

ley, and Dufferin Schools, seeing the different classes of boys and girls in each.

The same course is pursued in all the schools, and as all the classes, young and old, began drawing at the same time, what is said of one class will at present apply to all. In another year, when those who have commenced to draw in the junior class continue it in the senior ones, we shall be better able to judge of their progress.

Not very much time is given to drawing. One regular teacher of drawing is employed, who gives a lesson of fifteen minutes once a week to each class, putting the subject for the week upon the black-board. This is continued by the ordinary teacher, under whose direction fifteen minutes every day is appropriated for drawing. The system adopted is in the main that used in the Public Schools of Massachusetts; the copies and text books are the ones used there, and are all admirable in their way.*

The object principally aimed at, while training the hands and the eyes of the children, is to teach them to think, and to make them understand that they have, each of them, original inventive faculties, and capacity for original design. The pupils draw first upon slates, and afterwards with pencil upon paper. They begin with lines and geometrical forms, going on with curves, conventional forms of leaves and flowers, and simple ornamental patterns. From the first they are made to repeat the exercises from memory, and encouraged to make original design, or to vary at pleasure the form given. For instance, the lesson may be a clover leaf, trefoil. They are asked to arrange this in a continuous pattern, or to fill in a square or circle with it, or make some arrangement of it. The delight that the children take in these exercises, and their ingenuity and taste in this form of design, is wonderful, and a remarkable thing that we observed was that the very young children did as well as the elder ones, all having begun at the same time. This coincides with the published opinion of a distinguished authority upon art education, who gives as his experience that children have a natural faculty for design, which, if not cultivated, becomes dulled and obliterated with advancing years.

The kind of drawing thus happily introduced into the Public Schools of Toronto, while being the best basis for any kind of art has a distinct industrial application. It is better training for after life in any kind of handicraft than anything else they learn at school, except reading, writing and arithmetic, and it is as useful to them as any of these, without interfering with them. It will not be long before the example thus set in the schools of Toronto will be followed all over Canada, and the sooner the better.

One point which has been solved is the question whether ordinary school teachers, who have not learned to draw, can teach drawing. I should have supposed not, but they are doing it with the assistance I have described, and doing it, at least the elementary part, effectually. That they could do it much better if properly taught themselves is undeniable; but this must be a work of time, even if a Normal Art School were organized at once, as it should be. Meanwhile it is a satisfaction to know that much can be done, and is being done, with the materials that we have.

The Ontario School of Art has offered a scholarship as a prize to the best pupil in drawing of each of the three Public Schools of Toronto, and the Council is desirous to do the same with other schools throughout Ontario that may take up elementary and industrial drawing in the same efficient way.

I may mention one point in which the Schools of Toronto now compare favorably with those of my young days. Then school-boys were considered and treated as beings in a state of barbarism, with only one faculty to be cultivated—the memory, and only one instrument of cultivation—the cane. Now boys are treated as civilized beings, or as beings capable of being civilized. The school houses are surrounded with trees, grass and flowers; flowers and birds are in the school rooms, and under their care. In short their better instincts are appealed to, and their higher faculties cultivated. Perhaps eventually boys may even cease to be a nuisance.

I have the honor to be, your obedient servant,

L. R. O'BRIEN,

Member of the Council of the Ontario School of Art, and Vice-President of the Ontario Society of Artists.

Toronto, June 24th, 1879.

* Walter Smith's Drawing Books.

Mathematical Department.

Communications intended for this part of the JOURNAL should be on separate sheets, written on only one side, and properly paged to prevent mistakes. They must be received on or before the 25th of the month to secure notice in the succeeding issue.

GEOMETRICAL LOCI.

When a point is required which is to satisfy one geometrical condition, the problem is in general indeterminate, i.e., there is an infinite number of points which satisfy the condition. Thus, if a point be required subject to the single condition that it shall be at a given distance from a given point, it is evident that there is an infinite number of points which satisfy the required condition—in fact, that any point on the circumference of a circle whose centre is the given point and radius the given distance, is the required point. Or if a point be required subject to the single condition that it shall be at a given distance from a given straight line, it is clear that any point in either of two straight lines drawn parallel to the given straight line, on opposite sides of it and at the given distance from it, will be such a point as is required. *The assemblage of such points as satisfy the given condition is called the locus of these points.* Or we might give the following

DEFINITION.—When a line can be found such that every point in it satisfies a certain proposed condition, the line is called the locus of the point satisfying the proposed condition.

Thus in the example first given, a circle is the locus of a point at a constant distance from another given point; and in the second case, of two parallel straight lines, either is the locus of points at a constant distance from the other.

Illustrations of loci will readily present themselves:—

The locus of a point at a given distance from a given circle is evidently another concentric circle with radius greater or less by the given distance.

The locus of a point equidistant from two given points is a straight line drawn bisecting at right angles the straight line joining the given points.

The locus of a point equidistant from two given intersecting straight lines, is the straight line which bisects the angle between the given lines. For if AB, AC be the two given straight lines, and AD be drawn bisecting the angle BAC , and from D , any point in AD , perpendiculars DE, DF be drawn to AB, AC , then these perpendiculars are equal, because in the triangles DAE, DAF we have two angles in the one equal to two angles in the other, and the side AD common. Thus from whatever point in AD we draw perpendiculars these perpendiculars are equal, and AD is such a line that every point in it is equidistant from AB, AC , i.e., AD is the locus required.

In solving questions concerning loci the nature of the locus may generally be discovered by assuming the condition satisfied, and reasoning from the figure so obtained. Thus to find the locus of the middle points of all straight lines which have one extremity in a given point, and the other in a given straight line, we might let A be the given point and BC be the given straight line, and let D, E be the middle points of AB, AC , i.e., let D, E be points in the required locus. Then evidently (Prop. 2, Bk. VI.) DE is parallel to BC , and therefore will bisect any other line drawn from A to BC . Hence DE is the required locus.

The following are additional examples:

1. Find the locus of points at which two adjacent sides of a square subtend equal angles. (Evidently the diagonal of the square.)

2. Find the locus of a point such that the differences of its distances from two given straight lines may be of constant length.