WHITE'S

NEW COURSE IN ART INSTRUCTION

MANUAL

FOR

PRIMARY GRADES

BOSTON NEW YORK CHICAGO

THE PRANG EDUCATIONAL COMPANY

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PRIMARY GRADES

INCLUDING

OUTLINE BY LESSONS

WITH SUGGESTIONS FOR TEACHING

THE PRANG EDUCATIONAL COMPANY
BOSTON NEW YORK CHICAGO

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WHITE'S

NEW COURSE IN ART INSTRUCTION.

INTRODUCTORY.

WHITE'S NEW COURSE IN ART INSTRUCTION embodies the ideas and experience of many persons who, starting at widely separated points and working along different lines, have arrived almost simultaneously at the same conclusions.

It differs from other courses in plan, method, aims, and in its order of lessons.

I. **Its plan** comprehends the entire subject of art instruction, from which the several departments of the work and their subdivisions are derived. It follows, therefore, that the divisions are logical, natural, and recognized by established usage. Thus, the department of Geometric Drawing naturally and logically includes measurements, geometry, working drawings, developments, and, in short, the whole realm of mathematical, or instrumental, drawing. The department of Decorative Drawing embraces the study of color, historic ornament, botanical drawing, and the employment of the information thus gained in making original decorative designs, in paper-cutting, etc. Pictorial Drawing is the comprehensive term employed to cover all the elements of freehand drawing from regular solids, simple objects, sketching from nature, etc.

II. **The methods** employed are determined by the laws of the mind. Since the object itself impresses the mind more vividly and accurately than any representation of the object, models and objects take the place of pictures to be copied throughout the course; that is, pupils draw from real things, not from pictures. Since the mind acts according to certain laws, great care has been taken to correlate the various divisions of the

subject in order that the mind may pass naturally from one to another. Since different minds have individual peculiarities, great freedom is allowed the individual pupil in the application and expression of his own ideas; this, while adhering closely to underlying principles. Since the most rapid and substantial development of the mind occurs under intelligent guidance, an abundance of illustrative material is provided from which the pupils are led to discover principles, laws, relations, styles of handling, etc. These illustrations convey a great amount of information, but are in no sense *copies*.

III. **Its aims** are, first, to acquaint pupils with the rudiments of all kinds of drawing included under the two departments, mechanical and freehand, for the two are equally important, — one underlying all the industrial arts, and the other all the fine arts; therefore, provision is made for the related development of these two departments from the lowest grade throughout the course.

Second, to lead pupils to feel that, while art and love for the beautiful may be fostered by an artistic and beautiful environment, skill and power and quick original perception of beauty come only through faithful and persistent practice in drawing; for this reason correct proportions, accurate measurements, and exact truthfulness in drawing are considered of chief importance.

And, third, to develop a love for the beautiful in nature and in art. By the comprehensive study of color and form, it leads to mineralogy and other natural sciences; through historic ornament to mythology, ancient history, and historic art of all kinds; through plant form, to botany and original design; through model and object drawing, to pictorial art; and through the different divisions of geometric drawing, to manual training and all the manifold constructive arts.

IV. **The order of lessons** follows from the plan and aim of the course. While the teacher may modify any given lesson, suiting it to the needs of individuals or to particular classes, the general order should not be disturbed unless by omissions or additions which still recognize sound pedagogical principles. In this Manual three programs are provided: one for five lessons per week, and others for three and two lessons, respectively. Teachers will do well to adopt and follow one of these three plans without substantial change or modification.

THE PRIMARY COURSE.

ANALYSIS OF THE SUBJECT.

Drawing is the *representation of ideas of objects* by means of lines, light and shade, or color. Ability to draw implies: (1) a knowledge of objects, and (2) a knowledge of the principles underlying their representation. The first is acquired largely in the primary grades of school; the second, largely in the grammar grades.

1. OBJECTS.

All objects, whether natural or manufactured, have *color* and *form*. The color may be monochromatic or polychromatic; the form may be simple or complex. If the form of any object is simple, it is based on a type solid, on a division of a type, or on a variation of a type; if complex, it is composed of simple forms combined according to constructive or decorative laws. The work of the primary grades will therefore be considered under three heads: I. COLOR; II. FORM; III. ARRANGEMENT.

2. REPRESENTATION.

All representation of objects is either *Mechanical* or *Freehand*. In the primary grades, therefore, the elements of both mechanical and freehand drawing will be taught, that the pupil may be fully prepared to continue the work in the grammar grades. The course, from the first, aims at a symmetrical mental development in elementary art.

MATERIALS.

For Color.

The teacher should have a glass prism for producing the solar spectrum; a reproduction of the solar spectrum for reference; colored papers, showing six standards and twelve standard hues, with neutrals.

Each pupil should have small paper tablets, corresponding in color to those of the teacher. The colors for each year are as follows: —

1st Year. — Six standards (red, orange, yellow, green, blue, violet), four dark grays, and black.

2d Year. — Besides those of the first year, six standard hues, four light grays, and white.

3d Year. — Besides those previously studied, six new standard hues.

Bits of colored worsteds, silks, ribbons, and such natural objects as leaves, flowers, fruit, etc., collected by the children, will furnish valuable material for comparative study.

For Form.

Models. For the proper teaching of form, good type solids are essential. Each pupil should have, for individual use, during the primary course, the following models: —

1st Year. — Sphere, cylinder, cube, half-sphere, half-cylinder, half-cube.

2d Year. — Half-sphere, half-cylinder, half-cube, circular plinth, triangular prism, square prism, square plinth.

3d Year. — Ellipsoid, flat spheroid, ovoid, cone, pyramid.

Pupils should collect natural and manufactured objects based on the type forms, and compare them with the types.

Tablets. These are very helpful to the pupil in studying the faces of objects and their parts and relations, and in making original arrangements. Each pupil should have the following: —

1st Year. — Circles, semicircles, squares, oblongs $1'' \times 2''$, oblongs $1'' \times 1\frac{3}{8}''$, right-angled triangles.

2d Year. — Circles $1''$ dia., circles $1\frac{1}{2}''$ dia., semicircles, squares $1'' \times 1''$, squares $1\frac{1}{2}'' \times 1\frac{1}{2}''$, oblongs $1'' \times 2''$, oblongs $1'' \times 1\frac{3}{8}''$, oblongs $\frac{1}{2}'' \times 1\frac{1}{2}''$, oblongs $1\frac{3}{8}'' \times 2''$, right-angled triangles.

3d Year. — Circles $1''$ dia., circles $1\frac{1}{2}''$ dia., semicircles, squares $1'' \times 1''$, squares $1\frac{1}{2}'' \times 1\frac{1}{2}''$, oblongs $1'' \times 2''$, oblongs $1'' \times 1\frac{3}{4}''$, oblongs $1\frac{1}{2}'' \times \frac{1}{2}''$, oblongs $1\frac{3}{4}'' \times 2''$, right-angled triangles, ellipses, ovals, isosceles triangles.

Sticks. Colored sticks are invaluable in the first primary year, both in connection with the study of form, and in arrangement. They may also be used to advantage, for review and other purposes, during the second and third years.

Clay. The best sculptor's clay is preferable to any other. A cubical mass of this, six inches on a side, will supply a school of forty pupils with enough for a year's work. The clay should be wrapped in moist cloths, and, when not in use, kept in an earthen jar. When required for modeling, it may be cut into small pieces, of such size as may be needed for the lesson, by means of a fine, strong string, and distributed to the class. After the lesson, the pieces should be collected, sprinkled with water, swaged into a compact mass, wrapped in the moist cloths, and placed in the jar.

Paper. Three kinds of paper are required: (1) manilla paper for drawing; (2) colored paper for folding and cutting, etc.; (3) stiff manilla paper for the construction of objects. The size of the drawing paper should be $6'' \times 9''$; that of the other kinds is immaterial.

Pencils. Those best adapted to the primary grades are of small size and medium hardness, and they should be free from grit.

Erasers. These should not be used until the second or third year, and then only as directed by the teacher.

Rulers. The best rulers are those made especially for primary grades, divided only into inches, half-inches, and quarter-inches.

Scissors. If possible, each pupil should have a pair of blunt-pointed, four-inch scissors, of fair quality.

Glue. Liquid glue is better than mucilage or paste for use in constructing objects and in arrangements. For a lesson in construction, each pupil should have a card upon which is a drop of glue, and may use a stick, or a strip of oak tag, for a brush. The pupils should use no more glue than is absolutely necessary.

For Arrangement.

Sticks, *tablets*, *colored paper*, *scissors*, *glue*, *drawing paper*, and *pencils* are required for work of this kind. These have been described above.

All materials should be kept by the teacher in orderly groups, so that those required for a given lesson may be quickly distributed.

OUTLINE BY SUBJECTS.

FIRST YEAR.

I. COLOR.

1. Recognition of six colors.
2. Naming the colors.
3. Using the colors in arrangements.

II. FORM.

The Study of Type Forms, their Bisections and Details.

A. Analytical. *Expression* by oral description; construction.

Wholes. Model, using clay:

1. Sphere, and similar forms, natural and manufactured.
2. Cylinder, and similar forms, natural and manufactured.
3. Cube, and similar forms, natural and manufactured.

Parts and Relations:

a. Surfaces: curved; plane.
b. Faces: curved; plane.
c. Edges: curved; straight.
d. Corners.

Bisections. Model type forms and bisect, each part being a new whole:

1. Half-sphere, and similar forms.
2. Half-cylinder, and similar forms.
3. Half-cube, and similar forms.

} Teach: *bisect*, *center*.

Parts and Relations:

a. Surfaces: 1. Kinds — curved, plane.
2. Parts — faces.

b. Faces: (Use tablets.)
1. Kinds — curved, plane.
2. Number.
3. Shapes — circle, square, semicircle, oblong, triangle.
4. Location — right, left, top, bottom, front, back.
5. Positions — horizontal, vertical, oblique.
6. Parts — lines, angles.

c. Edges: (Use sticks.)
1. Kinds — curved, straight.
2. Number.
3. Location — right, left, upper, lower, front, back.
4. Positions — horizontal, vertical, oblique.
5. Parts — corners.

d. Corners:
1. Number.
2. Location — center, above, below, front, back, upper and lower right, upper and lower left.
3. Distances — 1 inch, 2 inches, 4 inches.

B **Synthetical.** *Expression* by drawing.

Points (representing corners).

Dictation exercises involving the representation of positions and distances.

Lines (representing edges).

Dictation exercises to obtain free and precise movement.

Geometric Figures (representing faces).

a. Tracing.
b. Drawing from dictation.
c. Drawing from object.

III. ARRANGEMENT.

Construct, using sticks:

1. Copies of historic frets.
2. Original borders.

Teach the following principles of Arrangement:

A. Repetition.
B. Alternation of position.

SECOND YEAR.

I. COLOR.

1. Recognition of six standards and six standard hues.
2. Naming the colors.
3. Using in arrangements — contrasted harmony.

II. FORM.

The Study of Type Forms, their Quadrisections and Details.

Expression by construction; drawing; oral and written description.

Wholes. — Reviewed. Teach the terms, { *length*, *width*, *height*, *compare*.

Quadrisections:

1. Quarter-sphere, and similar forms.
2. Quarter-cylinder, and similar forms.
3. Circular plinth, and similar forms.
4. Triangular prism, and similar forms.
5. Square prism, and similar forms.
6. Square plinth, and similar forms.

} Teach *quadrisect.*

Parts and Relations:

Review: { *a.* Surfaces. *b.* Faces, *c.* Edges } Teach *relation* { *parallel*, *not parallel = at an angle.* *d.* Corners. Teach *measurement* (using a ruler), 1″ to 12″ and ½″.

e. Angles: { Right = perpendicular. Oblique { acute, obtuse.

f. Triangle, and similar forms. Teach: *base*, *apex*, *altitude.*

g. Square, *h.* Oblong, } and similar forms. Teach: *diagonal*, *diameter.*

Note. — In drawing, give special attention to quality of line.

III. ARRANGEMENT.

Construct, using rectilinear figures:

1. Copies of historic borders and centers.
2. Original borders and centers.

Teach the following principles of arrangement:

A. Repetition: (*a*) linear (reviewed); (*b*) radial.
B. Alternation: (*a*) of size; (*b*) of form.

THIRD YEAR.

I. COLOR.

1. Recognition of six standards and twelve standard hues.
2. Naming the colors.
3. Using in arrangements — contrasted harmony.

II. FORM.

The Study of Type Forms, their Variations and Details.

Expression by construction; drawing; oral and written description.

Wholes. — Reviewed.

Variations:

1. Ellipse, and similar forms, natural and manufactured.
2. Flat spheroid, and similar forms, natural and manufactured.
3. Ovoid, and similar forms, natural and manufactured.
4. Cone, } and similar forms. Teach: *base*, *apex* or *vertex*, *axis*,
5. Pyramid, } *frustums* — *upper* and *lower bases*.

Parts and Relations. — Teach: *trisect* and $\frac{1}{4}$-*inch*.

a. Divide variations of type forms, and review geometric figures.
b. Circle, and similar forms. Teach: *circumference*, *center*, *diameter*, *radius*.
c. Ellipse, and similar forms. Teach: *long* and *short diameters*, or *axes*.
d. Oval and similar forms. Teach: *diameter*, *axis*.

NOTE. — In drawing, give special attention to sketching and lining-in, and to proper use of eraser.

III. ARRANGEMENT.

Construct, using geometric figures:

1. Copies of examples of historic borders, centers, and surfaces.
2. Original borders, centers, and surfaces.

Teach the following:

A. Repetition: review and apply to surfaces.
B. Alternation: review and apply to (*a*) centers, (*b*) surfaces.
C. Symmetry: combine simple geometric figures, to form symmetrical units, arranged in borders.

OUTLINES BY LESSONS.

The foregoing *Outline by Subjects* is the basis for the following *Outlines by Lessons*, which the teacher may modify to fit the particular conditions under which she works, contingent upon defective grading, the number of pupils and classes taught at one time, the amount of time allowed, and the quantity of materials at hand. To assist the teacher in this modification, three series of outlines have been made, as follows: —

The first of the series of Outlines by Lessons is arranged for *five twenty-minute* lessons each week for thirty-six weeks. As the average school year has forty weeks, this arrangement allows for delays arising at the beginning from organization, lack of supplies, and other causes; for holidays, examinations, and school exhibitions.

The second of the series of Outlines by Lessons is arranged for *three thirty-minute* lessons each week for thirty-six weeks. This may better suit the conditions of grading and the time allowed to the subject in some schools. It closely covers the ground of the first outline.

The third of the series of Outlines by Lessons is arranged for *two thirty-minute* lessons each week for thirty-eight weeks in the first year, and for thirty-six weeks in the second and third years, and is adapted for use in ungraded schools.

The Outline for Five Lessons a Week will be found to give most satisfactory results in well-graded schools where the conditions are favorable for the study of this subject, and it is recommended wherever it is practicable to use it.

OUTLINE FOR FIVE LESSONS A WEEK.

(See Plates, pages 76 to 90, for exercises in drawing and flats of objects to be constructed.)

First Year.

1
1. Present the spectrum.
2. Teach *sphere.*
3. Review sphere. Study similar forms by observation. Collect similar forms.
4. Discuss forms collected. Review sphere.
5. Model sphere.

2
1. Test knowledge of names of spectrum colors.
2. Teach *right* and *left.*
3. Review right and left. Teach *top* and *bottom.*
4. Model sphere.
5. Review.

3
1. Teach *red.*
2. Teach *cylinder.*
3. Review cylinder. Study similar forms by observation. Collect similar forms.
4. Discuss forms collected. Review cylinder.
5. Model cylinder.

4
1. Recognize and name red.
2. Teach *front* and *back.* Review right, left, top, and bottom.
3. Compare sphere and cylinder.
4. Model cylinder.
5. Optional.

5
1. Review red.
2. Teach *cube.*
3. Review cube. Study similar forms by observation. Collect similar forms.
4. Discuss forms collected. Review cube.
5. Model cube.

6
1. Teach *orange.*
2. Review right, left, top, bottom, front, and back.
3. Compare sphere, cylinder, and cube.
4. Model cube.
5. Review.

7
1. Recognize and name orange.
2. Review terms already taught, and teach *center*.
3. Review solids.
4. Recognition of solids from description and illustration upon the board.
5. Let each pupil select and model one type solid.

8
1. Review orange.
2. Teach *surface*, and apply.
3. Review surface.
4. Model spherical object.
5. Optional.

9
1. Teach *yellow*.
2. Teach *face*, and apply.
3. Review face. Find number of faces on each solid.
4. Review surface and face.
5. Model cylindrical object.

10
1. Recognize and name yellow.
2. Teach *edge*, and apply.
3. Review edge. Find number of edges on each solid.
4. Model cubical object.
5. Review.

11
1. Review yellow.
2. Teach *corner*, and apply.
3. Review corner. Find number of corners on each solid.
4. Teach *bisect*.
5. Let each pupil select and model some object, based on one of the type solids.

12
1. General review of color work.
2. Model sphere and bisect it.
3. Teach *half-sphere*. Collect similar forms.
4. Discuss forms collected. Review half-sphere.
5. Optional.

13
1. Teach *green*.
2. Model cylinder and bisect it.
3. Teach *half-cylinder*. Collect similar forms.
4. Discuss forms collected. Review half-cylinder.
5. Place solids from dictation and illustration to review terms.

14
1. Recognize and name green.
2. Model cube and bisect it diagonally.
3. Teach *half-cube*. Collect similar forms.
4. Discuss forms collected. Review half-cube.
5. Review.

15
1. Review green.
2. Review surface, using all the solids.
3. Teach *curved surface*, and apply.
4. Teach *plane surface*, and apply.
5. Model object based on the half-sphere.

16
1. Teach *blue*.
2. Review face, using all the solids.
3. Study faces of bisections.
4. Model object based on the half-cylinder.
5. Optional.

17
1. Recognize and name blue.
2. Teach *curved face*, and apply.
3. Teach *plane face*, and apply.
4. Review curved and plane faces.
5. Model object based on half-cube.

18
1. Review blue.
2. Teach *circle*, using models and tablets.
3. Teach *square*, using models and tablets.
4. Let each pupil select and model some object based on a bisection.
5. Review.

19
1. Teach *violet*.
2. Review shapes of plane faces studied.
3. Teach *semicircle*, using models and tablets.
4. Teach *oblong*, using models and tablets.
5. Teach *triangle*, using models and tablets.

20
1. Teach *handling of scissors*.
2. Practice *cutting to a straight line*.
3. Practice *cutting to a curved line*.
4. Cut straight lines.
5. Cut curved lines.

21
1. Review violet.
2. Review straight and curved edges.
3. Teach *straight line.*
4. Teach *curved line.*
5. Cut straight and curved lines on page A.

22
1. Review circle; cut the 4″ printed circle on page B of Drawing Book.
2. Teach *semicircle.*
3. Cut circle from colored paper.
4. Review semicircle; fold colored paper circle, and bisect.
5. Mount semicircles on page 1 of Drawing Book.

23
1. Review square.
2. Cut a 4″ square from colored paper.
3. Review bisect; fold the square previously cut on the diagonal, and bisect, producing triangles.
4. Teach *triangle;* mount triangle on page 4 of Drawing Book.
5. Optional.

24
1. Cut a 4″ square from colored paper; fold on a diameter and bisect, producing oblongs.
2. Teach *oblong;* mount oblong on page 4 of Drawing Book.
3. Teach *location of faces*, using terms *top*, *bottom*, *right*, *left*, *front*, *back.*
4. Teach *location of edges*, adding terms *upper* and *lower*, using models and sticks.
5. Optional.

25
1. Teach *location of corners*, using models, adding terms *above*, *below.*
2. Teach *point* (the picture of a corner), drawing on blackboard and on paper.
3. Teach *line* (the picture of an edge), drawing lines on blackboard and on paper.
4. Teach *inch.*
5. Locate points, reviewing inch.

26
1. Teach *horizontal*, and apply to faces, using tablets.
2. Review horizontal, and apply to edges, using sticks.
3. Practice horizontal movement, and draw horizontal lines.
4. 5. Draw horizontal lines on page 15 of Drawing Book.

27

1. Review all colors taught.
2. Teach *vertical*, and apply to faces and edges, using models, tablets, and sticks.
3. Practice vertical movement, and draw vertical lines.
4. 5. Draw vertical lines on page 15 of Drawing Book.

28

1. Teach *oblique*, and apply to faces and edges, using models, tablets, and sticks.
2. Practice oblique movement downward to the left, and draw oblique lines downward toward the left.
3. Draw oblique lines downward toward the left, on page 19 of Drawing Book.
4. Practice oblique movement downward toward the right, and draw oblique lines downward toward the right.
5. Draw oblique lines downward toward the right, on page 19 of Drawing Book.

29

1. Teach *two inches*, and apply, drawing lines 2″ long.
2. Teach *four inches*, and apply, drawing lines 4″ long.
3. Draw horizontal, vertical, and oblique lines, reviewing 2″ and 4″.
4. Review circle. Cut out a 2″ circle from colored paper, and make a toy fan; mount it on page 2 of Drawing Book.
5. Review square. Cut a 2″ square from colored paper, and make a toy shovel; mount it on page 3 of Drawing Book.

30

1. Review oblong. Cut an oblong from colored paper, and make a flag; mount it on page 3.
2. Cut the faces of the cylinder, reviewing circle; mount on page 6.
3. Place tablets to represent the circular faces of the cylinder; and draw oblong for surface with ruler, on page 7 of Drawing Book.
4. Cut the faces of the cube from colored papers, reviewing square; mount them on page 8 of Drawing Book.
5. Trace about the tablets laid to represent the faces of a cube, on page 9 of Drawing Book.

31

1. Cut the faces of the half-cylinder from colored paper, reviewing semicircle and oblong; mount them on page 10 of Drawing Book.
2. Trace about semicircles and draw oblongs with ruler, to represent faces of the half-cylinder, on page 11 of Drawing Book.
3. Cut the faces of the half-cube from colored paper, reviewing oblong and triangle; mount them on page 12 of Drawing Book.
4. Trace about tablets laid to represent the faces of the half-cube on page 13.
5. Review all colors taught. Arrange color tablets in the order of the spectrum, and mount them on page 14.

32
1. Teach *white* and *black*.
2. Practice drawing a 4″ square.
3. Cut a 4″ square from colored paper; mount on page 16 of Drawing Book.
4. Practice drawing a 2″ × 4″ oblong.
5. Cut a 2″ × 4″ oblong from colored paper; mount on page 16 of Drawing Book.

33
1. Teach *gray*.
2. Draw a 4″ square on page 17 of Drawing Book.
3. Draw a 2″ × 4″ oblong on page 17 of Drawing Book.
4. Construct a signal flag; mount it on page 18 of Drawing Book.
5. Teach *border*, *repeat*, and *alternate*, using sticks.

34
1. Cut two 4″ triangles from colored paper; mount them on page 20.
2. Draw two triangles on page 21 of Drawing Book.
3. Copy borders, illustrating repetition, with sticks. Arrange and mount Greek fret on page 22 of Drawing Book.
4. Make a freehand drawing of the Greek fret on page 23 of Drawing
5. Book.

35
1. Review border, repeat, and alternate.
2. Construct an original border with sticks, on page 24 of Drawing Book.
3. Make a freehand drawing of the original border previously constructed, on page 25 of the Drawing Book.
4. Review horizontal, vertical, and oblique. Make a representation, with sticks, of a simple object, involving vertical, horizontal, and oblique direction. Mount object on page 26 of Drawing Book.
5. Make a freehand drawing of the object previously constructed, on page 27 of Drawing Book.

36
1. Make original arrangements for borders with sticks, noting results on the blackboard.
2. Note the best and copy, using sticks.
3. Cut circles, squares, and triangles from colored paper.
4. Dictate an arrangement of colored papers, using the circles and squares,
5. or the squares and triangles, previously cut. Mount on page 28.

Second Year.

1
1. Review recognition and naming of spectrum colors, using the spectrum.
2. Review sphere, cylinder, and cube, as wholes.
3. Review surfaces, curved and plane.
4. Review terms: top, bottom, right, left, front, back, and center.
5. Model the sphere and an object similar in form.

2

1. Review white, black, and gray.
2. Review bisect, half-sphere, half-cylinder, and half-cube.
3. Review faces — curved and plane; also the number on each solid.
4. Practice movement for straight and curved lines and circles, and draw on the blackboard.
5. Model the cylinder and an object similar in form.

3

1. Teach *standard red.*
2. Review cutting in straight and curved lines. Cut freehand two 4″ squares and a 4″ circle.
3. Review semicircle, oblong, and triangle. Fold the squares and the circle previously cut; bisect, producing oblongs, triangles, and semicircles.
4. Cut oblong, triangle, and semicircle from colored paper, using those previously cut as patterns. Mount them on page 2.
5. Model the cube and an object similar in form.

4

1. Review standard red.
2. Review positions of faces — horizontal, vertical, and oblique.
3. Review edges — curved and straight. Make, with sticks, the three rectilinear figures previously studied.
4. Review positions of edges — horizontal, vertical, and oblique.
5. Model the half-sphere and an object similar in form.

5

1. Teach *standard orange.*
2. Review corner and point (its picture), using pencil and paper.
3. Dictation exercise, reviewing terms: upper, lower, above, below, right, left, upper right, upper left, lower right, lower left.
4. Review judging the length of one inch, two inches, and four inches, using sticks and drawing lines.
5. Model the half-cylinder and an object similar in form.

6

1. Review standard orange.
2. Review lines, — curved and straight, horizontal, vertical, and oblique, — drawing on blackboard and on paper.
3. Practice movement, and draw horizontal and vertical lines from dictation, on page 1 of Drawing Book.
4. Practice movement, and draw oblique lines.
5. Model the half-cube and an object similar in form.

7

1. Teach *standard yellow.*
2. Teach *quadrisect.* Fold a 4″ colored square into four oblongs 1″ × 4″. Mount the square on page 4.
3. Model a large sphere and quadrisect it, obtaining quarter-spheres. Collect similar forms.
4. Practice circular movement, drawing on blackboard and on paper.
5. Teach *compare*, using the sphere and its divisions.

8

1. Model a large cylinder and quadrisect it vertically, obtaining quarter-cylinders. Collect similar forms.
2. Teach *parallel faces*, and apply this term to different objects.
3. Teach *length*, *width*, *height*, and *thickness*.
4. Construct hanging bookshelves, using oak tag to illustrate parallel faces.
5. Practice free movement, and draw oblique lines downward to the left and right, on page 3.

9

1. Review standard yellow.
2. Model a large cylinder and quadrisect it horizontally, to obtain plinths. Teach *plinth*.
3. Teach *faces at an angle*, and apply.
4. Teach *right angle*, using tablets.
5. Teach *acute angle*, using tablets.

10

1. Teach *obtuse angle*, using tablets.
2. Model a large cube and quadrisect it on diagonals, obtaining triangular prisms.
3. Teach *triangular prism*, and apply.
4. Construct folding screen of oak tag. Review faces at an angle.
5. Optional.

11

1. Teach *standard green*.
2. Model a large cube; quadrisect it on diameters, obtaining square prism. Teach *square prism;* compare triangular and square prisms.
3. Teach *edges*, *parallel* and *at an angle*.
4. Draw lines, parallel and at an angle, on blackboard and paper.
5. Teach *use of ruler as straight edge*, and draw parallel borders on the screen previously constructed.

12

1. Model a large cube and quadrisect it horizontally, obtaining plinths.
2. Compare the two plinths and develop *circular plinth* and *square plinth*. Collect similar forms.
3. Make a freehand drawing of an object requiring parallel lines, on
4. page 5 of Drawing Book.
5. Review angles, drawing on blackboard and paper.

13

1. Teach *standard blue*.
2. Model an object based on the circular plinth.
3. Teach *right angles*, using sticks, and drawing on blackboard and paper.
4. Teach *acute angles*, using sticks, and drawing on blackboard and paper.
5. Teach *obtuse angles*, using sticks, and drawing on blackboard and paper.

14
1. Model an object based on the triangular prism.
2. Construct a commodore's pennant, using colored paper. Mount it on page 6 of Drawing Book.
3. Practice finding all inch marks on the ruler.
4. Judge distances on objects, and test by ruler.
5. Draw lines freehand of 1″, 2″, 3″, and 4″.

15
1. Teach *standard violet.*
2. Model an object based on the square prism.
3. Draw light and dark lines.
4. Teach *half-inch.*
5. Rule light and dark parallel lines ½″ apart, on page 7.

16
1. Model an object based on the square plinth.
2. 3. Construct a cricket. *a.* Draw the flat, an oblong 2″ × 4″. *b.* Cut and finish.
4. Draw right, acute, and obtuse angles from dictation.
5. Review half-inch, and draw light and dark lines freehand ½″ apart.

17
1. Teach *violet-red.*
2. Let each pupil select and model an object based on one of the quadrisections.
3. Cut all the faces of the square prism, triangular prism, and square plinth, from gray paper.
4. Fold a 6″ colored paper square to obtain a triangle, and prepare it for use in the next lesson.
5. Construct a cornucopia.

18
1. Make a freehand drawing of a triangular object, on page 9 of Drawing Book.
2. Fold a 4″ colored paper square on its diameters and mount on page 10 of Drawing Book.
3. 4. Practice drawing a 4″ square on paper and blackboard.
5. Optional.

19
1. Teach *orange-yellow.*
2. 3. Construct a bill book. *a.* Fold a 6″ square, and cut the flat. *b.* Make a ½″ band, and finish.
4. Review diameter of square. Make a handkerchief from white paper and fold on diameters.
5. Optional.

20
1. Practice drawing a 4″ square.
2. Practice drawing a 4″ square.
3. Draw diameter of square.
4. Draw a square and its diameters on page 11 of Drawing Book.
5. Review.

21
1. Teach *green-yellow*, comparing with standard yellow.
2. Teach *diagonal*, by folding a square on its diagonals. Mount on page 12 of Drawing Book.
3. Practice drawing a 4″ square and its diagonals.
4. Draw a square and its diagonals on page 13 of Drawing Book.
5. Teach *triangle*, *base*, and *vertex*.

22
1. Review triangle; teach *altitude*.
2. Make a freehand drawing of a triangle.
3. Review terms: base, vertex, altitude.
4. Make a freehand drawing of the handkerchief case, or of some simple
5. triangular object, on page 15 of Drawing Book.

23
1. Teach *blue-green*, comparing with standard green.
2. Review oblong. Cut freehand.
3. Practice drawing oblongs freehand.
4. Practice drawing oblongs with diameters and diagonals.
5. Fold a 4″ colored paper square, and make two oblongs. Fold one oblong for diameters and one for diagonals. Mount them on page 16 of Drawing Book.

24
1. Make a freehand drawing of a window with four panes, on page 17 of Drawing Book.
2. Make a freehand drawing of an oblong and its diagonals, on page 17 of Drawing Book.
3. Construct steps. *a*. Draw first flat, for the top and sides.
4. Construct steps. *b*. Draw second flat, for the lower step.
Construct steps. *c*. Finish.
5. Review the term repeat. Arrange triangles cut from colored paper in a border, to illustrate repetition, and mount border on page 8 of Drawing Book.

25
1. Teach *green-blue*, comparing with standard blue.
2. Arrange oblongs from colored paper in a border, illustrating repetition
3. and alternation of position. Mount on page 18 of Drawing Book.
4. Construct some object from an oblong, as a pair of cuffs from white paper.
5. Dictation exercise, involving oblong with diameters and diagonals.

26
1. Make a freehand drawing of an oblong object; as the face of an envelope with a stamp.
2. Prepare material for a curtain.
   a. Draw and cut an oblong from paper; fold one end for the hem.
   b. Make a border from colored paper, and finish.
3. (Prepare material for a curtain.)
4. Make a freehand drawing on paper of the curtain previously constructed.
5. Optional.

27
1. Teach *violet-blue*, comparing with standard blue.
2. Finish the curtain.
3. Make a mechanical drawing of a window sash, or other object involving square and oblong, on page 21 of Drawing Book.
4. (Make a mechanical drawing of a window sash, or other object involving square and oblong, on page 21 of Drawing Book.)
5. Optional.

28
1. Teach *alternation of size*, using tablets.
2. Construct an historic border from colored paper, illustrating alternation of size, on page 20 of Drawing Book.
3. Review alternation of position and alternation of size, using square and oblong tablets. Note results on the blackboard.
4. Review alternation of position and alternation of size, using semicircular and triangular tablets.
5. Review.

29
1. Review the six hues.
2. Construct an original border with colored paper, illustrating alternation of size. Mount it on page 22 of Drawing Book.
3. (Construct an original border with colored paper, illustrating alternation of size. Mount it on page 22 of Drawing Book.)
4. Make a freehand drawing of the original border previously constructed on page 23 of Drawing Book.
5. (Make a freehand drawing of the original border previously constructed on page 23 of Drawing Book.)

30
1. Construct a hanging basket.
   a. Fold a 6″ square and cut the flat.
   b. Fold and fasten.
   c. Finish.
2. (Construct a hanging basket.)
3. Construct a simple right-lined shield with a bend. Mount it on page 24 of Drawing Book.
4. Make a freehand drawing of the shield, combining a square and triangle, on page 25 of Drawing Book.
5. Optional.

31
1. Arrange a spectrum from colored paper tablets.
2. Construct a paper rack.
   a. Draw the flat from dictation.
   b. Cut; finish.
3. (Construct a paper rack.)
4. Make a freehand drawing of an object, combining a square and semicircle, on page 27 of Drawing Book.
5. (Make a freehand drawing of an object, combining a square and semicircle, on page 27 of Drawing Book.)

32
1. Teach *alternation of form.*
2. Make original arrangements, illustrating alternation of form, using tablets.
3. Construct an original border, illustrating alternation of form, from
4. colored paper. Mount the border on page 26 of Drawing Book.
5. Review.

33
1. Compare the grays; teach *neutral gray*, and apply terms, *warm*, *cool*, and *green-gray.*
2. Construct a picture frame and cord, combining oblong and triangle.
3. Mount on page 28 of Drawing Book.
4. Make a freehand drawing of the picture frame, on page 29 of Drawing
5. Book.

34
1. Teach *repetition in radial arrangements*, or *rosettes.*
2.
3. Make original arrangements, using tablets.
4. Cut geometric figures from colored paper, to be used in a subsequent lesson.
5. Optional.

35
1. Review colors taught.
2. Construct an original radial arrangement, using the colored paper
3. figures previously cut. Mount on page 30 of Drawing Book.
4. Make a freehand drawing of the radial arrangement previously con-
5. structed, on page 31 of Drawing Book.

36
1. Construct a cash envelope. *a.* Draw the flat. *b.* Cut; finish.
2.
3. Make a freehand drawing of an object, combining oblong and semi-
4. circle, on page 32 of Drawing Book.
5. Review.

Third Year.

1
1. Review standard spectrum colors.
2. Review sphere, cylinder, and cube.
3. Review terms: top, bottom, right, left, front, back, upper, lower, above, below, upper right, upper left, lower right, lower left.
4. Review bisect and quadrisect, drawing lines freehand and with ruler, on paper and blackboard.
5. Model one of the type solids.

2

1. Review the six new colors taught in the second year.
2. Review half-sphere, half-cylinder, and half-cube.
3. Review use of ruler; measure objects; rule lines.
4. Review cutting to a line. Cut lines previously ruled.
5. Model one of the bisections.

3

1. Teach *orange-red.* Compare with standard red.
2. Review cube and half-cube.
3. Review horizontal, vertical, and oblique lines, drawing lines freehand and with ruler, on paper and blackboard.
4. Dictation exercise: drawing vertical, horizontal, and oblique lines. Review inch and half-inch.
5. Model an object based upon a type, or a bisection.

4

1. Teach *red-orange.* Compare with standard orange.
2. Review triangular and square prisms.
3. Review terms parallel and at an angle, and draw lines freehand and with ruler, on paper and blackboard, to illustrate.
4. Draw a bookmark $2'' \times 6''$, accurately. Cut a $2''$ fringe freehand.
5. Model object based on prism.

5

1. Review orange-red and red-orange, comparing with other colors.
2. Review circular plinth and square plinth.
3. Review right angles and teach *perpendicular faces* and *edges.*
4. Review right, acute, and obtuse angles, by using sticks and drawing.
5. Model object based on plinth.

6

1. Teach *yellow-orange*, and compare with standard orange.
2. Review freehand cutting and judging $1''$ and $2''$; cut faces of prisms and square plinth, and mount on page 2 of Drawing Book.
3. Review light and dark lines, drawing freehand. Review angles, and draw angles freehand.
4. Review light and dark lines, ruling light and dark lines $\frac{1}{2}''$ apart.
5. Optional.

7

1. Teach *yellow-green*, and compare with standard green.
2. Teach *quarter-inch*, and apply.
3. Make a freehand drawing of a window screen with frame $\frac{1}{4}''$ wide, or door with panels, involving the use of eraser, on page 3 of Drawing Book.
4. Teach *flat spheroid.* Model a flat spheroid and object similar in form. Collect similar forms.
5. Optional.

8
1. Review green-yellow and yellow-green.
2. Teach long spheroid.
3. Model a long spheroid. Collect similar forms.
4. Construct a music roll.
5. Draw a St. Andrew's cross.

9
1. Practice movements for circles; draw circles freehand.
2. Cut two 3″ circles freehand; review the circle, bisect one, and mount circle and half-circles on page 4 of Drawing Book.
3. Make a freehand drawing of a wall or fence, or other simple object requiring sketching, erasing, and lining-in, on page 5 of Drawing Book.
4. Model long spheroid and similar forms.
5. Review.

10
1. Review green-blue and blue-green, comparing with standard colors.
2. Teach *ovoid*, comparing with the other curvilinear solids.
3. Construct a grater, from dictation. *a.* Draw and cut the flat. *b.* Finish.
4. Construct a grater, from dictation. *a.* Draw and cut the flat. *b.* Finish.
5. Model ovoid and collect similar forms.

11
1. Teach cone, comparing with cylinder. Collect similar forms.
2. Draw freehand, on paper, a "tit-tat-to" board. First square, $4\frac{1}{4}''$; second, $\frac{1}{4}''$ smaller on all sides, drawn inside the first; inner square divided into nine equal $1\frac{1}{4}''$ squares.
3. Draw freehand, on paper, a "tit-tat-to" board. First square, $4\frac{1}{4}''$; second, $\frac{1}{4}''$ smaller on all sides, drawn inside the first; inner square divided into nine equal $1\frac{1}{4}''$ squares.
4. Model cone and similar forms.
5. Optional.

12
1. Teach *blue-violet.*
2. Model cone; bisect. Teach *base*, *apex*, and *axis*.
3. Make a freehand drawing of an object which involves judging $\frac{1}{4}''$.
4. Construct cornucopia, using the cone to assist in obtaining the flat.
5. Practice freehand drawing of curved lines.

13
1. Teach *three-quarter of an inch*, and apply.
2. Teach *square pyramid;* apply terms base, apex, and axis. Collect similar forms.
3. Model pyramid.
4. Review triangles; teach *isosceles triangle* from pyramids.
5. Draw triangles accurately with ruler.

14
1. Review violet-blue and blue-violet.
2. Cut three isosceles triangles derived from a square pyramid, and mount them on page 6 of Drawing Book.
3. Construct a scoop. Draw the flat, using the pyramid to obtain the same.
4. Model object based upon the pyramid.
5. Draw triangles freehand, reviewing isosceles triangles.

15
1. Teach *red-violet,* comparing with violet.
2. Make a freehand drawing of the back of an envelope, on page 7 of Drawing Book.
3. Construct Maltese cross with tablets.
4. Make a freehand drawing of the Maltese cross previously constructed.
5. Construct a strawberry basket based upon part of pyramid.

16
1. Review violet-red and red-violet.
2. Teach *trisect.* Fold a 4″ square for Greek cross; cut, and mount on page 8 of Drawing Book.
3. Make a freehand drawing of Greek cross, on page 9 of Drawing Book.
4. Practice circular movement and draw circles.
5. Optional.

17
1. Review violet-blue and blue-violet.
2. Model on object based upon some combination of type forms previously studied, as a cylinder and flat spheroid combined for a vase.
3. Review measurement, ruling lines.
4. Draw with ruler some simple object involving measurement of 1″, $\frac{1}{2}$″, $\frac{1}{4}$″.
5. Construct a shield from colored paper; mount it on page 10 of Drawing Book.

18
1. Make a freehand drawing of the shield previously constructed, on page 11 of Drawing Book.
2. Model two flat spheroids or two long spheroids, and bisect them to obtain circles and ellipses; teach *ellipse.*
3. Review circular movement and practice elliptical movement.
4. Draw circles freehand.
5. Draw ellipses freehand.

19
1. Review red-violet and violet-red.
2. Model two ovoids; bisect them to obtain circle and oval; teach oval.
3. Review ellipse and oval from tablets.
4. Practice oval movement, and draw ovals.
5. Construct an object based upon the circular plinth; as a cake cutter

20
1. Draw a 4″ circle.
2. Cut a drawn circle, and teach *circumference.*
3. Fold circle previously cut from colored paper, and teach *diameter* and *radius;* mount the circle on page 14 of Drawing Book.
4. Make a freehand drawing of the circle and its parts, on page 15 of Drawing Book.
5. Draw two concentric circles.

21
1. Review the six hues taught this year.
2. Make a freehand drawing of a circular object, as a reading glass.
3. Construct a curtain ring; mount it on page 16 of Drawing Book.
4. Make a freehand drawing of the curtain ring, on page 17 of Drawing Book.
5. Optional.

22
1. Cut a paper ellipse, fold for diameters. Teach *circumference* and *long*
2. and *short diameters*. Mount on page 18 of Drawing Book.
3. Practice elliptical movement.
4. Make a freehand drawing of the ellipse and its diameters, on page 19 of Drawing Book.
5. Draw concentric ellipses.

23
1. Review the spectrum colors; make a spectrum from color tablets, and
2. mount on page 32 of Drawing Book.
3. Make a freehand drawing of an elliptical object, as eyeglasses or hand mirror.
4. Optional.
5.

24
1. Review ellipse and oval, using tablets.
2. Practice oval movement, and draw ovals freehand.
3. Cut an oval from colored paper; fold to show axis; teach *axis*. Mount the oval on page 22 of Drawing Book.
4. Make a freehand drawing of the oval, on page 23 of Drawing Book.
5. Optional.

25
1. Review white, black, and gray.
2. Construct an oval fan from colored paper, and mount it on page 24 of Drawing Book.
3. Practice oval movement and draw ovals freehand.
4. Make a freehand drawing of an oval object (as the fan previously con-
5. structed), on page 25 of Drawing Book.

26
1. Review repetition in borders, using tablets and folding and cutting colored paper.
2. Review repetition and alternation of size in borders, using tablets and folding and cutting colored paper.
3. Review repetition and alternation of position in borders, using tablets and folding and cutting colored paper.
4. Review repetition and alternation of form in borders, using tablets.
5. Review repetition in rosettes or centers, using tablets and folding and cutting colored paper.

27
1. Review warm, cool, green, and neutral gray.
2. Apply alternation to radial arrangements or rosettes, using tablets and folding and cutting colored paper.
3. Construct an original center from colored paper, illustrating alternation.
4. Construct an original center from colored paper, illustrating alternation.
5. Mount the original center previously constructed, on page 12 of Drawing Book.

28
1. Practice drawing the original center.
2. Practice drawing the original center.
3. Draw the original center, on page 13 of Drawing Book.
4. Draw the original center, on page 13 of Drawing Book.
5. Optional.

29
1. Copy historic border (Greek astragal), using tablets.
2. Review oblong and ellipse; practice drawing oblong and ellipse.
3. Review the term parallel, and rule parallel lines for historic border, on page 21 of Drawing Book.
4. Trace round tablets laid to form the Greek astragal, on page 21 of Drawing Book.
5. Draw the Greek astragal freehand, on page 21 of Drawing Book.

30
1. Review all colors taught.
2. Construct the Greek astragal from colored paper, and mount on page
3. 20 of Drawing Book.
4. Apply alternation and repetition to surfaces, using tablets and folding
5. and cutting colored paper.

31
1. Study an historic surface pattern, illustrating repetition and alternation.
2. Practice drawing units of an historic surface pattern.
3. Construct the historic surface pattern from colored paper, and mount
4. on page 26.
5. Optional.

32
1. Study historic symmetrical units.
2. Teach symmetry.
3. Make a freehand drawing of a symmetrical unit.
4. Make original symmetrical units, by folding and cutting paper.
5. Make original symmetrical units, by folding and cutting paper.

33
1. Construct an original surface pattern, using the symmetrical units previously cut.
2. Mount the surface pattern on neutral-gray paper.
3. Make a freehand drawing of the original surface pattern, on page 27
4. of Drawing Book.
5. Optional.

34
1. Review repetition and alternation of form in borders.
2. Study the Greek echinus, and practice oval movement.
3. Make a freehand drawing of the Greek echinus.
4. Construct the Greek echinus from colored paper; mount it on page 28 of Drawing Book.
5. (continued)

35
1. Study historical symmetrical units; make original symmetrical units.
2. Make tracings of original symmetrical units, on page 29 of Drawing Book.
3. Construct an original border from colored paper, using one or two of the symmetrical units previously cut. Mount on page 30 of Drawing Book.
4. Make a freehand drawing of the original border previously constructed, on page 31 of Drawing Book.
5. (continued)

36
1. Review the six standard spectrum colors.
2. Review the six standard hues taught in the second year.
3. Review the six standard hues taught this year.
4. Mount the eighteen spectrum colors on page 32 of Drawing Book.
5. (continued)

OUTLINE FOR THREE LESSONS A WEEK.

(See Plates, pages 76 to 90, for exercises in drawing and flats of objects to be constructed.)

First Year.

1
1. Present the spectrum.
2. Teach *sphere;* study similar forms; collect similar forms.
3. Model a sphere.

2
1. Teach *right* and *left.*
2. Teach *top* and *bottom;* and review right and left.
3. Model a sphere.

3
1. Teach *red.*
2. Teach *cylinder;* study similar forms; collect similar forms.
3. Model a cylinder.

4
1. Teach *front* and *back.* Review right, left, top, and bottom.
2. Compare sphere and cylinder. Discuss forms collected.
3. Model a cylinder and sphere, and compare.

5
1. Review red.
2. Teach *cube;* study similar forms; collect similar forms.
3. Model a cube.

6
1. Review right, left, top, bottom, front, and back.
2. Compare sphere, cylinder, and cube.
3. Model a cube and sphere, and compare.

7
1. Teach *orange.*
2. Teach *center*, and review terms already taught.
3. Review solids from description and illustration upon the blackboard.

8
1. Teach *surface*, and apply.
2. Review surface from description and illustration upon the blackboard.
3. Model a spherical object.

9
1. Teach *yellow.*
2. Teach *face*, and apply. Find number of faces on each solid. Review surface.
3. Model a cylindrical object.

10
1. Teach *edge*, and apply.
2. Review edge. Find number of edges on each solid.
3. Model a cubical object.

11
1. Review red, orange, and yellow.
2. Teach *corner*, and apply. Find number of corners on each solid.
3. Teach *bisect.*

12
1. Model sphere and bisect.
2. Teach *half-sphere.* Collect similar forms.
3. Discuss forms collected. Practice freehand movement.

13
1. Teach *green.*
2. Model cylinder and bisect. Teach *half-cylinder.* Collect similar forms.
3. Discuss forms collected, reviewing half-cylinder.

14
1. Place solids from dictation and illustration to review terms.
2. Model cube and bisect it diagonally. Teach *half-cube.* Collect similar forms.
3. Discuss forms collected, reviewing half-cube.

15
1. Teach *blue.*
2. Teach *curved surface,* and apply, using solids.
3. Teach *plane surface*, and apply, using solids.

16
1. Review face, studying faces of bisections.
2. Teach *plane face*, and apply.
3. Teach *curved face*, and apply.

17
1. Teach *violet.*
2. Review plane and curved faces.
3. Model an object based upon the half-sphere.

18[1]
1. Teach *circle*, using models and tablets.
2. Teach *square*, using models and tablets.
3. Model an object based upon the half-cylinder.

19
1. Teach *semicircle*, using models and tablets.
2. Teach *oblong*, using models and tablets.
3. Teach *triangle*, using models and tablets.

20
1. Review green, blue, and violet.
2. Teach *handling of scissors;* practice cutting straight lines.
3. Practice cutting curved lines.

21
1. Review straight and curved edges.
2. Teach *straight line.* Draw straight lines on blackboard and paper, freehand.
3. Cut straight and curved lines on page A of Drawing Book.[2]

22
1. Review circle; cut the 4″ circle from page B of Drawing Book.[2] Cut circle from colored paper.
2. Teach *half-circle;* fold colored paper circle and bisect.
3. Mount semicircles on page 1 of Drawing Book. Practice drawing straight lines on blackboard and paper.

23
1. Review square. Cut a 4″ square from colored paper. Review bisect, folding and cutting the paper square on a diagonal, producing triangles.
2. Teach *triangle*, and mount one of the triangles previously cut on page 4 of Drawing Book.
3. Teach *oblong.* Fold a 4″ square on a diameter and bisect, producing oblongs. Mount an oblong on page 4 of Drawing Book.

[1] From the eighteenth week, have frequent exercises in drawing the figures studied on blackboard or paper, or on both.

[2] Pages A and B may be taken out of the Drawing Book, for greater convenience in cutting the lines and figures.

24
1. Teach *location of faces and edges*, applying terms top, bottom, right, left, front, back, and teaching terms *upper* and *lower*, using models and sticks.
2. Teach *location of corners*, applying terms above and below. Teach *point* as the picture of a corner; place points on blackboard and on paper. Teach *line* as the picture of an edge; draw lines on blackboard and on paper.
3. Teach *inch*. (*a*) Judge inch lengths on objects; (*b*) locate points an inch apart; (*c*) draw lines an inch in length.

25
1. Teach *horizontal* and apply the term to faces, using tablets; apply to edges, using sticks.
2. Practice horizontal movement and draw horizontal lines.
3. Draw horizontal lines on page 15 of Drawing Book.

26
1. Teach *vertical* and apply term to faces and edges, using models, tablets, and sticks.
2. Practice vertical movement and draw vertical lines.
3. Draw vertical lines on page 15 of Drawing Book.

27
1. Teach *oblique* and apply term to faces and edges, using models, tablets, and sticks.
2. Practice oblique movement downward toward the left; draw oblique lines downward toward the left, on practice paper.
3. Practice oblique movement downward toward the right; draw oblique lines downward toward the right, on practice paper.

28
1. Draw oblique lines downward toward the left, on page 19 of Drawing Book.
2. Draw oblique lines downward toward the right, on page 19 of Drawing Book.
3. Teach *two inches* and *four inches* and draw lines 2″ and 4″ long on practice paper.

29
1. Review circle. Cut the printed 2″ circle from page B of Drawing Book. Using this as a pattern, cut a circle from colored paper and make a toy fan. Mount on page 2 of Drawing Book.
2. Review square. Draw freehand squares on paper and blackboard. Cut the 2″ printed square from page B of Drawing Book. Using this as a pattern, cut a square from colored paper and make a toy shovel. Mount it on page 3 of Drawing Book.
3. Review oblong. Draw oblongs freehand on paper and blackboard. Cut an oblong from colored paper and make a flag. Mount it on page 3 of Drawing Book.

30
1. Cut the faces of the cylinder, reviewing circle.[1] Mount the faces on page 6 of Drawing Book. On page 7, place tablets to represent the circular faces of the cylinder and trace them, and draw oblong for curved surface with the aid of the pattern previously cut.
2. Cut the faces of the cube from colored paper, reviewing square. Mount them on page 8 of Drawing Book. Trace about tablets laid to represent the faces of the cube, on page 9 of Drawing Book.
3. Cut the faces of the half-cylinder from colored paper, reviewing semicircle and oblong. Mount them on page 10 of Drawing Book. Trace about semicircle and draw oblongs with the aid of the patterns cut to represent the faces of the half-cylinder, on page 11 of Drawing Book.

31
1. Teach *white*, *black*, and *gray*.
2. Cut the faces of the half-cube from colored paper, reviewing oblong and triangle. Mount them on page 12 of Drawing Book. Trace about tablets laid to represent the faces of the half-cube on page 13 of Drawing Book.
3. Practice drawing a 4″ square.

32
1. Cut a 4″ square from colored paper. Mount it on page 16 of Drawing Book.
2. Practice drawing a 2″ × 4″ oblong. Cut a 2″ × 4″ oblong from colored paper, and mount on page 16 of Drawing Book.
3. Draw freehand a 4″ square, on page 17 of Drawing Book.

33
1. Draw freehand a 2″ × 4″ oblong, on page 17 of Drawing Book.
2. Construct a signal flag; mount it on page 18 of Drawing Book.
3. Cut two 4″ triangles from colored paper. Mount them on page 20 of Drawing Book.

34
1. Draw the triangles on page 21 of Drawing Book.
2. Teach *border*, *repeat*, and *alternate*, using sticks.
3. Copy borders with sticks, illustrating repetition. Arrange and mount Greek fret, on page 22 of Drawing Book.

35
1. Make a freehand drawing of the Greek fret, on page 23 of Drawing Book.
2. Construct an original border with sticks, on page 24 of Drawing Book, reviewing terms border, repeat, and alternate.
3. Make a freehand drawing of the original border, on page 25 of the Drawing Book.

[1] If found more convenient, do the cutting for the faces of this and the following lesson at the same time, and reserve them, mounting the faces of the two solids in the following lesson.

36
1. Review terms *horizontal*, *vertical*, and *oblique*, making, with sticks, a simple object involving horizontal and vertical direction. Mount the sticks on page 26 of Drawing Book. Make a freehand drawing of the object on page 27.
2. Make original arrangements for borders with sticks, noting results on the blackboard.
3. Cut circles, squares, and triangles from colored paper. Dictate an arrangement using circles and squares, or squares and triangles. Mount it on page 28 of Drawing Book.

Second Year.

1
1. Recognition and naming of spectrum colors and of white, black, and gray.
2. Review sphere, cylinder, and cube as wholes; review surfaces (curved and plane).
3. Model the sphere and an object similar in form.

2
1. Review bisect, half-sphere, half-cylinder, and half-cube.
2. Review terms: front, back, top, bottom, right, left, and center.
3. Model the cylinder and an object similar in form.

3
1. Teach *standard red.*
2. Review cutting in straight and curved lines. Cut freehand two 4″ squares and a 4″ circle.
3. Review semicircle, oblong, and triangle. Fold the squares and circle previously cut; bisect, producing oblong, triangles, and semicircle. Use these as patterns, and cut oblong, triangle, and semicircle from colored paper. Mount them on page 2 of Drawing Book.

4
1. Model cube and an object similar in form.
2. Review faces (curved and plane), and position of faces (horizontal, vertical, and oblique).
3. Review edges (curved and straight), and position of edges (horizontal, vertical, and oblique), making the three rectilinear figures with sticks.

5
1. Teach *standard orange.*
2. Review corner and point (its picture), using pencil.
3. Dictation exercise, using terms: upper, lower, above, below, right, left, upper left, upper right, lower left, lower right.

6
1. Review 1″, 2″, 3″, using sticks and drawing lines.
2. Review lines (curved and straight; horizontal, vertical, and oblique), and draw horizontal and vertical lines on page 1 of Drawing Book.
3. Model half-sphere, half-cylinder, or half-cube.

7
1. Teach *standard yellow.*
2. Teach *quadrisect.* Fold a 4″ colored paper square into four oblongs, 1″ × 4″. Mount on page 4 of Drawing Book.
3. Practice movement to draw oblique lines. Draw oblique lines downward to the left and downward to the right, on page 3 of Drawing Book.

8
1. Model sphere, review quadrisect; model cylinder, and quadrisect vertically.
2. Teach *parallel faces,* and apply. Construct hanging bookshelves from oak tag.
3. Practice free movement, and draw straight and curved lines.

9
1. Model a large cylinder, and quadrisect it horizontally to obtain circular plinths. Teach *circular plinth.* Collect similar forms.
2. Teach *faces at an angle,* and apply.
3. Teach *right angle* and *acute angle,* using tablets.

10
1. Teach *obtuse angle,* using tablets.
2. Model a large cube, and quadrisect it on diagonals, obtaining triangular prisms. Teach *triangular prism.*
3. Construct a folding screen from oak tag, reviewing faces at an angle.

11
1. Review standard red, orange, and yellow.
2. Model a large cube; quadrisect it on its diameters, obtaining square prisms. Teach *square prism.*
3. Teach *use of ruler as straight edge.* Teach *edges parallel* and *at an angle,* ruling lines.

12
1. Model a large cube and quadrisect it horizontally, obtaining square plinths. Teach *square plinth.* Collect similar forms.
2. Make a freehand drawing of an object requiring parallel lines, on page 5 of Drawing Book.
3. Review kinds of angles, drawing on blackboard and on paper.

13
1. Teach *standard green.*
2. Teach *pyramid;* apply terms *base, apex,* and *axis.* Model square pyramid.
3. Review kinds of angles, drawing on blackboard and paper.

14
1. Model an object based on the triangular prism.
2. Construct a commodore's pennant from colored paper. Mount it on page 6 of Drawing Book.
3. Practice finding inch marks on ruler; judge distances on objects and test by ruler; draw lines freehand of 1″, 2″, 3″, and 4″.

15
1. Teach *standard blue.*
2. Model an object based on the square prism.
3. Teach *half-inch.* Draw light and dark lines. Rule light and dark lines $\frac{1}{2}''$ apart, on page 7 of Drawing Book.

16
1. Model an object based on the square plinth.
2. Construct a cricket:
   a. Draw the flat — an oblong, $2'' \times 4''$.
   b. Cut and finish.
3. Review half-inch, and draw light and dark lines freehand, $\frac{1}{2}''$ apart.

17
1. Teach *standard violet.*
2. Cut all the faces of the square prism, triangular prism, and square plinth, from gray paper.
3. Construct a cornucopia; fold a $6''$ colored paper square, to obtain a triangle for the cornucopia.

18
1. Make a freehand drawing of a triangular object, on page 9 of Drawing Book
2. Fold a $4''$ colored square on diameters, and mount on page 10 of Drawing Book.
3. Practice drawing a $4''$ square on paper and blackboard.

19
1. Teach *violet-red.*
2. Construct a bill book:
   a. Fold a $6''$ square, and cut the flat.
   b. Make a $\frac{1}{2}''$ band, and finish.
3. Review diameter of square. Make a handkerchief. Fold a white paper square on diameters.

20
1. Practice drawing a $4''$ square.
2. Draw square with diameters on page 11 of Drawing Book.
3. Construct a handkerchief case.

21
1. Teach *orange-yellow.*
2. Teach *diagonal* by folding a square on its diagonals. Mount on page 12 of Drawing Book.
3. Draw a square and its diagonals on page 13 of Drawing Book.

22
1. Teach: *triangle*, *base*, *vertex*, *altitude.*
2. Practice drawing triangles.
3. Make a freehand drawing of the handkerchief case, on page 15 of Drawing Book.

23
1. Teach *green-yellow.*
2. Practice drawing oblongs with diameters and diagonals, freehand.
3. Fold a $4''$ colored-paper square, and cut two oblongs; fold each oblong, applying terms diameter and diagonal. Mount them on page 16 of Drawing Book.

24
1. Make a freehand drawing of a window with four panes, on page 17 of Drawing Book.
2. Make a freehand drawing of an oblong with its diagonals, on page 17 of Drawing Book.
3. Construct steps:
   a. Draw first flat.
   b. Draw second flat.
   c. Finish.

25
1. Teach *blue-green*, and compare with standard green.
2. Arrange oblongs cut from colored paper in a border, illustrating repetition and alternation of position. Construct border on page 18 of Drawing Book.
3. Construct some objects based on the oblong, as a pair of cuffs, from white paper.

26
1. Teach *green-blue*, and compare with standard blue.
2. Make a freehand drawing of an oblong object, as the face of an envelope with stamp.
3. Prepare material for a curtain:
   a. Cut oblong and make hem.
   b. Draw border lines.
   c. Select border.

27
1. Review repeat; arrange triangles cut from colored paper in a border, to illustrate repetition. Mount border on page 8 of Drawing Book.
2. Make a mechanical drawing of an object involving square and oblong.
3. Teach alternation of size, using tablets.

28
1. Teach *violet-blue*, comparing with standard blue.
2. Construct an historic border from colored paper, illustrating alternation of size, on page 20 of Drawing Book.
3. Review alternation of position and alternation of size, using tablets; note results on the blackboard.

29
1. Review the six hues previously taught.
2. Construct an original border with colored paper, illustrating alternation of size. Mount on page 22 of Drawing Book.
3. Make a freehand drawing of the original border previously constructed, on page 23 of Drawing Book.

30
1. Construct a hanging basket. Fold a 6″ square and cut.
2. Construct a simple right-lined shield with a bend. Mount it on page 24 of Drawing Book.
3. Make a freehand drawing of the shield, combining a square and triangle, on page 25 of Drawing Book.

31
1. Arrange a spectrum from colored paper tablets.
2. Construct a paper rack:
   a. Draw the flat from dictation.
   b. Cut and finish.
3. Make a freehand drawing of an object combining a square and semicircle, on page 27 of Drawing Book.

32
1. Teach *alternation of form.*
2. Make original arrangements illustrating alternation of form, using tablets.
3. Construct an original border from colored paper, illustrating alternation of form. Mount the border on page 26 of Drawing Book.

33
1. Compare the grays; teach *neutral gray*, and apply the terms *warm*, *cool*, and *green-gray.*
2. Construct a picture frame and cord, combining oblong and triangle. Mount on page 28 of Drawing Book.
3. Make a freehand drawing of the picture frame, on page 29 of Drawing Book.

34
1. Teach *repetition in radial arrangements* or *rosettes.*
2. Make original arrangements, using tablets.
3. Cut geometric figures from colored paper, to be used in subsequent lesson.

35
1. Construct an original radial arrangement, using the colored paper figures previously cut. Mount on page 30 of Drawing Book.
2. 3. Make a freehand drawing of the radial arrangement previously constructed, on page 31 of the Drawing Book.

36
1. Construct a cash envelope:
   a. Draw the flat.
   b. Cut and finish.
2. 3. Make a freehand drawing of an object combining oblong and semicircle, on page 32 of Drawing Book.

Third Year.

1
1. Review the six standard spectrum colors previously taught.
2. Review sphere, cylinder, and cube, and the terms: top, bottom; right, left; front, back; upper, lower; above, below; upper right, upper left, lower right, lower left.
3. Review the terms bisect and quadrisect, drawing lines freehand and with ruler, on paper and blackboard, bisecting and quadrisecting them.

2
1. Model one of the type solids and divide it, reviewing bisect; review half-sphere, half-cylinder, and half-cube.
2. Review use of ruler. Measure objects; rule lines.
3. Review cutting to a line. Cut lines previously ruled.

3
1. Review the six colors taught in the second year.
2. Review horizontal, vertical, and oblique lines, drawing lines freehand and with ruler, on paper and blackboard.
3. Dictation exercise, drawing horizontal, vertical, and oblique lines. Review 1″ and $\frac{1}{2}$″.

4
1. Model an object based on a prism.
2. Review triangular and square prisms and the terms *parallel* and *at an angle*. Draw parallel lines and angles freehand and with ruler, on paper and blackboard.
3. Draw and cut a bookmark 1″×6″; cut a 2″ fringe freehand.

5
1. Teach *orange-red;* compare with standard red.
2. Review circular plinth and square plinth, and model an object based on a plinth.
3. Review right, acute, and obtuse angles, using sticks and drawing.

6
1. Review freehand cutting, and judging the length of 1″ and 2″. Cut faces of prisms and square plinth, and mount on page 2 of Drawing Book.
2. Review light and dark lines, drawing freehand. Review angles, and draw angles freehand.
3. Teach *quarter-inch*, and apply.

7
1. Teach *red-orange* and compare with standard orange. Review orange-red.
2. Make a freehand drawing of a window screen, or door with panels, frame $\frac{1}{4}$″ wide, involving the use of eraser, on page 3 of Drawing Book.
3. Teach *flat spheroid.* Model a flat spheroid and an object similar in form.

8
1. Teach *yellow-orange* and compare with standard orange.
2. Teach *long spheroid.* Model a long spheroid and similar form.
3. Construct a music roll.

9
1. Practice movement for circles; draw circles freehand.
2. Cut two 3″ circles freehand; review bisect, and mount circle and semicircles on page 4 of Drawing Book.
3. Make a freehand drawing of a wall or fence, or other simple object, involving sketching, erasing, and lining-in, on page 5 of Drawing Book.

10
1. Teach *yellow-green* and compare with standard green.
2. Teach *ovoid*, comparing with other curvilinear solids. Model ovoid and an object similar in form.
3. Construct a grater from dictation: *a.* Draw and cut the flat. *b.* Finish.

11
1. Teach *cone*, comparing with cylinder. Model cone and collect similar forms.
2. Make a freehand drawing of a "tit-tat-to" board. First square $4\frac{1}{4}''$, second $\frac{1}{4}''$ smaller on all sides, drawn inside the first; inner square divided into nine equal $1\frac{1}{4}''$ squares.
3. Teach *base*, *apex*, and *axis*, from cones previously modeled.

12
1. Review green-yellow and yellow-green.
2. Make a freehand drawing of an object which involves judging $\frac{1}{4}''$.
3. Construct cornucopia, using the cone to obtain the flat.

13
1. Teach *square pyramid.* Model square pyramid; apply terms base, apex, and axis. Collect objects similar in form.
2. Review triangles. Teach *isosceles triangle* from pyramids.
3. Draw triangles with ruler.

14
1. Review blue-green and green-blue, comparing with green and with blue.
2. Cut three isosceles triangles derived from a square pyramid, and mount them on page 6 of Drawing Book. Draw triangles freehand.
3. Construct a scoop. Draw the flat, using the pyramid in obtaining the same.

15
1. Make a freehand drawing of the back of an envelope, on page 7 of Drawing Book.
2. Construct a Maltese cross with tablets, and make a freehand drawing of the same.
3. Construct a strawberry basket, based upon part of a pyramid.

16
1. Teach *blue-violet* and review violet-blue.
2. Teach *trisect.* Fold a $4''$ square for the Greek cross. Cut, and mount on page 8 of Drawing Book. Make a freehand drawing of the Greek cross, on page 9 of Drawing Book.
3. Practice circular movement and draw circles.

17
1. Model an object based upon some combination of the type forms previously studied, as a cylinder and flat spheroid combined to form a vase.
2. Review measurement. Teach *three fourths of an inch.* Draw with ruler some simple object involving measurement of $1''$, $\frac{1}{2}''$, and $\frac{1}{4}''$.
3. Construct a shield from colored paper. Mount it on page 10 of Drawing Book.

18
1. Teach *red-violet*, comparing with violet.
2. Make a freehand drawing of the shield previously constructed, on page 11 of Drawing Book.
3. Model two flat spheroids or two long spheroids; bisect them to obtain circles and ellipses. Teach *ellipse.*

19
1. Draw ellipses freehand.
2. Model two ovoids; bisect them to obtain circle and oval. Teach *oval.*
3. Review ellipse and oval from tablets. Practice oval movement and draw ovals freehand.

20
1. Construct an object based upon a circular plinth, as a cake cutter.
2. Draw a 4″ circle; cut it and teach *circumference.*
3. Cut a 4″ circle from colored paper; fold it and teach *diameter* and *radius;* mount it on page 14 of Drawing Book.

21
1. Make a freehand drawing of the circle and its parts on page 15 of Drawing Book.
2. Construct a curtain ring; mount it on page 16 of Drawing Book.
3. Make a freehand drawing of the curtain ring.

22
1. Review the six hues taught this year.
2. Practice elliptical movement; draw an ellipse freehand. Cut the ellipse and teach *circumference;* fold it for diameters and teach *long* and *short diameters.* Mount the ellipse on page 18 of Drawing Book.
3. Make a freehand drawing of an ellipse, on page 19 of Drawing Book.

23
1. Review circle, drawing concentric circles. Review ellipse, drawing concentric ellipses.
2. Make a freehand drawing of an elliptical object, as a hand mirror or eyeglasses.
3. Review oval, using tablets; practice oval movement and draw ovals freehand.

24
1. Cut an oval from colored paper; fold to show axis. Teach *axis*, and mount the oval on page 22 of Drawing Book.
2. Make a freehand drawing of the oval, on page 23 of Drawing Book.
3. Construct an oval fan from colored paper, and mount it on page 24 of Drawing Book.

25
1. Review the spectrum colors; make a spectrum from color tablets.
2. Practice oval movement, and draw ovals freehand. Make a freehand drawing of an oval object; as, the fan previously constructed on page 25 of Drawing Book.
3. Review repetition in borders, using tablets and folding and cutting colored paper.

26
1. Review repetition and alternation of size in borders, using tablets and folding and cutting colored paper.
2. Review repetition and alternation of position in borders, using tablets and folding and cutting colored paper.
3. Review repetition and alternation of form in borders, using tablets and folding and cutting colored paper.

27
1. Review white, black, and gray.
2. Review repetition in rosettes or centers, using tablets and folding and cutting colored paper. Apply alternation to radial arrangements or rosettes, using tablets and folding and cutting colored paper.
3. Construct an original center from colored paper, illustrating alternation, and mount it on page 12 of Drawing Book.

28
1. Draw the original center previously constructed, on page 13 of Drawing Book.
2. Copy an historic border (Greek astragal), using tablets.
3. Review oblong and ellipse; practice drawing oblongs and ellipses.

29
1. Review the term parallel, and rule parallel lines for the historic border, on page 21 of Drawing Book.
2. Trace around tablets laid to form the Greek astragal, on page 21 of Drawing Book.
3. Draw the Greek astragal freehand, on page 21 of Drawing Book.

30
1. Construct the Greek astragal of colored paper, and mount the border on page 20 of Drawing Book.
2. Study an historic surface pattern, illustrating repetition and alternation.
3. Construct an historic surface pattern from colored paper, and mount it on page 26 of Drawing Book.

31
1. Teach *symmetry*. Study historic symmetrical units.
2. Make a freehand drawing of a symmetrical unit.
3. Make original symmetrical units by folding and cutting paper.

32
1. Review warm, cool, green, and neutral gray.
2. Construct an original surface pattern, using symmetrical units previously cut.
3. Mount the surface pattern on gray paper.

33
1. } Make a freehand drawing of the original surface pattern, on page 27
2. } of Drawing Book.
3. Review repetition and alternation of form in borders.

34
1. Study the Greek echinus and practice oval movement.
2. Make a freehand drawing of the Greek echinus.
3. Construct the Greek echinus from colored paper. Mount it on page 28 of Drawing Book.

35
1. Study historic symmetrical units ; make original symmetrical units.
2. Make tracings of original symmetrical units, on page 29 of Drawing Book.
3. Construct an original border from colored paper, using one or two of the symmetrical units previously cut. Mount the border on page 30 of Drawing Book.

36
1. Make a freehand drawing of the original border previously constructed on page 31 of Drawing Book.
2. Review the twelve standard hues.
3. Mount the eighteen spectrum colors on page 32 of Drawing Book.

OUTLINE FOR TWO LESSONS A WEEK.

(See Plates, pages 76 to 90, for exercises in drawing and flats of objects to be constructed.)

First Year.

1
1. Present the colors of the spectrum for observation.
2. Study the sphere and spherical objects.

2
1. Teach *red.* Collect simple manufactured and natural objects of a red color.
2. Model a sphere.

3
1. Teach *cylinder.* Collect objects of similar form.
2. Model a cylinder.

4
1. Use collected forms to teach the terms *right*, *left*, *top*, and *bottom*.
2. Model a sphere and cylinder, and compare.

5
1. Review red. Use objects in nature, and give quotations.[1]
2. Teach *cube.* Collect similar forms.

6
1. Teach *orange.*
2. Model a cube.

7
1. Compare sphere, cylinder, and cube. Arrange so as to teach the terms *front*, *back*, and *center*.
2. Review solids from description and illustration upon the blackboard.

[1] A number of quotations on color will be found on pages 99 to 115.

8
1. Review orange.
2. Teach *surface*, and review terms already taught.

9
1. Teach *yellow*. Collect natural and manufactured objects of a yellow color.
2. Review surface. Teach *face* and *number of faces* on each solid.

10
1. Model spherical object, and review surface.
2. Model cylindrical object, and review surface and face.

11
1. Review yellow. Use objects in nature and give quotations.
2. Teach *edge* and *corner*.

12
1. Model a cubical object. Review surface, face, edge, and corner.
2. Teach *bisect*, and review center.

13
1. General review of colors.
2. Model sphere. Bisect sphere; teach *half-sphere*. Collect objects similar in form.

14
1. Model cylinder; bisect. Teach *half-cylinder*. Collect similar forms.
2. Place type solids and collected forms, from dictation and illustration, to review terms.

15
1. Teach *green*.
2. Model cube. Bisect diagonally; teach *half-cube*. Collect objects similar in form.

16
1. Review surface, using all the solids; teach *curved* and *plane surfaces*.
2. Model object based on the half-sphere.

17
1. Teach *blue*.
2. Study faces of bisections; teach *curved* and *plane faces*.

18
1. Model object based upon half-cylinder.
2. Teach *circle* and *square*, using models and tablets.

19
1. Teach *violet*. Collect objects of this color, natural and manufactured.
2. Teach *straight and curved edges*, using solids and tablets.

20
1. Model object based on half-cube.
2. Teach *handling of scissors;* practice cutting straight and curved lines.

21
1. Review violet. Use objects in nature, and give quotations.
2. Review straight and curved edges, and cut straight and curved lines on page A of Drawing Book.

22
1. Review circle; cut the 4″ printed circle on page B of Drawing Book.
2. Cut circle from colored paper; bisect and teach *half-circle.* Mount half-circles on page 1 of Drawing Book.

23
1. Review square; cut a 4″ square from colored paper; fold on diagonals; bisect, and teach *triangle.* Mount triangle on page 4 of Drawing Book.
2. Cut a 4″ square from colored paper; fold on diameter; bisect, and teach *oblong.* Mount oblong on page 4 of Drawing Book.

24
1. Teach *location of faces, edges,* and *corners,* using terms top, bottom, right, left, front, back, and center. Teach terms: *upper, lower, above, below.*
2. Teach *point* (the picture of a corner), *line* (the picture of an edge), *inch* and *judging distances of* 1″, 2″, 3″, and 4″.

25
1. Teach *horizontal;* apply to faces and edges (using tablets and sticks). Practice horizontal movement and draw horizontal lines of 1″, 2″, 3″, and 4″.
2. Practice drawing horizontal lines; draw horizontal lines on page 15 of Drawing Book.

26
1. Teach *vertical;* apply to faces and edges (using models and sticks). Practice vertical movement and draw vertical lines of 1″, 2″, 3″, and 4″.
2. Practice drawing vertical lines; draw vertical lines on page 15 of Drawing Book.

27
1. Teach *oblique;* apply to faces and edges (using models and sticks). Practice oblique movement and draw oblique lines of 1″, 2″, 3″, and 4″.
2. Practice drawing oblique lines downward to the left; draw oblique lines downward to the right, on page 19 of Drawing Book.

28
1. Teach *two inches,* and apply, drawing lines 2″ and 4″ long.
2. Practice drawing oblique lines downward to the right; draw oblique lines downward to the right, on page 19 of Drawing Book.

29
1. Cut a 2″ circle from colored paper and make a toy fan. (Use printed circle on page B of Drawing Book as pattern.) Mount on page 2 of Drawing Book. Cut a 2″ square from colored paper, and make a toy shovel. (Use the 2″ printed square on page B for pattern.) Mount on page 3 of Drawing Book.
2. Review oblong. Cut an oblong from colored paper, and make a flag. Mount on page 3 of Drawing Book.

30
1. Cut all the faces of the cylinder and cube from colored paper. Mount them on pages 6 and 8 of Drawing Book.
2. Trace about tablets laid to represent the cylinder, and draw the oblong on page 7 of Drawing Book. Trace about tablets laid to represent the faces of the cube, on page 9 of Drawing Book.

31
1. Cut the faces of the half-cylinder from colored paper, reviewing semicircle and oblong. Mount them on page 10 of Drawing Book. Trace about semicircles and draw oblongs to represent the faces of the half-cylinder on page 11.
2. Cut the faces of the half-cube from colored paper, reviewing oblong and triangle. Mount them on page 12 of Drawing Book. Trace about tablets laid to represent the faces of the half-cube, on page 13 of Drawing Book.

32
1. Review colors taught. Arrange colored tablets in the order of the spectrum, and mount them on page 14 of Drawing Book. Teach *white* and *black*.
2. Practice drawing a 4″ square; cut a 4″ square from colored paper, and mount on page 16 of Drawing Book.

33
1. Practice drawing a 2″ × 4″ oblong; cut an oblong from colored paper, and mount it on page 16 of Drawing Book.
2. Draw a 4″ square and a 2″ × 4″ oblong, on page 17 of Drawing Book

34
1. Construct a signal flag, and mount it on page 18 of Drawing Book.
2. Teach *border*, *repeat*, and *alternate*, using sticks.

35
1. Fold a 4″ colored paper square on a diagonal; bisect, making two triangles; mount triangles on page 20 of Drawing Book. Draw the triangles on page 21 of Drawing Book.
2. Copy borders with sticks, illustrating repetition. Arrange and mount sticks for Greek fret, on page 22 of Drawing Book.

36
1. Make a freehand drawing of the Greek fret, on page 23 of Drawing Book.
2. Construct an original border on page 24 of Drawing Book, reviewing border, repeat, and alternate.

37
1. Make a freehand drawing of the original border previously constructed, on page 25 of Drawing Book.
2. Make a representation of a simple object with sticks, involving vertical, horizontal, and oblique lines. Mount on page 26 of Drawing Book.

38
1. Make a freehand drawing of the object previously constructed, on page 27 of Drawing Book.
2. Dictate an arrangement of colored paper, using circles and squares, or squares and triangles, and mount on page 28.

Second Year.

1
1. Review recognition and naming of spectrum colors.
2. Review sphere, cylinder, and cube; surfaces (curved and plane); and the terms: center, top, bottom, right, left, front, back.

2
1. Review bisect, half-sphere, half-cylinder, and half-cube.
2. Review faces (curved and plane); shapes of faces (circular and square).

3
1. Review white, black, and gray.
2. Cut a 4″ circle and two 4″ squares; fold each, reviewing semicircle, oblong, and triangle; bisect, and mount on page 2 of Drawing Book.

4
1. Review horizontal, vertical, and oblique, making squares, oblong, and triangle.
2. Model half-sphere and an object similar in form.

5
1. Teach *standard red.*
2. Review judging lengths, 1″, 2″, 3″, and 4″, using sticks.

6
1. Model half-cylinder and similar object.
2. Practice movement, and draw horizontal and vertical lines on page 1 of Drawing Book.

7
1. Teach *standard orange.*
2. Model a half-cube and similar forms.

8
1. Teach *quadrisect.* Model a large sphere and quadrisect it. Teach the term *compare*, using sphere and its divisions.
2. Teach *length* and *width.* Review quadrisect by folding a 4″ colored square. Mount on page 4 of Drawing Book.

9
1. Teach *standard yellow.*
2. Model a large cylinder; quadrisect to obtain plinths. Teach *height* and *thickness.* Model object based upon circular plinth.

10
1. Teach *parallel faces* and apply. Construct bookshelves from oak tag.
2. Model a large cube; quadrisect it on its diagonals. Teach *triangular prism* and *faces at an angle.*

11
1. Practice free movement downward to the left and right, and draw oblique lines on page 3 of Drawing Book.
2. Construct a folding screen of oak tag, reviewing faces at an angle.

12
1. Teach *standard green.*
2. Model a large cube, quadrisect it on its diameters, and teach *square prism.*

13
1. Model a large cube and quadrisect horizontally, obtaining plinths. Teach *square plinth;* model object based upon the square plinth.
2. Teach *use of ruler;* teach *parallel lines.* Draw parallel borders on screen previously constructed.

14
1. Teach *standard blue.*
2. Make a freehand drawing of an object requiring parallel lines, on page 5 of Drawing Book.

15
1. Teach *right angle* and *acute angle,* using sticks; draw right angles and acute angles on blackboard and paper.
2. Construct a commodore's pennant from colored paper; mount on page 6 of Drawing Book.

16
1. Teach *standard violet.*
2. Teach *obtuse angle,* using sticks; draw obtuse angles on paper and blackboard.

17
1. Judge distances in inches, and test with ruler.
2. Teach drawing *light* and *dark lines* freehand.

18
1. Model an object based on the triangular prism.
2. Teach *half-inch;* rule light and dark lines $\frac{1}{2}''$ apart, on page 7 of Drawing Book.

19
1. Teach *violet-red.*
2. Trace about tablets and cut all the faces of the square prism and triangular prism from paper; mount the faces in order.

20
1. Model an object based upon the square prism.
2. Trace and cut all the faces of the square plinth and circular plinth, using paper and tablets; mount the faces in order.

21
1. Teach *orange-yellow.*
2. Fold a 4″ square on diagonals, and teach *triangle.* Teach *base, vertex,* and *altitude.*

22
1. Make some simple freehand drawing of a triangular object, on page 9 of Drawing Book.
2. Fold a 4″ square on its diameters; teach *diameter.* Mount the square on page 10 of Drawing Book.

23
1. Teach *green-yellow.*
2. Make a freehand drawing of the square and its diameters previously constructed, on page 11 of Drawing Book.

24
1. Fold a 4″ colored square on its diagonals; teach *diagonal.* Mount the square on page 12 of Drawing Book.
2. Make a freehand drawing of the square and its diagonals previously constructed, on page 13.

25
1. Teach *blue-green.*
2. Fold a 6″ square from colored paper to make a handkerchief case and a windmill; or, make a freehand drawing of a handkerchief, on page 15 of Drawing Book.

26
1. Fold a 4″ paper square, and make two oblongs; bisect; fold one for diameters, and the other for diagonals. Mount on page 16 of Drawing Book.
2. Make freehand drawings of oblongs previously constructed, with diameters and diagonals.

27
1. Teach *green-blue.*
2. Make an accurate drawing (with ruler) of a rectangular object, involving square and oblong, as a window sash, on page 21 of Drawing Book.

28
1. Teach *violet-blue.*
2. Construct a shield with a bend; mount it on page 24 of Drawing Book. Make a freehand drawing of the same, involving square and triangle, on page 25 of Drawing Book.

29
1. Make a freehand drawing of an object, combining square and semicircle, on page 27 of Drawing Book.
2. Construct a picture frame and cord, combining oblong and triangle; mount on page 28 of Drawing Book.

30
1. Review the six hues and arrange the spectrum colors.
2. Make a freehand drawing of the frame and cord previously constructed, on page 29 of Drawing Book.

31
1. Review repetition. Cut triangles from colored paper, and arrange them in a border; mount on page 8 of Drawing Book.
2. Teach *alternation of position;* construct an historic border in colored paper to illustrate; mount on page 14 of Drawing Book.

32
1. Make an original border illustrating alternation of position, using oblong tablets; construct the same from colored paper, and mount on page 18 of Drawing Book.
2. Draw the border previously constructed, on page 19 of Drawing Book.

33
1. Teach *neutral gray* and *warm gray.*
2. Copy an historic border illustrating alternation of size, using tablets. Construct the same from colored paper; mount on page 20 of Drawing Book.

34
1. Teach *cool gray* and *green-gray.*
2. Construct an original border from colored paper illustrating alternation of size; mount the border on page 22 of Drawing Book.

35
1. Construct an original border from colored paper illustrating alternation of form; mount on page 26 of Drawing Book.
2. Teach *radial arrangement* in a rosette; draw historic rosette from copy.

36
1. Construct an original rosette, using tablets; cut it from colored paper, using colors illustrating contrasted harmony, and mount on page 30 of Drawing Book.
2. Make a freehand drawing of the rosette previously constructed, on page 31 of Drawing Book.

Third Year.

1
1. Review the six standard spectrum colors, the six standard hues, and white, black, and gray.
2. Review sphere, cylinder, and cube; surfaces (curved and plane); faces (kinds and shapes); edges (curved and straight); angles.

2
1. Review bisect, half-sphere, half-cylinder, half-cube. Review terms: top, bottom; right, left; front, back; upper, lower; above, below; upper left, upper right; lower left, lower right.
2. Model one of the type solids, or one of the bisections; model an object based upon the type solid, or bisection, chosen.

3
1. Teach *orange-red* and *red-orange.* Compare with standard red and standard orange.
2. Review the terms vertical, horizontal, and oblique, drawing lines freehand and with ruler, on the blackboard and on paper.

4
1. Review quadrisect, quarter-sphere, and quarter-cylinder.
2. Review prisms. Model a square prism; bisect and quadrisect it, producing triangular prisms.

5
1. Review terms parallel and at an angle; draw lines freehand, parallel, and at angles.
2. Review plinths (circular and square). Model a circular plinth or a square plinth.

6
1. Teach *yellow-orange* and review orange-yellow.
2. Review angles (right, acute, and obtuse), and draw some simple object, to review quadrisecting and light and dark lines, on page 1 of Drawing Book.

7
1. Review cutting to a line; cut faces of prisms and square plinth, and mount on page 2 of Drawing Book.
2. Review 1″ and $\frac{1}{2}$″; rule light and dark lines $\frac{1}{2}$″ apart.

8
1. Teach *yellow-green*, and review green-yellow.
2. Teach *sketch* and *line-in;* make a freehand drawing of a window screen or door with panels involving the use of eraser, on page 3 of Drawing Book.

9
1. Teach *flat spheroid.* Model flat spheroid, and collect objects similar in form.
2. Practice circular movement for circles; draw circles freehand. Cut two circles from colored paper. Bisect one; review bisect. Mount circle and semicircles on page 4 of Drawing Book.

10
1. Review green-blue and blue-green; comparing with standards.
2. Model a long spheroid and collect similar form.

11
1. Teach *ovoid*, comparing with other curvilinear solids. Model ovoid, and collect objects similar in form.
2. Make a freehand drawing of a wall or fence, or other simple object, requiring sketching, erasing, and lining-in, on page 5 of Drawing Book.

12
1. Teach *cone*, comparing with cylinder. Model cone and collect similar forms. Teach *base*, *apex*, and *axis*.
2. Make a freehand drawing of an object which involves judging $\frac{1}{4}$″. Review $\frac{1}{2}$″ and teach $\frac{3}{4}$″.

13
1. Teach *square pyramid;* apply terms base, apex, and axis. Model square pyramid.
2. Review triangles. Teach *isosceles triangles* from pyramid. Draw triangles accurately with ruler.

14
1. Teach *blue-violet* and review violet-blue.
2. Draw triangles freehand, reviewing isosceles triangles. Cut three isosceles triangles derived from a square pyramid, and mount them on page 6 of Drawing Book.

15
1. Construct an object based upon the cone, as a cornucopia; or upon a square pyramid, as a scoop.
2. Teach *red-violet*, and review violet-red.

16
1. Make a frechand drawing of the back of an envelope on page 7 of Drawing Book.
2. Teach *trisect*. Fold a 4″ square for a Greek cross. Cut and mount on page 8 of Drawing Book.

17
1. Make a freehand drawing of the Greek cross on page 9.
2. Practice circular movement, and draw circles.

18
1. Review measurement, ruling lines. Draw with ruler some simple object involving measurement of 1″, $\frac{1}{2}$″, and $\frac{1}{4}$″.
2. Construct a shield from colored paper; mount it on page 10 of Drawing Book.

19
1. Make a freehand drawing of the shield previously constructed, on page 11 of Drawing Book.
2. Model two flat spheroids or two long spheroids. Bisect them to obtain circles and ellipses; teach *ellipse*.

20
1. Review circular movement; practice elliptical movement. Draw ellipses freehand.
2. Model two ellipses. Bisect them to obtain circle and oval; teach *oval*. Review ellipse and oval from tablets.

21
1. Practice oval movement and draw ovals freehand.
2. Draw and cut a 4″ circle. Teach *circumference;* fold circle and teach *diameter* and *radius*. Mount the circle on page 14 of Drawing Book.

22
1. Cut a paper ellipse; review circumference. Fold the ellipse and teach *long diameter* and *short diameter*. Mount the ellipse on page 18 of Drawing Book.
2. Practice elliptical movement. Make a freehand drawing of the ellipse and diameters on page 19.

23
1. Review the spectrum colors; make a spectrum from colored-paper tablets, and mount on page 32 of Drawing Book.
2. Practice oval movement, and draw ovals freehand.

24
1. Cut an oval from colored paper; fold to show axis. Teach *axis*, and mount the oval on page 22.
2. Practice oval movement, and make a freehand drawing of the oval on page 23 of Drawing Book.

25
1. Review white, black, and gray.
2. Construct an oval fan from colored paper; mount it on page 24. Make a freehand drawing of the fan on page 25 of Drawing Book.

26
1. Review repetition in borders, using tablets, and folding and cutting colored paper. Review repetition and alternation of size in borders, using tablets, and folding and cutting colored paper.
2. Review repetition and alternation of position and of form in borders, using tablets, and folding and cutting colored paper. Review repetition in rosettes or centers, using tablets, and folding and cutting colored paper.

27
1. Review warm, cool, green, and neutral gray.
2. Construct an original radial arrangement from colored paper, illustrating alternation. Mount it on page 12 of Drawing Book.

28
1. Practice drawing the original center.
2. Draw the original center on page 13 of Drawing Book.

29
1. Copy historical border (Greek astragal), on page 21 of Drawing Book.
   (*a*) Trace about tablets.
   (*b*) Draw freehand.
   (*c*) Rule parallel border lines for each.
2. Construct the Greek astragal from colored paper and mount on page 20 of Drawing Book.

30
1. Apply alternation and repetition to surfaces, using tablets, and folding and cutting colored paper.
2. Study an historic surface pattern illustrating alternation and repetition, and practice drawing the units of the same.

31
1. 2. Construct the historic surface pattern previously studied from colored paper, and mount on page 26 of Drawing Book.

32
1. Teach *symmetry*, studying an historic symmetrical unit; make a freehand drawing of the same.
2. Make original symmetrical units by folding and cutting paper.

33
1. Construct an original surface pattern, using the symmetrical units previously cut. Mount on gray paper.
2. Make a freehand drawing of the original surface pattern, on page 27 of Drawing Book.

34
1. Study the Greek echinus; make a freehand drawing of the Greek echinus.
2. Construct the Greek echinus from colored paper; mount it on page 28 of Drawing Book.

35
1. Make tracings of the original symmetrical units previously cut, on page 29 of Drawing Book.
2. Construct an original border from colored paper, using one or two of the symmetrical units previously cut. Mount the border on page 30 of Drawing Book.

36
1. Make a freehand drawing of the original border previously constructed on page 31 of Drawing Book.
2. Review all colors taught, and mount the eighteen spectrum colors on page 32 of Drawing Book.

SUGGESTIONS FOR TEACHING.

I. COLOR.

Make the first lesson a familiar talk on the sunlight, the rainbow, and the spectrum, producing the spectrum before the children by means of a prism. Then test each one's knowledge of color names.

To teach a color. — Having provided a collection of miscellaneous colors, and a good example of the color to be taught, hold the color before the pupil, have him observe it, and ask him to select a similar color from the collection. Repeat this exercise until the pupil can readily select the right color whenever asked. Then name the color, and afterward designate it by its name.

The pupil should have little slips of colored papers to arrange according to his own ideas, or from a chart, from dictation, or from memory, as the teacher may suggest. At the end of the first year he should be able to recognize and name, in their order, the six colors — *red*, *orange*, *yellow*, *green*, *blue*, and *violet* — as well as *black*, *white*, and *gray*.

During the second year, these six colors should be so fixed in the mind of the pupil that he will, without hesitation, select the *standard* colors from all others. Before this, the paper tablet, a ribbon, a dress, a cherry, a currant, and a geranium flower, were all *red*. When the pupil knows the standard colors, he will perceive that possibly only one is *standard red;* the others are lighter or darker. The six new colors studied during this year — *violet-red*, *orange-yellow*, *green-yellow*, *blue-green*, *green-blue*, and *violet-blue* — are to be taught in the same manner as were the first six, and the grays are to be classified as *warm*, *cool*, *green*, and *neutral*.

During the third year, review the spectrum colors and lead the pupil to recognize *hues*. He will perceive that he already knows six hues. Teach six others, each as a separate color; then compare each hue with two standards, and with its companion hue. At the end of this year, the pupil should be able to recognize and name, in the order in which they occur in the spectrum, the eighteen selected colors, and should also know the typical grays.

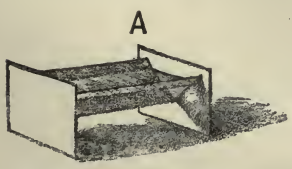
An effort should be made to cultivate the pupil's taste for color, by using colored paper in construction and arrangement. In each arrangement, he should be limited to one active color, using with it a passive — white, black, or one of the eight grays taught. The pupil will find that a color is more effective on one gray than on another; he should, therefore, be led to select the best possible ground for his units.

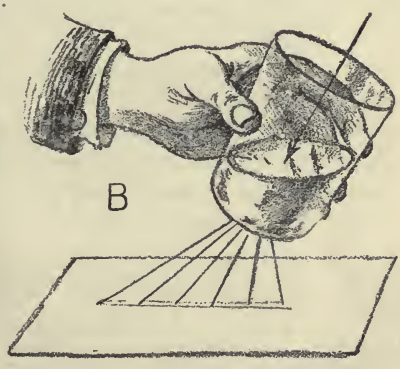
Refer to color constantly. Interest the pupil in the colors of the clouds, and of minerals, plants, and animals. Make collections of beautifully colored objects, compare natural and artificial coloring, and look for color in common things, where, at first sight, none seems to appear.

An Illustrative Lesson.

Teaching Red.

Preparation. — Make arrangements for throwing the solar spectrum upon some part of the wall or ceiling of the room, or upon a screen. This may be done by using a triangular prism of glass, or by





using a little trough with glass sides, containing clear water, as shown in A; or by holding a glass partly filled with water, as in B.

Place several red objects in different parts of the room.

See that each pupil is provided with the first year color tablets.

Review. — Review the spectrum, where found in nature, etc.

Presentation of the Color. — Hold a sheet of red paper before the class. Ask in which part of the spectrum they see such a color. Ask them to select a tablet like it. Give the name *red.* Ask whether they can find any red object in the room; whether they remember having seen red objects elsewhere; what red object they could bring from home for use in the next lesson. Write *red* on the blackboard and have a piece of red paper hung beside it. Lead the pupils to use the term.

(See, also, Notes on Color in the Appendix, page 92.)

II. FORM.

Form must be taught from models and objects.

The *teacher* (1) presents the object, (2) directs the pupil's attention, (3) induces expression. The *pupil* (1) observes, (2) reflects, (3) expresses what he has perceived.

The following outline of steps for a form lesson, if persistently followed, will lead to good results: —

1. *Observation:*
   (*a*) Through the hand, of size, shape, and texture.
   (*b*) Through the eye, of appearance and action.
2. *Reflection* — comparison with familiar objects:
   (*a*) In the room.
   (*b*) Elsewhere (objects remembered).
3. *Expression:*
   (*a*) Oral and written description.
   (*b*) Construction (modeling in clay, and making simple objects from paper).
   (*c*) Drawing.

An Illustrative Lesson.

Studying a Sphere.

Preparation. — Place a few spherical objects — an orange, a ball, an apple, a bead, etc. — in different parts of the room. Distribute spheres.

Observation. — Give name of object. Direct the pupils to grasp the sphere in the right hand, in the left, in the right again. Ask how it feels to the hand (smooth, round); what it will do when placed on the desk top (roll every way); and what it will do when placed in the groove or on the floor (stand). Have the sphere held at arm's length and observed; have it turned in different positions, and ask how it looks to the eye (round).

Reflection. — Ask the pupils what they can see in the room having the shape of the sphere; and what they remember to have seen elsewhere having the same shape. Ask them to tell about the largest sphere they ever saw, the smallest, etc.

Expression. — Write the name *sphere* on the blackboard. Have it pronounced correctly first in unison, then by individuals. Ask questions to bring out the use of the words *sphere* and *spheres*.

After the first lesson on each form, the pupil should collect objects based on the form studied. For example, after the first lesson on the sphere, the collection of objects of similar form might include marbles, beads, seeds, bulbs, fruits, etc.

CLAY MODELING.

In a modeling lesson, the aim should be to find out what the pupil knows, and how much he can tell about the model or object. The perfect form must be produced by modeling with the fingers, having the work nearly always exposed to view, for comparison with the type model.

Model each object *directly*, unless the aim is to teach a *derived* form. Do not model a sphere first; it wastes time, dries the clay, does not improve the final result, and is not philosophical. Press the clay gradually, *with the fingers*, into the required form.

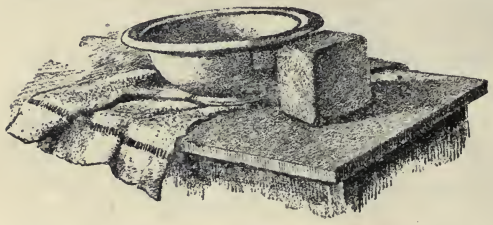
When modeling an object based on a type solid, have the object in the presence of the pupils. They may, however, occasionally be asked to work from memory.

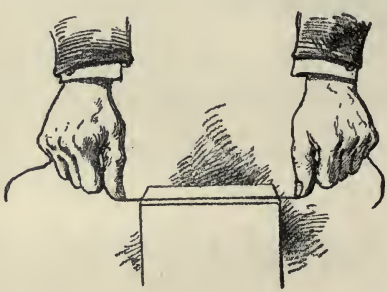
Small clay models can be divided most satisfactorily by means of a thin, stiff card, and larger ones by using a strong thread.

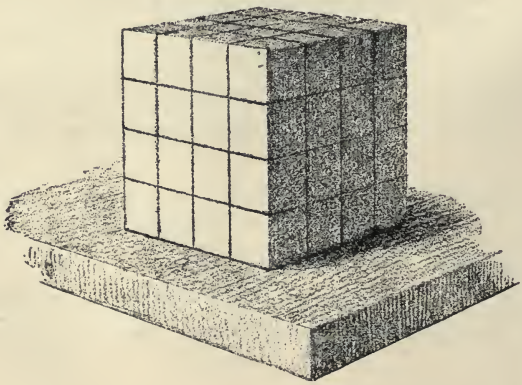
An Illustrative Lesson.

Modeling the Sphere.

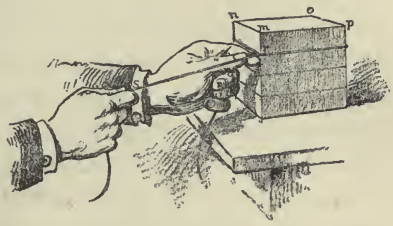
Preparation. — Be sure that the clay is in good condition, — of the same consistency throughout, and soft enough to be easily modeled, but not so soft as to adhere to the fingers. Swage the clay into a cubical mass by dropping it again and again upon a smooth board. Cut it by means of a fine strong string, held taut between the thumbs, into cubical pieces about one inch on a side, the mass being turned upon its side when making the horizontal cuts; or, the horizontal cuts may be made by passing the string around the mass, as shown at *m*, *n*, *o*, *p*. In this case hold one end fast and pull *s*, allowing the string to slip between the thumb and finger







at *r* until the clay is cut, just as butter is "wired" at the market. Have the pieces of clay distributed and placed upon each desk on a sheet of manilla paper. Distribute the spheres.



Review.—Review the sphere rapidly, asking how it feels, how it looks, what it will do.

Modeling.—Lead the pupils to see that the clay has corners and rough places while the model has not. Show them how to take the clay between their thumbs and fingers and press in its corners, turning it round and round, again and again, until it looks like the sphere.

Have the type solid and the clay model placed side by side upon the desk and compared. Continue modeling until the form is as nearly perfect as possible. The clay spheres should now be placed on the desk beside the models, so that the teacher may select the best for preservation.

Each selected model should be marked with the initials of the maker. This may be done by a pin or a pen.

At the end of the lesson the remaining clay should be collected, placed on a suitable cloth, previously provided for this special purpose, laid in a basin, mixing bowl, or earthen jar, and sprinkled generously with water. After allowing it to stand for a short time, swage it again into a cubical mass, wrap it in moist cloths, and set it away in a covered jar or covered with a piece of waterproof cloth.

Keep the clay always ready for use; that is, keep it swaged into a solid mass, and covered with moist cloths, protected in some way from the air.

Occasionally spread the clay out in a thin layer on a board, and allow it to dry thoroughly *in the sun*.

The end of all modeling in clay is to lead the pupil to *know form*. The more perfect this knowledge, the more accurately will he be able to represent form, or draw, where he is required to do so at a later stage of the work.

(See, also, Notes on Clay Modeling in the Appendix, page 116.)

DETAILS OF FORM.

Faces.

Teach faces from the solids. Use the tablets, then have the pupil cut paper to represent faces. There are three ways in which to do this, each adapted to a certain stage of the work: 1st, press the paper upon the face of the model to be cut, so as to obtain creases to guide in cutting; 2d, trace around the face, and cut on the pencil line thus obtained; 3d, cut freehand —that is, by judging the size and shape, without measuring or obtaining guide lines upon the paper.

A curved face, for example that of a cylinder, may be cut as follows: Mark a point upon one edge of the cylinder; place the cylinder upon its side on the sheet of paper, with this point touching one corner of the sheet; roll the cylinder along, without allowing it to slip, until this point again touches the paper. This gives the length of the face; that is, the distance around the cylinder. Set off the proper width for the face, and cut the oblong.

Tablets may be used to represent faces. For making arrangements where geometric figures are used as units, the accurate machine-made tablets are furnished.

Edges.

Teach edges from the solids. First, use sticks to represent edges. The pupil can more readily indicate the length and position of an edge, by selecting and laying a stick upon his desk or slate than by drawing. The representation of edges by drawing should come later. After the pupil knows how to use the ruler, have him measure edges.

Corners.

Teach corners from the solids. A cube has eight corners and twenty-four angles, three at each corner.

Points.

In drawing, points are pictures of corners, and are also used to indicate positions and distances.

To place a point, hold the pencil nearly perpendicular to the surface upon which the point is to be placed, and press lightly upon the paper. A point has *position* only. Points should be so small, that when two are connected with a line they are no longer visible as dots.

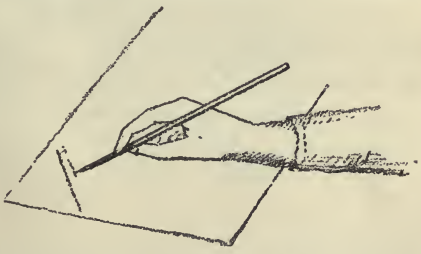
When teaching the length of one inch, use the cube. After having the pupil mark off the distance with the cube upon the paper, until he can do it with accuracy and facility, place the cube upon the desk in front, and teach him to judge the distance, placing on the paper a point to represent each nearer upper corner. Repeat this exercise until he thoroughly knows the distance.

Lines.

In drawing, lines represent either edges or outlines. During the first two years, the pupil should be taught to draw lines both freehand and mechanically.

A. In order that the pupil may draw freehand with ease, certain general rules must be observed: —

I. *Position.* — The body should be erect, facing the desk, the right hand holding the pencil two or three inches from its point, and in such a position that the pencil is at right angles to the line to be drawn.



II. *Movements.* — Preliminary practice in the movements is valuable, and should be persistently carried on until the pupil has control of his hand and arm. The movements are rectilinear and curvilinear. There are three of each.

Rectilinear: 1, horizontal; 2, vertical; 3, oblique.
Curvilinear: 4, circular; 5, elliptical; 6, oval.

In the first, the hand moves from left to right; in the second, from the top downward; in the third, either way, according to the direction of the line. If the oblique line approaches a horizontal, the movement is from left to right; if it approaches a vertical, it is from the top downward. (In all cases, the pencil is to be held at right angles to the direction of the line.) In the fourth, the movement is from the lowest point in the circle upward to the left, the pencil being held in the position required for vertical lines. In the fifth, the movement is from the highest point in the ellipse downward to the left, the pencil being held in the position required for horizontal lines if the long diameter of the ellipse is horizontal, or in that required for vertical lines if the long diameter is vertical. In the sixth, the movement is from the *round end* of the oval downward to the left, or upward to the left, according to its position.

Every line should be drawn with one continuous movement.

No erasing by the pupil is to be allowed until the second year. Then he is to be *taught* the use of the eraser.

B. In order that the pupil may draw mechanically with accuracy, he must be taught early the use of the ruler, and this course provides for practice in *measuring* and in *ruling*. In both these exercises the aim is to secure, 1st, accuracy; 2d, facility.

The pupil should measure with any part of the scale, and not depend on the figures marking the divisions.

When ruling horizontal lines, in order to allow for the space occupied by the pencil, the ruler should usually be held a little below the intended position of the line; when ruling vertical or oblique lines, the ruler may be held upon either side of the line, as may be convenient.

Angles.

The difference in direction of two lines is an angle. The size of an angle does not depend on the length of its sides. A jointed two-foot rule, splints, and strips of paper for folding are all helpful in teaching angles.

Geometric Figures.

Teach the geometric figures from the solids.

A geometric figure (for children) is the picture of a plane face of a solid. In this series of lessons the pupil first draws the geometric figure from the solid, then some application of the figure — that is, some simple object based on the figure; next, he studies and draws the divisions or parts (details) of the figure; and, lastly, some object involving in its representation the use of the geometric figure and its details.

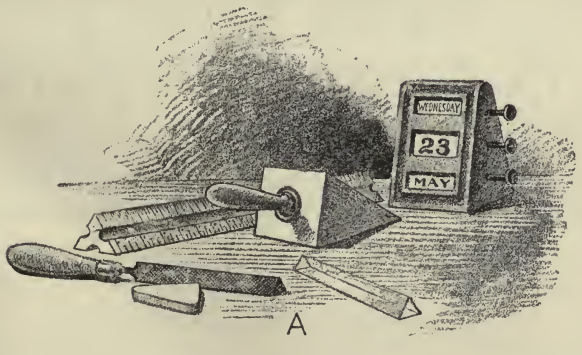
The geometric figures should be drawn both mechanically and freehand; mechanically, for training in accuracy; freehand, for training in the judgment of distances and proportions.

An Illustrative Lesson.

Teaching the Geometric Figure, Triangle.

(*Second Year.*)

Preparation. — Place one or two objects having a triangular face, — a draftsman's scale, an eraser, a three-cornered file, etc. (see A),

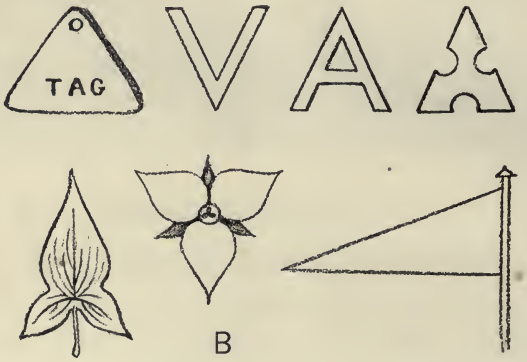


A

— in different parts of the room. Or, if none of these can be found, cut such objects as are shown in B from paper or cardboard, — a tag, two capital letters, an ornamental form, a leaf, a flower, a pennant.

Distribute the half-cubes and the tablets. Have materials ready to cut several paper triangles of different shapes and sizes.

The Lesson. — Show a large paper triangle, or draw one upon the blackboard, and ask the pupils to show a model having a face of that shape; to find a tablet shaped like the face. Tell them that a face like that is a triangular face. Ask them to find an object in the room having a face like it; to find a triangular object. Lead the pupils to discover for themselves that while triangular faces



may vary in shape they have certain elements in common. Cut paper triangles to illustrate this. Let the pupils find and describe these common elements: *plane surface, three straight lines,* and *three angles.* A plane surface bounded by three straight lines and having three angles is a *triangle.*

Have the pupils find other triangles in the room. Let them draw triangles on the blackboard, on practice paper, and in their drawing books, and write the name of the figure in each one drawn. Use the term in a short language lesson.

Objects based on Geometric Figures.

The following is a partial list of objects, based on the geometric figures, suitable for drawing in the primary grades: [1] —

[1] These are arranged alphabetically under each head, but *not* in the order to be followed in the course.

OBJECTS BASED ON GEOMETRIC FIGURES.

Triangle.

Bookmark.
Corner bracket and shelf.
Draughtman's triangles.
Jib and stay sails.
Paper cap.
Pennant.
Signal flag.

Square.

Checkerboard.
Cold-wave flag.
Greek cross.
Handkerchief and case.
Hanging basket.
Maltese cross.
Sash (lower or upper).
Saint Andrew's cross.
Square envelope.
Strawberry basket.
Toy shovel.
Weather signal.
Windmill (paper).

Oblong.

Book cover.
Bookmark.
Roman cross.
Door.
Envelope (front and back).
Flag.
Picture frame.
Reel.
Spade.
Tag.
Window.
Window screen.

Circle.

Cover for funnel iron or thimble.
Curtain ring.
Fan.
Ink-well cover.
Penwiper.
Plate.
Stove cover.
Washer.
Whirligig.
Wheel.

Ellipse.

Artist's palette.
Clam shell.
Elliptical buckle.
Escutcheon.
Hand mirror.
Ornamental window.
Photograph frame with elliptical opening.
Plumber's chain link.
Ship's cable link.
Spectacles.
Tag (for key ring).

Oval.

Fan.
Handbellows.
Horse collar.
Horseshoe.
Horseshoe magnet.
Padlock.
Racket.
Spoon.

The following order should be observed in drawing from any object: —

(*a*) Determine the proportion of the object — that is, the whole width as compared with the whole length.
(*b*) Determine the size of the drawing (according to the size of the paper upon which it is to be made), and indicate whole width and whole length. This fixes the whole space to be occupied by the drawing.
(*c*) Determine the positions of the principal parts, and their relations, and indicate these on the paper.
(*d*) Sketch the principal parts.
(*e*) Sketch details.
(*f*) Erase unnecessary or incorrect lines.
(*g*) Line-in; finish the drawing.

Flats.

Flats are developments of whole objects. They lead to true development of surface. In a flat, two or more faces of a solid are combined and modified, so as to produce some simple object interesting to a child. All the flats required in this course are illustrated on Plates XI.–XIV. This series of flats, based on the solids, is only given as one possible series. It is hoped that the teacher will be able to invent others equally good, or better.

Flats should first be accurately drawn on tough, smooth, manilla paper (thin oak tag is best); then cut out and finished, as indicated by the pictorial sketches.

III. ARRANGEMENT.

Teach, by means of the solids, the meaning of such words as *arrange*, *row*, *repeat*, and *alternate*, as suggested in the Outline by Lessons. Teach the terms *border*, *center*, and *surface* from objects in the room and from examples of good design, of which each teacher should make a collection.

During the first year, the pupil is to copy an historic fret, with sticks, before making original arrangements. The first column of illustrations in Historic Ornament (Plate XV.) will furnish sufficient material. Make a large drawing of one of

these frets; or make a large, colored-paper chart to hang before the class. Each pupil should copy this by arranging sticks, using the desk, a slate, or a strip of gray paper of the proper size, for a background; the paper will be found most satisfactory.

Pupils generally have most difficulty with the spacing, and to this the teacher should give special attention. Two or three of the best arrangements should be put into permanent form and preserved. This may be done by mounting them on a background, or in the drawing books. Use only one color in each arrangement, unless alternation of color is to be taught.

During the second year, the pupil is to copy an historic border or center with tablets (for examples, see Plate XV.), and then should make original arrangements. The amount of surface covered by the units should receive special attention. In radial arrangements, a strong, well-defined center should hold the parts together, or appear to do so. Parts not connected with the center, or connected only by points, must not be allowed. These arrangements should be simple. As a rule, limit the pupil to the use of five units; never allow him more than nine.

During the third year, the pupil is to copy an historic border and surface (see Plate XV.). It may be necessary here to use one color and two, or even three, grays; but in no case allow the use of two colors, unless alternation of color is to be taught in radial arrangements, illustrating alternation of form.

To make symmetrical units, by combining two or more geometric figures, requires more invention of the pupil than any preceding work. Illustrations of these units, taken from historic ornaments, are given on Plate XV. The pupil should endeavor to keep in mind not only the shape of the individual unit, but the shapes resulting from a combination of these units in an arrangement; for a commonplace unit, when skillfully disposed over a surface, will often give a very pleasing result. To this end, many experiments should be made by the pupils, and the results noted by the teacher upon the blackboard, or in a note-book (which every teacher should keep). The pupil should then select the best arrangement, and construct and draw it.

During these three years the drawing of arrangements should be as accurate as possible. Use a ruler to draw margin lines; place points at ends of sticks, used as units, to fix positions; trace around geometric units; measure the spaces between them; and do everything to insure accuracy. The *end* of all arrangement is *beauty*. A careless, ill-drawn pattern is not beautiful.

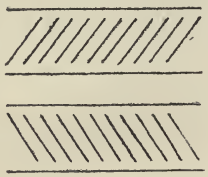
An Illustrative Lesson.

Arranging a Border.

(Previous lessons are supposed to have been given to make clear such terms as *arrange*, *border*, and *repeat*.)

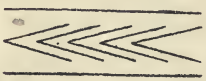
Preparation. — Give each pupil a dozen 1″ sticks of one color, and four 4″ sticks of the same color for margins. Select a simple historic border, like Fig. 1, Plate XV., and draw it upon the blackboard, or upon a chart, or construct it, using 3″ sticks, glued upon a cardboard.

The Lesson. — Have the border copied correctly, by laying sticks upon the desk or paper. Ask such questions as, What have you made? What did you use to make it? Show me one of the things you used. A single thing, like that used in a border, is called a *unit*. In what position is each unit placed? In what other position might each have been placed? (Horizontal, oblique.)



You may make a border in which the units are oblique. Suppose you were to put two oblique units together to form one unit. What would your border be like then?

or



Can you not make a unit of some other shape, using two sticks? T, L, X, +, ‖, etc. Can you not make a border, using one of your original units repeated? (Of course original only in the sense that it is the result of the pupil's own thinking.)

Conclusion. — The best borders should be sketched upon the blackboard. Encourage the pupils to find examples of borders and bring them to school for study.

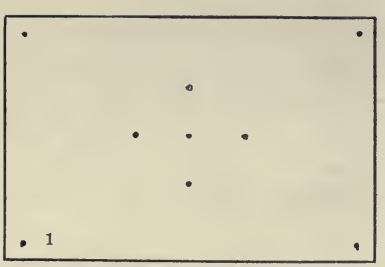
ILLUSTRATIONS.

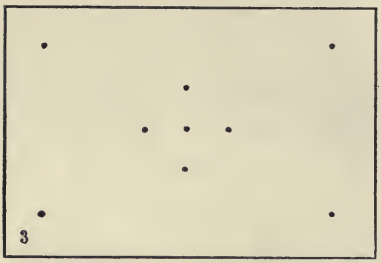
The following illustrations, Plates I. to X., show all the finished drawings required, and a few optional exercises.

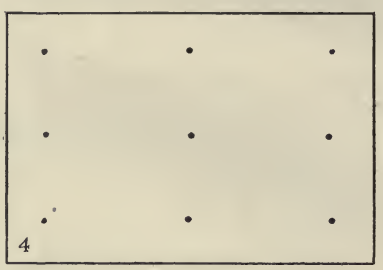
Plates XI. to XIV. show constructed objects, not all of which are required of the pupil, but which may be made as busy work, or home work.

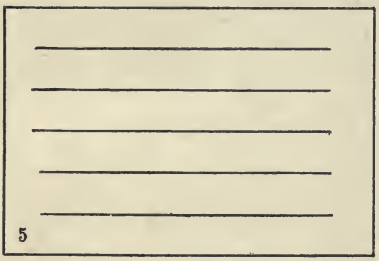
Plate XV. gives examples of simple historic ornament.

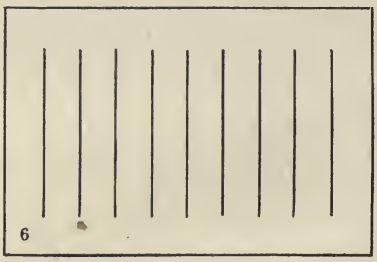
PLATE I. — FIRST YEAR.

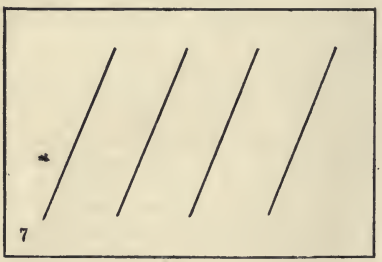




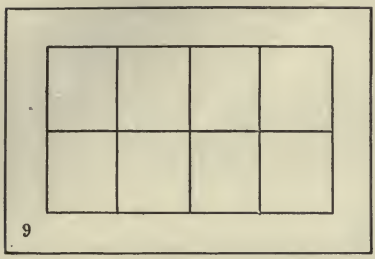








1. Locating points.
2. Judging one inch.
3. Judging inch from corner, etc.
4. Review of terms and measurements taught.
5. Horizontal lines.
6. Vertical lines.
7. Oblique lines, downward to the left.
8. Oblique lines, downward to the right.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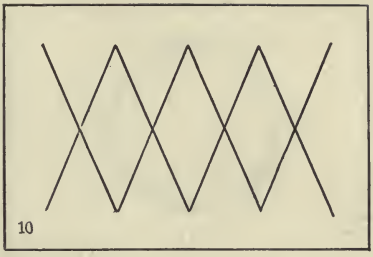
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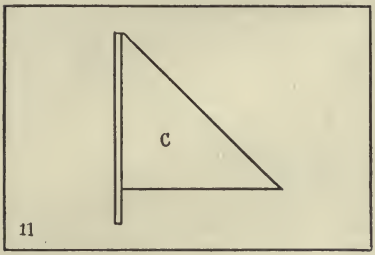

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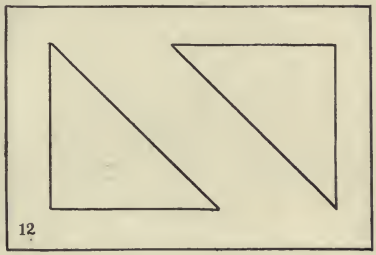
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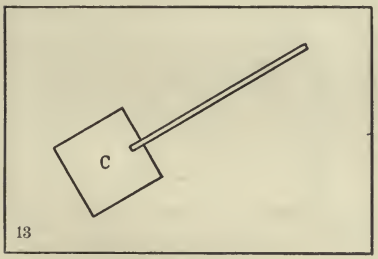

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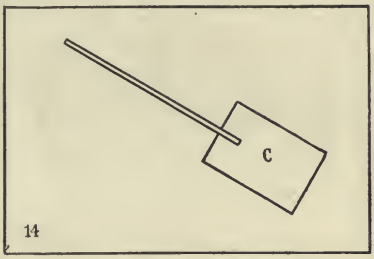

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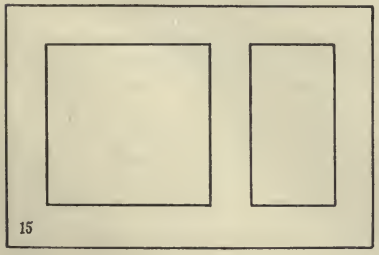
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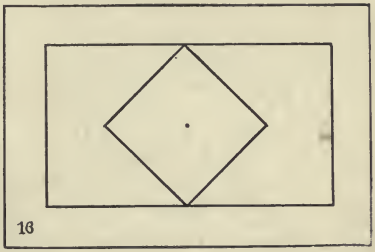
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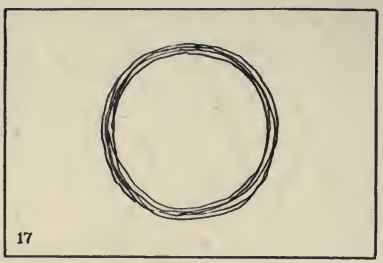
9. Review, horizontal and vertical lines.
10. Review, oblique lines.
11. Triangular object, pennant, constructed.
12. Triangles.
13. Square object, toy shovel, constructed.
14. Oblong object, toy spade, constructed.
15. Square and oblong.
16. Review, oblong and square; optional.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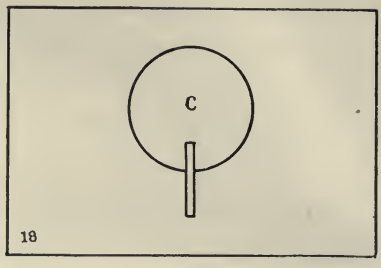

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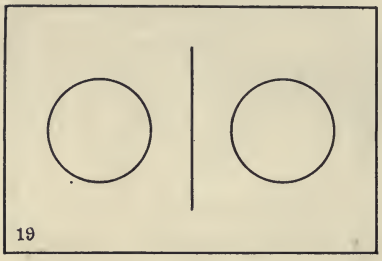
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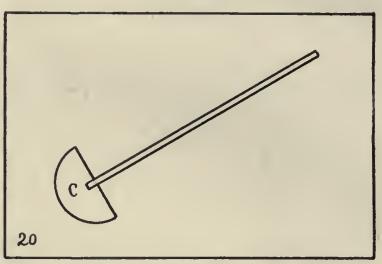

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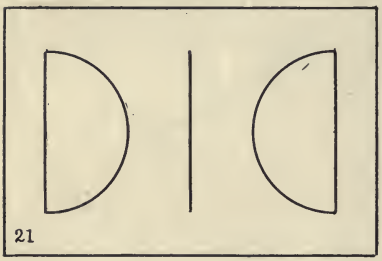
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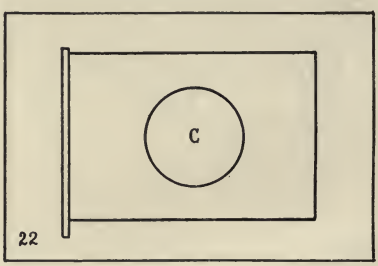

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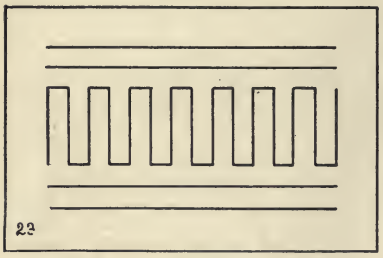
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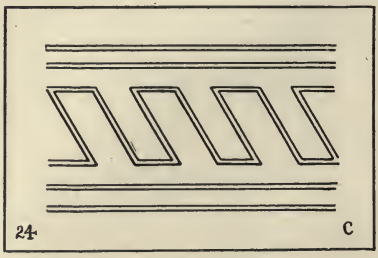

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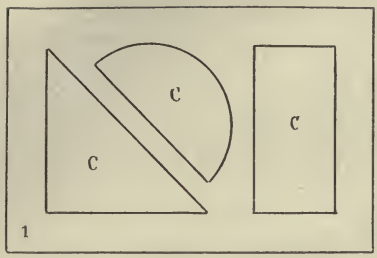
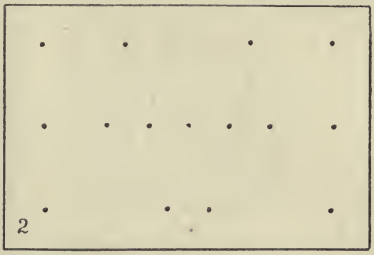
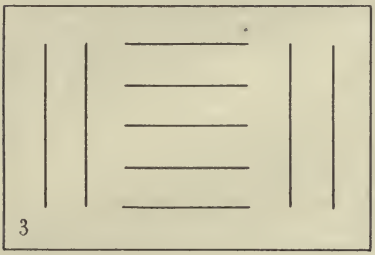
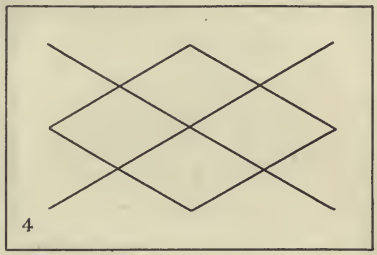
17. Practice of circular movement.
19. Circles.
21. Semicircles.
23. Historic border

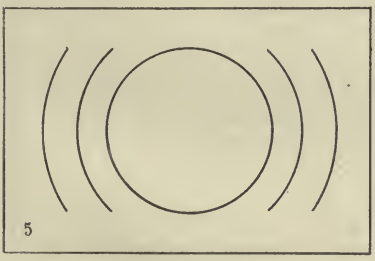
18. Circular object, fan, constructed.
20. Semicircular object, toy sod cutter, constructed.
22. Japanese flag, constructed.
24. Original border, constructed.

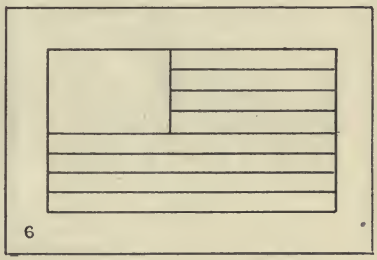


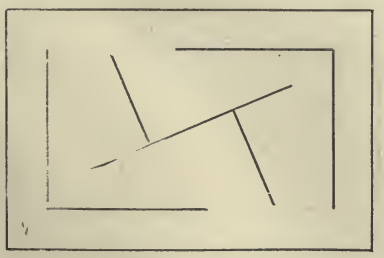


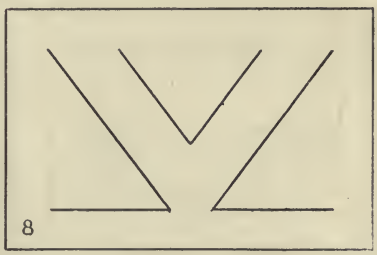




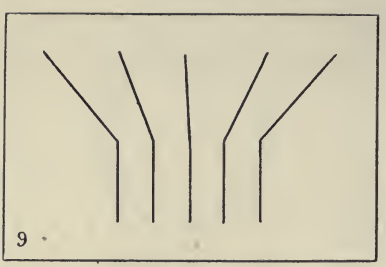








1. Divisions of circle and square.
2. Location of points at definite distances.
3. Review, vertical and horizontal lines.
4. Review, oblique lines.
5. Circle and curved lines.
6. Object involving parallel lines: a flag.
7. Right angles.
8. Acute angles.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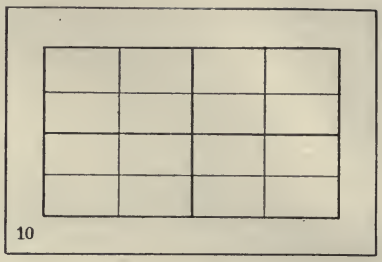
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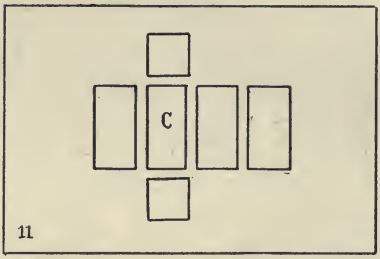

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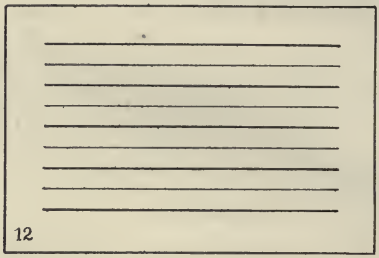
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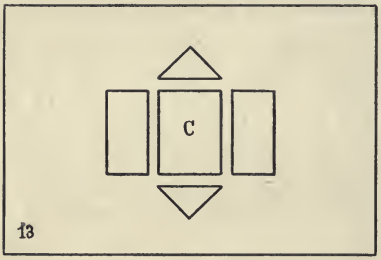

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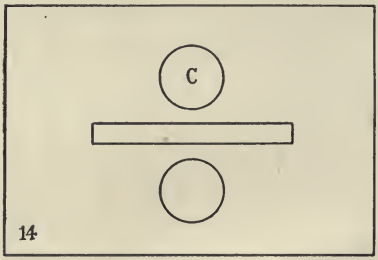

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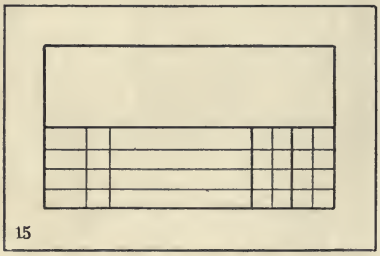
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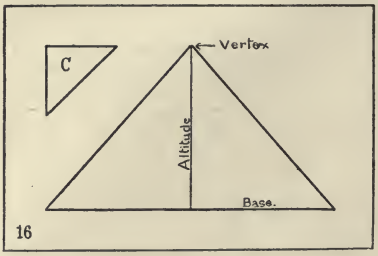

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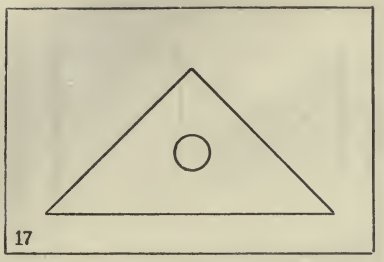
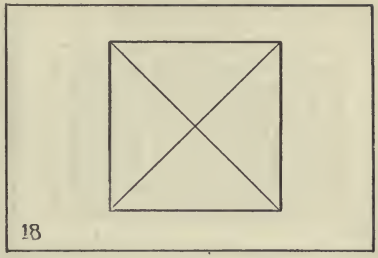
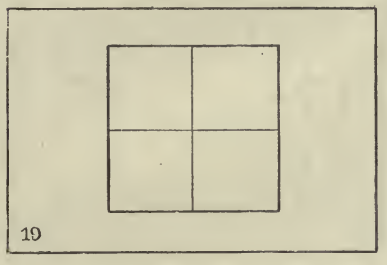
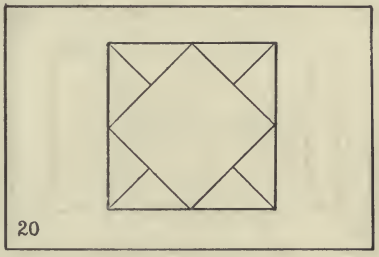
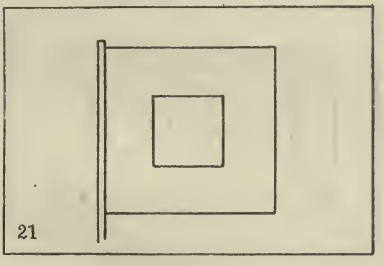
9. Obtuse angles.
10. Light and dark lines.
11. Faces of a square prism.
12. Light and dark lines a half-inch apart.
13. Faces of a triangular prism.
14. Faces of a circular plinth.
15. Object involving judgment of half-inch: a bill head.
16. Triangle, with details.

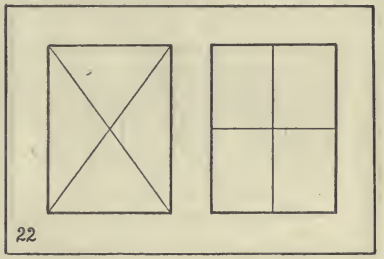


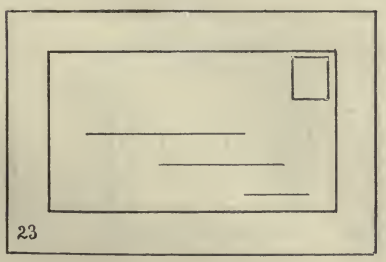


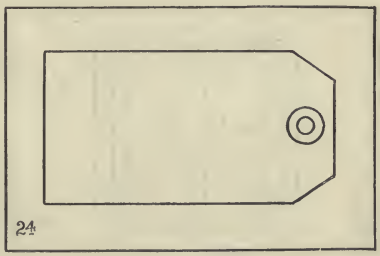




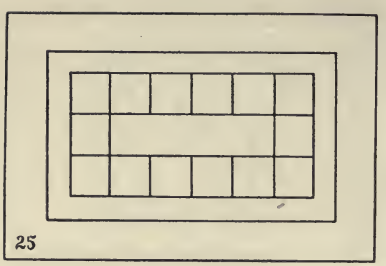








17. A triangular object, draftsman's triangle.
18. A square with diagonals.
19. A square with diameters.
20. Same as 18, adding inner square.
21. A square object: cold-wave flag.
22. Oblongs with diagonals and diameters.
23. An oblong object: face of an envelope with stamp.
24. An oblong object, a shipping tag.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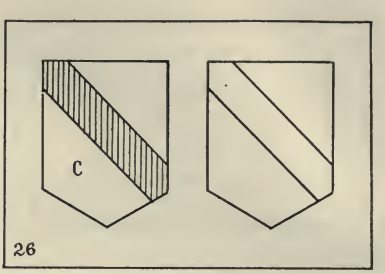

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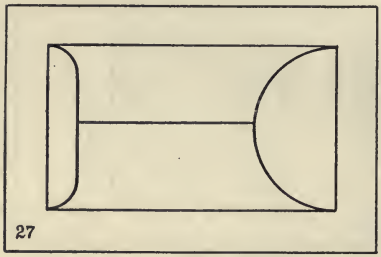
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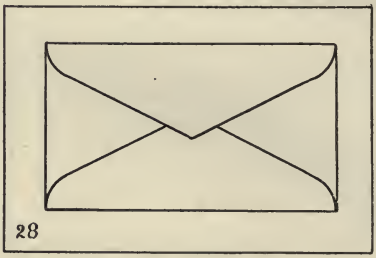
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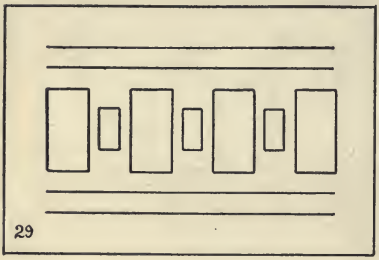
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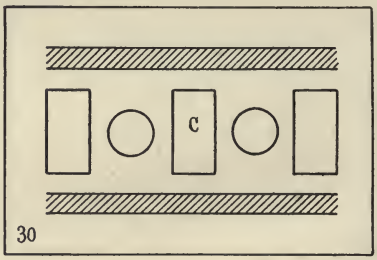

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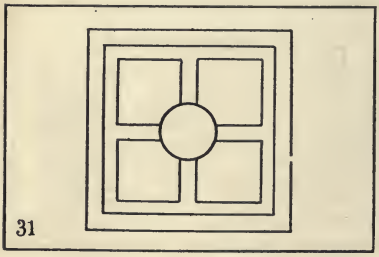
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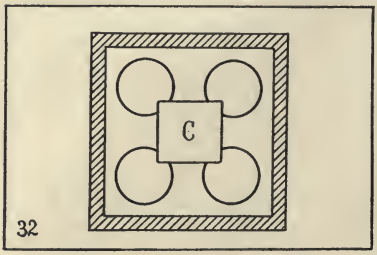
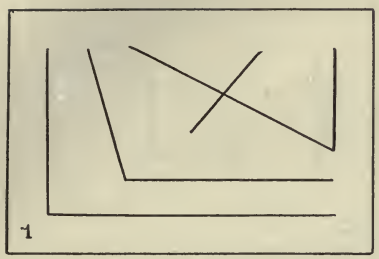
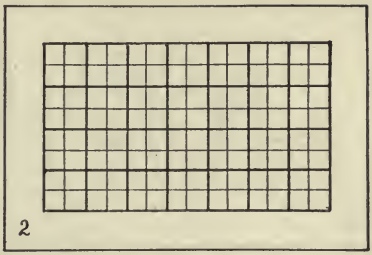
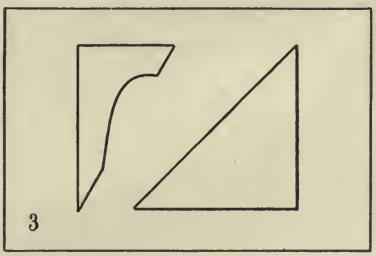


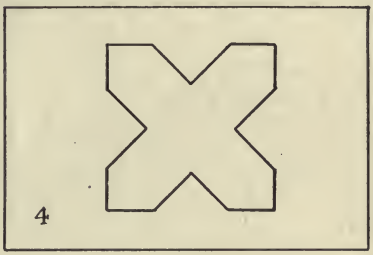
32

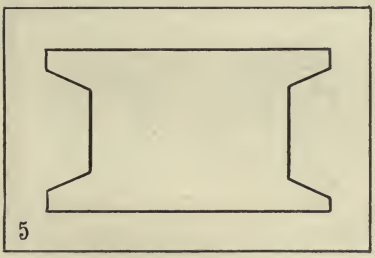
25. An ornamental window (squares and oblongs).
26. A shield with a bend.
27. A cash envelope.
28. An oblong envelope.
29. An historic border.
30. An original border (alternation of form).
31. An historic rosette.
32. An original rosette (radial repetition).

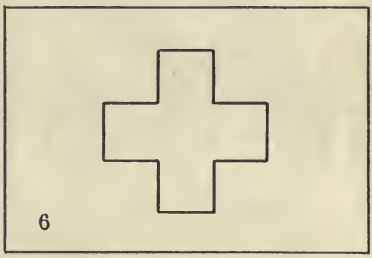


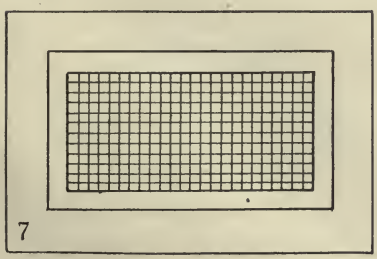


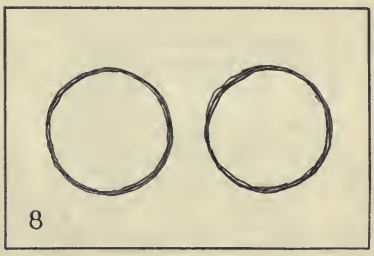




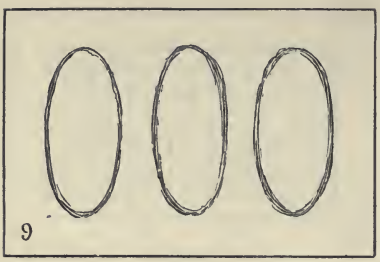


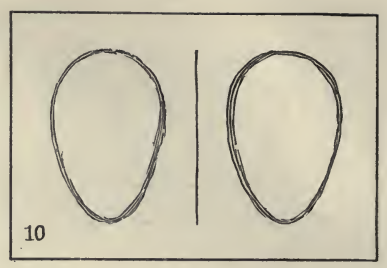


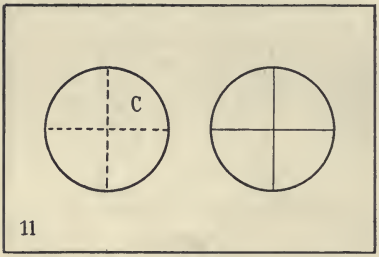


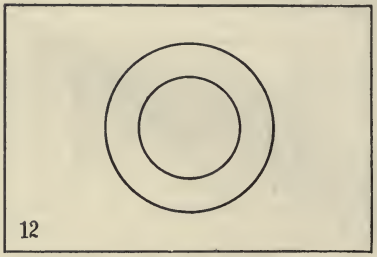


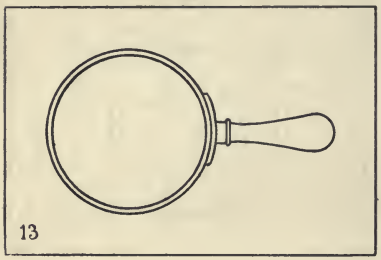
1. Angles.
2. Ruled light and dark lines, ½″ apart.
3. A bracket and shelf.
4. St. Andrew's cross.
5. Silk reel.
6. Greek cross.
7. Window screen, ¼″ meshes.
8. Circles for movement.

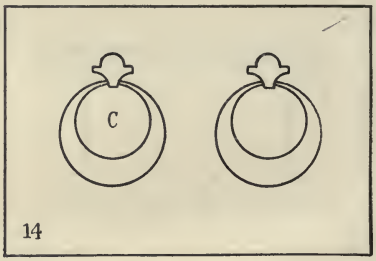


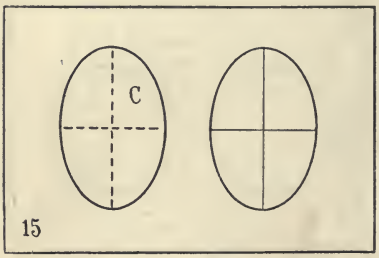


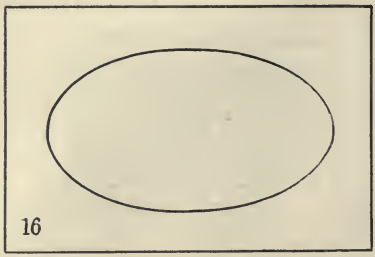




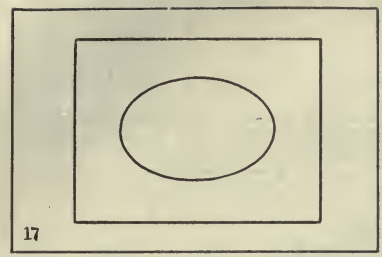


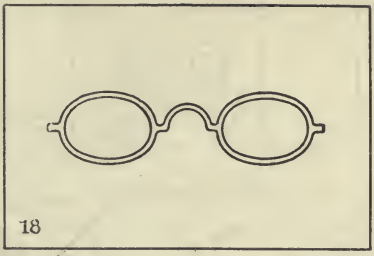


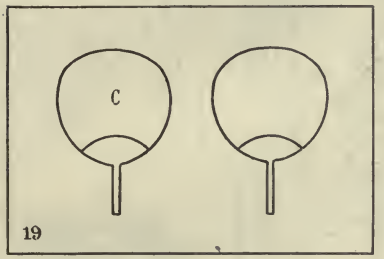


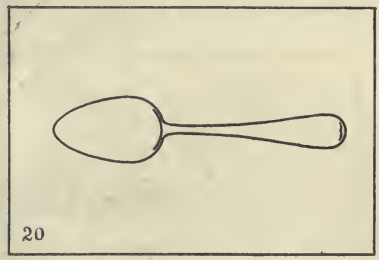


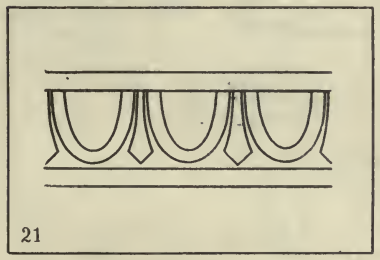
9. Ellipses, for movement.
10. Ovals, for movement.
11. Circle, cut, folded, and drawn.
12. Concentric circles.
13. A circular object: reading glass.
14. A curtain ring, constructed and drawn.
15. Ellipses, cut, folded, and drawn.
16. Ellipse.

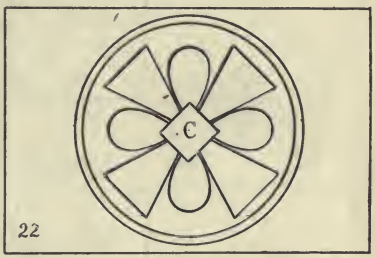


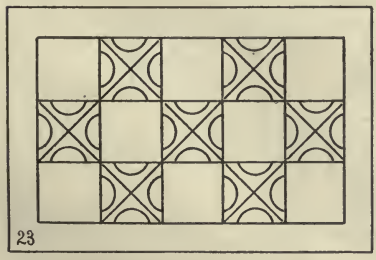


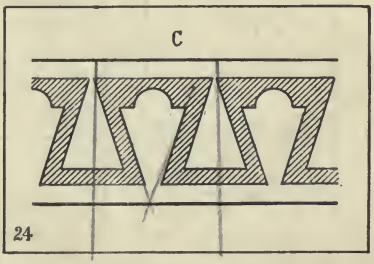




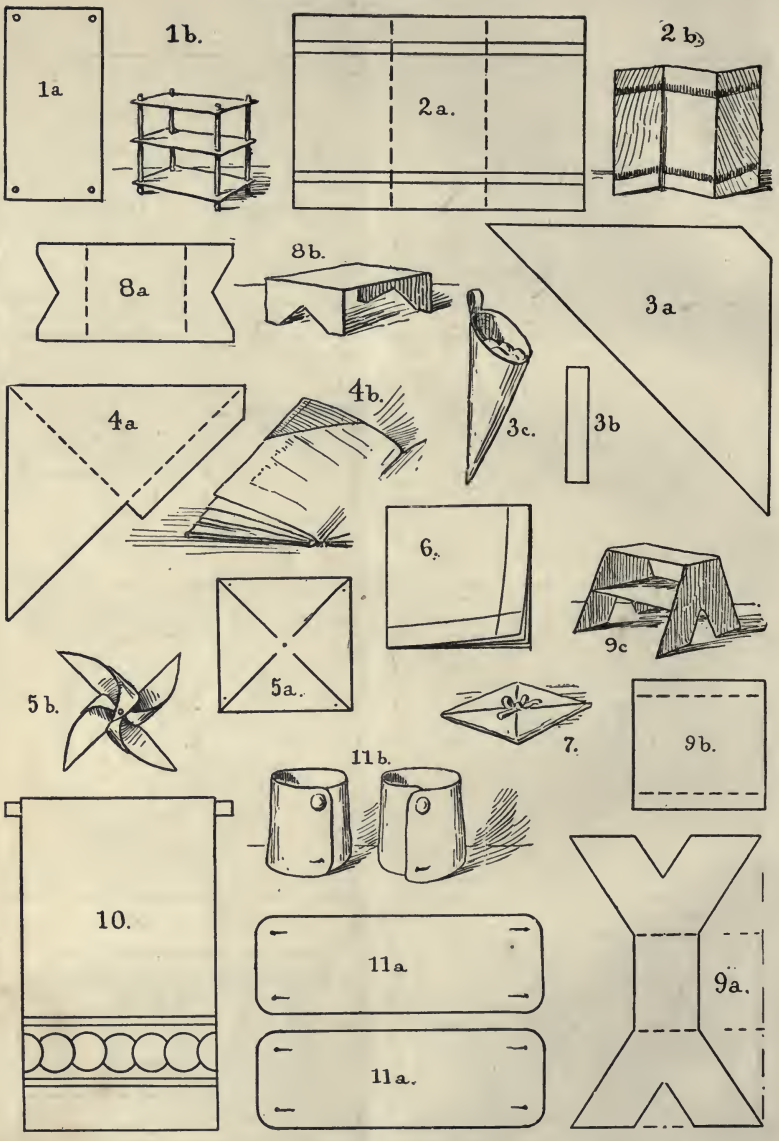




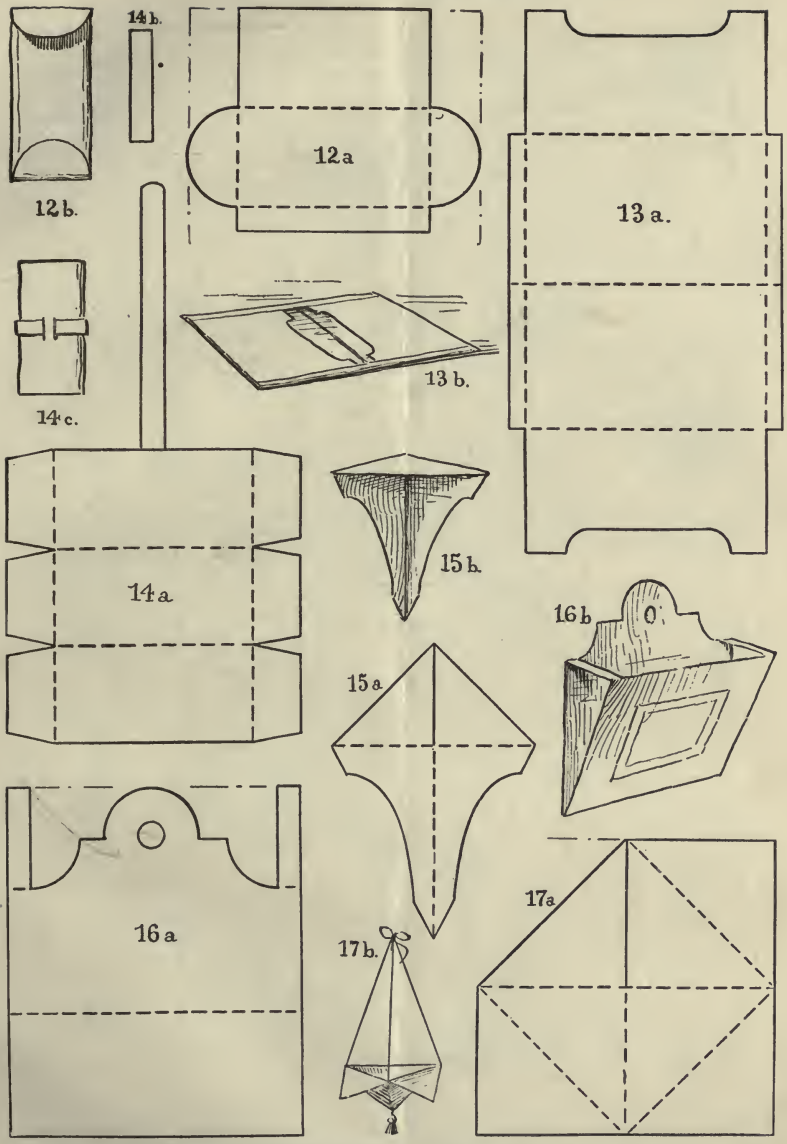




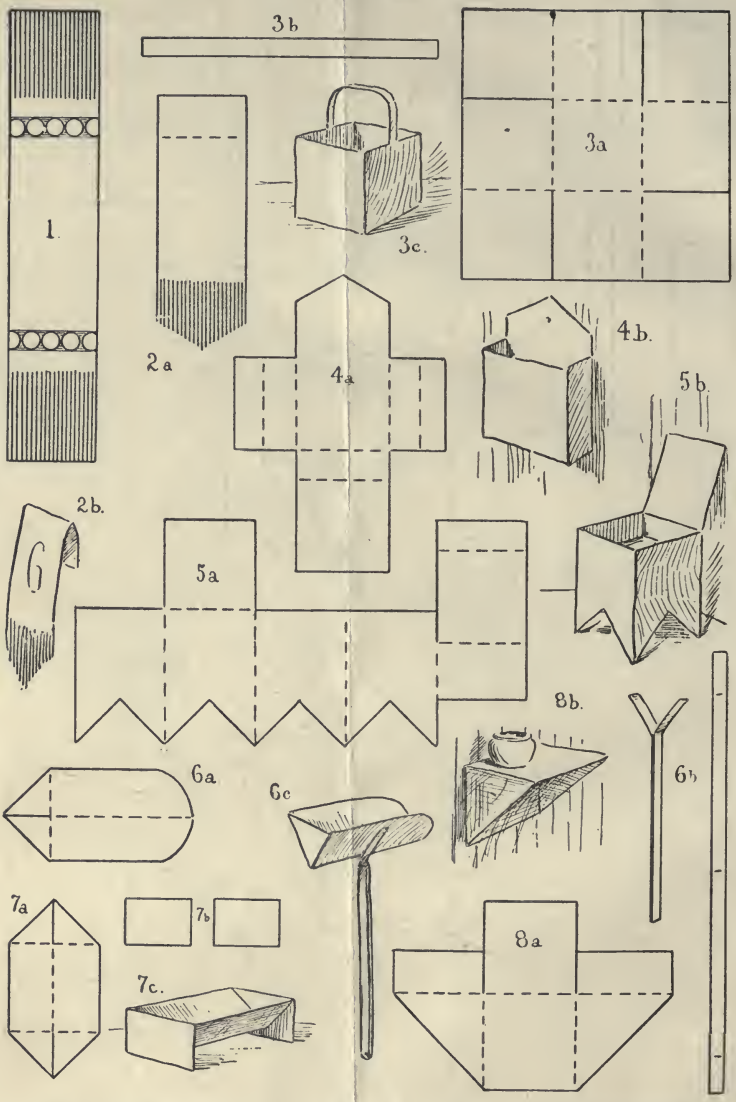
17. Photograph frame.
18. Object involving ellipses: spectacles.
19. Oval fan, constructed and drawn.
20. Object involving ovals: a spoon.
21. An historic border: Greek echinus.
22. An original rosette.
23. An historic surface: Gothic wall decoration.
24. An original border with symmetrical units.



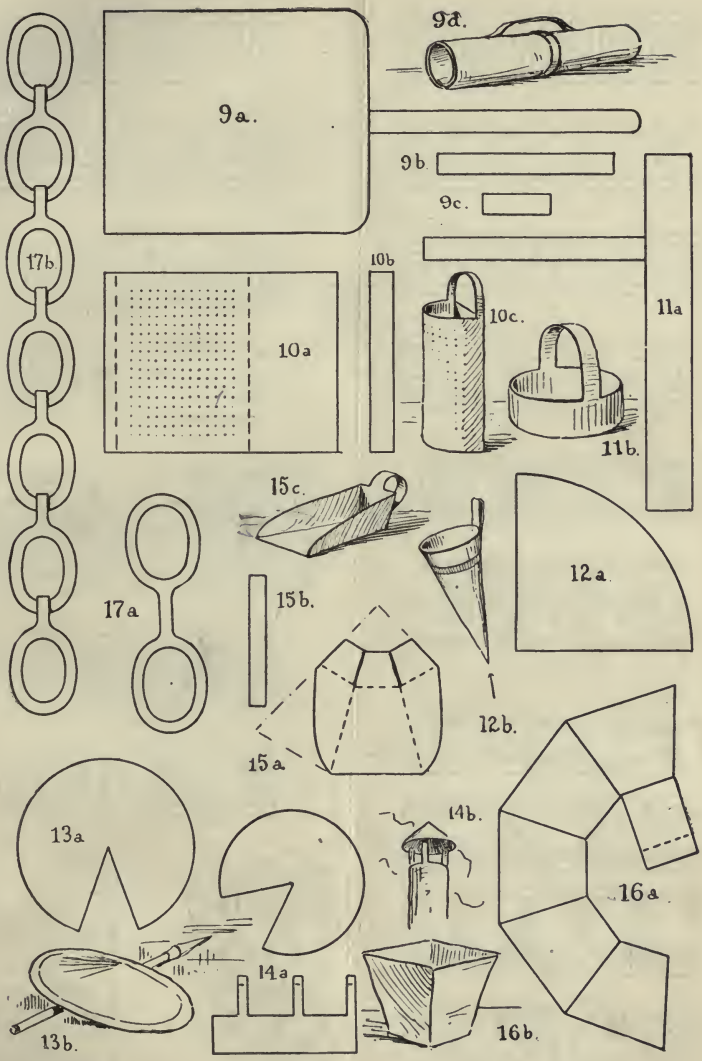
Parallel Faces: 1 a, one shelf; 1 b, bookshelves. *Faces at an Angle:* 2 a, flat of folding screen; 2 b, screen in position. *Applications of the Triangle:* 3 a, flat of cornucopia; 3 b, loop; 3 c, cornucopia; 4 a, flat of bookmark; 4 b, bookmark. *Applications of the Square:* 5 a, flat of pinwheel; 5 b, pinwheel. 6, handkerchief folded on diameters. 7, handkerchief case. *Applications of the Oblong:* 8 a, flat of cricket; 8 b, cricket. 9 a, 9 b, flat of steps; 9 c, steps. 10, curtain. 11 a, flats of cuffs; 11 b, cuffs.



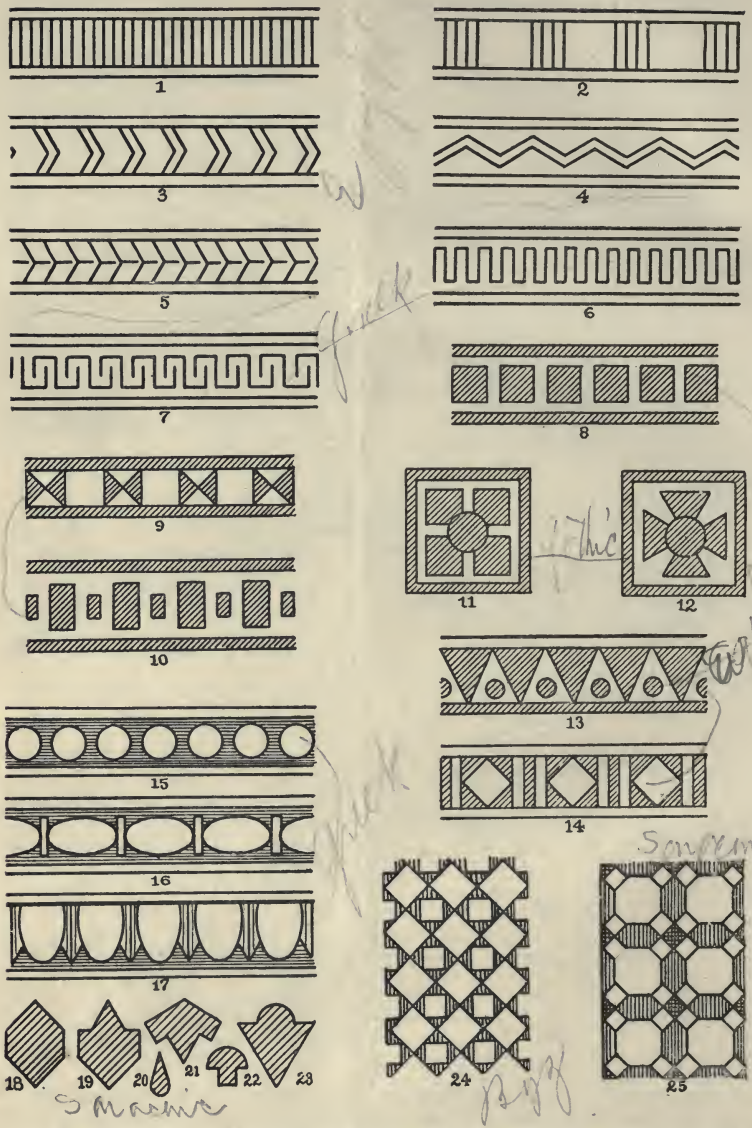
Applications combining Geometric Figures.— Parallel: 12 a, flat of cash envelope; 12 b, envelope. 13 a, flat of cardcase; 13 b, cardcase. 14 a, flat of bill book; 14 b, guard; 14 c, bill book. *At an Angle:* 15 a, flat of corner bracket; 15 b, bracket. 16 a, flat of paper rack; 16 b, rack. 17 a, flat of hanging basket; 17 b, basket.



Practice in cutting Parallels: 1, bookmark. 2 a, 2 b, badge. *Applications involving Plane Faces at Right Angles:* 3 a, flat of cubical basket; 3 b, handle; 3 c, the basket. 4 a, flat of card basket; 4 b, card basket. 5 a, flat of box; 5 b, box. *Applications involving Plane Faces at Oblique Angles:* 6 a, flat of mason's hod; 6 b, handle; 6 c, hod. 7 a, flat of trough; 7 b, ends; 7 c, trough. 8 a, flat of shelf with triangular brackets; 8 b, shelf.



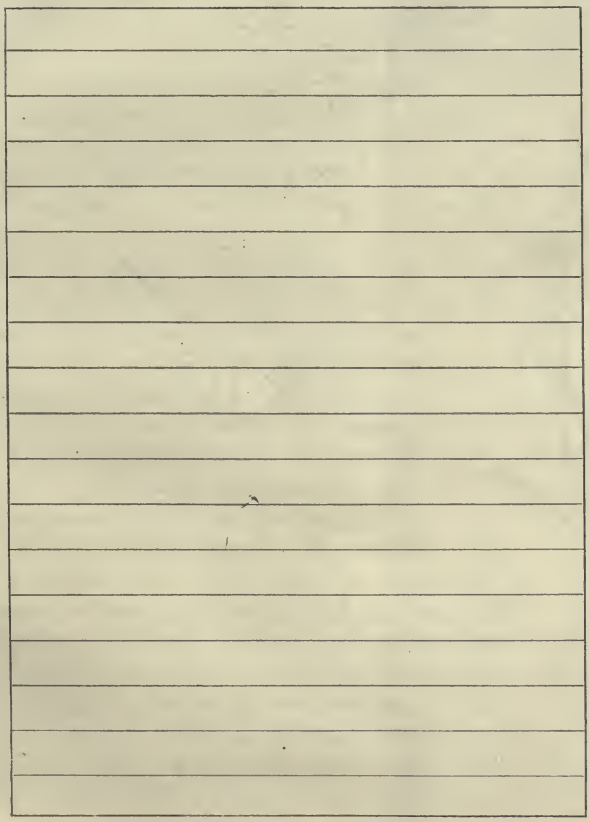
Applications involving Curved Faces : 9 a, flat of music roll ; 9 b, 9 c, handle and guard ; 9 d, music roll. 10 a, flat of grater ; 10 b, handle ; 10 c, grater. 11 a, flat of cake cutter ; 11 b, cutter. *Applications involving Conical and Radiating Faces :* 12 a, flat of cornucopia ; 12 b, cornucopia. 13 a, flat of shield ; 13 b, shield. 14 a, flats of ventilating pipe ; 14 b, ventilating pipe. 15 a, flat of candy scoop ; 15 b, handle ; 15 c. scoop. 16 a, flat of waste basket ; 16 b, basket. *Object involving Ellipses :* 17 a, a link ; 17 b, chain.

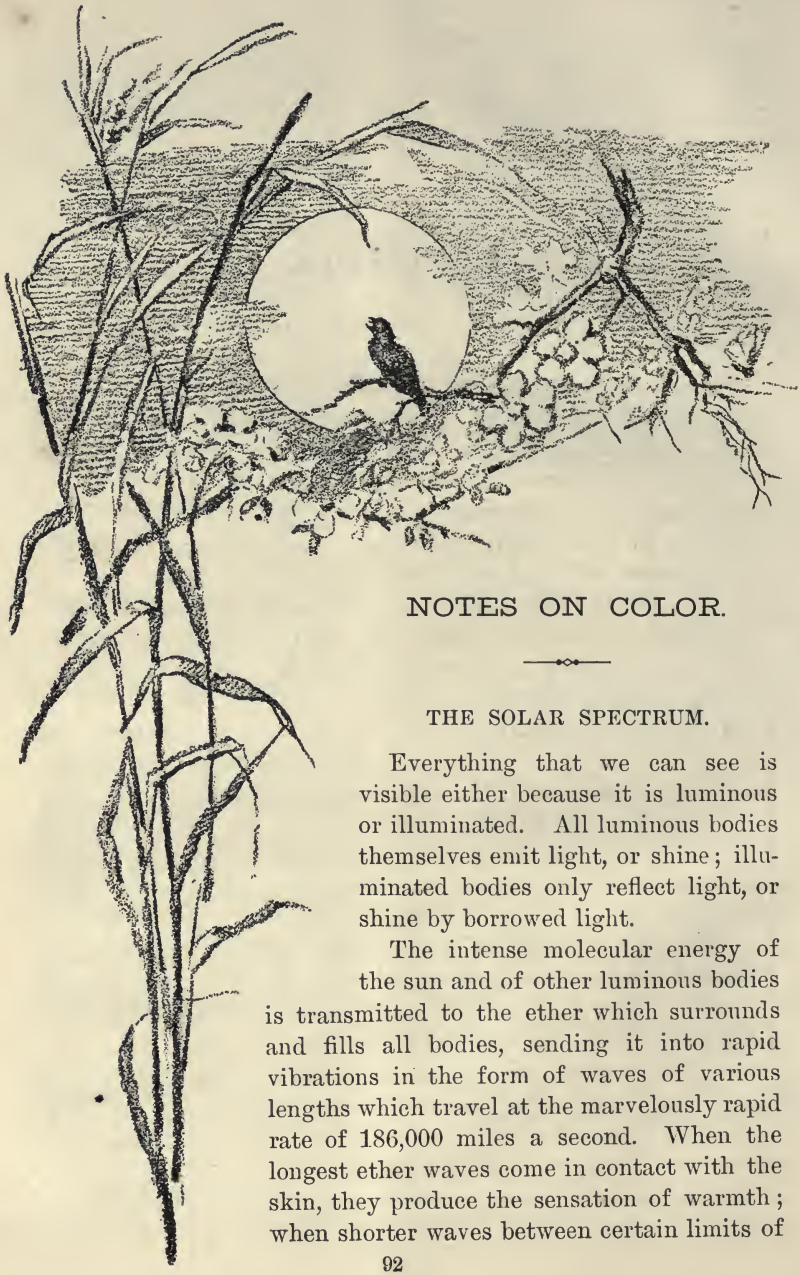


First Year: 1, 2, 3, 4, 5, from Egyptian costumes; 6, 7, from Greek vases. *Second Year:* 8, 13, 14, from Egyptian tombs; 9, 10, from Byzantine jewel work; 11, 12, from Gothic tile work. *Third Year:* 15, 16, 17, from Greek vases; 18, 19, 20, 21, 22, 23, from Saracenic wall decorations, Alhambra; 24, a Byzantine tile floor, from Rome; 25, a Saracenic tile floor, from the Alhambra.

APPENDIX.

SOLAR SPECTRUM COLORS.





NOTES ON COLOR.

THE SOLAR SPECTRUM.

Everything that we can see is visible either because it is luminous or illuminated. All luminous bodies themselves emit light, or shine; illuminated bodies only reflect light, or shine by borrowed light.

The intense molecular energy of the sun and of other luminous bodies is transmitted to the ether which surrounds and fills all bodies, sending it into rapid vibrations in the form of waves of various lengths which travel at the marvelously rapid rate of 186,000 miles a second. When the longest ether waves come in contact with the skin, they produce the sensation of warmth; when shorter waves between certain limits of

length fall upon the eye, they excite the nerves of the retina, which, thus stimulated, awaken in the brain the sensation of light. Still shorter vibrations cause chemical change.

The longest and the slowest of the waves affecting the retina produce the sensation of red; the shortest and quickest, that of violet.

A ray of light is a single, indivisible line of light, and a beam is composed of many luminous rays. A beam of light, traversing a perfectly clear medium, is invisible. A sunbeam passing through a hole in a shutter into a darkened room is only revealed by the solid particles of dust in the atmosphere, or by objects intercepting the beam.

When a beam of light passes from one medium to another of different density, as from air to water or glass, its rays are bent from their course, or refracted. The degree of refraction between two media varies with the media.

Analysis of Solar Light. — A beam of solar light consists of an infinite number of rays, produced by an infinite number of ether waves of various lengths. These rays are of different degrees of refrangibility, according as they are produced by short waves or long waves, the short, luminous waves being more refrangible than the long waves. By means of a crown-glass or flint-glass prism, therefore, a beam of solar light can be separated into its constituent parts.

Darken a room, and let the light, coming through a narrow slit or hole in the shutter, fall obliquely upon the face of a triangular prism, so placed that one face is uppermost and horizontal. The beam of light will be refracted and dispersed. If the prism is equilateral, having a refracting angle of about 60°, a vertical band of rainbow colors, called the *solar spectrum*, will be produced.

If this solar spectrum is thrown upon a white screen, wall, or card, we shall find that three colors are prominent or conspicuous, — red, green, and blue-violet. We also see, next to the red, orange; next to the green, greenish yellow; next to the blue, blue-green, and greenish blue, and at the extreme end, violet. It would be difficult to recognize a pure yellow, as this occupies but a very narrow space in the solar spectrum, and nothing approaching indigo can be discerned. The pigment, indigo, in its purest state is a dull, greenish blue; its place in the spectrum could never then be on the violet side of the

pure blue. The correct sequence of spectrum colors is as follows: red, orange, yellow, green, blue, violet.

Hues. — The prismatic spectrum shows also a fine series of well-defined hues. The term *hue* is applied here to any color of the spectrum, except the six normal spectrum colors. Thus, a red may appear to incline toward violet, or toward orange; an orange may appear reddish or yellowish. In these instances, the red is a violet hue of red — violet-red, or an orange hue of red — orange-red. The orange is a red hue of orange — red-orange, or a yellow hue of orange — yellow-orange. The same modifications occur in the other colors of the spectrum, except that there is not in any spectrum a hue which can be called a red hue of violet.

Some of the hues of the solar spectrum are made up of several rays, or groups of rays. The sensation, red-violet, may be excited by the simultaneous action upon the retina of red and violet. We can illustrate this by mixing lights of these colors. Pigments well chosen as to quality will also, upon being mixed, produce the hue. The following are practical illustrations of hues produced by mixing colored pigments: red modified by violet produces violet-red; modified by orange, orange-red. Orange modified by red produces red-orange; modified by yellow, yellow-orange. Yellow modified by orange produces orange-yellow; modified by green, green-yellow. Green modified by yellow produces yellow-green; modified by blue, blue-green. Blue modified by green produces green-blue; modified by violet, violet-blue. Violet modified by blue produces blue-violet; modified by red, red-violet.

The sequence of colors in the solar spectrum, including the hues, are violet-red; *red*, orange-red, red-orange; *orange*, yellow-orange, orange-yellow; *yellow*, green-yellow, yellow-green; *green*, blue-green, green-blue; *blue*, violet-blue, blue-violet; *violet*.

Much advantage is derived by the employment of this simple nomenclature to designate the various hues, over the old-time attempts at naming colors according to natural and artificial substances from the animal, vegetable, and mineral kingdoms. As standards derived from these are themselves variable, such a method of naming colors has always been open to criticism. The spectrum colors are, however, sufficiently definite to admit of being used as standards, and all uncertainty of color names is thereby avoided.

Pure Color. — The white light of the sun is compounded of an almost innumerable series of colored elements. When waves of light of all possible lengths act simultaneously upon the eye the sensation of *white* is produced; but when waves all of the same length act upon the eye a *color* sensation is produced. If a definite color sensation is generated, and the sensation of white, or of white light, is added, the effect of this addition will be to diminish the action of the colored light and the mixture will be paler than the original color. Color that is entirely free from white light is termed *pure color*. The pure standard colors are those found in the spectrum, and all colored light coming from painted surfaces should be compared with the spectrum to determine its purity.

The pale color produced by the addition of white to a pure standard color is called a *tint*. The tints vary in strength according to the amount of white light added; the intenser the light the paler the tint. The number of tints that may be produced by subjecting a pure or standard color to different effects of illumination cannot be limited. These variations in tint are termed *degrees*, the value of which changes with their nearness to or remoteness from the pure color. Each degree of a color is also called a *tone;* hence the value of a tint depends upon its nearness to the pure color, or upon its *tone*.

Under a feeble light the pure, or standard, color will be in shade, or appear quite dark; and since the color of all objects is derived from the light, in the absence of light there is no color. The darker colors produced by a feeble light are called *shades*. There are many different tones in the shades as well as in the tints, and the *value* or strength of a shade depends upon its degree of variation or remoteness from the pure color.

The various tones of a pure color arranged in an orderly manner according to their values, from the palest tint to the pure, or standard, color, and from this to the darkest shade of that color, form a *scale* of color.

Luminous Colors. — The term *luminous* is applied to a color that has great power of reflecting light. Different colors have this quality in varying degrees, orange-yellow possessing the highest degree of reflecting power and violet only a small degree. The following shows the colors in the order of decreasing luminosity:

orange-yellow, orange, green-yellow, yellow-green, green, orange-red, red, blue-green, blue, and violet.

Colors are called *intense* when they excel both in purity and luminosity; but an inordinate increase of luminosity is often attended by a loss of tone. Artists sometimes speak of color in painting as *luminous*, meaning only what is popularly understood by *bright*.

COLOR HARMONIES.

Harmony in Color exists when colors opposed, or in juxtaposition, produce combinations and effects agreeable to the eye. The mind is soothed, or agreeably moved, by a view of colors sustaining a correct equilibrium or due subordination to each other.

Modern research in Optics has revealed the fact, that each minute elementary portion of the retina is capable of receiving and transmitting three sensations; or, in other words, is supplied with three nerve fibrils adapted for the reception of three sensations: one set of these nerves is strongly acted upon by long waves of light and produces the sensation we call red; another set responds most powerfully to waves of medium length, producing the sensation we call green; and the third is strongly stimulated by short waves, and generates the sensation known as violet.

The red of the spectrum acts powerfully on the first set of nerves, but it also acts with less energy on the other two sets. The green of the spectrum acts powerfully on the second set of nerves, but it also acts with less energy on the other two sets. The violet of the spectrum acts powerfully upon the third set of nerves, but it also acts with less energy on the other two sets. Red, green, and violet are the fundamental colors of the spectrum. If the three sets of nerves are simultaneously stimulated to about the same degree, the sensation which we call white will be produced.

The theory of harmony of color can be sustained, or accounted for, by experimenting with the solar spectrum to produce color sensations, with the above explanation serving as basis.

A hue is produced by the modification of one spectrum color by the adjacent spectrum color.

All the colors of the spectrum from red to yellow-green give, by mixture, hues which are always identical with some of the colors

situated between red and yellow-green. Thus, the mixture of red and yellow-green gives orange or yellow, according to the proportions in which they are mixed; the mixture of red and yellow gives orange; the mixture of orange and yellow-green gives yellow.

All colors of the spectrum from violet to blue-green give, by mixture, hues which are always identical with the colors situated between those limits. Thus, the mixture of blue-green and blue gives green-blue; of blue-green and violet, violet-blue or blue, according to the proportions; of violet and blue, violet-blue.

All color harmonies are found in nature, — in rocks and shells; in the sunset clouds and the waves of the sea; in grasses, flowers, and the plumage of birds.

Contrasted Harmony. — The pale yellow or yellow-orange of the moon against the gray-blue of the sky, or the reflection of the moon in the green-gray water, are instances of contrasted harmony. Any single color against a gray background always gives this harmony, and natural examples of it are found in the coloring of the cedar bird, with its touch of luminous red in its gray plumage; in the red-cup lichens growing upon the gray rock; in the cardinal flower seen against the dark background of almost invisible green; in the lily-of-the-valley with its pure white against the protecting green leaves, which have much subduing gray in their darker shades; in the trees in the spring with their delicate green against the gray bark of the trunks and the gray sky; in the trees in autumn with their brilliant yellow, orange, red, and brown foliage appearing against the cold gray sky; where green weeds and grasses grow in the crevices of old stone walls; in the brilliant algæ, the gray-green of the water being broken by motion into many variations of tone. These are but a few of the innumerable harmonies of contrast that may be found on every side in nature.

Dominant Harmony. — Dominant harmony is illustrated by a view of different tones of a scale of color arranged according to their values. Any scale of color, or part of a scale, illustrates dominant harmony.

Dominant harmony may also be illustrated by two tints and the standard, or two shades and the standard, of any one color. In applied design, varied effects may be produced by changing the order of the tones used. Thus, the standard may be used for the

background and the two tints in the design, or one of the tints for the background and the other tint and the standard in the design, or a shade for the background and the standard and the other shade in the design.

Although the harmonies of contrast are brilliant and pleasing, the finest blending of color, the most subtle and yet varied harmonies — those in which the sunlight revels — are the dominant harmonies. In these, the local color passes imperceptibly in varying degrees from light to dark, and dark to light, producing illustrations of scales of color. Among flowers we find the most beautiful variations in the rose, morning-glory, nasturtium, petunia, gloxinia, hollyhock, moccasin flower, fleur-de-lis, crocus, etc.

Analogous Harmony. — An ideal illustration of analogous harmony is found in a view of any one of the spectrum colors with its adjacent hues, arranged in an orderly manner. Thus, a combination of blue-violet, violet, and red-violet or of orange-red, red-orange, orange, and yellow-orange, forms an analogous harmony.

In nature, this harmony is found in the plumage of birds, as of the duck, the dove, the oriole, the sparrow, and the bluebird; in such minerals as coal, agate, rock crystals, cairngorm stone, onyx, jasper, amethysts, and opals; in the pearly nautilus, the courie, and the nacre of the pearl oyster; in the autumnal foliage of maples, oaks, birches, and sumach.

Chromatic Equivalents. Complementary Harmony. — A harmony in color exists between equivalents of the chromatic spectrum scale.

The equivalent of a color is the opposite of that color, or one which, when mixed with it, produces a neutral. Two equivalents, when mixed by rotating colored disks or by interposing colored light, produce white light. Any two equivalents in juxtaposition form a harmony of contrast.

The equivalent colors have also been called *complementary* colors, and the harmony produced is a *complementary harmony.*

The pairs of colors forming complementary harmony are red and blue-green, orange and green-blue, yellow and violet-blue, green and violet-red, blue and orange-yellow, violet and green-yellow. There are innumerable complementary harmonies, as there is an innumerable number of hues.

Perfected Harmony. — Perfected harmony occurs when a dominant or analogous harmony of colors is combined with the color complementary to the prevailing hue. Illustrations of this harmony may be found in the sunset clouds, when these combine a dominant harmony of violet, its tints and shades, with the yellow light of the sky beyond; or when the clouds form an analogous harmony of violet and its hues (blue-violet, violet, red-violet, and violet-red), complemented by the brilliant yellow of the setting sun. The pansy, whose violet often varying from a pure tone to its lightest tints and darkest shades, forming a dominant harmony complemented by the bright yellow center or the edging of the petals, shows a beautiful perfected harmony.

COLOR HARMONIES IN POETIC QUOTATIONS.

Hark! Now he is tapping the old hollow tree,
One step farther on; now look upward; that's he.
Oh, the exquisite bird! with his downward hung head,
With his richly dyed greens, his pale yellow and red!
On the gnarled tree trunk with its sober-toned gray,
What a beautiful mingling of colors are they!

— *Mary Howitt.*

A crust of tiny rubies clings
To this gray boulder on the waste,
Thick-set in fairy cups and rings
That wintry frosts have not effaced.

Exquisite color, rare design,
Inimitable daintiness,
In faultless pattern, broidered fine,
The gray and ancient rock to dress.

— *Anna Boynton Averill.*

That cloistered wall was compassed in
With pillars wonderful for work and hue.
This one, a palm stem; that, papyrus thin.
Yonder, in stone, lotuses pink and blue.

— *Edwin Arnold.*

The buttercup is like a golden cup,
The marigold is like a golden frill,
The daisy with a golden eye looks up,
And golden spreads the flag beside the rill.
And gay and golden nods the daffodil.

The gorsey common swells a golden sea,
The cowslip hangs a head of golden tips,
And golden drips the honey which the bee
Sucks from sweet hearts of flowers and stores and sips.

— *Christina G. Rossetti.*

Emeralds! The color, Fanny, of the light
Sifted through lime leaves on a summer noon,
Or curl of crested wave, when foam bells bright
Fringe the green furrows of the sea in June.

Such should true emeralds be; green — it is said —
As throat of parroquet; or spark quick twinkled
From firefly's lamp; or fresh unfolded blade
Of water grass; or lotus leaf unwrinkled

New-risen from the pool; or glow which fringes
The gleaming amethysts in the peacock's train.
Sourindo Mohum holds "all Virtue lingers
On tints like these."

— *Edwin Arnold.*

And then from the shape's vague sheen
Quick lusters of blue will float,
That melt in luminous green
Round a glimmer of ruby throat.

— *Edgar Fawcett.*

The burnished dragon-fly is thine attendant,
And tilts against the field,
And down the listed sunbeam rides resplendent
With steel-blue mail and shield.

Thou art the Iris, fair among the fairest,
Who, armed with golden rod,
And winged with the celestial azure, bearest
The message of some God.

— *Henry W. Longfellow.*

To an Oriole.

How falls it, oriole, thou hast cause to fly
In typic splendor through our northern sky?

At some glad moment was it Nature's choice
To dower a scrap of sunset with a voice?

Or did some orange tulip, flecked with black,
In some forgotten garden, ages back,

Yearning towards Heaven, until its wish was heard,
Desire unspeakably to be a bird ?

— *Edgar Fawcett.*

Light yellow leaves with spots and stains
Of violet and crimson dye,
Or tender azure of a sky
Just washed by April rains.

— *Henry W. Longfellow.*

And perhaps, perhaps I shall go to the wood
Where the pines bend to the feathery ferns,
And the cardinal flowers bloom as red as blood,
And the moss to gold in the sunshine turns.

— *Lucy Larcom.*

I pray you gaze awhile on these lit stones,
By fancy fetched from Australasian steeps,
Where moony pearl sets blazing scarlet tones,
And pale gold melts to green ; and amber leaps

To bloomy violets ; and celestial blues
Flecker to rose and ruby. You shall turn
Nowise these jewels, but their shifting hues
To some new brilliancy will swiftly burn.

— *Edwin Arnold.*

The broken sunbeams glance between,
And tip the leaves with lighter green,
With brighter tints the flowers.

Little white feathers, filling the air,
Little white feathers ! how came ye there ?
" We came from the cloud-birds sailing so high ;
They're shaking their white wings up in the sky."

Little white feathers, how swift you go !
Little white feathers, I love you so !
" We are swift because we have work to do.
But hold up your face and we'll kiss you true."

And in its warp and woof
There runs a thread of gold that glitters,
And sometimes in the pattern shows most sweet
Where there are somber colors.

EXPRESSION OF COLOR. — POETIC QUOTATIONS.

Red.

Red is expressive of ardor, courage, and the sanguine passions. It is peculiarly a military color appropriate to war. Red plumes were worn by military heroes in ancient times; Hannibal, Scipio, and Alexander the Great bore shields of this color. In a flag, it means defiance, and is the emblem of blood. Red naturally stimulates; it excites the bull to rage, and indicates fierceness in the comb of the cock and the wattles of the turkey. In its gentler influences, red moves and assists the affections of

"Love, Hope, and Joy, fair Pleasure's smiling train."

It is the most effective of colors.

The following quotations from the poets show some of its relations and attributes: —

Beauty.

'Tis beauty truly blent, whose red and white
Nature's own sweet and cunning hand laid on.

— *Shakespeare.*

Joy.

See, your guests approach:
Address yourself to entertain them sprightly,
And let's be red with mirth.

— *Shakespeare.*

Hope.

For me the balm shall bleed, the amber flow,
The coral redden, and the ruby glow.

— *Pope.*

Dignity.

The scarlet honor of your peaceful gown.

— *Dryden.*

Ardor.

He spoke: the goddess with the charming eyes
Glows with celestial red, and thus replies.

— *Pope.*

Anger.

If I prove honey-mouth'd, let my tongue blister,
And never to my red look'd anger be
The trumpet any more.

— *Shakespeare.*

Spread the red rod of angry pestilence.

— *Milton.*

Orange.

Orange is an effective color at a great distance, acting powerfully upon the eye. Its influence on the mind and feeling is gay and cheerful. It is preëminently a warm color, being the contrast to blue, whose peculiar attribute is coolness. The poets use in its place the terms *golden*, *gilding*, *orient*. The following are some quotations: —

> Heaven's golden-wing'd herald.
>
> — *Crashaw.*
>
> Orient liquors in a crystal glass.
>
> — *Milton.*
>
> From golden cups and harebells blue.
>
> — *Mrs. Pickersgill.*
>
> Culls the delicious fruit that hangs in air,
> The purple plum, green fig, or golden pear
>
> — *Rogers.*
>
> Bear me to the citron groves,
> Where the lemon and the piercing lime
> With the deep orange, glowing through the green,
> Their lighter glories blend.
>
> — *Thomson.*

Yellow.

Yellow, which is the natural symbolical color of the sun, is, in the East, a regal color, more especially so in China, where it is exclusively royal. The sensible effects of yellow are gay, gaudy, glorious, full of luster, enlivening, and irritating. Shakespeare uses it metaphorically to characterize jealousy: —

> I will possess him with yellowness,
> For his revolt of mien is dangerous.

Again the same poet uses it to characterize old age: —

> I have lived long enough, my way of life
> Is fall'n into the sear, the yellow leaf.

Goldsmith, one of nature's pupils, has celebrated

> The yellow-blossom'd vale,

and Byron speaks of

> The yellow harvest's countless seed.

In *Timon of Athens* Shakespeare says: —

> What is here?
> Gold? yellow, glittering, precious gold?

Green.

Green, as a color, is associated with the ideas of vigor and freshness; it is hence symbolical of youth and the springtime of life, being analogous to the spring of the year. It is the general color of the whole vegetable creation, and contrasts more agreeably with all colors than any other individual color. In its hues and tones, green is cool or warm, sedate or gay, as it inclines to blue or to yellow, to its dark shades or its light tints.

Green is emblematic of immortality; it also denotes memory. Plenty is personified in a mantle of green. In mythological subjects, it distinguishes the draperies of Neptune, the Naiads, and the Dryads. It has been held to be a sacred, or holy, color.

The following quotations are cited from the poets, as illustrating the powers and properties of green: —

Youth, Vigor, Freshness, Hope.

While virgin Spring, by Eden's flood,
Unfolds her tender mantle green.

— *Burns.*

If I have anywhere said a green old age, I have
Virgil's authority.

— *Dryden.*

Here in the sultriest season let him rest
Fresh in the green beneath those aged trees;
Here winds of gentlest wing will fan his breast,
From heaven itself he may inhale the breeze.

— *Byron.*

Green contrasts effectively, forming complementary harmonies with flowers, for there is a prevailing hue in the foliage of almost every plant by which it is harmonized with the colors of its flowers.

No tree in all the grove but has its charms,
Though each in hue peculiar; paler some,
And of a warmish gray: the willow such,
And poplar, that with silver lines his leaf;
And ash, far-stretching his umbrageous arms;
Of deeper green the elm; and deeper still,
Lord of the woods, the long-surviving oak.
Not unnoticed pass
The sycamore, capricious in attire;
Now green, now tawny, and ere autumn yet
Have changed the woods, in scarlet honors bright.

— *Cowper.*

Blue.

Blue is the most retiring and diffusive of colors, with the exception of purple and black. It possesses what is technically called the quality of coldness. Its influence on the feelings and passions partakes of this cold and shadowy relation, in soothing and inclining to melancholy. It is a sedate color, even in its utmost brilliancy. It is the symbol of generosity. Seamen use it metaphorically for truth and fidelity; and friendship in sea phrase is *true blue*. It is the color of Heaven and of the eye, and hence is emblematic of intelligence and divinity. It is, accordingly, by a natural analogy, used in mythological representations to distinguish the mantle of Minerva (the blue-eyed goddess) and the veil of Juno (the goddess of air). Diana is robed in blue and white, and the Egyptian Isis and her priests in pure azure, while Poetry is personified in a vesture of celestial blue.

The following quotations instance the effects of this color, and show the coincidence of its use in poetry and painting: —

As soothing.

Long, Pity, let the nations view
Thy sky-worn robes of tend'rest blue,
And eyes of dewy light!

— *Collins.*

As emblematic of intellectuality.

The blue-eyed progeny of Jove.

— *Dryden.*

As indicating melancholy and cold.

O coward Conscience! how dost thou afflict me!
The lights burn blue! It is now dead midnight,
Cold, fearful drops stand on my trembling flesh.

— *Shakespeare.*

Violet.

Violet is a stately, dignified, sedate, grave color, soothing in its tints and saddening in its shades.

It partakes of the properties of blue, which is its ruling hue. In nature it is seen beautifully harmonizing the broad shadows and bright sunshine ere the light declines into deep orange or red. Violet in its red hues, or purple, is a regal, magisterial, and pompous color. It is used in court mournings, and is also symbolical of heroic virtue. In dissertations on this color and its hues, *purple* has been considered the most expressive and poetic. The following quotations afford examples of the various expressions of this color and its hues: —

The pale violet's dejected hue.

— *Akenside.*

Aurora has but newly chased the night
And purpled o'er the sky.

— *Dryden.*

Here Love his golden shafts employs; here lights
His constant lamps, and waves his purple wings.

— *Milton.*

He is come to ope
The purple testament of bleeding war.

— *Shakespeare.*

BLACK, WHITE, GRAY.

These colors are symbols of eternity — of first and last and midst. Rainbow colors also mean "without end."

A knowledge of the relations and effects of color upon the feelings and intellect is essential for a proper exercise of taste in their application. The teacher and pupils can find in the writings of the modern American poets — Whittier, Bryant, and Longfellow — many illustrations of color-meaning, which will add interest to the lessons on color.

The science of color is naturally easier than that of sound, and should have been acknowledged of importance long ere this in the education of our youth. As a source of innocent and enlightened pleasure, the subject of color is entitled to our highest esteem. It is our duty to so cultivate the children's powers of observation, that they may derive enjoyment from viewing nature's plans in coloring, and let these lead them to the choice of colors in the arrangement of even their simplest designs. It is not necessary, at first, that they should learn to express themselves as to what constitutes harmony of coloring; it is necessary, however, that they correctly and appreciatively use colors harmoniously, and for this the teacher must be held responsible.

We add a few more quotations to show the teachers to what sources they may look for help towards a sympathetic teaching of the subject of color which will produce the highest moral results.

The power of sunlight is beautifully set forth in the following: —

The mineral kinds confess thy mighty power.:
The lively diamond drinks thy purest ray's collected light compact;
At thee the ruby lights its deepening glow, and with a wavering radiance inward flames;
From thee, the sapphire, solid ether, takes its cerulean hue;
The purple streaming amethyst is thine;
With thine own smile the yellow topaz burns;
No deeper verdure dyes the robes of spring than the green emerald shows;
And, all combined, thick through the whitening opal play thy beams.

Other objects in nature manifest harmonies of color, and change with the changing light and atmosphere, at dawn, at midday, and at sunset. The following is a description of the range of the *Presidents* in the White Mountains.

The five mountains, Washington, Clay, Jefferson, Adams, and Madison, being but five lobes of earth, which seen at a proper distance may be likened to the petals of a flower whose bloom is not fixed by seasons, but flushes and fades by incalculable laws. And it is not fixed hues, such as a rose, dahlia, or tulip bears, that this corolla of the earth is appointed to display, but every tender dye which the sun's pencil leaves upon the flora of New England glows upon them at morning or at sunset, and their bloom is the richest when the vital forces of the garden and the forest are checked by the winter frosts and buried in snow. — *Starr King.*

And the building of the wall was of jasper, and the city was pure gold, and the foundations of the wall of the city were garnished with all manner of precious stones.

The first foundation was jasper, the second sapphire, the third chalcedony, the fourth emerald, the fifth sardonyx, the sixth sardius, the seventh chrysolite, the eighth beryl, the ninth topaz, the tenth chrysophrasus, the eleventh jacinth, the twelfth amethyst. — *Revelations.*

Colors of the stones: —

Jasper, an Egyptian pebble, brownish-yellow or reddish-yellow.
Sapphire, blue, red, or ruby-red.
Chalcedony is of different colors, green, flesh-red, or grayish-red. In stripes or layers, it is agate; if the stripes are all horizontal it is onyx.
Emerald, green.
Sardonyx, reddish-yellow, or nearly orange.
Sardius, carnelian red.
Chrysolite varies in color from a pale green to a bottle green.
Beryl, green or bluish-green.
Topaz, generally yellowish; but sometimes colorless, or of a greenish, bluish, or brownish hue.
Chrysophrasus, grayish-green.
Jacinth, red.
Amethyst, bluish-violet.

Remember that the truth of nature is a part of the truth of God; to those who do not search it out, darkness; to those who do, infinity and light!

Read good books on this subject; reflect and observe much; encourage children to collect natural colored specimens; to keep in scrap-books all prose and poetic extracts mentioning colors; cultivate their taste by making practical applications of color harmonies in the decoration of the schoolroom. For this purpose let there be two or three stands, tables, or shelves, as well as the teacher's

desk and window-sills that can be used to hold pretty articles,— pictures, vases, shells, scarfs, etc., and allow the children to arrange and rearrange them. Keep plants in the schoolroom ; have fresh flowers often. Obtain a few standard pictures to hang on the walls. Make neat color charts, illustrating the course of color lessons. Mount the best of the children's color work to hang on the walls ; keep some bound with ribbon in book form, for inspection. In every way keep yourself and the pupils attentive to the beauties in nature and in art. This silent teaching will do much to soften, invigorate, and humanize them, and to arouse and cultivate their æsthetic powers.

Little Bird with Bosom Red.

Little bird with bosom red,
Welcome to my humble shed ;
Daily near my table steal,
While I pick my scanty meal.

The Farmer's Song.

Tell me what the farmer sows :
Golden grain, golden grain.
Tell me why the farmer sows :
A harvest ripe to gain.

When the sun is warm and high,
Then he sows, with all his might,
Yellow grain, yellow grain,
On the fertile plain.

The Evening Sun.

How I love to see thee,
Golden evening sun !
How I love to see thee,
When the day is done !

The Corn Song.

All through the long, bright days of June,
Its leaves grew green and fair ;
And waved in hot midsummer noon
Its soft and yellow hair.

O'er Prairie Green and Fair.

O'er prairie green and fair,
We're galloping, galloping on;
As free, as free as air.
Where'er we go no bounds arise,
Except the blue and boundless skies.

The Busy Bee.

Thou on eager wing art gone
To the hedgerows near the lawn,
Or where cowslips hang their heads
In their green and grassy beds.

The Sea.

Oh, how I love the bright blue sea,
Now sparkling in the sun!
It is a thing so glad, so free,
Who would its white waves shun?

Autumn.

In the early morning hour,
Ere the dew has left the bower,
In the ruddy purple beam,
Come and see the vineyard's gleam.

Evening Song.

Evening winds are breathing
Through the forest green;
Crimson clouds are wreathing
In the sky serene.

The Violet.

Down in a green and shady bed,
A modest violet grew;
Its stalk was bent, it hung its head,
As if to hide from view.

Promise.

There is a rainbow in the sky ;
  Upon the arch where tempests trod,
God wrote it ere the world was dry :
  It is the autograph of God.

The Arbutus.

Where the trees grow scant and stunted,
  And scarcely a shadow is cast,
There nestles the trailing arbutus
  Close, close to the hill's cold breast ;
The storm winds give to it courage,
  The skies give it power to bless,
And it giveth to all its loving,
  In its happy thankfulness.

Now pink as the lip of the seashell,
  Now white as the breaker's foam,
It spreadeth its stainless treasure
  To brighten its rugged home.
Low trailing amid the mosses
  Its delicate blossoms lie, —
Giving the earth its beauty,
  Its worship giving the sky.

The Water Lily.

O star on the breast of the river !
  O marvel of bloom and grace !
Did you fall right down from heaven,
  Out of the sweetest place ?
You are white as the thoughts of an angel,
  Your heart is steeped in the sun ;
Did you grow in the Golden City,
  My pure and radiant one ?

Nay, nay, I fell not out of heaven ;
  None gave me my saintly white ;
It slowly grew from the darkness,
  Down in the dreary night.
From the ooze of the silent river
  I won my glory and grace.
White souls fall not, O my poet,
  They rise — to the sweetest place.

Moon and Dawn.

The bluest gray — the grayest blue,
  Where golden, gleaming stars are set;
A moon, where glorious yellow waves
  Make fair the rippled rivulet.

Night has her curtain over all;
  The firs show dark against the sky;
The only sound is in the song
  Of a late nightingale close by.

The wooded walks which seemed so sweet
  Seen in the morning's fairy light,
Now dim and shadowy, hold no charm
  Save the mysterious charm of night.

One swallow stirs, the gold stars fade,
  In the cold sky a chill wind wakes;
The gray clouds frighten out the morn
  And through pale mist the new day breaks.

The Violet.

The woodland and the golden wedge
  Of sunshine slipping through,
And there beside a bit of hedge,
  A violet so blue!

A Summer Picture.

From saffron to yellow, from purple to gray,
  Slow fades on the mountain the beautiful day;
I sit where the roses are heavy with bloom,
  And wait for the moonlight to whiten the gloom.

Proud Summer with his roses' sheen,
And dress of scarlet, blue, and green,
Floods us with such a sea of light
We miss the faint, far isles of Night,
And thoughtless dance, while he with lutes
Beguiles us, or assists to fruits.
But like a shade from spirit-land
Dim Winter beckons with his hand, —
He beckons; all things darker grow,
Save white-churned waves and wreathing snow.

God's Providence.

From the far blue heaven
Where the angels dwell,
God looks down on children
Whom He loves so well.

The Violet.

Timid blue-eyed flower,
In thy quiet bower, 'mid the moss so green,
Say, what art thou doing?
Why so lowly bowing, ever art thou seen?

A Song of Cheer.

The skies are blue above us,
The earth is green and glad;
And friends there be who love us, —
Then why should we be sad?

Sweet flowers are freshly springing,
There's fragrance in the air;
Glad birds are gayly singing, —
Then banish every care.

Field Flowers.

What do the bluebells whisper,
Nodding their heads all day?
What do the blue grasses
And red clover say?

Thick as the stars of heaven,
Little field flowers grow;
Surely they talk together,
Bending their heads so low.

October.

There comes a month in the weary year,
A month of leisure and healthful rest;
When the ripe leaves fall and the air is clear, —
October, the brown, the crisp, the blest.

How peaceful the sunlight fell
Across the woodland's pleasant reaches,
And like a shower of golden rain
The leaves dropped from the golden beeches.

Though dead leaves rustle at my feet,
And all the fields are brown and sober,
The heart may blossom with new hope
Beneath the gray skies of October.

To a Daisy.

There is a flower, a little flower,
With silver crest and golden eye,
That welcomes every changing hour,
And weathers every sky.

It smiles upon the lap of May,
To sultry August spreads its charm.
Lights pale October on its way,
And twines December's arm.

The purple heath and golden broom
On moory mountains catch the gale ;
O'er lawns the lily sheds perfume,
The violet in the vale.

But this bold flower climbs the hill,
Hides in the forest, haunts the glen,
Plays on the margin of the rill,
Peeps round the fox's den.

'Tis Flora's page — in every place,
In every season, fresh and fair,
It opens with perennial grace,
And blossoms everywhere.

To the Fringed Gentian.

Thou blossom, bright with autumn dew,
And colored with the heaven's own blue,
That openest when the quiet light
Succeeds the keen and frosty night.

Thou comest not when violets lean
O'er wandering brooks and springs unseen,
Or columbines, in purple dressed,
Nod o'er a ground bird's hidden nest.

Thou waitest late and com'st alone,
When woods are bare and birds are flown,
And frosts and shortening days portend
The aged year is near his end.

Then doth thy sweet and quiet eye
Look through its fringes to the sky,
Blue, blue, as if that sky let fall
A flower from its cerulean wall.

— *Bryant.*

Four-Leaved Clover.

Oh, I'd search the world over
For one four-leaved clover!
Bend low, pretty grass, bend low;
Jump little crickets, and tumble you bees;
Green little grasshoppers, limber your knees;
There's one hidden somewhere, I know.

The Humming Bird.

Little green hummer
Was born in the summer.
His coat was as bright
As the emerald's light.

The Rivulet.

Run, little rivulet, run!
Sing to the fields of the sun
That wavers in emerald, shimmers in gold,
Where you glide from your rocky ravine, crystal cold;
Run, little rivulet, run!

Run, little rivulet, run!
Sing of the flowers every one;
Of the delicate harebell and violet blue;
Of the red mountain rosebud, all dripping with dew;
Run, little rivulet, run!

— *Lucy Larcom.*

Gowns of Gossamer.

There shiver, in rose-tinted white, the pale anemones ;
There pink, perfumed arbutus trails from underneath bare trees ;
Hepatica shows opal gleams beneath her silk-lined cloak,
Then slips it off, and hides amid the gnarled roots of the oak.

When little star-shaped innocence makes every field snow-white,
With her four-cornered neckerchiefs, there is no lovelier sight ;
And when the wild geranium comes, in gauzy purple sheen,
Forerunner of the woodland rose, June's darling, summer's queen,
With small herb Robert, like a page close following her feet,
Jack-in-the-pulpit will stand up in his green-curtained seat.

Marsh marigold and adder's tongue will wade the brook across,
Where cornel flowers are grouped, in crowds, on strips of turf and moss ;
And wood stars, white from lucent green, will glimmer and unfold,
And scarlet columbines will lift their trumpets, mouthed with gold.

— *Lucy Larcom.*

Red Top and Timothy
  Come here in the spring ;
Light spears out of emerald sheaths,
  Everywhere they swing.

Harmless little soldiers,
  On the field they play,
Nodding plumes and crossing blades
  All the livelong day.

Timothy and Red Top
  Bring their music band ;
Some with scarlet epaulettes
  Strutting stiff and grand ;

Some in sky-blue jackets ;
  Some in vests of pink ;
Black and white their leader's coat,
  Restless Bob-o-link !

NOTES ON THE STUDY OF FORM AND ITS EXPRESSION BY MODELING IN CLAY.

FIRST YEAR.

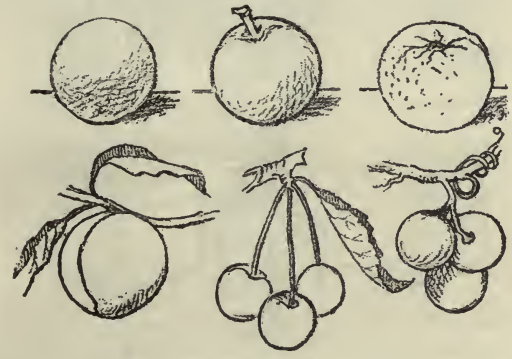
Modeling in clay is especially useful in the study of elementary form. The child studies the object (a geometric type solid), and, without much talk about it, begins to shape the clay in imitation of the wooden model. This necessarily includes sighting the object, and quiet, attentive observation, calling into play the perceptive faculties; next, an observation of the shapeless lump of clay; and then the child's mind institutes a comparison, forms a judgment, and, in judging, discriminates. When he is imitating a given form in clay, he forms and applies conceptions, or he thinks.

The result aimed at is the expression in the clay of the child's own thought; hence the teacher must wait with patience until the child, having gained his knowledge of the form, feels impelled to express his thought by representing it in the clay.

No mechanical aid should be permitted at first, the fingers being the only tools. When any other tool is found necessary a modeling stick should be used.

Description of Geometric Type Solids studied in the First Year.

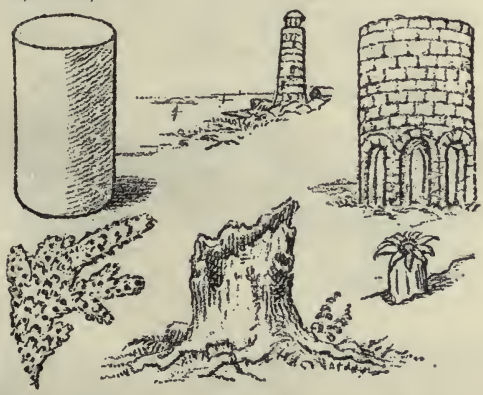
Sphere, Cylinder, Cube, Half-sphere, Half-cylinder, and Half-cube.



Sphere.

The Sphere is a body or space contained under a single surface, which in every part is equally distant from a point within, called its center. It has one curved surface.

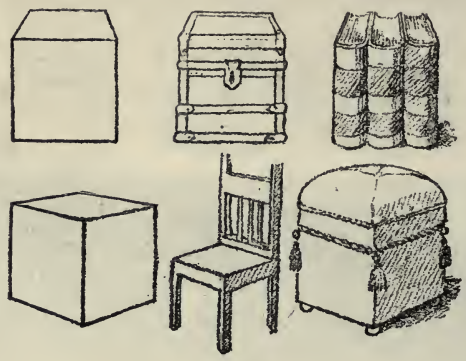
Objects shaped like the Sphere: Sun, planets, earth, and other celestial bodies; raindrops, dewdrops, bubbles; apples, oranges, peaches, cherries, grapes; balls, marbles, beads, etc.



Cylinder.

The Cylinder is a body of roller-like form, whose longitudinal section is oblong, and whose cross section is circular. It may be limited, or unlimited, in length. It has one curved surface, and two plane circular ends.

Objects shaped like the Cylinder: Tree trunks, stems, glass tubes, organ pipes, tubipora and other forms of coral, the chamber of a steam engine, the barrel of a pump, towers, handles, round bottles, vases, lamp chimneys, pencils, rollers, etc.



Cube.

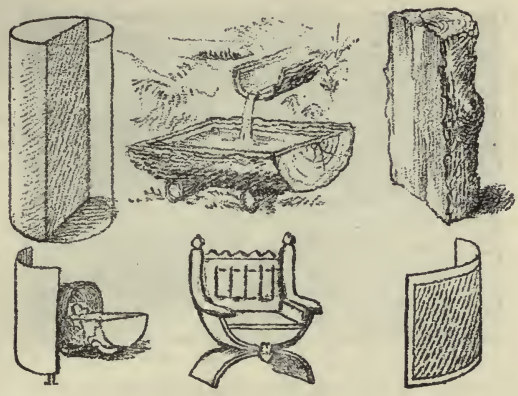
The Cube is a plane bounded by six equal squares. It has six equal plane faces, twelve straight edges, and eight solid angles.

Objects shaped like the Cube: Boxes, paper weights, dice, loaf sugar, toy blocks, and jardinières. Ancient houses, some Egyptian chairs, and parts of Early English furniture were based on this plan.

Half-sphere.

The Half-sphere is one half of a sphere, when divided by a plane passing through its center. It has a curved surface, and one plane circular face.

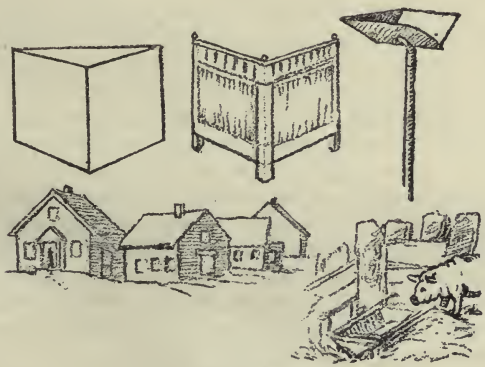
Objects shaped like the Half-sphere: Egyptian brass and copper vessels, Roman bronze bowls, modern bowls and cups, china and glass lamp shades, gongs, baskets, domes, the crowns of some hats and caps, some jellyfishes, some species of fungia and meandrina (corals), some birds' nests, seeds, etc.



Half-cylinder.

The Half-cylinder is the half of a cylinder, obtained by cutting the cylinder through its axis. It has a curved surface, one oblong plane face, and two semicircular plane faces.

Objects shaped like the Half-cylinder: Logs of wood, troughs, gutters, moldings, screens, shields, graters, match safes, etc.



Half-cube.

The Half-cube is the half of a cube, obtained by cutting the cube on one of its diagonals. It has two equal square plane faces, one oblong plane face, and two triangular plane faces.

Objects shaped like the Half-cube: The following may be of this form: a book (partly open and having square covers), the roof of a cubical toy house, a hencoop, and a folding screen (opened to form such a shape).

Modeling Lessons.

The Sphere.

The wooden models and the clay for this lesson having been distributed, the lesson is begun by letting the children look at the spheres that have been distributed, and at the larger one held by the teacher. The children are told to take the little wooden balls and play with them awhile. After this, the teacher asks some of the children to tell what they did. "I rolled my ball"; "I tossed my ball"; "I let mine rest on the desk," etc. The teacher tells the children to press the balls, to smooth them, to knock them gently on the desks, and allows them to act with them in other ways, until she feels sure that they know that the *ball is small, round, smooth, and hard.*

The purpose of the lesson is to have the children model in clay an object of the same size and shape; therefore the quality *roundness* should be made prominent. The teacher now sees that the children exercise their power of active self-direction in acquiring the notion of roundness, concentrating their minds upon this particular quality to the exclusion of all others.

What she says to the children is: "We will take the clay, look at the ball, and shape the clay into another ball like it. We shall also learn to call it by another name, — *sphere*, — and whenever we talk about it after this we shall talk about the *sphere*. I am beginning to model my sphere. Watch me a little while. You may all begin to model spheres."

During the exercise, the children hold the clay in the fingers, and press it gently or move it into the right form (the teacher having done so before them); they constantly refer to the wooden model, and compare their work with it. As the clay nears the correct form they press more and more gently on all remaining irregularities. They do not roll it in the palms of the hands, hidden from view, but model with their work in view, this method demanding more effort, inviting comparison, giving constant food for thought, and some gratification to the little workman as he meets with a moderate degree of success.

A little conversation may be carried on during the lesson, as the children must be encouraged and advised to work slowly and carefully, to improve the shape constantly, and not at any time to spoil what has already been done.

At the close of the lesson, the children should be allowed to see each other's work, as this may be a new incentive for greater effort in the next exercise.

As to what should be done with objects modeled by the children, much might be said. The practice of immediately destroying what has been accomplished with the expenditure of time and labor, even if it is but a simple clay sphere, is morally bad. The children should be allowed to enjoy the result of their work, and their work should be saved from lesson to lesson, each child's work being placed in a box of his own, marked with his name. If it accumulates, and cannot be cared for in the schoolroom, he should carry it home and keep it. It is true that the object is valueless, that the mental processes of the child when at work are of the first importance, that our purpose has been gained when these have been carried on; but if a child is ever to learn to respect the work of his hands, he should not have the idea given him that he works only to have the work destroyed.

The clay is inexpensive, the exercises in modeling are few. Do not care about using the same clay again and again. If, however, circumstances do not allow teachers to control this matter, and modeling lessons must be given, using the same clay from year to year, they should make themselves familiar with the notes on the care of clay on page 65.

The Cylinder.

The wooden models and the clay for this lesson having been distributed, the teacher and children study the cylinders. The teacher must remember that, upon the distribution of the clay and the models, the minds of the children recall the objects previously known, the wooden sphere and the clay; also their essential relations of time, place, and themselves as modeling the sphere. Or, in other words, they remember a past experience. If this representation is full and vivid, the idea of the roundness of the sphere ought to be very distinct, the greater energy having been spent upon that. Here, then, is the place from which to lead the children in their study of the cylinder. This object is also round, but round only in one direction, and both teacher and pupils begin to shape the clay to imitate the round cylinder.

The representation of the cylinder in clay thus far has necessitated the use of the products of sense perception contained in the individual concept *cylinder*. The teacher may decide whether this shall also result in the verbal expression: "*The cylinder is round in one way, long, and has two flat ends.*"

The modeling to obtain the cylindrical form is done with the fingers, but there may be need of rolling the clay on a plane surface. The ends should be cut carefully with a thread. After the ends have been cut the edges should be smoothed, and the curved surface improved, if necessary.

The Cube.

The wooden models are distributed. Small quantities of clay, of about the size of the model, have also been distributed. The children are allowed to handle the cubes, study them as directed by the teacher, and describe them. Having counted, compared, and thought about the sides, they conclude: "*The cube has six sides, all of the same shape and size.*" After observing and counting the edges, they conclude: "*The cube has twelve edges, all of the same length.*" Having observed and counted the corners, or solid angles, they conclude: "*The cube has eight corners.*"

The first observation before modeling the cube should be: "*The sides of the cube are flat*"; or (if the children understand the expressions *plane* and *faces*), "*The faces of the cube are plane.*" They are now directed to begin modeling the cube. One side is observed, and the clay is slowly shaped on one side into a square plane. This is done with the fingers gradually, or by little steps, with no sudden pounding or beating of the clay into the required shape by mechanical means. In process of developing this face, the mass of clay will have somewhat modified its shape, and another plane will have been suggested. It would be best if the second face modeled were the one exactly opposite the first. Either one of the other four may be modeled next, then its opposite; and the exercise should be continued until all six sides are modeled of approximate shape. The square sides of the model should be constantly studied, and the work constantly compared with the model.

Thus far, even with the utmost care in modeling, the edges will be imperfect and the corners blunt. To perfect these, the children may be allowed to use tools, or to pat the cube gently on a plane surface, so as to bring out the edges and corners more definitely.

The objects to be modeled of similar shapes to the sphere, cylinder, and cube need not be explained here. There is the same importance in the first study of the object for definite knowledge of the object; then comes the recognition of the shape as like the type, or the relation of the object to its type. Then follows modeling; and, in each instance, the type form is modeled simply at first, and then the points of difference are added.

In all these elementary exercises in modeling, nothing will be so difficult that the teacher cannot, with a little thought and previous preparation, easily direct it. The children may here also be allowed considerable liberty in methods of procedure, provided they do not violate any necessary conditions of good workmanship.

The illustrations given under this subject will suggest some forms, based upon the geometric type solids studied in the first year.

The Half-sphere, Half-cylinder, and Half-cube.

The above-named bisections are produced by first modeling their wholes, and then cutting these with a strong, fine thread, or a card. All rough edges should be finished off smooth, and false cuts should be remedied.

Notes.

The Clay. — The consistency of the clay, when ready for use, should be that of moderately soft putty. It should be very plastic, but not clinging or sticky; on the other hand, it should not be so dry that the fingers soon make it brittle. It will take a little experience to get it in working condition, if it has hardened. It should, if hard, be moistened and worked, or kneaded, into the right condition.

Amount of Clay for a Class. — Clay is furnished in six-pound bricks, and this, if carefully used, will be sufficient to provide a class of fifty pupils, if the same clay is used over and over again.

Size of the Lumps of Clay for Distribution. — The clay should be cut for distribution into irregular lumps of about the size necessary for modeling the object.

Handling the Clay. — Care should be exercised in handling the clay; the fingers being principally used, there is no need of soiling the rest of the hands with it, or of rubbing it on the clothing. A piece of common brown wrapping paper can be laid on the desk to protect it. If there are bits of clay left after a lesson, they can thus be collected without difficulty and the paper thrown away. It is possible to clean the fingers by rubbing them against each other.

Time for a Modeling Lesson. — From fifteen to twenty minutes should be long enough to model any of these simple objects, and ten minutes is long enough for some. If the clay is worked much longer, the heat of the fingers and the exposure to the air soon dry it, and it is then impossible to work it. To prevent this condition of the clay and to enable him to continue the work, the artist modeler moistens or dampens the clay, or, possibly, only the fingers. This, of course, is not practicable for children in the schoolroom.

As a modeling lesson is necessarily attended with some care of material and general righting of things, it is advisable to conduct such a lesson during the last twenty minutes of the school session.

Tools for Clay Modeling. — The tools, if any are used, should be simple. A stick with one flat end and one pointed end will be sufficient for beginners. Such sticks can easily be whittled by some of the older children in the school; or, if this is impossible, they can be made by a carpenter at small expense.

Preparation for Giving a Modeling Lesson. — The teacher must make sure that the clay is in good condition for work, and of sufficient quantity for all the pupils, and it should be cut for distribution into pieces of nearly the same size for each pupil. In order to keep it from drying before it is used, it should be covered with a piece of oilcloth.

To save time in the distribution, several children, at least one for each aisle, should perform this work at the same time.

Before giving the lesson, the teacher should have modeled the object at least once herself, in order to have experienced the difficulties the children are likely to encounter.

In this, more than in any other study, the greatest care must be exercised

by the teacher to give the directions simply, making sure that they are understood and patiently followed. Careless or rapid work results in discouraging failure.

Good modeling clay can be procured at any sculptor's, stucco worker's, pottery, or school-furnishing supply house.

The modeling of all these objects has been in the "round," or in "entire relief." The clay is held nearly all the time in the fingers, allowed to rest at times, and then also shaped with the fingers. It should be gently handled with either hand, constantly studied, and slowly modified. When finished, the clay models should be good representations of the wooden ones.

These objects may also be modeled on a base or background for support. This background may be square, circular, or oblong, and should be $\frac{1}{4}''$ in thickness. The place of the object is marked off upon it, and then the object is built upon it. In this method, particles or pieces of clay are taken, one at a time, and pressed upon the object in process of being modeled. Care must be taken that each little quantity is made to cohere with the general mass of the developing form; this can be done by moving it gently while pressing it into shape.

This is a process of building up the form, or *packing*, and may be used at times to give variety to the work, as this is the sculptor's method of working his clay model.

SECOND YEAR.

Success in the modeling of type solids and objects based upon them, for the second year, depends to some extent upon the careful work done and the good habits formed by pupils in the first year; much, however, may be accomplished by the teacher who takes up clay modeling for the first time in the second year, provided the work is allowed to progress slowly.

The aim to be kept in mind in these lessons is thoughtful observation of the forms to be modeled, and simple, correct, or truthful expression of the same.

Clay is considered the medium best adapted to the imitation of solid forms.

Every new exercise in clay modeling has some connection or relation with the preceding. The teacher should be fully impressed with this idea, and should take advantage of the fact when conducting the lesson. She should know exactly what parts or features of the lesson are familiar to her pupils, and hold them responsible for these; she should remember what parts were difficult for them in past exercises, and assist them to surmount these, or bridge them over till they have gained more power from practice. She should be fully prepared to present new steps in the most advantageous and economical manner; and in order to accomplish this she must, herself, have previously taken these steps and experienced their difficulties.

The teacher should herself model the object when the class is modeling, for this will help her to keep the exercise generally under control. She should show her work from time to time to the pupils, not for their admiration, but that they may know how far it has progressed. When the models are completed, the pupils should be allowed to see each other's work.

If properly conducted by the teacher, a lesson in clay modeling may be one of the happiest occasions for the little pupils. In it, they actually create, and nothing else so fascinates the mind of the child. If the teacher has made conscientious preparation for the lesson, she will be able to control and guide all the pupils easily without undue anxiety as to the results. She will feel reliance in the earnest efforts and the capacity of her class; her voice will naturally be quiet and subduing, her words encouraging and stimulating. And, if the children give interested attention, make careful attempts at doing, and are thinking, — "Here is a simple thing to do, but it is worth doing well; we must try with all our might; well begun is half done; every mark that we make will show that our fingers have been there," — if they are allowed uninterrupted quiet, in which to work up their little mysteries, their make-believes (for which these modeling exercises afford such grand

opportunity), the time will have been well spent, even if every pupil has not a perfect clay model as a result.

These exercises should foster a love of truthful expression. Only the teacher who feels that love and devotion must be the key-note of every well-directed effort, can bring life into the shaping clay, knowing that

> "No deathless pile is reared from intellect;
> Immortal things have God for architect,
> And man is but the granite he lays down."
>
> —*John Boyle O'Reilly.*

An Exercise in Modeling.

An exercise, for example, upon the modeling of the square prism, may be conducted somewhat as follows, the teacher asking questions and giving directions as the lesson progresses: —

"What have we for study to-day? Which one do you know? This *new* block is a prism. Place the cube and the prism beside each other, and tell which is longer. We will look at the prism and tell about its sides, its edges, and its angles. Place the prism on one of its ends and let us see what it makes us think of. Place it on one of its long sides and think of some things it resembles. If it were hollow and had a cover, what would it be? I will tell you a story of one box, called Pandora's box, in our next lesson, when we model objects shaped like a square prism. We will model the square prism lying on one of its long sides on an oblong tile. The tile on which it is to be modeled will be 3″ long, 2″ wide, and about $\frac{1}{4}$″ thick. Draw an oblong 3″ × 2″ with the ruler upon the modeling slab.[1] Now let us cover this oblong with clay, taking but little at a time. Pat the clay gently down on the slab. We must begin on the farther long edge of the slab, and work up very close to it, keeping the clay straight with the line and evenly upright. Keep on very busily until the whole oblong is covered. Try to keep the upper surface, or top, of the tile even and plane. Do not smooth it much, but pat it even, with little, light, quick strokes of the finger tips. Watch the edges carefully, and if they seem to be crooked use the modeling stick to straighten them. Do not cut away much clay, but rather smooth the edges by patting or pressing them inward.

"Now that the tile or background is finished we are ready to model the square prism. Take the wooden models and place them on the center of the oblong. Think how they should be placed to look well. See, I place mine — the long sides of the prism with the long sides of the oblong; now I place the prism

[1] This may be a piece of stiff card or paper, a wooden or china tile. If either of the last two is used, it must be washed clean after each modeling lesson, and be held in readiness for the next one.

across the oblong. How do you like it? Can you place it so? Try to have an even margin all around the square prism. You may now rest a little, while I look at your work. Yes, I think we can all go on. We must show where the square prism is to be modeled on the tile. The best way is to mark around it where it now is, and we will do so carefully, keeping the pencil close to the edge of the wooden model. Take much pains to keep the angles correct. Now lift the models and set them on the desks. Before we begin modeling let us tell about

THE SQUARE PRISM.

We study now a little block made for us
Of wood so smooth; with two ends equal squares.
We turn it round; each oblong side now before us
With the three others equally compares.

We edges count; four long, eight short ones bound it,
At angles joined, all equal, square, and right.
We look once more, and think, where'er we found it,
We'd surely know this little block at sight.
(*Repeated by the children.*)

"Now we may begin to model it, and sing: —

Close to the oblong outline
Pack the clay bit by bit,
In every little hollow
Press it and make it fit.

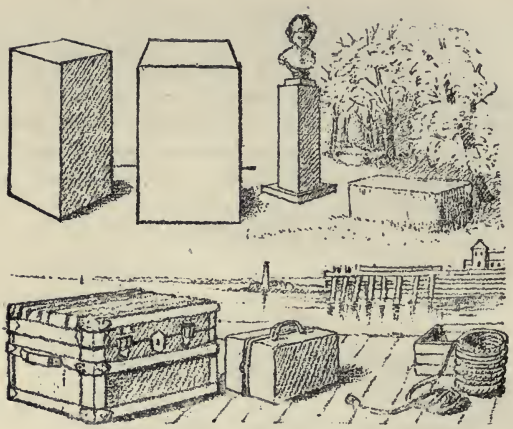
Clay is so soft and yielding,
Fingers must model with care;
A little haste may injure
What has cost time to prepare.

Working with steady patience,
Not stopping a moment for fun,
Till she who sees our efforts,
Kindly says, 'Dear ones, well done.'"

DESCRIPTION OF GEOMETRIC TYPE SOLIDS STUDIED IN THE SECOND YEAR.

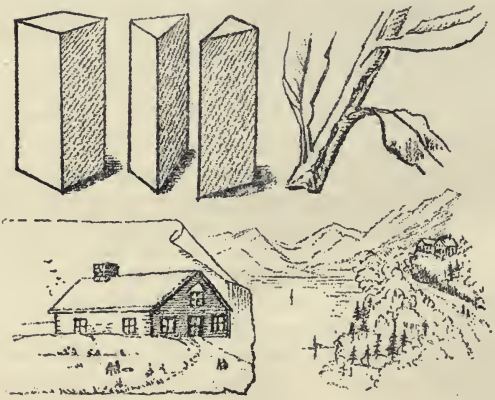
Square Prism, Triangular Prism, Square Plinth, and Circular Plinth.

The Square Prism (or quadrangular prism) is a solid whose bases, or ends, are equal and parallel squares, and whose sides are equal parallelograms (oblongs). It has two equal square ends, four equal oblong sides, four long straight equal edges, eight short straight equal edges, and eight solid angles.



Square Prism and Similar Forms.

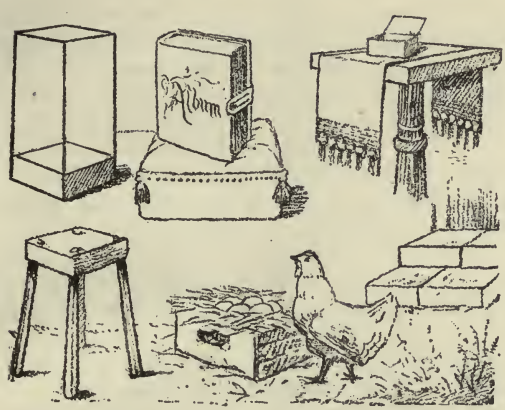
Objects based upon the Square Prism: Pillars, blocks of stone, bricks, wooden cases of drawers, benches, bars, beams, cameras, houses, chimneys, cars, trunks, valises, paper baskets, bottles, jars, tin cans, etc.



Triangular Prism and Similar Forms.

The Triangular Prism is a solid whose bases, or ends, are equal and parallel triangles, and whose sides are parallelograms. It has two equal triangular ends, three oblong sides, three long straight equal edges, six short edges, and six solid angles.

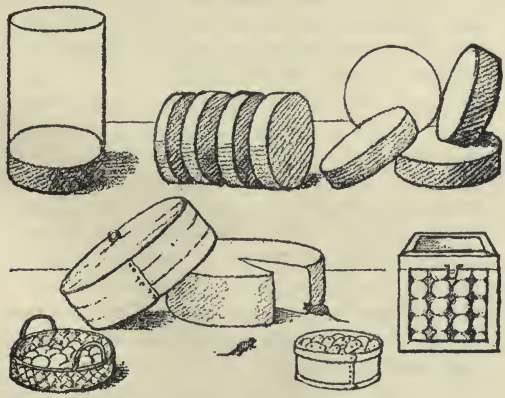
Objects based upon the Triangular Prism: Stems of some plants (as the papyrus and sweet pea), the flint or crown-glass prism used in optics for the dispersion of light, glass chandelier pendants, mountains, roofs of houses, tents, hencoops, moldings, troughs, gutters, books partly open.



Square Plinth and Similar Forms.

The Square Plinth is a solid whose faces are six parallelograms, the opposite pairs being parallel and equal to each other. Two of these are square. It has two equal square faces, four equal oblong faces, eight equal long edges, four equal short edges, and eight solid angles.

Objects based upon the Square Plinth: Tiles, slabs, blocks, boxes, books, lowest part of a pedestal, an abacus, hassocks, a square table top, a tin oil can.



Circular Plinth and Similar Forms.

The Circular Plinth is a solid like a cylinder, having an oblong longitudinal section and a circular cross section, with the longitudinal section less than the cross section. It has one curved surface and two plane circular ends.

Objects shaped like the Circular Plinth : Cross sections of thick plant stems, bases of columns, dry measures, cheeses and cheese boxes, hassocks, collar boxes, checkers, counters, tiles, bread boards, drums, tambourines, banjos, millstones, wheels, washers, baskets.

Lessons on the Half-sphere, Half-cylinder, Half-cube, Square Prism, Triangular Prism, Square Plinth, Circular Plinth.

Before beginning the work proper of the second year in modeling, a review of the sphere, cylinder, and cube, half-sphere, half-cylinder, and half-cube should be made.

The Sphere. — (See Modeling Lessons, *The Sphere*, page 120.) Bisect the sphere. Study the half-sphere, and model it as a whole.

The Half-sphere. — Develop a square tile of 2″ side and of about $\frac{1}{4}$″ thickness by packing bits of clay upon each other, compactly moving each added bit upon the surface of the whole, pressing it firmly in place, and gradually forming the square. Make it moderately even, with square edges and well-formed angles. Upon this tile the half-sphere of 1″ diameter is to be modeled.

Direct the children to place gently their wooden models of the half-sphere upon the center of the clay tiles, the plane faces being downwards, and trace circles around them lightly on the tiles. Remove the wooden models, setting them in view for study on the desks, with plane faces downwards.

First pack the clay near the circumference of the circle marked on the tile, then fill in the circle. Study the height and curve of the half-sphere ; build up this height, and develop the roundness by packing little pieces of clay upon each other and pressing them into the general mass.

Aim to model the object of the proper size at once ; for although it is possible to cut off, or take away a little clay here and there if it develops too large, it is generally better not to do so.

Watch the development carefully, comparing often with the model. Turn the work to view it from all sides.

When the work is as nearly correct as the pupils can make it, direct them to smooth it a little with the fingers, but not so much as to take away the character of the work. The impressions of the fingers may be left without much smoothing of the surface, and the work may be considered finished.

The Cylinder. — (See *The Cylinder*, page 121.) Bisect the cylinder. Study the half-cylinder, and model it as a whole.

The Half-cylinder, 2″ long and 1″ in diameter. — The best position in which the half-cylinder can be modeled is lying on its oblong plane side. Model an oblong 3″×2″ and about $\frac{1}{4}$″ thick for a tile. On this, lightly place the wooden model, with its oblong plane face downwards, and equally distant from opposite sides. Trace the oblong faintly on the clay tile, and then remove the model. Build up the half-cylinder on this oblong as base. Pack the bits of

clay evenly and compactly, and try to preserve the plane semicircular ends smooth and even; if these are lost, however, use the modeling stick. Never lose sight of the shape of the model, and preserve the curved surface of the cylinder throughout; smooth it when the whole is completed.

The Cube, 1″ side. — (See *The Cube*, page 122.) Bisect the cube diagonally. Study the half-cube, and model it as a whole.

The Half-cube. — Model a square tile 2″ on a side and about ¼″ thick. Place the half-cube upon it on one of its triangular faces, and trace its shape lightly upon the clay tile. Begin to develop the triangle, working neatly to its outlines on the tile, then build the half-cube, or triangular prism. The angles of 45° will be more difficult to keep than the one of 90°, but if sufficient care is exercised, and the modeling stick is used, the results will be satisfactory. Study the height of the model, and build the clay half-cube of the same size. Keep the sides moderately smooth as the modeling progresses, and do not depend upon cutting or trimming after the whole is done, as this might disturb the edges or break the sharp angles. In that case, to restore the damage, water or very moist clay would have to be used.

Note. — The mending of a clay model, which necessitates the preparation of the partly dried surface by wetting, so that the new clay will adhere, is too difficult for young pupils, and should not be attempted. The teacher, however, should know how to do this, for it may occasionally be necessary that she make a correction, when a pupil has modeled with great care, and the work has been injured through no carelessness of his own.

The Square Prism. — Model a large cube, quadrisect it on its diameters, obtaining four square prisms. This may be done by cutting with a string, a strong thread, or a stiff card. Choose the best prism. Smooth any roughnesses on the edges and perfect the angles. Use this and the wooden model for study, and model another clay prism on a tile.

Make a tile 3″ × 2″ × ¼″. Gently lay the wooden model of the square prism upon it, leaving an even margin on all sides. Trace its contour lightly on the clay tile; remove the model, and develop the square prism. First, build the oblong shape exactly, and then raise the whole, with small additions closely packed and carefully worked into the mass, until the square prism is shaped. The sides must be kept vertical and plane during the modeling, the edges sharp and even, and the angles perfect. This can only be done by modeling slowly and carefully, and using the modeling stick to preserve the form. For example, if the many additions and continued pressure from the upper side of the square prism should get it out of shape, broadening it, or inclining its sides, press these with the modeling stick from time to time, or pat them gently into the right position.

The Triangular Prism. — Model a large cube and quadrisect it diagonally, to obtain the triangular prism. Choose the best one, and finish off all irregularities. Use this and the wooden model of the triangular prism for study, and model a triangular prism on a tile.

Model a clay tile $2'' \times 2'' \times \frac{1}{4}''$. Place gently upon its center the triangular prism, resting on a triangular end. Trace lightly around the model on the clay tile; remove the model and begin to develop the clay prism. Begin with the triangle, keeping its outlines correct; then slowly and carefully build up the prism, adding piece by piece, watching the sides as they develop. If these are not easily kept upright and perfectly plane, hold an oblong tablet against one while working or pressing the other. Smoothing the sides with the modeling stick will also keep them even. When the three upright edges are completed, much careful work must be done in finishing the end. This triangular end must be very true, with sharp edges and correct angles. Test the clay model by holding the wooden model against it. Corrections that involve a change in the length of the sides of the triangle probably cannot be made, as they would necessitate a change in the width of the oblong side of the prism. In this, as in preceding exercises, it is best to proceed slowly, carefully, and exactly, so that no changes need be made when the whole is finished.

The Square Plinth. — Model a large cube and quadrisect it horizontally, obtaining four plinths. Choose the best or most regular of these, and finish its edges and angles. Use this and the wooden model for study, and model a square plinth $1\frac{1}{2}''$ square and $\frac{1}{2}''$ thick. First model a tile $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times \frac{1}{4}''$. Upon the center of this gently place the wooden model, and lightly trace around it. Remove the square plinth model, and begin to model one in clay.

Pack the bits of clay firmly upon the tile, following the outlines of the square, then fill in the square; repeat this until the plinth is of the required thickness. Model the edges sharp and even, the angles exact, and the sides plane. This can be done best if the square shape is adhered to closely at the beginning, and not lost in the development. The modeling stick, or a stiff card, may be used to keep the upright sides even.

If the packing has been done carefully by means of small additions of clay, not much work will be needed to finish the upper square surface; for this should be moderately even or plane at every stage of the development of the square plinth.

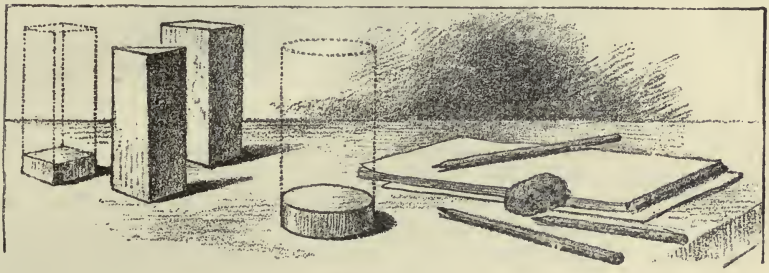
In this exercise, as in the preceding, avoid mistakes from carelessness, hurry, or the use of too much clay at a time. Let the work be so correct as it goes on, that no great changes will be necessary to complete it.

The Circular Plinth. — Model a large cylinder and quadrisect it horizontally, obtaining circular plinths. Choose the best of these, and finish any rough edges or uneven surfaces; use this and the wooden model for study, and model a circular plinth of $1\frac{1}{2}''$ diameter and $\frac{1}{4}''$ thickness on a tile.

Model a square tile $2''$ on a side and $\frac{1}{4}''$ thick. Place the wooden circular plinth gently upon the center of the tile, leaving even margins; trace lightly around the model on the clay tile; remove the wooden model and begin to model the circle in clay. Keep the circumference of the circle exact, and fill in the circle by packing pieces of clay compactly together until the required thickness of the plinth is reached. Use the modeling stick constantly to preserve the upright surface even, moderately smooth, and correctly curved. If the

packing has been done with proper care, the upper surface of the plinth will be moderately even or plane. If a smoother finish is necessary, however, the surface should be gently patted with the finger tips, and depressions should either be smoothed out with the fingers or (in case they are too large to be remedied in this way) filled up to even the surface.

Objects based upon the Square Prism, Triangular Prism, Square Plinth, and Circular Plinth.



The following general directions are all that need be given for modeling objects based upon the type solids; for teachers and pupils will be able to work independently in modeling these after having attentively followed the directions for the types.

In these lessons care must be taken that the objects chosen are familiar to the pupils, and can conveniently be brought into the schoolroom for study. It is not always necessary that each pupil be provided with an object. One object will be sufficient for a class, if it is simple, and large enough to be readily seen and recognized by the pupils.

First, direct the pupils to observe the object carefully, then help them to describe its shape, and tell some of its characteristics, without, however, carrying the description too far, or leading them away from the important point for consideration, — namely, the shape of the object, its parts and their general proportion, and the geometric type solid to which it is related.

It is not necessary to copy all the details of the object in the clay model. After the general type form has been modeled, the most characteristic details may be selected, and be rendered in the clay as simply as possible.

Generally, the clay model will look best on a tile for background, and this should be modeled first. The object may then be modeled upon it by packing or building up bit by bit, as in the exercises on the type solids heretofore described. Or they may be developed free, from a general mass, by pressure and finger modeling, and then attached to the tile; in the latter case, the surface of the tile and the side of the object to be attached should both be roughened and

moistened, and then pressed together, without, however, changing the shape of either.

In finishing work, the pointed round end of the modeling stick is used for all small depressions or hollows, either smooth or rough; the pointed flat end is used for large plane or curved surfaces, and for developing edges and angles. All marks representing texture on the surface of objects may be made with either the pointed round or the flat end, with the edge of the blade, or with the fingers, that is in the manner that will best bring out their character. The teacher will be able to decide this by experimenting a little previous to the lesson.

All parts standing out in relief from the object can best be modeled free, being afterwards attached to the object. If surfaces that are to be attached are small, they can be strengthened by the addition of a little moist clay, pressed firmly into both parts.

Stems, cup handles, and basket handles may be modeled by rolling long, cylindrical forms on the desk, or modeling surface, with the palm of the hand and the fingers. To do this, the clay should be moderately moist. If these details of objects are very delicate, they require much care in handling, and even then they often break before they dry.

Objects that are modeled from the solid mass of clay are liable to shrink and crack in drying, particularly if the clay has been very moist. Much of this may be avoided by using moderately dry clay, modeling the form slowly and gently, and not moving or disturbing the clay that is already in place and partly dried by any sudden jarring, violent breaking, or rapid cutting in the process of developing the object.

The Notes on Modeling, page 116 (under First Year), are applicable to these lessons. The teacher is referred to them for further directions.

The children should be allowed more liberty and originality in methods of modeling objects based upon type solids, and the teacher, therefore, need not plan to direct all the steps to be taken in these lessons.

In the earlier stages of clay modeling, objects with slender parts in high relief should not be chosen for exercises, as they necessitate a framework of wood or wire for their support. This is not practicable for the schoolroom.

Clay models cannot be made more realistic by the addition of parts from natural objects, as, for instance, using raisin stems for clay grapes, apple seeds for the core of the clay half-apple, a clove for the blossom end of a clay apple, a peach stone in a clay half-peach, etc. Such practice is false in principle and a violation of good taste. The same may be said of coloring the clay model. Striking, knocking, or patting a lump of clay into the required shape expeditiously; rolling the clay in the palms of the hands, to produce a sphere; pounding, or knocking, clay with the wooden model of the cube, to develop a cube; or cutting a cube from a mass of clay, with a card or knife: all these are unworkmanlike, bad methods, in all of which the end to be gained — a better knowledge of the form studied by a thoughtful development of that form — is entirely lost sight of.

THIRD YEAR.

Nearly all the manual steps necessary in clay modeling have been thoroughly treated in the *first* and *second* years of this course, and if these have been carefully followed much power will have been gained. There has also been some opportunity for the exercise of judgment in the use of original methods in the modeling of objects of varied forms based upon the type solids, and there will not be necessary much detailed direction for the modeling of the remaining type solids. The following principles, however, are given to help make these lessons of educational value, and they should be constantly borne in mind by the teacher: —

1. The *power* of *expression* gained in clay modeling is of greater value than the knowledge of the object, or the successful product of the clay model.

2. The child does not get a knowledge of the object by modeling it in clay. This only gives him a *knowledge* of the *processes*, by means of which his knowledge of the object may be expressed.

3. As clay modeling is meant to train the power of observation, and as observation is a necessary activity of the mind in acquiring knowledge, *objects* must be brought before the child for study.

4. If the purpose of modeling in clay is to train the child's power of observation, repeating the same exercise in order to imitate the form more perfectly is not so valuable an exercise as it is sometimes thought to be. To train observation, the mind of the child should not be held attentive to one object for a long time, but should have varied, new, and interesting objects presented to it, for the power to observe is best trained by studying new phenomena.

5. If a knowledge of the object is necessary to a proper expression, or model-

ing, of the same, and if such knowledge must be acquired by voluntary and conscious observation under intelligent guidance, a modeling exercise *without* the presence of the *object* for study must be a mere futile pastime.

6. When the child has acquired knowledge of a form, and this knowledge guides him in making the form (or controls his practice) there exists an interaction of the mind and the hand in the manual processes. Thus: The mind attends to and guides the hand, and the actions of the hand have a reflex influence on the mind. It is only when the mind acts with the body that the child is developed and trained. Simply doing without the guidance of knowledge will never uplift or educate the child, either intellectually or morally.

7. In a properly conducted exercise in clay modeling, the presentative, the representative, and the thought powers are all awakened into activity.

Without deeming it necessary that the teachers should always be conscious of the various steps by which objective, concrete, and abstract (or general) knowledge is acquired, it will be helpful to them to see that the several mental powers are trained by a natural and harmonious activity in even a simple lesson in clay modeling — to know that, in a study of the object, the mind of the child perceives the relation of *space* — *i.e.*, intuitively recognizes this relation when it perceives an extended object as extended; that it recognizes intuitively the relation of *time*, as any expression of his thoughts at the time of modeling will illustrate, "I am beginning to model now," "The clay model will be finished soon;" that it perceives the relation between *substance* and *attribute*, as, "The clay is soft"; and the relation of *cause* and *effect*, as, "If we handle the clay model roughly, it will break."

In the presence of an object, the mind acts. The product of this activity, when it is the result of but one perceptive act through a single sense, is called a *percept;* when the result of several perceptive acts through one or more senses, a *concept.* Percepts and concepts are individual objects of knowledge.

When imitating a form in clay, the child is to show, as far as his skill in the process will permit him, his concept of that form, or he is to *represent* that form. The teacher must here remember that the *representative* power is conditioned by the *presentative* power, or that the re-knowing of objects will be clear and perfect if the previous knowing has been so.

In a lesson in clay modeling, all the *thinking* powers are exercised. The child forms general *concepts* — *clay models, clay modeling* — and

the processes for forming these include comparison, discrimination, analysis, abstraction, synthesis, and generalization. Thus the mind of the child perceives successively that *several* individual models are made of clay; and, by comparison, it discerns that *all* the models are made of clay. The discerning by comparison of this common likeness of several objects is *judging*, and the mental product, *clay models*, is a *judgment*.

The comparison of different objects to discern their likeness also involves the discerning of their differences, or *discrimination*. It thus follows that judging involves discrimination; as, *good* clay models, *perfect* clay models, *imperfect* clay models, *beautiful* clay models, *ugly* clay models, etc.

The mind of the child discerns that what is known of the clay in the various exercises, as, for example, that *the clay, when plastic, can be modeled*, is true of all clay which is plastic, or his mind passes from the particular facts as reasons to a general fact. This power is *inductive reasoning*. His mind also reasons deductively; for having seen much plastic clay, when a fresh lump of clay is furnished him he immediately discerns the quality of *plasticity* and models this particular clay.

Many more examples could be given to show that various mental activities are exercised in a modeling lesson; and it must be remembered that if the power of the mind to observe is increased by observing, the power to judge by judging, and the power to reason by reasoning, each modeling lesson should develop these powers by occasioning their harmonious activity.

And again, if observation and experience of common things involve the activity of mental processes or the inductions of common thought, and if these processes form the true basis of scientific thought (the latter merely being characterized by closer observation, a broader range for comparison, more definite concepts with keener analysis of the same, more exactness in judging, and more careful inductions), and if it is true that common knowledge and common thought blend into scientific knowledge and scientific thought, then it becomes the duty of every teacher to so surround the pupils with objects that shall arouse their interest, and bring the perceptive faculties into play, that they will be induced to watch for and study phenomena, and exercise judgment and reason. The

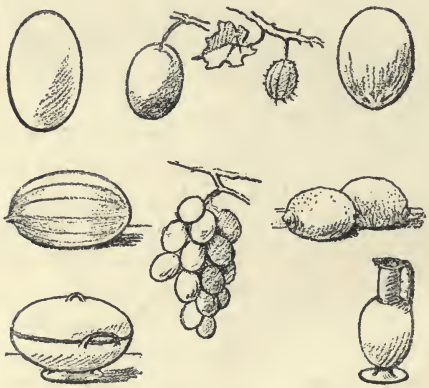
children should be furnished with objects, and *always* with objects, to awaken thought.

This method should be pursued in all branches of elementary instruction. When a child has *seen* a truth, he *knows* that truth; when he expresses his knowledge of the same, he will express it truly, and be limited only by his control of the vehicle of expression.

Teachers must first of all make the right conditions for effective study.

Description of Geometric Type Solids studied in the Third Year.

Ellipsoid (or Prolate Spheroid), Oblate (or Flat) Spheroid, Ovoid Cone, and Square Pyramid.



The Long Spheroid and Similar Forms.

The Ellipsoid (or *Prolate Spheroid*) is a body whose longitudinal section is an ellipse and whose cross section is a circle. It is produced by the revolution of an ellipse on its major axis. Its long contour, or side view, is elliptical, and its end view is circular.

Objects shaped like the Ellipsoid: Plums, grapes, gooseberries, barberries, cucumbers, watermelons, cocoanuts, butternuts, acorns, vase forms, Chinese lanterns, tureens, etc.

The Oblate Spheroid (or *Flat Spheroid*) is a form whose longitudinal section is a circle, and whose cross section is an ellipse. It is produced by the revolu-

The Flat Spheroid and Similar Forms.

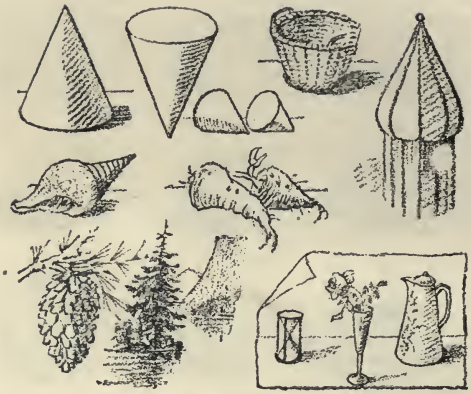
tion of an ellipse upon its minor axis. Its broad or full view is circular, and its side view is elliptical.

Objects shaped like the Oblate Spheroid: Squashes, tomatoes, sea urchins, pebbles, concretions, some seeds (nasturtium, lentil), parts of vase forms, tureens, Japanese boxes and baskets, door knobs, etc.

The Ovoid and Similar Forms.

The Ovoid is a form whose longitudinal section is an oval, and whose cross section is a circle. It is produced by the revolution of an oval upon its axis. An ovoid is an egg-shaped object.

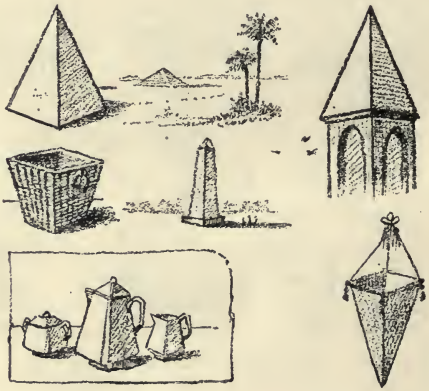
Objects shaped like the Ovoid: The human head, birds' eggs, the sea egg, strawberries, pears, vase forms, pitchers, egg cups, etc.



The Cone and Similar Forms.

The Cone is a form whose longitudinal section is a triangle, and whose cross section is a circle. It is produced by the revolution of an isosceles triangle upon its altitude. The cone has a circular base, and tapers from the base to a point called the apex. The apex is opposite the center of the base.

Objects shaped like the Cone : Pine cones, spires of shells, spines of porcupines and of some plants, parsnips, carrots, beets, church spires, hourglasses, funnels, lamp shades, light extinguishers, etc.



The Pyramid and Similar Forms.

The Square Pyramid is a form having a square base and four equal triangular sides.

Objects shaped like the Square Pyramid: Spires, pitchers, baskets, and monuments may be shaped, in parts, like a square pyramid.

Lessons on the Ellipsoid, Oblate Spheroid, Ovoid, Cone, and Square Pyramid.

In modeling objects shaped like the ellipsoid, oblate spheroid, ovoid, cone, and square pyramid, the type solids upon which they are based should first be modeled, and then their characteristic details should be added. (See page 134 for fuller directions.)

The Ellipsoid. — Model this directly from the clay, pressing it gradually into the required form. Observe the curved contours carefully, and imitate the size and shape of the wooden model. Make a clay tile of suitable size, and attach the ellipsoid. (See Lesson on *The Sphere*, page 120.)

The Oblate Spheroid. — Model a sphere and gradually press it into a flat spheroid, first with the fingers, then in the palms of the hands. Model a square tile of suitable size, and attach the flat spheroid to it.

The Ovoid. — Model this directly from the clay, developing the half-spherical end as in the lesson on *The Sphere*, and then model the ellipsoidal end. Study the shape of the wooden model, and imitate it accurately. When the spherical end has been modeled, rest this end in the palm of the left hand while modeling the rest of the ovoid, thus helping to preserve its round form. Turn it often, to view it from all sides. The ovoid is one of the most difficult forms to model, as its contours vary more than those of the other type forms. For this reason it is also one of the most beautiful forms. Model an oblong tile of suitable size, and attach the ovoid to the tile, placing it on its side.

The Cone. — Model the circular base first, then rest the clay with this circular face upon a smooth plane surface, and develop the tapering side with the fingers by drawing the clay gently from the base toward the apex of the cone. Great care must be taken to keep the axis vertical, and the apex pointed. A card may be used to help determine the proper slant of the curved surface; by comparing with its edge, the depressions and projections are readily perceived, and the apex can be kept easily over the center of the base.

The Square Pyramid.—First develop a square for its base, then work the clay gradually for the four triangular sides, by pressing it and at the same time drawing it gently to the required form. The even development of the four sides can best be determined by taking a view from the apex in the direction of the axis of the pyramid. The edges should be kept moderately sharp, and the apex pointed.

The type solids modeled this year will form a good basis for a study of vase forms, which may now be designed or modeled by the pupils. The flat spheroid only requires the addition of a cylindrical neck; the ellipsoid, of a short cylindrical neck, and a circular plinth as base. The ovoid may be poised on either the small or the large end, a neck and base being added. Tapering, or conical, vases may also be designed. Each pupil should have a circular plinth of wood, 1″ thick and about 3″ in diameter, upon which to rest the clay. The pupils may imagine this to be a potter's wheel, and turn it to view the model on all sides.

The antiquity of the art of pottery and the beauty of Egyptian and Greek vases may form subjects of conversation, and the children may be led to understand and repeat the following extract from "Keramos," by Longfellow:—

"Turn, turn, my wheel, turn round and round,
Without a pause, without a sound;
So spins the flying world away.
This clay, well mixed with marl and sand,
Follows the motion of my hand;
For some must follow and some command,
Though all are made of clay."

EXERCISES IN STICK-LAYING.

Sticks can so easily be used to express direction that exercises in stick-laying may properly precede the drawing of simple objects in outline and of simple designs, and may be used in making inventive pictures for number, language, and reading lessons.

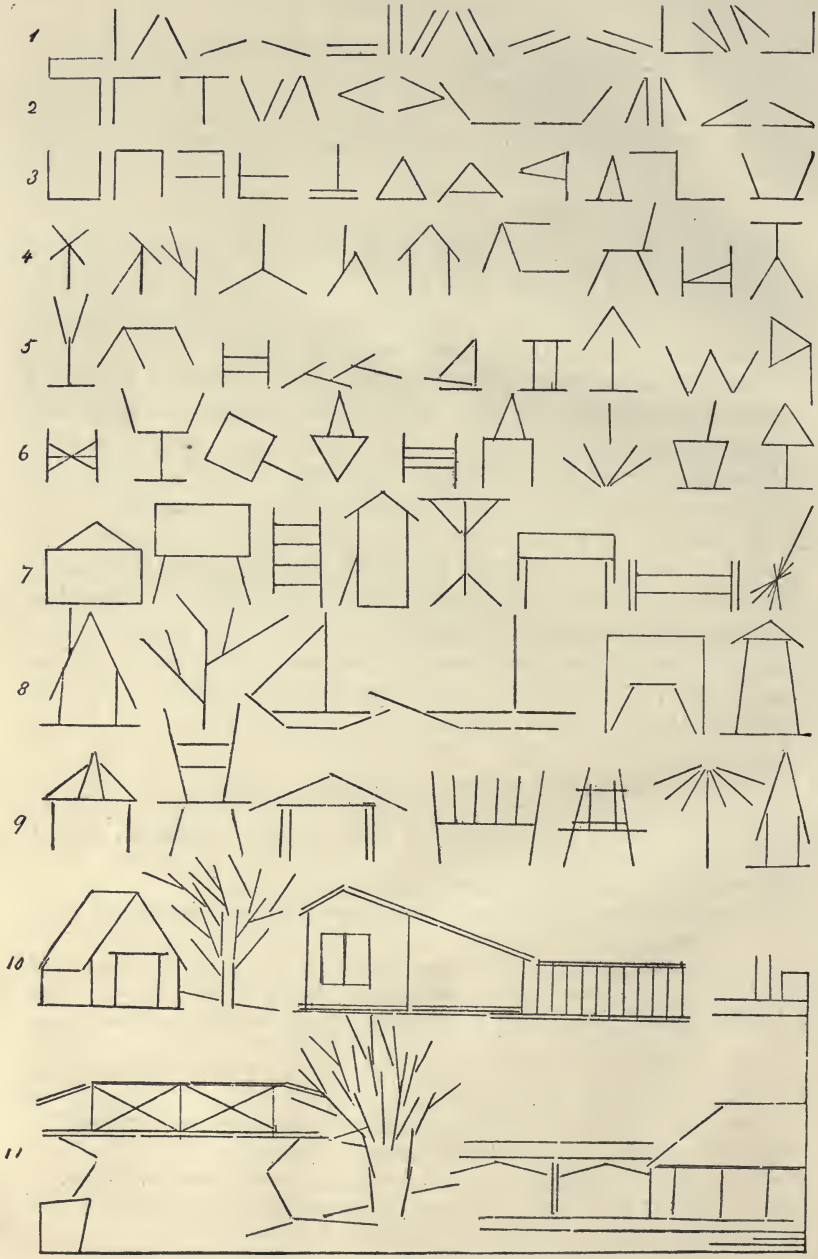
The lessons in this subject may be: *first*, imitative, illustrating direction, parallel lines, lines at an angle, angles, triangles, and other geometric plane figures; *second*, from memory; *third*, original. For all these exercises, the children should be provided with the right number of sticks of the required lengths.

In memory exercises, the teacher may choose the objects; she should be sure, however, that the sticks distributed will adequately outline the objects she chooses. The illustrations in the plate opposite show a variety of more or less rectilinear objects, represented in two dimensions without reference to foreshortening and convergence. The teacher should also record successful inventions of the children for future reference.

ILLUSTRATIONS FOR STICK-LAYING.

1. Sticks placed in various positions from dictation: horizontal, vertical, oblique, parallel, at an angle.
2. *Two sticks:* right angles, acute angles, obtuse angles.
3. *Three sticks:* box, table, flag, two boats, triangle, roof, pennant, hat, steps, flowerpot.
4. *Three sticks:* windmill, telescope, branch, roof with flagstaff, roof and chimney. *Four sticks:* parts of houses, chair, gate with bar down, table.
5. *Four sticks:* goblet, roof, clotheshorse, branch, sailboat, pedestal, lamp, chopping knife.
6. *Five sticks:* rustic gate, fruit dish, shovel, wall basket, shelves, church spire, umbrella, mortar and pestle, lamp.
7. *Six sticks:* picture, chart on stand, ladder, house, tables, fence, broom.
8. *Six sticks:* house, tree, sailboats, hearth, lighthouse.
9. *Seven sticks:* summerhouse, chair, porch, crib, easel, umbrella, church.

10, 11. *Ten or more sticks:* house and tree, house and shed, pier and steamboat, bridge and willow, depot and roofed platform.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PAPER FOLDING AND CUTTING.

The following plates illustrate the use of colored paper in making elementary designs. The paper is folded a certain number of times in parts of the same size and the whole design is cut at once by cutting one unit from the several thicknesses of paper.

In each exercise, the pupils should have a definite idea of what is to be done, by either studying out for himself how it is done, or at first being shown how to cut certain forms. Haphazard cutting of folded paper has no educational value and should be discouraged. It may afford amusement, but does not stimulate thought.

Paper for folding should be thin, as many thicknesses of heavy paper are difficult to cut. The folds should be even and sharply defined, or space is lost in folding. The design should be such that the cut can be begun at the edge of the folded paper.

The scissors should be sharp, and the lines should be evenly cut, so that the design may be regular.

The units used in the exercises for each year should be based upon the geometric planes studied in the year. Thus, in the first year, the designs may require the cutting of straight or curved lines, circles, squares, and triangles; in the second year, the cutting of oblongs might be added, and in the third year, the cutting of ellipses, ovals and inventional forms.

Plates I. and II. — *Borders*, illustrating the principles of order, regularity, and repetition and alternation of form, position, and size.

Plate III. — *Centers, rosettes*, and *squares*, illustrating the principles of repetition, alternation, and radiation from a center.

Plate IV. — *Surface patterns*, illustrating the principles of order, repetition, alternation, and symmetry.

PLATE I.

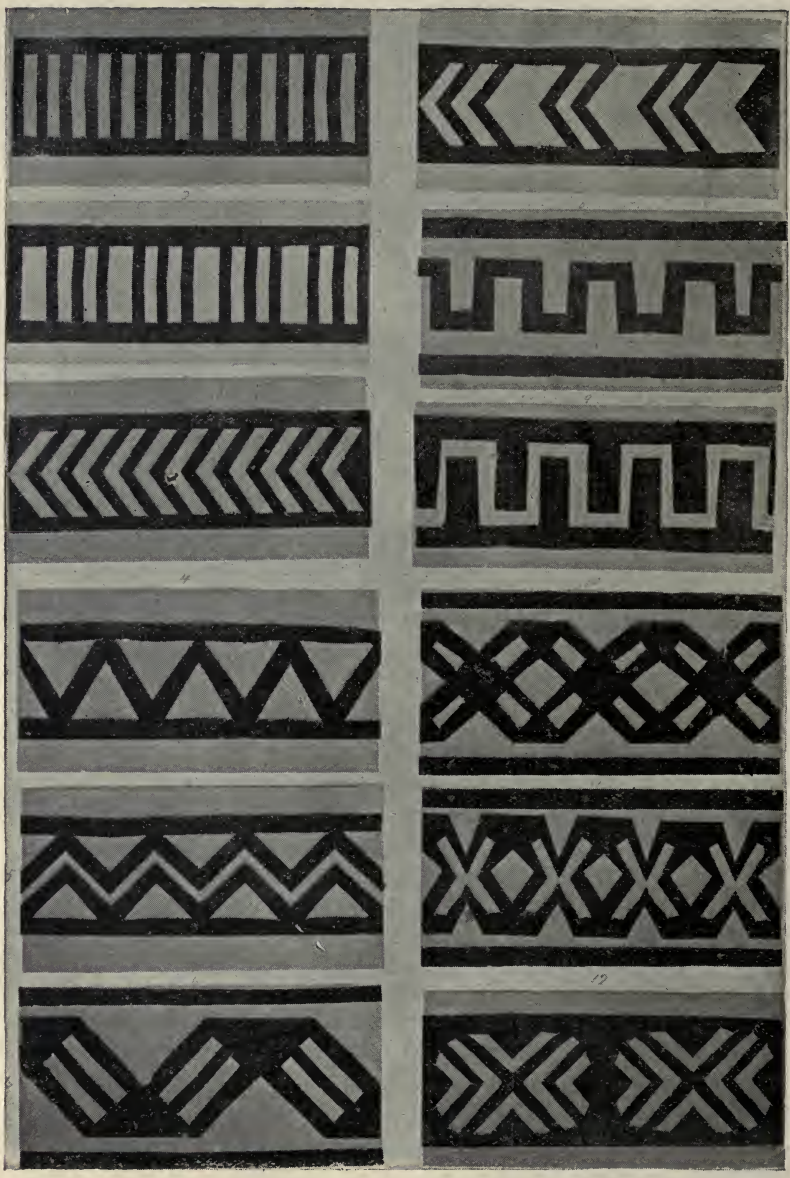


PLATE II.

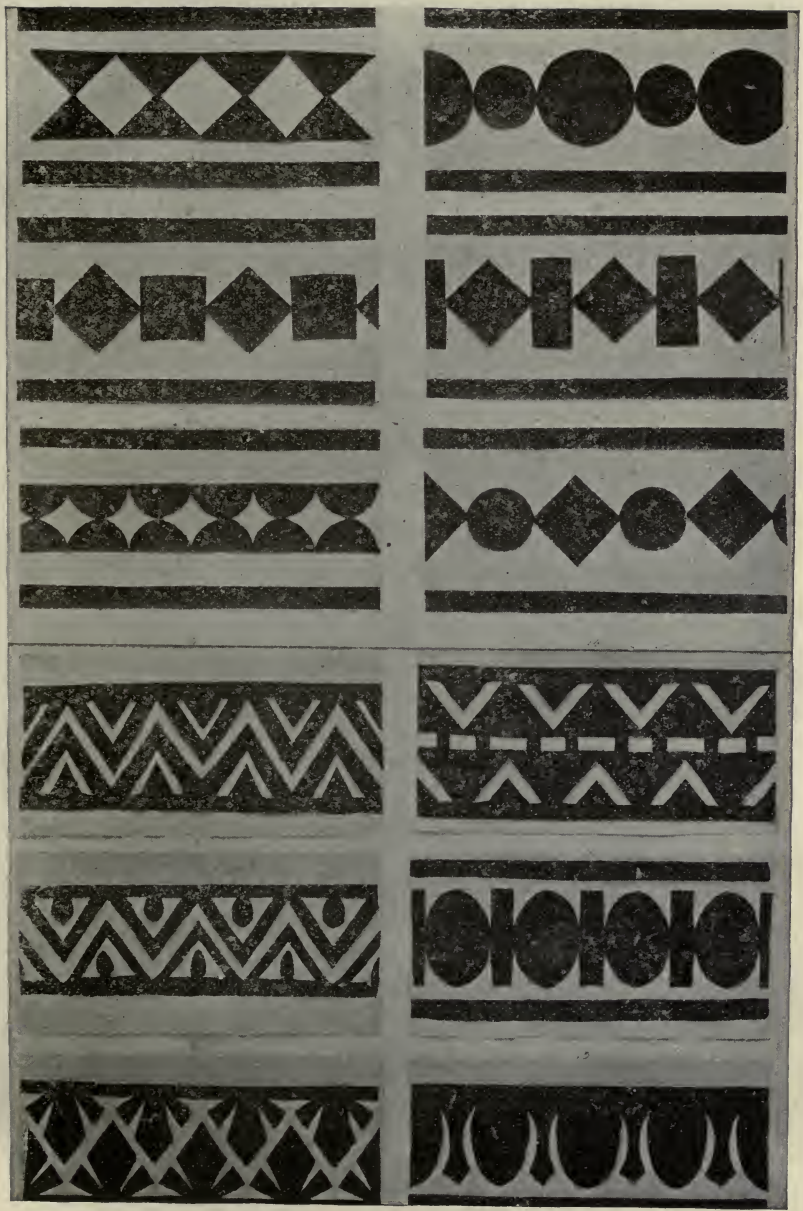


PLATE III.

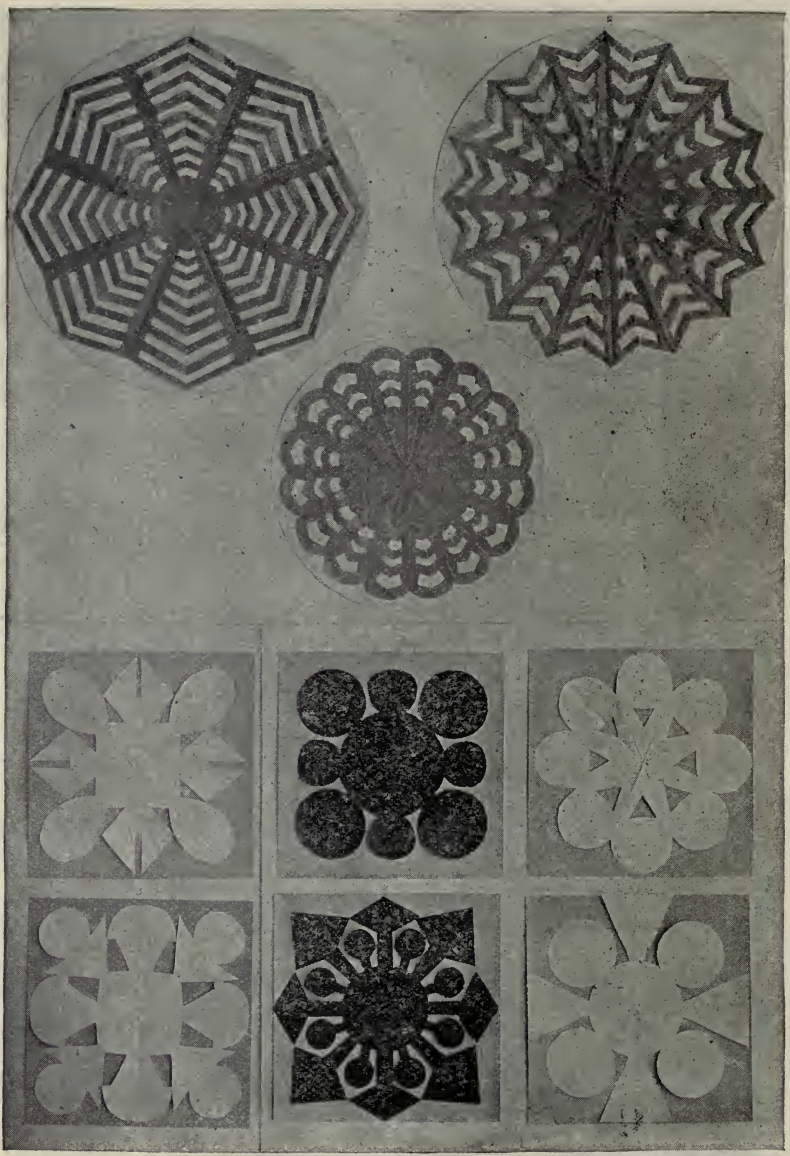
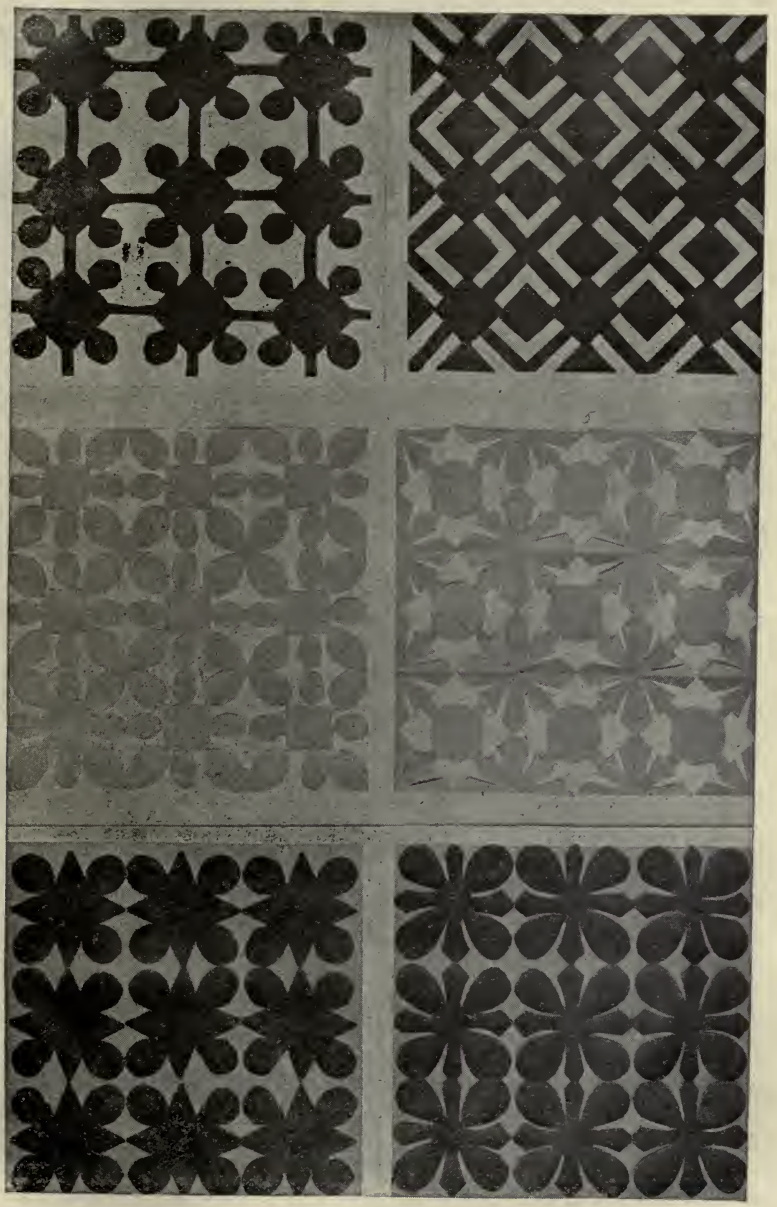


PLATE IV.



BLACKBOARD ILLUSTRATIVE SKETCHING

The ability to illustrate by rapid sketching on the blackboard is of great importance to the teacher. A few well-chosen strokes may help the *word description*, add interest to the lesson, and obtain involuntary attention from pupils.

Sketches on the blackboard should be done rapidly with a few expressive lines, and with no attempt at finish and detail.

A good preparation for this work includes: systematic practice of free strokes, straight and curved, to gain facility in handling the crayon, study of the power of the line in drawing, and study of form for expression by the line and shade, study of geometric type solids and simple natural and manufactured objects similar to them in form, sketches from memory and imagination, study of the simple laws of composition.

With such preparation, the teacher should be able to make use of illustrative sketching in drawing, language, reading, number, geography, history, and natural science lessons.

The *motion* for all practice exercises must be regular, consecutive, steady, and rapid.

On experiment, it will soon be found that the crayon, when used on the side, will produce a good quality of line, cover the surfaces rapidly in shading, and give the appearance of solidity to the picture

PLATE I.

Nos. 1 to **10** are for practice.

The *straight* strokes should be of medium length, say one foot long; that is, of such length as may be easily drawn from any one position.

The *curved* strokes, of which the circle is the basis, should be drawn, first, as long as the arm can conveniently reach, then shorter. They should throughout have a gradually increasing and decreasing curve and an increasing and decreasing strength.

The *large circle* is made with a circular motion of the whole arm; the arrows in the illustration indicate its direction.

The modification of the circle will produce ellipses; in No. 5 the curves of the circle are flattened on the upper and lower sides; in No. 6, on the left and right sides.

A combination of circular and elliptical movement will produce the oval, as shown in No. 9. This should be practiced in various positions.

No. 10 will afford good practice for concentric arcs. For the upper quarter of the circle, begin with the long outer arc and make a forward motion from left to right; then make a backward light motion, without lifting the crayon. Continue this exercise, decreasing the length of the stroke each time in approaching the center of the circle. For the lower quarter, begin at the center and increase the length of the strokes; here the emphatic stroke is the backward one. For the left quarter, begin with the long outer stroke moving upward, using pressure on the return downward stroke and decreasing the length of stroke toward the center. For the right quarter, begin at the center, and increase the length of stroke toward the circumference.

No. 11. The Ferns. — This is an application of the previous exercises in shorter curves, with such modifications as the form and other characteristics of the plant require. The drawing is purposely conventional, and is rather a typical representation of rock fern.

PLATE II.

No. 1. The Fence. — This is an application of parallel, vertical, and horizontal strokes. Draw each slat of the fence with an even downward stroke; keep the strokes equally apart; connect them with the upper and lower horizontal strokes for the cross bars; add the post, with a sphere. Draw irregular short, broken strokes to represent grass.

No. 2. Trunks of Trees and Rocks. — This is an application of oblique strokes. The outlines of the distant mountains may be sketched first; then with a firm, heavy pressure, the tree trunks and rocks. If the character of stroke on the tree trunks cannot be obtained by one effort, make second strokes, bearing on well with the crayon. Add short broken marks to represent the path and a few ferns, or other herbs, in the foreground.

No. 3. The Well. — This may be represented in side view, then requiring only a few broad parallel, horizontal strokes, joined at their ends by vertical ones. The chain, or rope, supporting the bucket is fastened to the well sweep, and this is supported by a tree stump. Only a few lines are made to represent grass.

No. 4. The Gate. — This is an application of horizontal, vertical, and oblique strokes. The horizontal strokes should be drawn first, then the two vertical strokes, and last the oblique cross bar. The post on the right is made with the side of a longer piece of crayon. As far as possible, each part should be produced with but one stroke.

The tree with its bare branches is a good illustration of oblique strokes in various directions. The best result will be produced if a tree is studied at the time. No description of how branches and twigs articulate with other

branches is as helpful as seeing how they do so on the tree. The birds are added to give life to the sketch, and may afford subject for a language lesson.

No. 5. The Stone Wall and Shrub. — Draw irregular broken lines for the outlines of the rocks, and soft gray strokes for the tree trunk behind the wall. Use the side of rather a short piece of crayon for the leaves on the bush. Mass them somewhat and dispose them in the form of sprays. Outdoor study of foliage should precede this exercise.

No. 6. After the Rain. — A story accompanying this sketch can be developed with the drawing. Draw the large heavy rain clouds with the side of the crayon. Draw the rainbow, an arc of a large circle, and let it lose itself in the clouds. The church with its conical spire should be drawn with as few strokes as possible, as an effect merely is desired; the pines, their conical tops pointing upward, and with branches to the left and right, are made with short slanting irregular strokes. The church and the pines should be more distinct than the other features in the picture. The strokes for the clouds are circular. To balance the picture and offset the curved outlines of the clouds, some horizontal strokes may be drawn to represent clouds at the left. Nearly all the other strokes are oblique.

No. 7. Cat-tail and Pickerel Weed. — Distinct and regular marks are very rarely required for pictorial effect, and this is illustrated by this little composition. The catkins are drawn with broad strokes, white on the left and light gray on the right, of varying pressure. A few of the prominent leaves and stems of the pickerel weed should be singled out and represented, and a suitable background be broadly drawn.

No. 8. The Pond Lilies. — These are represented by short curved strokes; some toward us, some to the left, and some to the right. The near ones should be distinct and the distant ones indistinct, to give the appearance of roundness.

PLATE III.

No. 1. The Waning Moon surrounded by Clouds. — Draw the crescent of the moon with one stroke of nearly equal pressure throughout. With the same circular motion draw the outlines of the clouds, varying the curves somewhat. Fill in the space, or mass the surface of the clouds.

No. 2. The Earth with Clouds. — Draw the circle and give it the appearance of solidity by tinting the left half. Use the circular motion for the outlines of the clouds; group them artistically and cover their surface with the flat side of the crayon, varying the pressure, to produce light and dark tones, or relief.

No. 3. The Balloon, the Sea, the Setting Sun, and a Boat. — The balloon is spherical; the basket, half spherical; the setting sun, a flat, circular plane; the sea, a few horizontal strokes, varying in tone. The composition is so simple that it will not require description.

No. 4. The Sea, Clouds, a Sailboat, and Rocks. — Draw first a few horizontal lines, for the surface of the sea in a calm; and broken oblique strokes of varying width for the clouds. Draw the sail with the side of a whole crayon; add the mast and hull; draw the reflection with the side of the

crayon, using but little pressure, as it must be less pronounced than the sail. The rocks are best represented by heavy oblique strokes of crayon.

In the preceding descriptions of the illustrations it should be remembered that however carefully directions are given as to qualities of strokes, much is left to the judgment of the illustrator. To produce the right feeling, or effect, discrimination must be exercised in the qualities of strokes, distribution of masses, and composition of lines, and much practice and thoughtful study should be given to each exercise.

Nos. 5–10. These are so simple that no descriptions need be given. They are applications of the half-sphere in manufactured objects.

No. 11. A Tree Stump.

No. 12. A Chestnut Burr.

No. 13. A Bird's Nest.

No. 14. Acorn Cups, illustrating the application of the half-sphere in natural objects.

PLATE IV.

No. 1. Apple, Orange, and Peaches.—These illustrate the application of the sphere. Choose large specimens for study; represent the light side with emphatic white strokes, as in the drawing, if the light strikes the object from the left. Determine the highest point of light, or glitter point, if the surface is reflective; mark this with decision. Draw a light tone over the right half and give the effect of reflected light. The result must be a spherical solid appearance. Draw the peach branch with the square end of the crayon, keeping the mark equally wide. Draw the long, full, lanceolate leaves with one stroke, using the side of the crayon.

No. 2. Tree Trunks. — This drawing illustrates the application of the cylinder. Draw some slightly oblique and some generally upright broad strokes with the side of the crayon, for the bare trunks and branches. The strokes must vary in width and tone, the nearer ones being broader and whiter than those that are distant. Draw the foliage, partly covering the branches, with an even tone, using the side of the crayon. Draw the leaves on the near branches more distinctly. Parts in the foreground must be drawn with character and emphasis.

No. 3. Jardinière with Plant. — This illustrates the application of the cube. Draw first a cube, then modify it with a little decoration. Each leaf of the plant may be drawn with one stroke, using the side of the crayon, and tapering the strokes at their ends. The attachment of the leaves to the upright stalk need not necessarily be drawn, as this might then be too prominent.

No. 4. An Orange halved and quadrisected. — The object chosen for study should be large and well divided. The light must be very judiciously placed in this composition, else the whole will appear mixed.

No. 5. A Cottage and Accessories. — The cottage illustrates the application of a square prism, triangular prism, cube, and rectangular plinths. The hencoop illustrates the application of the triangular prism. The table, nearly a square prism. The chairs are based upon cubes. The pump and trough illustrate the cylinder, sphere, and square plinth.

The illustration may be used by the teacher in the second school year for review exercise of type solids studied during the year.

The pine trees help the composition by their upright and oblique trunks; without them there would be monotony in the general horizontal direction of most of the strokes.

No. 6. A Hearth, with Logs in the Fireplace.—Draw, first, the suggestion of tiles, then the andirons of simple outline; leave these black, to represent wrought iron; and as the illustration is only to be suggestive, a few long, slightly oblique strokes may represent the logs, for in their position the definite shape, that of a quarter cylinder, would not be apparent.

No. 7. Tomatoes and Plum.—The tomatoes are based upon the flat spheroid; the plum upon the ellipsoid. It should be noticed that the axial lines, determining the poise of each of these objects, take different directions.

No. 8. Lemons.—These are based upon ellipsoids. Two objects may make a good group; three, however, are more easily grouped.

No. 9. Onions.—This composition illustrates all the variation that two similar objects can be made to express. The high light on the near onion might have been more marked.

No. 10. A Measure of Potatoes.—The measure illustrates a circular plinth; the potatoes are ellipsoidal.

No. 11. Horse-radish, Parsnip, and Beet.—These illustrate various shapes of cones. The specimens should be well grouped, and the sketch made from the objects. The direction of the strokes in shading will help to indicate the position of each.

No. 12. Basket and Pears.—The basket illustrates the application of the cone, and should be drawn first as a cone with lines leading to the apex. On this the basket (simply a frustum of a cone) should be drawn. The pears are ovoidal. A few only need be represented by a full continuous outline, as many are partly hidden.

PLATE V.

No. 1. The Brook that became a White Cloud.

No. 2. The Cloud that burst into Rain.

No. 3. The Cloud that came down in Snow, and the Sport it made for the Children.

No. 4. The Christmas Tree.

No. 5. A Cornucopia.

No. 6. Branch of a Spruce Tree

No. 7. A Branch covered with Ice.

No. 8. A Sled.

PLATE VI.

No. 1. Sheep.

Nos. 2, 3, and 4. Dogs.

Nos. 5 and 6. Cats.

Nos. 7 and 8. Horses.

PLATE I.

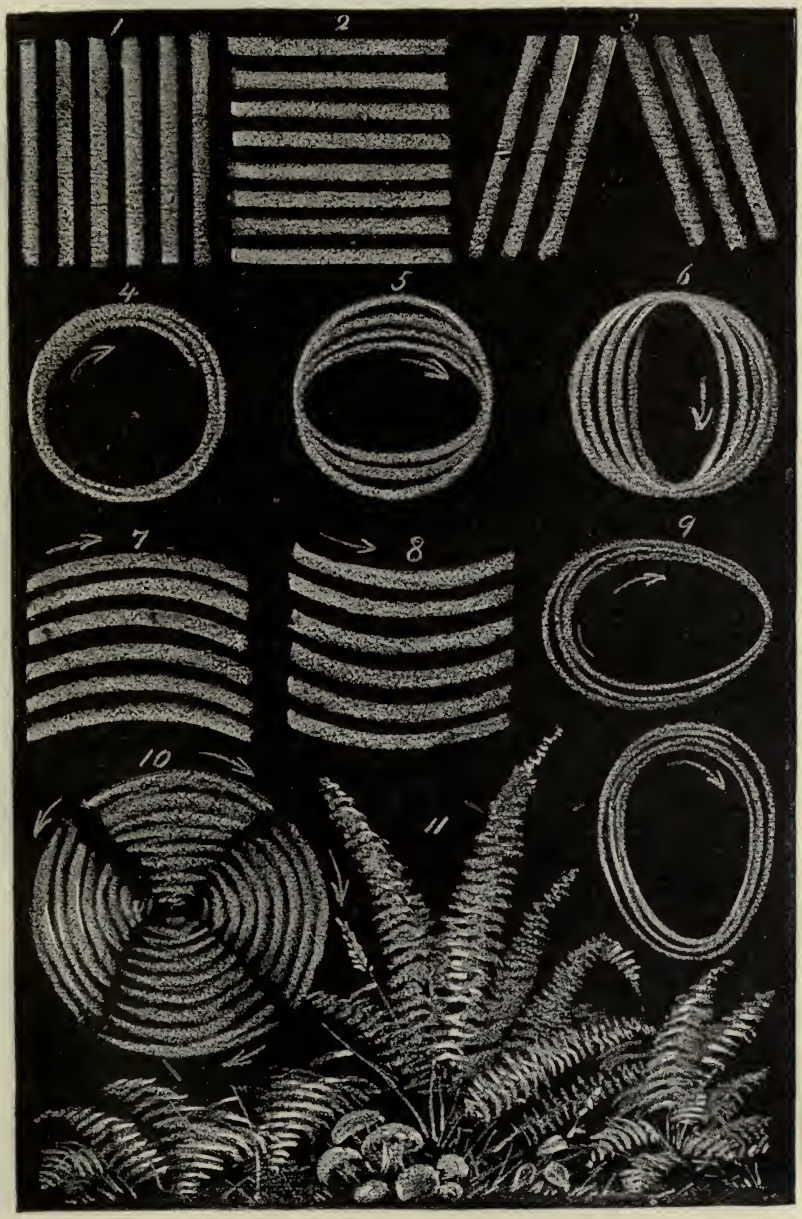


PLATE II.

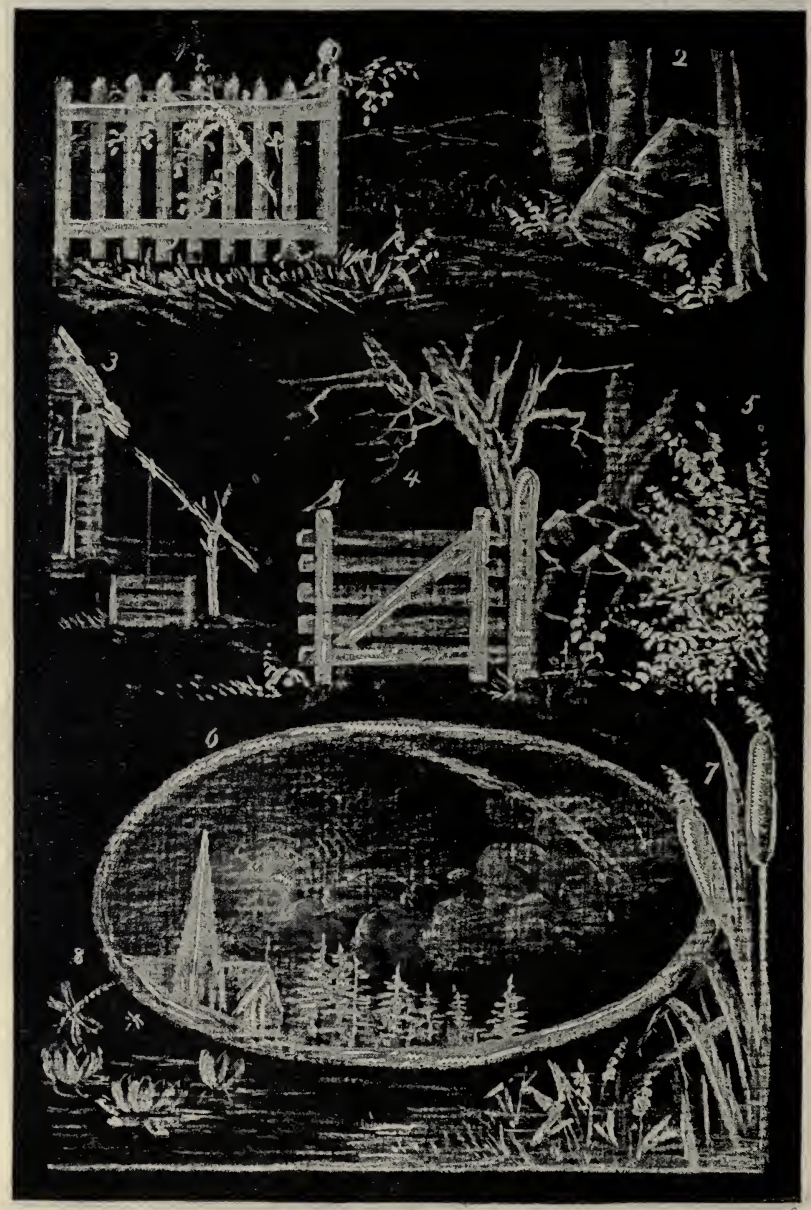


PLATE III.

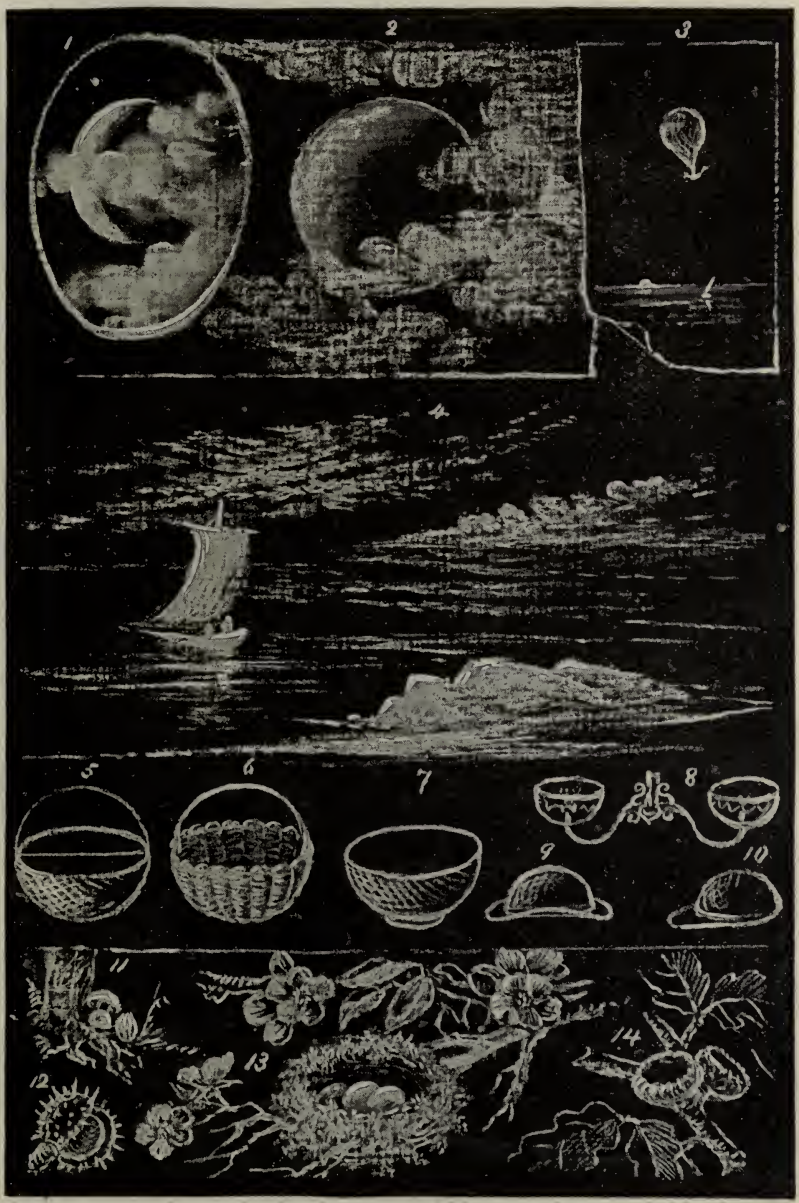


PLATE IV.

PLATE V.

PLATE VI.

ILLUSTRATED DEFINITIONS.

GEOMETRIC SOLIDS.

A Solid is space inclosed by surfaces — it has length, breadth, and thickness. In art, the term may be applied either to a model or an object.

Sphere. A solid bounded by one curved surface, every part of which is equidistant from its center. A solid formed by the revolution of a circle upon its diameter.

Hemisphere. Half a sphere. A solid obtained by bisecting a sphere with a plane passing through the center.

Spheroid. A curvilinear solid bounded by one curved surface, all plane sections of which are ellipses or circles.

Prolate Spheroid, Long Spheroid, or **Ellipsoid.** A curvilinear solid, formed by the revolution of an ellipse upon its major axis.

Oblate Spheroid or **Flat Spheroid.** A curvilinear solid formed by the revolution of an ellipse upon its minor axis.

Ovoid. A solid having the form of an egg. A solid formed by the revolution of an oval upon its axis.

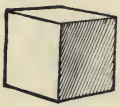
Cylinder. A roller-like body, with flat, circular ends. A solid formed by the revolution of a rectangle upon one of its diameters.

Half-cylinder. A solid formed by dividing a cylinder with a plane passing through its axis.

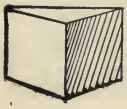
Circular Plinth. A very short cylinder. A cylinder in which the height is less than the diameter of its flat, circular faces.

Cone. A solid having a circle for its base, and tapering to a point, or vertex. A solid formed by the revolution of an isosceles triangle upon its altitude.

Circular Frustum. That part of a cone which remains when the top part is cut off by a plane parallel with its base.



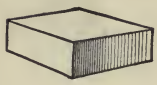
Cube. A solid bounded by six equal square faces.



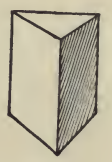
Half-cube. A solid formed by dividing a cube upon a diagonal of one face. A half-cube is a triangular prism.

Prism. A solid whose ends are similar, equal, and parallel, and whose sides are parallelograms.

Square Prism. A prism whose ends are square.



Square Plinth. A very short square prism. A plinth in which the height is less than the diameter of the square faces.



Triangular Prism. A prism whose ends are triangles.

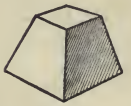
Pentagonal Prism. A prism whose ends are pentagons.

Hexagonal Prism. A prism whose ends are hexagons.

Octagonal Prism. A prism whose ends are octagons.

Pyramid. A solid having one base bounded by any number of straight lines, and having the same number of triangular faces with a common vertex.

Square Pyramid. A pyramid whose base is a square.



Square Frustum. That part of a square pyramid which remains, when the top part is cut off by a plane parallel with its base.

Triangular Pyramid. A pyramid whose base is a triangle.

Pentagonal Pyramid. A pyramid whose base is a pentagon.

Hexagonal Pyramid. A pyramid whose base is a hexagon.

Octagonal Pyramid. A pyramid whose base is an octagon.

Truncated Solid. That part of a cylinder, cone, prism, or pyramid, which remains, when the upper part is cut off by a plane at an oblique angle with the base.

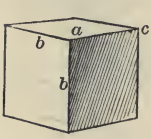
DETAILS OF SOLIDS.

Surface is the boundary of a solid; it has length and breadth, but no thickness. In art, the outside of a thing is considered its surface.

Face. A part of a solid (*a*) bounded by edges.

Edge. A part of a solid, where the surface abruptly changes its direction (*bb*). A part of a solid where two faces meet.

Outline. The line, real or apparent, by which a figure is defined.



Corner. A part of a solid (*c*), where three or more edges meet.

Point. A point has position only, without size; but in drawing it is indicated by a dot, and represents a corner, or marks position.

Line. The boundary of a face. A line has length only; but in drawing it is indicated by a fine mark of the pencil or crayon, and represents an edge or an outline.

Straight Line. A line which has the same direction throughout its length.

Curved Line. A line which constantly changes its direction throughout its length.

Broken Line. A line made up of very short straight lines or of dots.

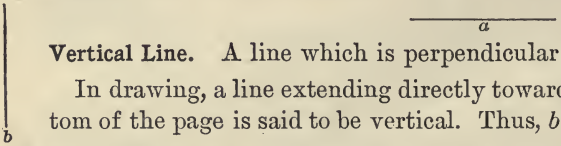
NOTE. — When the word "line" is used alone, a straight line is meant.

Positions of Lines.

According to their positions, lines are *horizontal*, *vertical*, or *oblique*.

Horizontal Line. A line which is level.

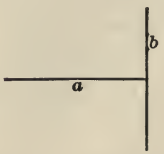
In drawing, a line which extends directly toward the right and left of the page is said to be horizontal. Thus, *a* is a horizontal line.



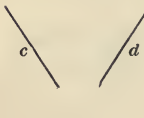
Vertical Line. A line which is perpendicular to a horizontal.

In drawing, a line extending directly toward the top and bottom of the page is said to be vertical. Thus, *b* is a vertical line.

NOTE. — Vertical and perpendicular have not the same meaning. A *vertical* line always points up and down; but any line forming a right angle with another is *perpendicular* to that line, no matter what its direction may be. Thus, *a* is *perpendicular* to *b*, although not a *vertical* line.

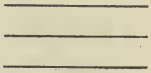


Oblique Line. A line which is slanting to the right or left. Thus, *c* and *d* are oblique lines. If the upper end of the line leans toward the right, it is called a *right-oblique* line, as *d*; if toward the left, a *left-oblique* line, as *c*.



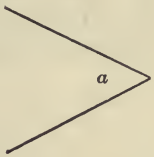
Relation of Lines.

In their relation to each other, lines may be *parallel* or *at an angle.*



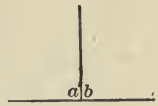
Parallel Lines. Two or more lines that are the same distance apart throughout their length.

Lines at an Angle. Lines that are not parallel.



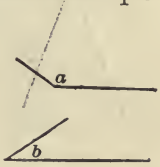
Angle. The difference in direction of two lines, which meet at a point, is called an angle. Thus, *a* is an angle.

Angles are divided according to the directions of their lines into *Right Angles* and *Oblique Angles.*



Right Angle. An angle formed by one line meeting another in such a way as to make the two adjacent angles equal. Thus, *a* and *b* are right angles. The lines forming these angles are *perpendicular.* (See note under "Vertical Line.")

Oblique Angles. All angles which are not right angles are oblique. Oblique angles are either *obtuse* or *acute.*



Obtuse Angle. An angle that is greater than a right angle. Thus, *a* is an obtuse angle.

Acute Angle. An angle that is less than a right angle. Thus, *b* is an acute angle.

NOTE. — The lines forming an angle are called its *sides;* the point at which they meet is called the *vertex* of the angle.

GEOMETRIC FIGURES.

Plane. A surface on any part of which a straight line may be drawn in any direction.

NOTE. — The top of the desk, if it can be imagined without thickness, may illustrate a plane.

Geometric or **Plane Figure.** A portion of a plane limited by lines.

Rectilinear Figure. A portion of a plane limited by straight lines.

Curvilinear Figure. A portion of a plane limited by curved lines.

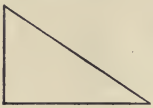
Mixtilinear Figure. A portion of a plane limited by both straight and curved lines.

RECTILINEAR PLANE FIGURES.

Triangles.

A Triangle is a plane figure having three sides and three angles.

Triangles are divided into six classes: according to their angles, into *Right-angled, Obtuse-angled,* and *Acute-angled* Triangles; according to the relative lengths of their sides, into *Isosceles, Equilateral,* and *Scalene* Triangles.



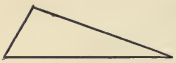
Right-angled Triangle. A triangle having one right angle.

Obtuse-angled Triangle. A triangle having one obtuse angle.

Acute-angled Triangle. A triangle having all its angles acute.

Isosceles Triangle. A triangle having two of its sides equal.

Equilateral Triangle. A triangle having all its sides equal.



Scalene Triangle. A triangle having no two of its sides equal.

NOTE. — Every triangle may have two names — one given it on account of its sides, the other on account of its angles. For example, an equilateral triangle is also an acute-angled triangle, for having three equal sides always gives it three acute angles.

Quadrilaterals.

Quadrilateral. A plane figure having four sides.

Rectangle. A quadrilateral whose angles are all right angles.

Rectangles are divided into *squares* and *oblongs.*

Square. A rectangle whose sides are equal.

Oblong. A rectangle whose adjacent sides are unequal.

Rhombus. A quadrilateral whose sides are equal, two of its opposite angles being acute, and the other two obtuse. A *Diamond* is a rhombus.

Rhomboid. A quadrilateral whose angles are like those of a Rhombus, but only its opposite sides are equal.

Trapezium. A quadrilateral no two of whose sides are parallel.

Polygons.

A Polygon is a rectilinear figure having more than four sides. When all the sides and angles of a polygon are equal, it is called a *regular polygon;* when the sides or angles are unequal, it is called an *irregular polygon.* Geometrically, triangles and quadrilaterals are frequently classed as polygons.

Regular Pentagon. A polygon having five equal sides and five equal angles.

Regular Hexagon. A polygon having six equal sides and six equal angles.

Regular Octagon. A polygon having eight equal sides and eight equal angles.

A polygon having seven sides is called a **Heptagon.**
A polygon having nine sides is called a **Nonagon.**
A polygon having ten sides is called a **Decagon.**
A polygon having eleven sides is called a **Undecagon.**
A polygon having twelve sides is called a **Dodecagon.**

CURVILINEAR PLANE FIGURES.

Circle. A plane figure bounded by a curved line, every part of which is equally distant from a point within called the center.

A *semicircle* is half a circle, and is obtained by cutting a circle on its diameter. It is a *mixtilinear* figure.

Ellipse. A plane figure, bounded by a regular curve, every point in the outline of which is at the same combined distance from the foci.

Oval. A plane figure similar in shape to the longitudinal section of a hen's egg.

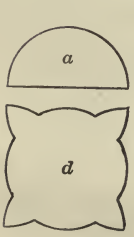
Crescent. A plane figure bounded by two curved lines, so arranged as to resemble the shape of the new moon.

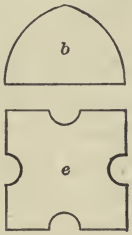
Lens. A symmetrical plane figure bounded by two curved lines, curving in opposite directions.

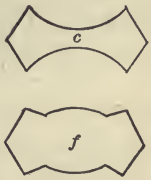
Trefoil. An ornamental figure of three foils or leaves, resembling a clover leaf.

Quatrefoil. An ornamental figure of four foils or leaves, resembling the petals of a flower.

MIXTILINEAR PLANE FIGURES.







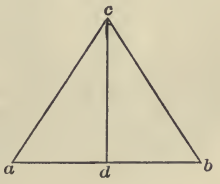
Of these there are, of course, an infinite number. They are used in art largely as inclosing forms for designs. The foregoing figures (*a*, *b*, *c*, *d*, *e*, *f*) illustrate these.

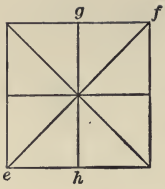
DETAILS OF GEOMETRIC FIGURES.

Base. That part of a rectilinear figure upon which it is supposed to rest, as *ab*.

Apex. The highest angle above the base, as *c*.

Altitude. The perpendicular distance from apex to base, as *cd*.





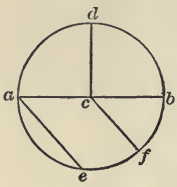
Axis. Any line which divides a symmetrical figure into two equal and similar parts, as *ef* or *gh*.

Diagonal. A line connecting opposite angles, as *ef*.

Diameter. A line connecting the centers of opposite sides of a plane figure, as *gh*.

Diameters are sometimes distinguished as *vertical* and *horizontal*.

Diameter of a Circle. A line drawn through its center, between opposite points in the circumference, as *ab*.



Radius of a Circle. The distance from the center of a circle to any point in the circumference, as *cd*.

Circumference. The unbroken line which bounds a curvilinear figure.

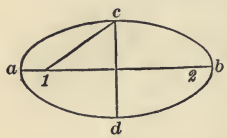
Arc. Any part of a curve, as *db* or *ef*.

Chord. A straight line connecting the extremities of an arc, as *ae*.

Segment. The space inclosed by an arc and its chord.

Sector. The space between any part of the circumference and two radii of a circle, as *bcf*.

Quadrant. The space inclosed by one quarter of the circumference and two radii of a circle, as *dcb*.

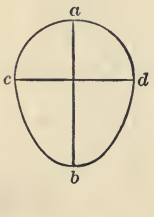


Long Diameter. The longest straight line which can be drawn in an ellipse, as *ab*.

Short Diameter. The shortest straight line which can be drawn in an ellipse, cutting the figure into two equal parts, as *cd*.

The long and short diameters of an ellipse are always perpendicular, and bisect mutually.

The terms *long* and *short diameter* are sometimes applied to the axis and the line representing the greatest width in an oval; as, long diameter *ab*, short diameter *cd*.



Foci. Points in an ellipse from which the curve may be drawn mechanically, as *1*, *2*. The distance from *c* to *1* always equals one half of *ab*.

MISCELLANEOUS TERMS.

Alternation. The repetition of one set of units separated by another set of units of a different character, in reciprocal succession.

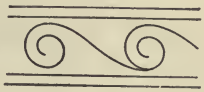
Axis of Symmetry. A line drawn through the middle of a figure, so that the parts on one side are exactly repeated in a reverse order on the other. The axis may be drawn in any direction, being governed by the character of the figure; in the ornamental figure next below, it is vertical.

Bisect. To divide into two equal parts.

Bisymmetrical Design. A symmetrical arrangement in which one half is the exact reverse of the other.

Blocking-in Lines. Sketched lines which indicate masses.

Border. An ornament which consists of a regular repetition of ornamental units, along a line of indefinite length. The cut shows a familiar Greek border, composed of scrolls or spirals.



Botanical Drawing. The representation of plant form.

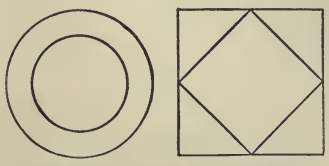
Center. A radial design.

Center Line. A line representing the center of a solid.

Cinquefoil. An ornamental figure having five foils or lobes, often applied in windows, panels, etc.

Circle. In Christian art, a symbol of eternity.

Cinquefoil.

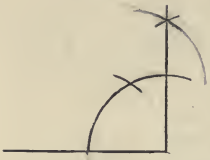


Concentric Circles and Squares.

Concentric. Having a common center.

Connecting Line. A line connecting similar parts in the drawings of two views of an object.

Construction. Making, or building; putting together the parts of any figure so as to give its peculiar form and structure. *Construction lines* are the framework upon which a drawing is made; they determine the distances, proportions, etc. *Construction*, as applied in geometrical problems, refers to the measurements and steps taken in the solution of the problems. The light lines in the cut show a method of construction in erecting a perpendicular at the end of a given line.



Contrast. The result of a juxtaposition of lines, forms, or colors of different characters.

Contrasted Harmony. (See "Harmony of Color.")

Conventionalization. The modifying of natural forms in such a way that the principles of their growth are retained and unimportant details omitted or simplified. A conventional form is a form idealized according to the evident intent of nature.

Cordate. Resembling a heart in outline.

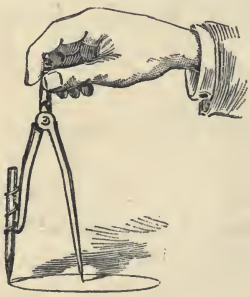
Greek Cross.

Latin Cross.

St. Andrew's Cross.

Maltese Cross.

Cross. Two bars placed transversely upon each other in various ways, each form having its own name. A symbol of suffering. Some of the more common crosses are shown in the illustrations.



Dashed Line. A series of dashes arranged in line. Invisible parts of objects are represented by dashed lines.

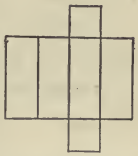
Describe a Circle. To draw with a compass. The accompanying cut shows the position of the hand, while describing a circle with the compass.

Design. The plan, combination, or arrangement of any construction or ornament for a given purpose, whether constructive

or decorative. The word is often misused to apply merely to ornamental subjects.

Detail. A selected part of a figure or object, usually drawn on a larger scale than is convenient for the whole.

Develop. To represent on a plane the entire surface of a figure.



Development. The entire *surface* of any solid or object when laid out upon one plane, as in the cut, which shows the development of a square prism. (See "Flat.")

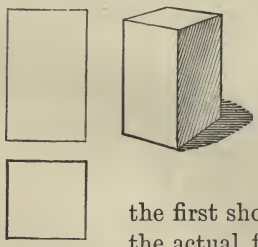
Diaper. A panel or flat, recessed surface covered with wrought work in low relief. (This form of decoration was used greatly by the Moorish artists for the enrichment of the walls of the Alhambra.) An all-over pattern.

Distribution. An orderly disposition of the units in the field of a design.

Dot-and-dash Line. A series of dots and dashes alternated in line. Center lines are drawn with dot-and-dash lines.

Dotted Line. A series of dots, or very short dashes, arranged in line. Connecting lines are drawn as dotted lines.

Elementary Design. A pleasing arrangement of units within a given form, based on certain recognized principles.



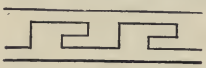
Elevation. A drawing giving the actual form and proportions of an object, as produced on one or more vertical planes. *Elevation* is opposed to *Plan*, which gives the actual form and proportion of an object as produced on a horizontal plane. Thus, in the three figures given the first shows the appearance of a prism, the *plan* shows the actual form and proportion of the base of the prism, and the *elevation* gives the form and proportion of one of the sides of the prism. Some objects require several different elevations, to show all the facts of form of all their details.

Field. That portion of any surface to be occupied by a design.

Flat. A development of the *whole* of an object; *e.g.*, the *flat* of a paper windmill is like a square with its diagonals.

Flat Ornament. An enrichment of a surface by means of contrast obtained by colors, or the use of light and dark.

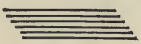
Fret. An ornament consisting of a series of lines or bands called *fillets*, which form a succession of angles, usually right angles, and are sometimes interlaced.



Full Line. A continuous line. Outlines and visible edges are always drawn with full lines.

Geometric Drawing. The drawing of lines, surfaces, and solids with instruments.

Ground. That upon which the object rests. The field of a design.



Half-tint. The darkening or shading of a surface, by means of a succession of parallel and equidistant lines, either vertical, horizontal, or oblique.

Harmony. Such an adaptation of the parts of a design to each other, that they form a complete and pleasing whole.

Harmony of Color. An arrangement of colors pleasing to a cultivated taste. There are five principal Harmonies: —

1. **Contrasted.** Composed of one color with neutrals.
2. **Dominant.** Composed of tones of color in one scale.
3. **Analogous.** Composed of colors from neighboring scales.
4. **Complementary.** Composed of colors which, when mingled, will produce white or gray.
5. **Perfected.** Usually composed of analogous or dominant combinations, with another color complementary to the prevailing tone.

Neutral colors may be added to all these combinations.

Hue. Any color found in the spectrum, except the six standard colors.

Mass. General shape, regardless of detail.

Neutral Color. A term used in decorative arts, to denote a color which has little or no effect upon the hue of a juxtaposed color. A neutral color is sometimes called a *passive color.*

The neutral colors are *white, gray,* and *black.*

Ornament. Any decoration or enrichment of form, color, or construction, intended to beautify an object.

Overlap.

Overlap. To lie over or upon. When a part of an ornament seems to lie upon another part, it is said to *overlap.*

Perspective. The science underlying the representation on a plane of any object exactly as it *appears* to the eye from one fixed point of view. The first cut under "Elevation" is a drawing *in perspective* of the prism represented.

Pictorial Drawing. A representation of the appearance of an object or group, as seen from one point of view.

Plan. A top view. (See "Elevation.")

Plinth. A square member forming the lowest part of the base of a column; hence, any flat rectangular block, such as might be cut from a plank.

Proportional Measurement. A method of obtaining relative distances upon distant objects, by means of a pencil or similar implement.

Quadrisect. To divide into four equal parts.

Quality of a Color. The character of a color relatively considered. The quality of a color is said to be *warm*, when it approaches in appearance any of the colors in the red part of the spectrum; or *cold*, when it approaches in appearance any of the colors in the blue part of the spectrum. Colors acquire certain qualities by juxtaposition.

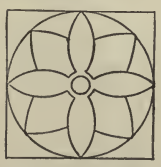
Quatrefoil. An ornament having four foils or lobes, often applied in panels, windows, etc. A symbol of the Evangelists.

Quatrefoil.

Radiation. A method of arrangement in ornamental design, in which the parts diverge from a point. The *rosette* shown in the figure below is an example of radiation from a center. The horse-chestnut leaflets radiate from a point not in the center.

Repetition. An arrangement in which a number of similar forms or objects are placed in a row, or arranged round a center or over a surface.

Representation. Delineation by means of lines, light and shade, or color. All drawing is representation.



Rhythm. Repetition with accent. The frequent recurrence of some characteristic in the various parts of a design, without being obtrusive.

Rosette. A radiating ornament made of petal-like parts.

Scale of Color. The entire range of tones, from white, through its tints, a standard or hue, and its shades, to black.

Spectrum. A band of colors, produced by allowing rays of sunlight to pass through a triangular prism of glass, or other refracting medium. The spectrum contains red, orange, yellow, green, blue, and violet, usually called the *standard*, or *primary*, colors, and an indeterminate number of intermediate hues.

Standard Color. One of the six primary colors of the spectrum. A standard pigment color is one which imitates one of these, as closely as possible.

Symmetry. The result of a proper disposition and proportion of the parts of a design, forming a complete whole or unit.

Tangent. Touching at a single point. A line touching a curve which, even when produced, does not intersect it.

Tint. A color produced by adding light, or white, to a standard or hue.

Tone. One color in a scale of colors. Tone is also used to describe the general effect produced by any combination of colors.

Trefoil.

Trefoil. An ornament of three foils or lobes, often applied in panels, windows, etc. A symbol of the Trinity.

Trisect. To divide into three equal parts.

Unit of Design. One of the distinct fractions, or parts, of a design, repeated uniformly to complete the figure. One of the spirals in the design under "Border" is the *unit of design*, which, repeated, makes the completed figure shown.

Unity. Such a combination of parts as to constitute a complete and pleasing whole. The result of uniformity in the character of the main lines or units in a design.

Value. In color, the power or force of a color upon the eye. It is directly proportional to the amount of light the color reflects.

Variety. The result of variation, or difference, in the details of a design, without affecting its unity.

View. A term used to indicate the standpoint of the observer, when making a drawing of an object, as the *end view*, when only the end is seen.

Working Drawings. Drawings which represent facts of form; drawings from which objects may be accurately made or constructed. In making a working drawing, the eye is supposed to be opposite each part of the object represented.