by only a few persons) encloses a land area of 774,000 square miles, and adding only half as much more for the ocean and gulf makes the disturbed area very nearly as large as that given by Reclus for the great Lisbon earthquake of 1755. Indeed, the state department has reported one reliable observation showing that it reached Bermuda. The irregularities of the isoseismals are, of course, due to the varying geologic and topographic structure of the country, and will well repay a more careful study than we have space for here. The rapid loss of energy in the sands and alluvial deposits of the north-east coast and lower Mississippi valley is especially noticeable. The isolated areas of different intensities, too, are typical of cases which would be very numerous were it possible to plot intensities in great detail, instead of only indicating the general features of their distribution.

The coseismals were determined by many very reliable and consistent but non-instrumental observations, the most accurate being from points in that part of the disturbed area north of a line from Jacksonville, Fla., to St. Louis. For the most part, high velocities of wave-transmission are indicated. Where the lines are somewhat crowded, it must be owing, at least in part, to the earlier tremors having failed to reach so far; so that a later phase of the wave was successively felt and recorded. The general use of standard time has added greatly to the reliability of these observations; and, on the whole, we may perhaps be justified in feeling a certain sense of self-satisfaction, in view of Mallet's remark, that "the accurate measurement of time is one of the surest indications of advancing civilization."

At the present age of this young and interesting science, probably the most valuable results will be obtained from observations made at numerous points in a selected district, with some simple instruments which will accurately record the time, number, and duration of every shock that occurs.

TECHNICAL AND MANUAL TRAINING CLASSES OF THE SOCIETY OF DECORATIVE ART.

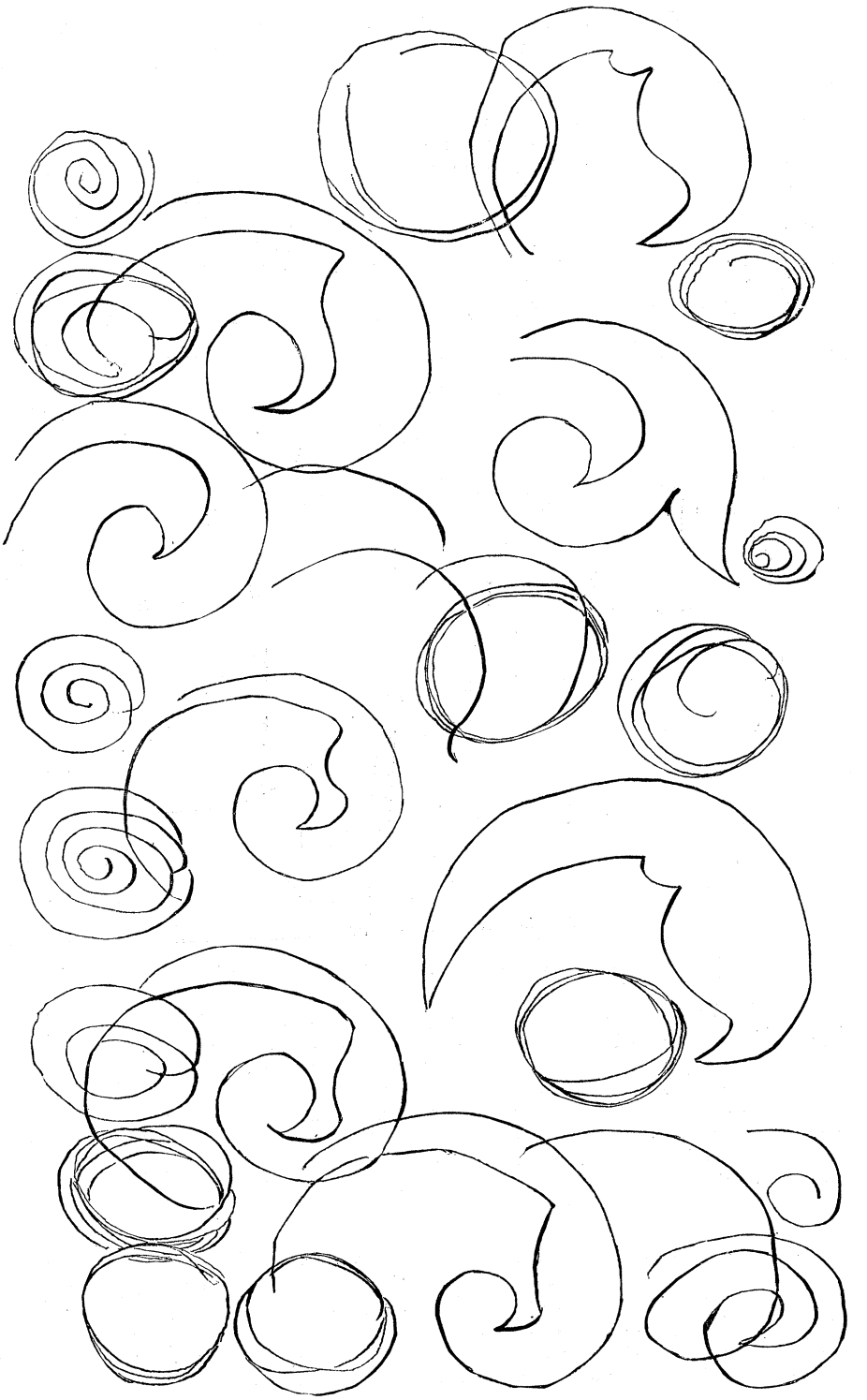
IN the autumn of 1885 the Society of decorative art of New York, desiring to extend its educational advantages, opened an art-school, where men and women, boys and girls, might be trained in the principles of art, and in the rudimentary steps of various art-industries. The first season was one of much usefulness and encouragement, and the second opens with promise. The school is centrally located in West 22d Street, Nos. 37 and 39. An important feature of the school, in addition to classes in drawing, painting, modelling from life, from still-life, and from the antique, is a special department in manual training, as applied to practical designing, modelling in clay, wood-carving, and metal-working.

In considering the plan of instruction of this new school, the fact must be borne in mind that the work of the Society of decorative art has, from its inception, been distinctively educational. The object of the society was to develop art-industry in America; to extend among women the knowledge of art-needlework, and its adaptation to household decoration; to provide instruction; to lend books; to give helpful criticism for the guidance of those at a distance; and, in addition, to furnish a salesroom where artistic work might be brought to the notice of purchasers.

In the brief period of its life, — less than ten years, — the society has faithfully striven to accomplish these purposes. A standard of color-design, workmanship, and adaptation, has been created through its influence, — an influence which is felt in every home throughout the country, and may be recognized in the wares of the humblest shop where decorative materials are sold. Needlework was almost a lost art, so entirely had the sewing-machine triumphed: it has already taken a place among art-industries. Hundreds of women have been trained by the society, and have gone forth to earn a living and provide homes for themselves and those dependent upon them.

The demand of the age is for workers — men or women — who can 'do.' The artisan who has command of head and hand alike is the one who is sure of success. Human machines can have no chance in competition with those who are intelligent in their work. Head-craft and hand-craft combined give to the worker a solid stone on which to stand. The society's department for technical and manual training provides just this education. Classes have been formed where boys and girls are taught to think and do; to use brain, eye, and hand together, that they may become intelligent and disciplined workers.

The school is fortunate in having secured the services of Mr. J. Liberty Tadd as director, who brings to his work an enthusiasm and confidence born of success. The keynote of his teaching is, that everybody has capacity in some direction. Training will develop the peculiar aptitude. The earlier in life this work of training begins, the better for the pupil. The child, restless and impatient, is eager to try its hand, and welcomes a suggestion to 'make something.' This desire is gratified and directed, interest is held, ambition stirred, and thought developed. The result is calm, quiet growth, an appreciation of labor, a

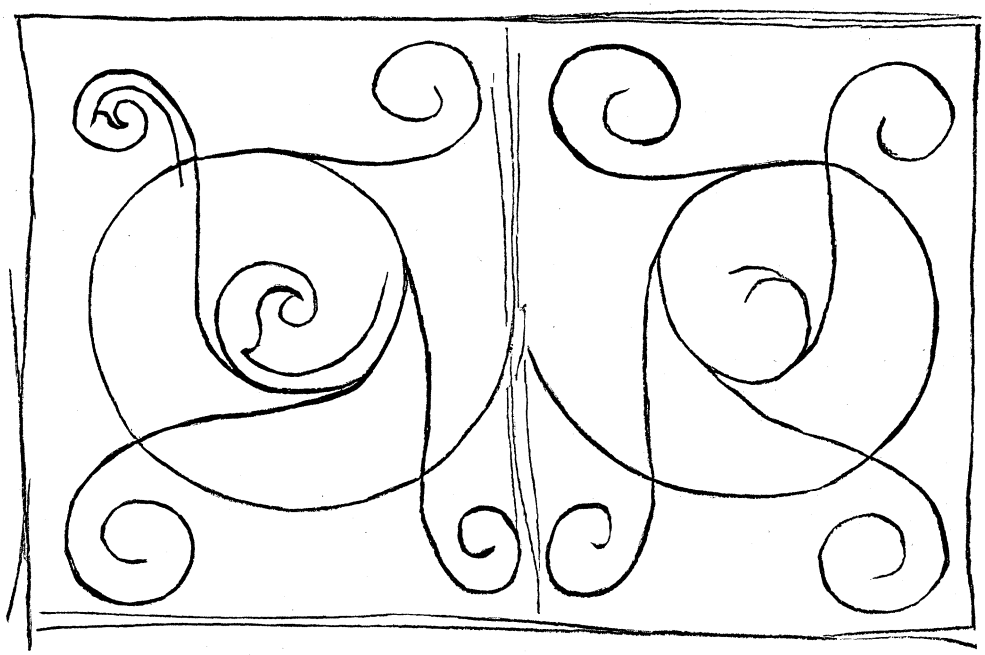


ELEMENTARY PRACTICE AT THE NEW YORK ART-SCHOOL (slightly reduced).

knowledge of material, and an ability to both plan and execute that is surprising. Children cannot be made interested and enthusiastic by abstract ideas. They must see, to know.

At the foundation of technical study lies practical designing. Some knowledge of its principles is necessary in almost every pursuit. The acquisition of this knowledge, and reasonable skill, may be easily obtained without special gift or artistic talent. Let us take, for example, one of the free classes. These meet three evenings of the week. The students are ranged on either side of long tables, each of which commands a view of the large blackboard. In front of each pupil is a sheet of clean brown paper, a piece of rubber, and a pencil.

The instructor draws upon the blackboard with a piece of chalk the elements of all drawing or design, — three lines, straight, diagonal, and curved. He explains that the first step in drawing is to learn to put these down with free sweep of the hand, — no piecing out or adding to a broken, given-out line. Many attempts are made, and many sheets of paper covered with crude efforts, to catch the proper knack or to acquire steadiness of hand. But paper is cheap, and the struggler is not limited by material. The hand has naturally more facility in some directions than in others: this tendency must be controlled, and evenness of action developed. It cannot be done all at once. Then comes the second step. The elementary lines are to be combined into certain forms, — motives of the Persian, Egyptian, Greek, Roman, Moorish, modern French, or any other school of design chosen by the instructor. These forms are drawn upon the board: the pupil repeats them on the side of his paper. He has now a leaf as his dictionary, and will in time learn the peculiar characteristics of each school of ornament. He is asked to take the forms given, to enlarge, combine, and repeat them in a pattern which shall be suitable for something, — sofa-cushion, frieze, mantel-tile, church-panel, or locomotive plate. The pupil is called upon for a mental creation. He draws a square or rectangle and locates the central point, from which and around which the intervolutions of his pattern are to be arranged. At this stage he is apt to find himself rather dazed and helpless. He is obliged to think definitely.

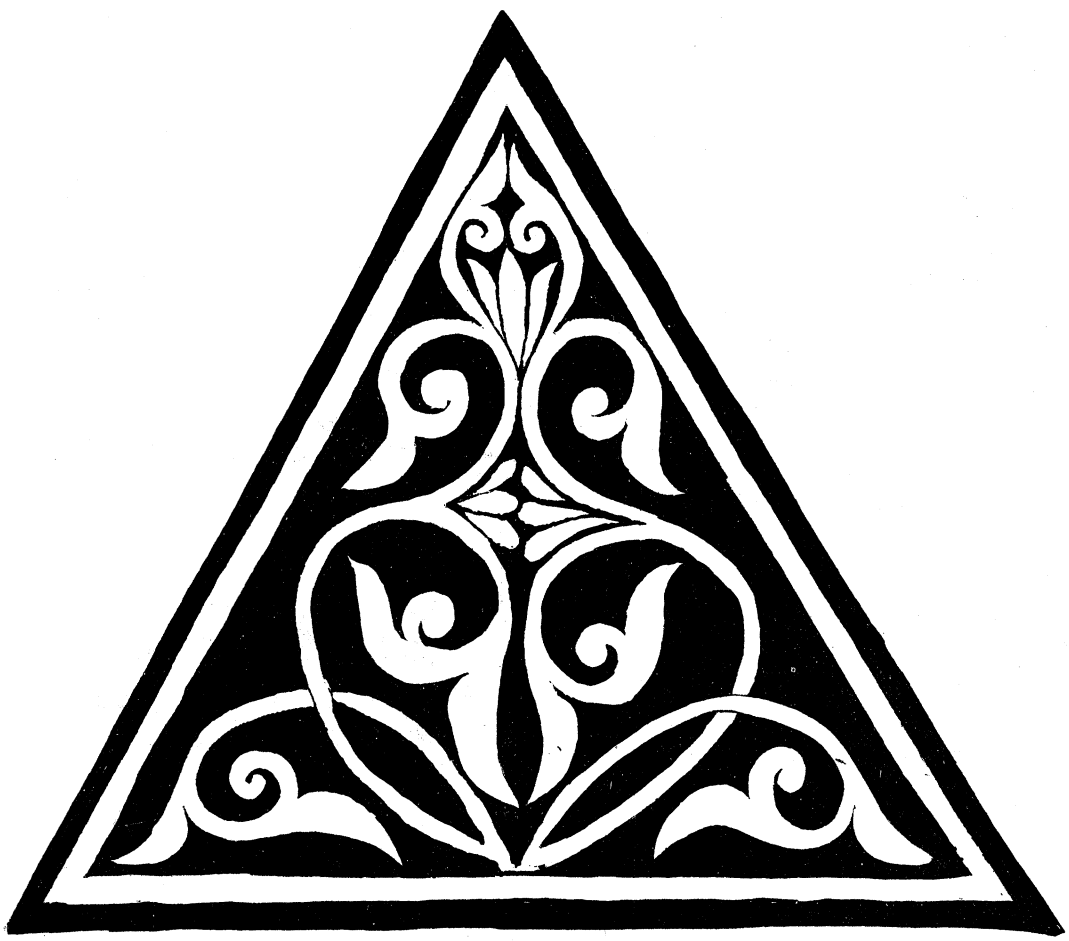


A BOY'S (AGE 11 YEARS) FIRST DESIGN (same size).

He is assisted a little, and his ideas brought into shape by the question, 'For what do you propose to make a design?' Usual answer, 'A panel.' 'That is too indefinite: a panel for a door, wainscot, ceiling, sideboard, desk, or chair-back?' Suppose the decision to be a sideboard. Then follow the questions, 'How many panels are there to be?' 'Are all to be the same shape and size?'

'Is the design to be carved in relief, or outlined on the wood?' etc. When the thing has been so variously and closely considered, the pupil has quite distinctly a mind-picture of his sideboard, and he sees his design, or the one he means to make, in its place, reproduced in material. He knows exactly what he wants to do, the leading thought being the adaptation of his design to the

The designs are drawn in narrow ribbons or spaces about half an inch wide. When the pattern is finished, to make it more vigorous, it is thrown into relief by blackening the background. This is done with India ink and a brush. This is a lesson in accuracy. To follow the curves neatly, preserving a strong, clean outline, is no easy matter. A free, steady, and true hand is needed.



THE BOY'S SECOND DESIGN (one-third size).

place and material in which it is to be given permanent shape. The first result is crude, and unworthy of his own thought, but day after day the improvement is marked. With deftness of hand comes strength and vigor of conception. The same motives will weave themselves into a hundred different combinations; and yet, through all the deviations and intricacies of a geometrical figure or Arabesque scroll-work, may be seen the original elements.

The best work is marked for inspection, and placed against the wall. In three months' time there is usually a display of much artistic value.

As yet, the work has been only on the flat surface. The pupil must go further. When a good design has been made, the important requisite is to give it form, to 'put it into the round' by repeating it in clay. Here the work is tested in the cheapest possible material, and here the pupil learns to use his hands in earnest. Artist and

artisan meet in the modelling-room, for in this reproduction the truth of art is found. In the dividing, handling, and manipulation of material their use is learned, and with this knowledge comes power. Fidelity, experience, and skill acquired in the use of clay give double value to the later work in wood, iron, brass, copper, stone, or marble.

When the student repeats his conception in the clay with his own hand, when, instead of a flat surface, his work takes form, he learns its minute details, and sees what lack of fitness there may be in the design. He is trained also to a system of

MODELLING FROM LIFE.

'values,'— the value of material and of labor. He learns that it is the skill of the artisan which gives value to material. The modelling-room makes flexible and develops every muscle of his hand and wrist.

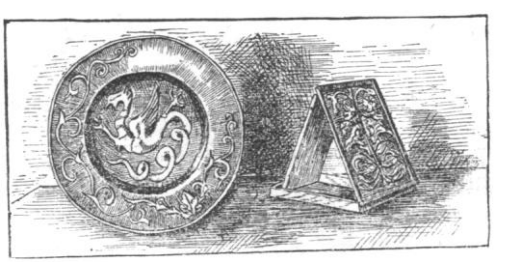
The school attempts no graded course at present. The pupil, however, who undertakes wood-carving or metal-work without some knowledge of design, can never be an independent worker. The first need when he takes up his panel or his sheet of copper or brass, before a tool is handled, is ability to draw thereon a pattern.

Many specimens of wood-carving and metal-work done by students can be seen at the schools, as well as the actual processes themselves. The woman who takes fifty cents' worth of oak, or eighty cents' worth of mahogany, and can add to it as it passes through her hand such beauty of carving that its value is increased a hundred-fold, has a power that is worth something. The range of wood-work is unlimited. Panels, mirror-frames, a substantial wood-box, a massive hall settee with antique scroll-work, are made, all with ornamental carving. In the metals, among the many articles made, are brass finger-plates for doors, silver napkin-rings beautifully chased, copper plaques, Arabesque corners and hinges for boxes, tables, and so on.

It is a painful truth that not all the men and women who set before themselves an artist's career can or do succeed. But talent and industry may raise a man or woman from the rank and file into distinguished standing, both in the minor or industrial arts and in the higher fields of sculpture and painting. The two departments stand in a helpful relation to each other, and should be so considered.

This is the stand-point from which the art-school of the Society of decorative art is working. The classes of the industrial and technical department are free three evenings in the week. One of these evenings is to be given particularly to the instruction of those who wish to become teachers. The day classes, held morning and afternoon, have a moderate charge. The studios are open, and free to students for practice, every day.

A small but carefully chosen library has been opened this season, where, in a bright room, the



SOME OF THE RESULTS.

pupils may have access to books and current art-literature, foreign and American, with opportunity for quiet thought and study.

The motive of the whole system is true education, and intelligent work on the simplest, most practical principles. No attempt is made in the technical and manual training classes to specialize. A boy or girl is simply prepared for life, ready for any trade to which they may be called, in command of self, with a knowledge of what can be done, and a power to do it accurately, intelligently, and skilfully. But leaving out all question of artist or artisan, there is a discipline, a culture, and a training of the powers of observation, that are of inestimable value in after-life.

From time to time during the winter, lectures are given at the school upon subjects connected

with the studies. Visitors who wish to see the work of the school will find the studios open each day from nine until twelve in the morning, and from one until four in the afternoon. The free classes are taught from half-past seven to half-past nine, Monday, Tuesday, and Wednesday evenings of each week. EMMA MOFFETT TYNG.

RIO DE JANEIRO LETTER.

THE scientific movement of Brazil can afford but little matter of interest to the outside world. Within the last few years a few isolated workers have succeeded in making their names known beyond the limits of the country, but for the present they are too few to have established any noteworthy centres of scientific thought, either in the way of societies or periodicals. Outside of the medical profession, which maintains a very creditable society and one or two special journals, the spirit of association has taken the direction mainly of organizing geographical societies, of which Rio de Janeiro boasts of three,— the old and highly reputable though decidedly fossilized Historical, geographical, and ethnological institute, the more recent Rio de Janeiro section of the Lisbon geographical society, and the Rio de Janeiro geographical society. Each publishes its review, mainly valuable on account of the insertion and discussion of old and little-known documents, recent contributions of importance rarely appearing. This abundance of geographical societies is not due to a superabundance of active workers, but to a sudden outburst of enthusiasm and fraternal good feeling, awakened by a visit from the Portuguese explorer of Africa, Major Serpa Pinto. On this occasion Brazilians and Portuguese united in founding a section of the Lisbon society to commemorate his visit. National rivalries soon appeared, however, and led to the withdrawal of a portion of the Brazilian element to found the Rio de Janeiro society, which, of the three, appears at present to possess the most vitality and promise of usefulness.

The other scientific publications are the *Archivos do museu nacional*, of which six volumes have been issued, containing articles on archeology, anthropology, zoölogy, and geology, contributed mainly by the officers of the museum; the *Annals da Escola de minas de Auro Preto*, of which the four volumes published are mainly devoted to metallurgy and mineralogy; and the recently established monthly *Revista do observatorio*, which is taking a very useful direction in the collection of meteorological observations from various points of the empire. Private enterprise in the publication of scientific journals has taken the direction of technical reviews for engineers and architects, of which three are published. In the absence of other organs, articles of general science are sometimes inserted in these, particularly in the oldest and best established of them, the *Revista de engenharia*. The last number of the *Archivos do museu*, issued near the end of last year, contained profusely illustrated articles on the extraordinary ornamented pottery of the mounds of Marajo. The next volume, to be issued shortly, will be devoted to a memoir by Dr. C. A. White of Washington, on the Brazilian cretaceous fossils, and will undoubtedly be the most important contribution ever made to South American invertebrate paleontology.

Since the beginning of the present year, three official commissions have been organized, from which results of some value may be expected, and of which notice has already been given in *Science*. The first in point of time is for a geographical and geological survey of the province of San Paulo, on the plan of the U. S. surveys of the territories, under the charge of Prof. O. A. Derby of the national museum. The first work undertaken was the exploration of the second largest river of the province, the Paranapanema, tributary of the Parana. The party, consisting of Dr. Theodoro Sampaio, geographer, with Dr. J. W. Aguiar as assistant, and Dr. Paula Oliveira geologist, embarked on the upper river May 22, and has only just returned, having traversed about 900 kilometres of difficult river in a sparsely populated, almost desert region, and about 500 kilometres by land, all in a region that had never before been scientifically examined. The river was found to be full of dangerous falls and rapids in its middle section, of the extension of about 120 kilometres, but comparatively free from obstruction in an upper section of 200 kilometres, and a lower section of 309 kilometres. The latter section promises to become an important link in the system of internal communications with the distant province of Matto Grosso. For over half its course, the river flows through a region of bedded traps, presumably of triassic age. The chief of the commission has been engaged in the examination of a remarkable development of nepheline sienites, occurring in several points of the province, and in such intimate association with typical volcanic rocks, tuffs, phonolites, trachites, nepheline, leucite, and olivine basalts, as to establish the volcanic character of the whole group. The passage of nepheline sienite to phonolite is clearly demonstrated, and leucite rocks are reported for the first time in South America.

A second commission, appointed by the minister of agriculture, is for a study of the disease of