigations now in progress in the school, preliminary statements in regard to which have already been published.

The city of Cleveland affords unusual advantages for a scientific school. It is an important railroad centre and lake port, and offers excellent opportunities for studying the various engineering problems connected with transportation. It is the centre of extensive mining and manufacturing interests. It has chemical works, steel-works, rolling-mills, furnaces, forges, machine-shops, and manufactories of electric machines and appliances, and of various other sorts. These, in many cases, are the most extensive of their kind in this country, and their variety is noteworthy. Almost all varieties of engineering structures and of manufacturing processes can be seen in the city, and are available for examination and study by the students. These advantages, and their influence in insuring the prosperity and usefulness of the school, were fully appreciated by Mr. Case, and had no slight weight in influencing him to found the school.

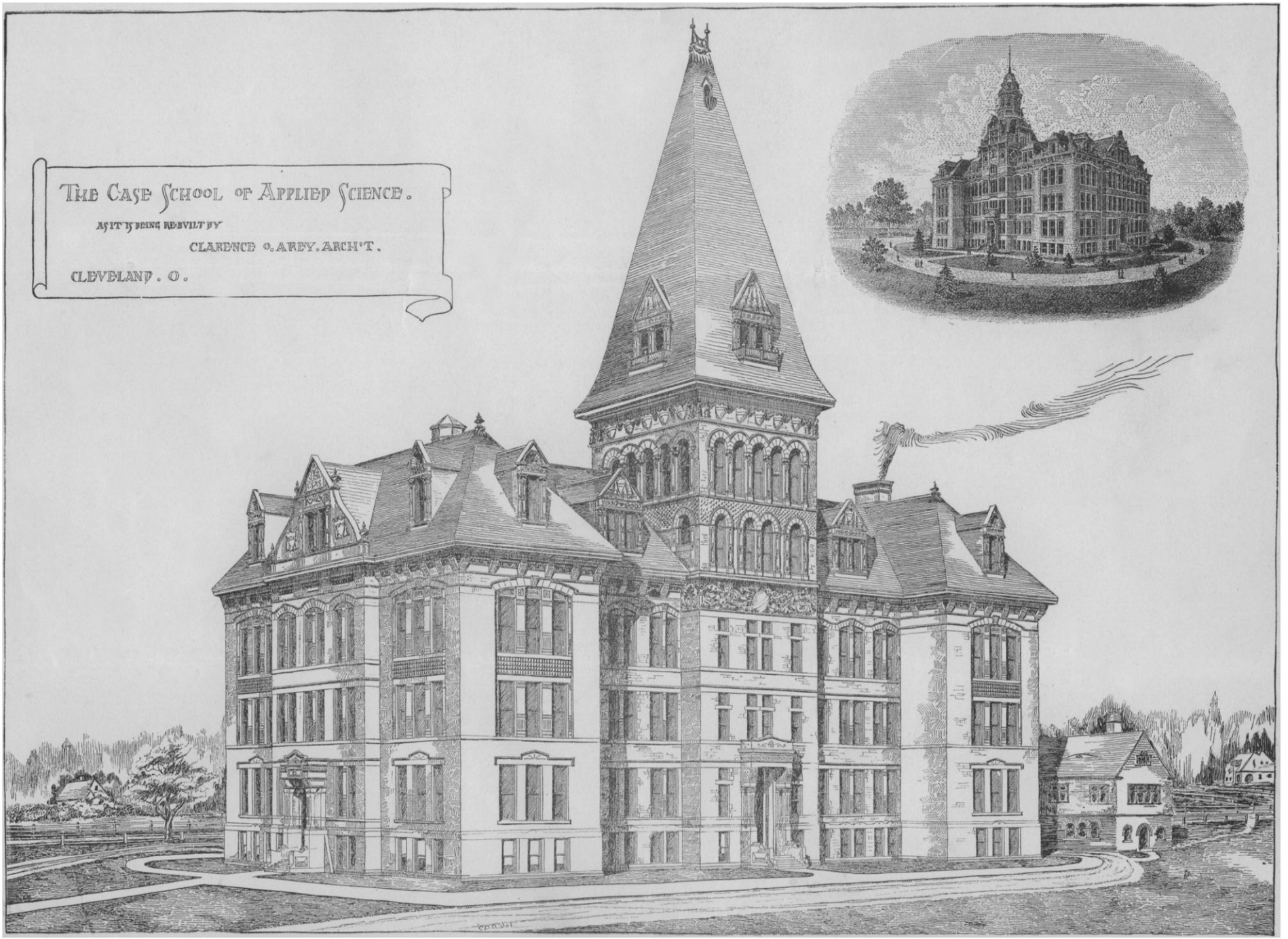
## ETHNOLOGY.

### Prehistoric Researches in South-eastern Spain.

TWO Belgian engineers, Messrs. Siret, are about to publish the important results of their extensive archæological researches in Spain, which extend over the coast from Carthagena to Almeria. The oldest remains belong to the neolithic period. There is not a trace of metal to be found in these ancient habitations. The implements consist of polished axes, perforated shells, pottery, grinding-stones, chipped flints, and primitive walls of stone. In another class of sites which belong to a more recent period, remains of copper and a few bronze implements were found. The inhabitants lived in stone houses, the stones being cemented by earth. Flint implements, particularly arrow-heads and knives, ornamented pots, bone points, and numerous copper celts, were found in the houses. Cremation was practised to a considerable extent by the people of that period. Copper ores and scoriæ proved that they practised the art of smelting.

In a later period fortified villages, with walls made of stone and mud, were built on the tops of the hills. In the space surrounded by the walls, the ruins of burnt houses, implements, remains of grain which was kept in clay pots, cloth made of broom, and hand-mills, were found. Flint was used only for making saws. The dead were buried in natural caves, or in stone boxes under the houses or near them.

At the end of the copper period the inhabitants still lived on the tops of steep hills, in fortresses. The implements consisted of the same material, but, besides, moulds for casting copper, ivory, gold, and silver were found. Over twelve hundred graves belonging to this period were opened. All of them were situated in the houses, and consisted either of small chambers of stone, of stone boxes, or of huge clay pots with rounded bottom and wide mouth. The largest of these are over three feet long and two feet wide. The skeletons are doubled up, hands and knees being pressed against the chin. Sometimes husband and wife are found in the same urn. The study of this vast amount of material will be highly interesting.


THE CASE SCHOOL OF APPLIED SCIENCE.
AS IT IS BEING REBUILT BY
CLARENCE O. AREY. ARCH'T.
CLEVELAND. O.