Pottery Making

JUDSON T. WEBB
POTTERY MAKING

AN ILLUSTRATED TEXT BOOK ON ART POTTERY MAKING FOR TEACHERS AND ARTISTS

BY

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PREFACE

The study of pottery involves the study of history, science, and art. Pottery, in its broadest meaning, includes all articles made of clay and baked in fire, such as stoneware, china, majolica, tile, and brick.

The process of making clay into pottery has been practiced from remote antiquity, even by prehistoric races, and in many countries at the present time, has developed into a vast commercial industry.

The aim of this book is not to study pottery making as a commercial enterprise, but to place it on an educational basis from the standpoint of art. Such an aim will make necessary the elimination of all scientific processes that cannot be studied intelligently by lower grade pupils.

It is hoped that the problems in clay modeling, together with the simplified method of glazing and firing, will present a manual art which can be practiced successfully in all school grades under the direction of the regular teacher.
CHAPTER I

Pottery Building

Pottery is made up of body and glaze. Glaze is glass composition which gives the surface of the clay its finish and color. Clay is a mineral widely distributed over the earth’s surface. It is found in different grades of quality and color.

This course will not explain the manufacture of all kinds of pottery, such as china, stoneware, and majolica which require different grades of clay, but will confine itself to art pottery which can be made of almost any plastic clay that will stand 2000 degrees heat.

The adapting of the glaze to the clay is a problem in chemistry which is in advance of grammar school work and can not be taken up there successfully. It is, therefore, necessary to use prepared clay and glazes. Pottery materials for public school work (and including clay, glazes, underglaze colors, and also tools and kilns) are on the market.
Therefore, with the aid of this manual, the regular public school teacher can use pottery making in the school-room.

There are several methods of making pottery forms, viz., modeling from the mass of clay, building with coils, wheel building, casting and pressing with moulds, and throwing on the wheel. Modeling from the mass of clay is used in making tile, clocks, candlesticks, etc. Building with coils is used in making vases, lamps, and jardinières. Where a potter’s wheel is available, large fern-bowls and jardinières may be built with coils with the aid of the wheel. This method is called wheel building. In order to do successful work in casting and pressing it is necessary to be able to make moulds. Throwing pottery forms on the wheel is an ancient method of making pottery employed by the Greeks and Egyptians. It is now used in some of the large commercial potteries, but on account of the expense of equipment and the amount of practice necessary to enable the student to make the simplest forms, throwing has not been taken up to any extent in the public schools.

The first problem in the course is a spill, 5” high and 3” in diameter. It may be given
to any class of beginners above the fourth grade. The spill is built with coils as illustrated in the cut. The base is made 3" in diam. and \( \frac{1}{4} \)" thick by pressing into shape with the thumb, a small lump of clay. A coil, long enough to reach once around the base, \( \frac{1}{2} \)" in diam., is rolled on a flat surface and placed on the edge of the base working it into the base both inside and outside. Care should be taken to weld the parts thoroughly. Other coils are made, placed in position and welded in the same manner until the required height is reached.

Little time should be spent in finishing the surface during the building. Much better results in finishing can be obtained when the clay is leather hard. There is also an advantage in building as much as possible in one sitting.

When the spill is in condition to finish, a steel finishing tool is used. First, the top is made level, then the inside circle is corrected, using the curved edge of the tool. The outside edge at top is worked down until parallel to the inside edge, making the wall
uniform in thickness. The outside surface is made smooth by means of a diagonal stroke with the straight edge of the tool. A final finish is given by rubbing the surface with the finger dipped in water. Sandpaper should never be used as it is not sanitary in public school work. When the spill is thoroughly dry it is ready for the biscuit firing.

Problem 2 is a vase 6" high and 3" in diam. at the largest part. The base is 2" and the opening at top is 1\(\frac{3}{4}\)" in diam. The widest part of the vase should be 4" from the bottom. The coiling is commenced the same as the spill. The wall is built on a straight slant to about 4" high where the diam. should measure 3". At this point the coils are gradually made shorter, which will curve the wall until the required height is reached. The curve at the top should end tangent to a horizontal line. When the vase is leather hard, it is finished with a steel tool the same as the spill.

Problem 3 is a bowl 4" high and 5" in diam. at the largest part. It is 3\(\frac{1}{2}\)" in diam. at the bottom and 3" at the top. The wall should slant more than in problem 2 with a
slight curve up to 3" high. The coils are then gradually made shorter, curving the wall in and then up, forming a double curve. The curve should end at the top tangent to a vertical line.

The lines introduced in problems 1, 2 and 3 form the basis of most pottery forms, as illustrated in cuts 4, 5, 6 and 7.

Fig. 4 gives three examples illustrating the straight line as used in pottery forms. These forms may be used to great advantage in the study of applied design for beginners.
using straight lines, incised. Instruction is given in chapter 2.

![Fig. 5](image)

The single curve lines may be used in many beautiful forms by changing the proportion, as illustrated in Fig. 5.

![Fig. 6](image)

The double curve as given in Figure 6, is used very generally in vase forms.
Fig. 7 illustrates the single curve inverted. Many useful forms in utility ware are based on these lines, such as pitchers, teapots, lamps and fernbowls.

Problem 5 is a square candlestick, 7" high, the base 5" square and the top 2" square. The candlestick is made from the mass of clay in three sections, top, shaft, and base.

The base is made first by pressing out a mass of clay with the thumbs into a square tile 5" by 5" and 3/4" thick. The shaft is made by beating out a mass of clay into a solid oblong 6" long, 2" by 2" square at base
and 1" by 1" square at top. The top is 2"x 2"x1/2". These sections are cemented together with slip (clay reduced to a liquid with water to the consistency of cream) and thoroughly worked together with a modeling tool. Clay is modeled in at the base and top, forming the curve as in cut. When leather hard the surface is scraped smooth with a steel finishing tool. A cavity is cut through the bottom about 2" up into the shaft to prevent breaking in the biscuit firing. A round cavity 1/2" deep is made in the top to hold the candle.

Problem 6 is a square tile 6" by 6" and 3/4" thick. It is pressed into shape with the thumbs from a mass of clay. When leather hard it is finished with a steel scraper. Four panels 2"x2"x1/4" deep are cut in the back to prevent warping.

The tile may be decorated according to instruction given in Chapter 2.
CHAPTER II

Pottery Decoration

It is not the purpose of this chapter to give instruction in the principles of design, but to give a few simple examples of decorated pottery to illustrate what is appropriate in pottery decoration.

There are three general principles upon which all true decoration is based and these should be recognized in pottery decoration as well as in other fields. These principles are known as Rhythm, Balance, and Harmony. Any good book on design will give the student definition of these principles.

There are several methods of applying decoration to pottery, viz.: insizing, inlaying, relief designs by depressing the background, relief designs applied, and underglaze painting.

In each method the decoration should be
so arranged as to be a part of the form and not to disturb the lines of beauty in the form itself.

Naturalistic forms should not be used as units of design unless governed by the principles of design. They should be conventionalized and arranged according to the laws of rhythm, balance, and harmony.

Insizing is a simple method of decorating vases and tile with outline designs. The design is drawn or traced on the object with a pencil when it becomes leather hard, the pencil point making a slight depression in the clay. When the design has been arranged and corrected, a V-shaped or round pointed tool is used to retrace the lines, cutting the design well into the clay. Care should be taken in cutting clear and uniform lines.

A square spill 7" high, 4" by 4" at top and 3" by 3" at bottom is given to illustrate this method. The spill is built with coils and decorated with an original design based upon suggestions given in Fig. 1. Sharp rough edges should be softened by rubbing them lightly with the finger dipped in water.
The square fern bowl given in Fig. 2, is an example of inlaying with underglaze color. It is inlaid with apple green under a mat ivory glaze. The instruction for building is given in Chapter I.

Inlaying with underglaze color is a method of decoration used where a contrast of color is desired. The design is made in broad lines or masses. The design is applied as in Fig. 1 when the object is leather hard, the masses being sketched in outline. A square end modeling tool is used to cut out the design to the depth of one-sixteenth of an inch.

The underglaze color, which is usually full strength, is mixed with clay, the amount depending upon the tint desired. For medium tints an equal amount of clay should be used. This should be mixed with water to the consistency of modeling clay and ground thoroughly with a palette knife on glass.

Small portions of the mixture are rolled into coils in proportion to the size of the grooves. Sufficient water is painted into the groove with a brush to moisten the clay.
The design is then filled in with the color level with the surface.

It is not necessary to keep the color from spreading over the edges of the design, as, when the color becomes hard, the surface is scraped smooth with the straight edge of the steel tool. This removes the surplus color and the design is brought out in clear outline with the background. The sharpness of the outline will depend upon the care taken, when cutting the design, in keeping the edges true and uniform.

Many color schemes may be used with good effect with this method. A few color suggestions are given as follows: green underglaze under light gloss green, dark brown under light gloss brown, blue or green under mat ivory.

Underglaze colors are colored clays, not glazes and can be used under the glaze only. When used otherwise the color will not be full strength and will have but a biscuit effect. When the object is dry, it is fired in a biscuit kiln, after which it is glazed and fired in a gloss kiln. See instruction under glazing and firing.

Relief decoration by depressing the background is a method which produces very sat-
isfactory results. This method is illustrated in Fig. 3, a round fern-bowl 8" in diam. and 3" high, not including feet. The design is applied as in Fig. 2. Instead of cutting out the design as in Fig. 2, the background is cut away, leaving the design standing out in relief. The background should be cut down about one-eighth of an inch deep. This should be done when leather hard, keeping the bowl this consistency with a damp cloth until completed.

Relief decoration by application is done by modeling the design in relief upon the surface of the object as in sculpture. This method is illustrated in the nut set given in Fig. 4. The forms are built and kept moist until the design is applied. The clay may then be allowed to become leather hard and the details worked out with a wooden or steel modeling tool.

The large bowl is 10" in diameter and 3" high and the small bowls are 4" in diameter
and 1½" high. The set is glazed in a mat green mottled with brown.

Underglaze painting is done by applying the color with a flat sable brush while the clay is damp. The color is mixed with clay and water to the consistency of artist's oil paint, the tint depending upon the amount of clay used. The color should be applied thick enough to cover the clay thoroughly. The effect is similar to inlaying as the glazes are applied over in the same manner using the same color schemes. Good results may be had in landscape effects, as illustrated in Fig. 5 on a tile. The tile is 6" by 6" modeled according to instructions given in Problem 6, Chapter I.
CHAPTER III

General Problems

This chapter is devoted to a few practical problems in hand-built pottery, the methods of work being given in Chapter I. The first problem is a vase 14" high and 6" in diameter at the largest part. The base is 4" and the top 3" in diameter. It is built by the coil method, using coils \( \frac{3}{4} \)" in diameter. The decoration is in relief by depressing the background. The depression is greatest near the edge of the leaf. There is also a slight depression on the leaf near the edge which gives the leaf the appearance of turning up at the edge. A small ridge divides the leaves and gradually disappears as it descends. The vein in middle of the leaf is made by using a downward stroke with the steel tool. A mat bronze or
a green glaze mottled with blue is a suitable color for this vase.

Problem 2 is a clock, the design given being only a suggestion. Other sizes and proportions may be made with good results. The three parts — top, body and base — are made separate and solid from the mass of clay. These parts are then modeled together carefully, using slip as a cement. The opening for the clock is not made until in condition to finish. On account of the shrinkage of the clay, which is about one-eighth of an inch to an inch, the opening for the works should be made one-eighth larger than the diameter of the works. Any color desired may be used for the glaze. Mat green or bronze are appropriate. Clock works may be had from any wholesale clock dealer.

Problem 3 is a smoking set containing five pieces, tray, cigar holder, ash tray, and match holders. The tray is 8" by 11" and 3/4" thick. It is made from the mass of clay pressed out with the thumbs. The rim is made by modeling a coil on the edge as in
building. When in condition to finish, four panels are cut in the bottom, as in the tile, to keep it from warping.

Prob. 3

The large jar is 5" by 5" at the bottom, 4" by 4" at top and 6" high. Large coils 3/4" in diameter are used at the base, gradually decreasing in size toward the top. The outside surface is made flat and smooth without regard to the panels. When leather hard the walls are first made smooth with the steel tool; the panels are then cut in one-fourth of an inch at the bottom, gradually decreasing in depth toward the top. The lid is made from a mass of clay formed into a low square pyramid 5" by 5" with altitude 1 1/4". A coil is modeled on the underside, forming a rim that will fit inside of the top of the jar. A cavity is cut in the under side of the lid to hold a sponge. The match boxes and ash tray are made in the same manner as the large jar. A light brown mottled
with a dark brown mat glaze makes an artistic finish for this set.

Problem 4 is a suggestion for a plain desk set. It is 8" by 11" and 1" thick, made from the mass of clay pressed out with the thumbs. When formed, it is inverted and the feet are modeled on firmly. It is left in this position until leather hard. Panels are omitted in the bottom as the depressions in the top are sufficient to prevent warping.

Depressions one-fourth of an inch deep are made in the top to hold the ink wells. The cavities at each end for stamps and pen points are 2" by 1" and 1/2" deep. Lids are made one-fourth of an inch larger than cavity each way. A rim is made on the bottom of the lids to prevent them from sliding. A depression 7" long, 2" wide and 1/4" deep is made in front for pens and pencils. Glass ink wells may be had at any stationery dealer's. A mat green or bronze finish may be used.

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Problem 5 is an exercise in wheel finishing. A bowl 8" in diameter and 4" high is built with large $\frac{3}{4}"$ coils. When leather hard, the bowl is made fast to the center of the wheel with slip. The tool is held resting firmly on the crossbar, as in Problem 5b. The blade of the tool is brought near to the surface of the bowl, and, as the wheel revolves, the rough parts of the surface are gradually cut away until the tool makes a continuous cut around the bowl. The tool is moved up and down slowly until the surface is perfectly true. A steel scraper may be used to smooth the surface as the wheel slowly revolves.

Problem 6 is a vase 12" high, 7" at base and 5" at top, built with large coils and turned down on the wheel as
in Problem 5. The design is sketched on after the surface is made true on the wheel. The background is depressed, leaving the design in relief as Problem 3, Chapter II.

Problem 7 is a mantle clock 13" by 3" at the base and 8" high. The cylindrical part of the clock is 5" in diameter and 3" deep. It is built with large coils like a spill. The top of the cylinder is inclosed to the size of the works to be used, allowing one-eighth for shrinkage. This inclosure is one-half inch below the top. The base of the clock should be built at the same time as the cylinder, as the shrinkage should be uniform. It is made from a solid mass of clay, the panels being cut in when leather hard. A deep cavity is cut up under the base, leaving the wall about one-half inch thick. The cylinder is then cemented to the base with slip. A mat bronze glaze is used for a finish. It is fitted with a 2 1/2" dial eight-day works.

Problem 8 is an electric lamp 12"
high, 8" in diameter at the base and 2½" at the top. The base is made first from a solid mass of clay 7" in diameter and 1" thick. The first coil is made 1" in diameter and placed 2" from the outer edge of the base. It is blended down gradually to the edge. The next coil is placed a little nearer the center and modeled down, forming the curve at the base. Additional coils are placed in the same manner, narrowing the shaft to about 2" in diameter near the top. It is then curved out to about 3" at the top. A flat piece 3" in diameter and ½" thick is made for the top. A cavity is made in the top large enough to admit a tube through which the wire passes. A hole is also made in the side at the base to admit the wire. The lamp is glazed in mat bronze, and fitted with a glass or silk shade to match.

Problem 9 is a jardiniere with 3 handles. It is 12" in diameter and 8" high, built with large coils on the wheel. This method enables anyone who is proficient in coil
building, to make perfectly symmetrical forms any size consistent with hand-made pottery. Circular forms can be built in as great variety shapes as in hand building. The handles are made separate and modeled on while damp.

The method of building on the wheel is as follows: The base is pressed on the center of the wheel head with the thumbs and made true with the tool as the wheel revolves. A $\frac{3}{4}$" coil is made and applied as in hand building. The wheel is then revolved slowly and the coil made true with a tool. The succeeding coils are applied in the same manner.
CHAPTER IV

Mould Making

Mould making is a department in pottery work that requires mechanical skill, although it is not beyond the average eighth grade pupil. A potter's wheel is a valuable assistant, but not indispensable, in mold making. The following instruction is for the use of the wheel illustrated in Fig. 1.

All pottery forms in this course, from which moulds are made, can be classed under three heads, viz., one, two, and three-piece moulds.

The first mould to consider is made in one piece from a spill and is called a one-piece mould, as illustrated in Fig. 2. The model is made solid of clay the exact shape of the spill, 4" high, 2" at bottom and 2½" at the top. When leather hard, the model is
placed inverted on the center of wheel head upon which a clay tile 5" in diam. and 1" thick has been built and made true with the wheel tool. When the model has been centered as near as possible on the tile, as in Fig. 3, it is made fast to the tile with a slip. As the wheel revolves it is turned true with the wheel tool. It is now ready for the mould, which is made without removing the model from the wheel. A piece of linoleum long enough to reach around the tile and wide enough to extend 1" or more above the bottom of the model, is placed around the tile and tied securely with a strong cord. This will leave a space 1 1/4" around the model inside of the linoleum. A quantity of plaster of paris sufficient to fill this space to one inch above the bottom of the model is mixed according to directions given in Chapter VIII. The plaster
is poured into the space slowly and allowed to remain until hard. The model is then removed by digging it out with a tool, being careful not to mar the mould inside. When the mould is thoroughly dry it is ready for casting, according to instruction given in Chapter V.

Problem 2 is a bowl requiring a two-piece mould. It is 4" high and 5" in diameter at its widest part and gradually decreases each way from the center to 4" at bottom and 3½" at top. The mould is therefore made in two parts, dividing at the long diameter, that it may draw both ways.

The model is made solid of clay, and, when leather hard, it is placed right side up on the center of the wheel, without the tile, and made fast with slip. It is finished with the tool as in Prob. 1. The long diameter is located and a cir-
cumference line drawn from this point with a pencil as the wheel revolves. A wall of clay 1\(\frac{1}{2}\)" thick is built around the model up to the line, being careful not to work it into the model.

When the wall is made level up to the line it is made true with the tool, cutting a half-inch groove in the top, (see Fig. 5). This is to hold the parts of the mould together. The linoleum is then placed around the wall, letting it extend above the top of the model. Tie the linoleum securely and fill with plaster up to the top of the model. When the plaster is hard, the model is inverted and the clay wall removed, exposing the lower half of the model. The exposed edge of the mould is painted with dope, (see Chapter VIII). The linoleum is again placed around the mould, extending an inch above the bottom of the model. This space is filled with plaster, which completes the mould. When hard the parts are separated (the dope preventing them from sticking), and the model removed. Directions for casting with a two-piece mould are given in Chapter V.

Problem 3 is a three-piece mould. The top of the vase turns out, preventing the upper half of the mould from drawing.
(See Fig. 6). The mould is made according to the same instruction for Problem 2. When completed, the lower half is removed and the upper half is divided in two vertically. A diameter is drawn on the top and vertical lines are drawn down the side from each end of the diameter. A saw is used to cut into the mould following the vertical lines, cutting half way into the model. A thick knife or hatchet is used to crack the mould by driving it in carefully with a hammer. The completed mould is shown in Fig. 7. The parts in the upper half are secured with a cord when casting.

Problem 4 is a handle mould. A model of the handle is made of clay and imbedded one-half in an oval clay tile. The tile should be large enough to allow a 1½" wall around the handle. A narrow piece of
linoleum is placed around the tile, extending 1" above the handle. This space is filled with plaster to 1" above the handle. The handle is inverted and the clay removed. Three or four circular cavities are cut in the wall of the mould, located one-half inch from the model, as in Fig. 8. The plaster wall is painted with dope and the remainder of the mould is made 1" thick. The mould is then separated and the model removed. A half-round groove 1½" wide is cut around the handle in both halves, bringing it up close to the edge of the cavity. This groove is a receptacle for the surplus clay as the handle is formed by pressing the parts together.

Problem 5 is a spout mould, made in the same manner as the handle mould, leaving the ends open, as in Fig. 9.

Problem 6 is a lid mould. The model is made of clay and finished on the wheel. It
is placed right side up on a clay tile, centered on the wheel and large enough to allow a one-inch wall for the mould. Plaster is then poured up to the edge of the model. The linoleum is removed and the division wall finished with the tool, cutting a groove as in the two-piece mould. See Fig. 10. The remainder of the mould is poured 1" above the top of the model, after painting the division wall with dope. Instruction for the use of these moulds is given in Chapter V.
CHAPTER V

Casting and Pressing with Moulds

Problem 1 is the use of the one-piece mould for casting. The slip is prepared according to directions in Chapter IX. It is poured from a can into the mould until the mould is filled to the top. See Fig. 1. The slip will gradually settle in the mould as it stands, caused by the water being absorbed from the slip by the porous mould. The mould should be kept full by pouring in more slip. A deposit of clay is being formed on the inside wall of the mould, which is to be the body of the spill. When this deposit is thick enough, which is determined by scraping near the edge of the mould, the slip is poured out. In several hours, the spill be-
comes loose in the mould, caused by the shrinkage of the clay, and can be removed from the mould. It is finished with a steel tool and when dry is ready for firing.

Problem 2 is casting with the two-piece mould. The parts of the mould are placed together, as in Fig. 2, the casting process being the same as in Problem 1. When the bowl is ready to be removed from the mould, the top part of the mould is taken off and the bowl lifted out. All casting in the problems to follow is done according to the foregoing instruction.

Problem 3 is a Chocolate Set, consisting of a pot and six cups, made in moulds. The moulds are in two pieces, made according to directions given in Problem 2, Chapter IV. The spout in the pot is not made in the mould but modeled on solid after the pot is cast and when leather hard, shaped with a tool. The handles are made of strips of clay and modeled on with slip when hard enough to keep their shape. The set is glazed in brown and white enamel drip.
Problem 4 is a tea set consisting of a teapot, sugar-bowl and creamer. They are made in two-piece moulds with the use of the lid, handle and spout moulds. The lids are cast in the moulds with slip, as a two-piece mould. The handles are pressed into the moulds, using regular model-clay. A coil of clay a little larger than the handle is rolled and made slightly flat. It is placed in one side of the mould. The other side is pressed down firmly in position and the surplus clay is forced out into the groove, leaving the handle perfect in form. The han-
dle is trimmed and fitted to the body and modeled on with slip. The spout for the teapot is made in the mould by pressing a thin sheet of clay in each side, letting the edge project. Slip is painted on the edge and the parts pressed firmly together. The spout is fitted to the body and four small holes are cut through under where the spout is to go. The spout is then modeled on with slip.

The spout on the pitcher is made in the same manner as the spout on the chocolate pot.

When leather hard, the set is finished with a steel tool ready for firing. Several suggestions for color are given, as follows: Light blue with royal blue drip or blend, in gloss glaze, light gloss yellow with brown drip or blend, gloss green and white enamel blend, mat green, and mat blue gray.
CHAPTER VI

Glazing and Firing

Most pottery is fired in a biscuit kiln before it is glazed. It must be thoroughly dry before it is stacked in the kiln as the least dampness in the pottery will cause it to break in the firing. Biscuit and glaze ware are fired in the same kiln but not at the same time. The biscuit should be fired more slowly than the glaze during the first hour, although the temperature need not be as high, 06 cone being used for biscuit and 05 for glaze.

In stacking a biscuit kiln, the large pieces are placed on the bottom as close together as possible, placing small ones inside of large ones, as it does not injure them to touch. When the muffle is full the kiln is closed. To light the kiln, a little oil is allowed to run into the pan of the burner in
which a piece of paper is placed. A match is applied to the paper and the kiln starts to burn.

A small stream of oil just beyond a fast drop is then turned on. The flow is increased a little every half hour until it begins to get red inside, when all the oil may be turned on that can be consumed without making smoke. It is impossible to burn oil successfully without sufficient draught. Either the flames will produce smoke, or it will take too long to reach the degree of heat required. Good combustion produces a flame without smoke and can be secured only by sufficient draught to furnish the necessary oxygen. A 9" 30' stack is not too large for small pottery kilns. Too much draught should be checked with a damper.

Fig. 1
The temperature is registered with an 06 cone placed in the kiln about 5" back from the spy hole. The cone can be seen as soon as it becomes light in the kiln. As the heat increases more oil is added, until the cone begins to bend at the top. It will soon turn into a hook when the oil should be shut off. The kiln should cool several hours before opening.

The ware, as it comes from the kiln, is called biscuit and is ready to be glazed. Glazing is an important part of pottery making, as good results depend upon a definite knowledge of the requirements. The glaze must be of the proper consistency to cover the body thoroughly. If too thin, the biscuit will show through when fired. If too thick the ware will have a clumsy appearance. Glaze is put up in a powder form which dissolves readily in water with which it is reduced to the consistency of cream. No other ingredient is necessary.

Enamel wash-basins are desirable in which to mix glazes. Drinking cups and glaze brushes are also necessary equipment.

The inside of the vase is glazed first by pouring in half a cup of glaze. It is turned
two or three times horizontally before pouring out. This should be done rapidly or too much glaze will be absorbed. All spots not glazed are touched up with the glaze brush. The outside is glazed by holding it at the top or bottom, as illustrated in Fig. 2. The cup is filled with glaze, and as the vase is revolved forward the glaze is poured over rapidly. It is not necessary to cover the space around where it is held at first pouring, as it may be inverted and a little glaze may be poured over it. The remaining spots are touched up with a brush. It will require a little practice to enable anyone to cover the vase well in one pouring. Practice makes perfect, in this as in many other things where technic is required. Different effects, such as drip, bronze, blended and mottled, are made by first glazing the vase with the under tone, the remaining glaze being applied with a brush. To
produce a bronze, the vase is glazed in mat brown with green No. 11 spatted on with a brush. The green and blue mottled effect is made by glazing with mat green No. 11, the mottled effect being produced by spattering with mat blue. The blended effects are made by blending the over color with a downward stroke of the brush from the top. In drip effects the light color is put on first and the dark color painted on in the form of a drip. White enamel is the only glaze that can be used as a drip over a dark color. Glaze dries immediately and may be stacked in the kiln as soon as enough pieces are glazed to fill the kiln.

Care should be taken in stacking a glaze kiln, as some glazes are placed on the bottom and others on the shelf, on account of the difference in temperature required to develop them. There is a higher temperature on the bottom under the shelf than on the shelf. This must be taken into consideration.

All soft mat glazes develop in the heat registered with 05 cone and must be placed on the shelf upon which the cone rests. All gloss glazes and hard mat glazes require several degrees more heat and are placed on the
bottom under the shelf where they receive sufficient heat to develop them at the same time 05 cone turns. All pieces must be placed on stilts and at least one-fourth of an inch apart as when the glaze melts it becomes soft and the pieces, if touching, would stick together.

When the kiln has been stacked and closed, the fire is started the same as in the biscuit firing, but the oil may be increased more rapidly.
CHAPTER VII

Methods in Clay Modeling for Graded Schools.

This chapter is an outline of form study, including pottery making as it may be taken up in the grades. The problems given are the type forms together with natural objects and pottery forms which are based on the type forms.

The making of finished pottery objects in the various color effects creates an interest in the work that cannot otherwise be had. The best results can be obtained in systematic training only where the teacher can arouse a genuine interest in the subject.

Ideas can be expressed in clay better than in almost any other medium. The expressing of an idea develops original power, and as the constructional faculties are developed
the child is better able to deal with matters in his general school work.

Pottery work is therefore well adapted to this system of development. The making of a piece of pottery involves several distinct processes, and when the process is completed it is real and is evident of self-activity, which is the fundamental condition of knowledge and development.

The equipment necessary for work in the grades is as follows: A smooth board 8 inches by 10 inches with a cleat nailed on one edge to raise it to a horizontal plane, should the pupil work at the desk. Plaster plaques are best to model on, but, if they cannot be had, a sheet of paper the size of the base of the object will do. This keeps the clay from adhering to the board so that the object may be turned around. A steel finishing tool and a boxwood modeling tool are used in the upper grades. In the lower grades tools that are needed can be made by pupils. Each problem will mention the tools to be used when needed. Sandpaper should never be used, as the dust created is breathed by the pupils and is therefore injurious.
FIRST YEAR

Lesson 1. The Sphere

Sufficient clay is given to each pupil to make a sphere 2" in diameter. All but a small portion of the clay is taken between the thumbs and fingers and made into a solid mass, making it as round as possible by revolving and pressing at the same time. Uneven places may be filled with the surplus clay.

Lesson 2. The Apple

The apple is made 2" in diameter. The clay is worked into a spherical form first. The shape of the apple is then formed by making the depressions for the stem and blow with the thumb. The stem is made of a small coil of clay. The apple should be given in one lesson. No extra finish should be given it with a tool, and it would be too hard to work with the fingers when leather hard.
Lesson 3. The Cube

The cube is 2" square. It is formed with the thumbs and fingers, pressing the faces into shape with the thumbs. The corners and edges are formed by working them out between the thumbs and fingers. Surplus clay may be added when needed.

Fig. 3

Lesson 4. The Square Ink Well

The ink well is 2" square at the base and 2" high with lid. The lid is one-fourth of an inch thick and has a small circular piece stuck on the bottom to fit in the cavity to keep it from sliding. A cube is made first. For the lid a section is then cut off with a thread. The cavity for the ink is made by pressing the thumb down into the top, working the clay around carefully. This will change the form to some extent, but it can be worked back with the thumb.

Fig. 4

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Lesson 5. The Cylinder

The cylinder is made 3" high and 1½" in diameter. It is modeled with the thumbs and fingers like the cube. The cylindrical surface is studied and compared with the sphere. It should not be rolled on a flat surface, but each face and edge should be modeled carefully.

Lesson 6. The Spill

A lump of clay is made into a solid form the size and shape of the cylinder. It is not necessary to finish the surface. The thumb is carefully pressed into the top, working the wall between the thumb and fingers as it is revolved. The spill will be somewhat larger than the cylinder on account of pressing the wall out. Care should be taken to keep the wall straight and uniform in thickness. The spill should be made in one lesson, as the clay must be fresh and plastic when worked into shape.
Lesson 7. The Mug

The mug is made the same as the spill, 3" high and 2" in diameter. The wall is made thin by pressing between the thumb and fingers. The sides may be made to flare at the top to about 2½" in diameter. The handle is made by rolling a piece of clay into a coil on the desk ½" in diameter. It is bent into shape and fitted carefully to the mug and cemented on with slip.

Lesson 8. The Candlestick

The candlestick is made in two parts. First make a tile 4" in diameter and ½" thick. The candle holder is made like the spill 3" high and 1½" in diameter. The candle is a small cylinder with a burnt match used for a wick. The handle is made and stuck on like the mug handle. All parts are united with slip.
SECOND YEAR

Lesson 1. The Hemisphere

Review the sphere, making it 2" in diameter. Cut the sphere in two with a thread. Study the faces carefully, comparing circular, spherical and cylindrical faces. Give the name hemisphere.

Lesson 2. Teacup and Saucer

The teacup in this lesson is based on the hemisphere. Make a sphere 2" in diameter and cut in two with a thread. One-half is made into the cup by pressing the thumbs into the flat face, bringing the sides up with the thumbs and fingers. The handle is made of a small coil. The other hemisphere is made into a saucer in the same manner as the cup.

Lesson 3. The Square Prism

The square prism is modeled like the
cube, making it 3" high and 2" wide on each side. Compare the oblong and square faces, giving the name oblong face. For an exercise in cutting, a thin slab may be cut lengthwise of the prism with a thread.

Lesson 4. A Jewel Box

Make a square prism 3" long and 2" wide, finishing it carefully. Cut a slab lengthwise 1/4" thick, being careful to make it uniform in thickness. The exercise in cutting in Lesson 3 should help in this work. This slab is used for the lid. A thin slab is stuck on the under side and made to fit the inside of the box to keep the lid in place. The box is made hollow by cutting out the clay with a square end wood tool. The tool can be easily made from a small stick by the pupils. It is about 4" long and 1/2" wide, with a thin wedge-shape end. The walls of the box are 1/4" thick.
Lesson 5. The Ellipsoid

The ellipsoid is made 3" long and 2" in diameter in the same manner as the sphere. Compare the surface with the sphere.

Lesson 6. The Lemon

It would be of advantage, in modeling the lemon, to have the natural object for a model. Make it as near in size and shape of the object as possible. The ellipsoid is modeled the size of the lemon. It is then compared with the lemon and the necessary details worked out.

Lesson 7. A Vase

An ellipsoid is made 4" long and 21/2" in diameter. About 1/2" is cut off from each end with a thread. The hollowing out is done by pressing the thumb in at the top, forming the vase according to directions given in Lesson 6, first year.
THIRD YEAR

Lesson 1. The Equilateral Tr. Prism

The prism is 3" high and each face is 2" wide. It is modeled like the square prism. Cross sections are cut from the end 1/4" thick with a thread. These sections are called equilateral triangles.

Lesson 2. The Chicken Coop

The chicken coop is made with two equilateral triangles, 3" on a side and 1/4" thick, and six oblongs 3" long, 1/2" wide and 1/4" thick. These parts are made during one lesson and allowed to become leather hard. They are covered with a damp cloth and wrapped in a piece of newspaper to keep them from getting too dry. The next lesson is devoted to sticking the parts together with slip, placing the oblongs at the top, bottom and middle of the sides of the triangle.
Lesson 3. The Ovoid

The ovoid is 3" long and 2½" in diameter. It is modeled like the sphere, using the type form for a model. Compare the ovoid with the ellipsoid, noting the difference in the curves, one end being like the sphere and the other more pointed.

Lesson 4. The Pear

The pear is modeled like the apple. A pear should be used for a model if possible. Make the ovoid first as in Lesson 6, second year.

Lesson 5. The Square Pyramid

The pyramid is 4" high and 2" square at the base. The side faces are triangles with the two sides longer than the base. Compare them with equilateral triangle.
FOURTH YEAR

Lesson 1. The Cone

The cone is 4" high and 2" in diameter at the base. It is modeled solid like the cylinder. Compare the surface with the cylinder. Make a cross section parallel to the base 2" up from the base. The lower half is a form upon which the cup in the following lesson is based. Give the name Frustrum of a Cone.

Lesson 2. The Cup

The cup is made with slanting straight sides, 3" high, 3" in diameter at top and 2" in diameter at bottom. The cup is built of coils according to directions given in Problem 1, Chapter I. A simple problem in decoration is introduced at this time by insizing a border around the top of the cup, using straight lines as units of design. An original design should be used. Instruction in this work is given in Problem 1, Chapter II.

Pieces may be glazed and fired to advantage at this stage of the work.
Lesson 3. A Vase Form

The vase is 4" high and 3" wide within an inch of the top. The base is 2" in diameter and the top 1½". This vase is built with ½" coils, according to instruction given in Problem 2, Chapter I. It is decorated with an original insized border design. If glazed, a mat green would be desirable over the insizing.

Lesson 4. The Ink Well

The ink well is 3" high and 3" square at the base. A solid pyramid is formed and a cross section is made parallel to the base 1½" from the apex. The top section is used for a lid and is prepared with a square piece on the under side to keep it in place. A square cavity to hold the ink is cut with the wood modeling tool, as in Lesson 4, second year. Gloss green No. 12, blended with white enamel is used for a finish.
Lesson 6. A Square Fern Bowl

The fern bowl is made with coils $\frac{1}{2}''$ in diameter. The base is $5''$ square and $\frac{1}{2}''$ thick. The coils are made long enough to reach once around the base, the corners being made sharp by pressing the coils from the outside between the fingers. The sides of the bowl flare, making it $6''$ square at the top. The sides are decorated with a simple panel design cut in with a square end modeling tool, the design being drawn on paper and traced through on to the clay with a dull pencil. The background is cut out, leaving the design to stand out. The bowl may be glazed in bronze.

Lesson 7. A Square Vase

The square vase is $4''$ high, $3''$ square at top and $2^{1/2}''$ square at the bottom. It is built with coils and decorated with an original design insized with an insizing tool. The vase is glazed with mat green.
FIFTH YEAR

Lesson 1. A Mug

The mug is 4" high and 3" in diameter. It is built with coils and decorated with an in-sized design. The handle is made by rolling a coil 3/4" in diameter, making it slightly flat. It is bent into shape, fitted to the mug and stuck on with slip. A yellow gloss glaze, blended with green No. 12, is suitable for the mug.

Lesson 2. A Square Tile

The tile is 4" in diameter and 3/4" thick. It is made according to directions given in Problem 6, Chapter I. The decoration is an original in-sized design. The design is drawn on paper and traced through on the clay with a dull pencil when the clay is leather hard. Mat blue gray is a pleasing color for a tile.
Lesson 3. A Vase

The vase is 5" high and 3" in diameter at the widest part, the top is 2" and the bottom is 2½". It is built with coils about 3/8" in diameter, according to directions in Problem 2, Chapter I. The vase is glazed with a light blue body and a dark blue drip in either a mat or gloss glaze.


The candlestick is 5" high, 4" in diameter at the base and 2" in diameter at the top. The shaft is 2" at the base and 1½" at the top. The base is made solid ½" thick, and the shaft is made in a solid mass. The top is made ½" thick with a 3/4" hole cut through for the candle. The three parts are stuck together with slip, filling in at the base and top with clay to form the curves. A Cavity is cut up through the bottom into the shaft to prevent breaking in the firing. Glaze in mat green.
Lesson 1. An Oblong Fern-Bowl

The fern-bowl is 6" long, 4" wide and 3" high. It is built with coils 1/2" in diameter. The feet are made 1" square and 1/2" thick and stuck on with slip as soon as the coiling is finished. This is done by inverting the bowl and leaving it inverted until it becomes leather hard. It is decorated according to Figure 3, Chapter II.

Lesson 2. A Square Candlestick

The square candlestick is made 6" high—in three parts, base, shaft and top. The base is 5" square, the top is 2" square and the shaft is 2" square at the base and 1 1/4" at top. These parts are stuck together with slip and the curves carefully worked in with clay as in Problem 5, Chapter I. It is finished in a mat bronze glaze.
The tile is 5" square and \( \frac{3}{4} \)" thick. Instruction for making is given in Problem 6, Chapter I. The decoration is in relief and is modeled on with the fingers about \( \frac{1}{8} \)" high. A modeling tool may be used in working out the details. The tile is glazed in mat blue.

Lesson 4. A Square Vase

The vase is 6" high, \( 4\frac{1}{2} \)" at widest part, \( 3\frac{1}{2} \)" at base and 3" at top. It is built with coils and decorated with a design in relief by depressing the background according to the instructions given in Problem 3, Chapter II. It is glazed in mat blue gray, or any plain mat glaze, as mottled effects mar the decoration.
Lesson 1—Vase with Handles

The vase is 10" high, 6" in diameter at the widest part, 4" at the base and 3½" at top. It is built with ½" coils, the handles being applied immediately after the coiling is completed. The handles are 1¼" wide and ¼" thick and are applied with slip, working them thoroughly into the body of the vase. When leather hard the vase is finished with a steel scraper. It is glazed in a mat bronze.

Lesson 2—A Tile Inlaid Effect

The tile is 5" in diameter and ¾" thick, decorated with an original design. The design is drawn on paper and traced on the tile when leather hard. The design
should be in broad lines or masses and cut down about $\frac{1}{8}$" below the surface. This space is filled with underglaze, as in Fig. 2, Chapter II.

Lesson 3—A Tea Set

The tea set includes a teapot, creamer and sugar bowl. The teapot is 5" in diameter and 6" high. The creamer and sugar bowl are 3" in diameter and 2½" high. They are built with coils and the spout and handles are made by hand and applied as soon as the coiling is finished. They are glazed with light blue dripped with royal blue gloss.
EIGHTH YEAR

Lesson 1—Electric Lamp

The electric lamp is 12" high, 8" in diameter at the base and 3" at the top. It is built with coils, as in Problem 8, Chapter III. It is glazed in a mat green color.

Lesson 2—A Vase

The vase is 11" high, 5" in diameter at the largest part, 3" at top and 4" at base. The instruction for making and decorating this vase is found in Problem 1, Chapter III. A green and blue mottle in the mat glaze is suggested for color.

Lesson 3—A Round Fern Bowl

The fern bowl is 10" in diameter and 4" high. The three feet 1/2" high are applied as soon as the coiling is finished. The de-
sign is in relief, made by depressing the background, as in Fig. 3, Chapter II. It is glazed in a mat bronze color.

Lesson 4—Pair of Round Decorated Candlesticks

The candlesticks are 8" high and 5" in diam. at base, decorated with relief design with depressed background.
CHAPTER VIII

Preparation of Materials—Clay for Modeling

Clay taken from the bank may be easily prepared for modeling by first reducing it to a slip, straining it through a 60-mesh sieve and drying it out in plaster moulds. Inexpensive moulds may be made of Michigan plaster by making a clay model, either square or round, the size of the capacity desired, and the plaster poured over to about 2" thick. When dry, the slip is poured into the mould, and the plaster absorbs the water rapidly. When hard enough the clay is worked on a board or plaster slab until in condition for use.

Slip for Casting

Casting slip should be of the consistency of thick cream. It is prepared by reducing
any dry clay, that will cast, to the right consistency by adding water and letting it stand until dissolved. It is then stirred and strained and is ready for use.

Mixing Glazes

Prepared glazes are put up ready for use by adding sufficient water to reduce them to the consistency of cream. The water is poured over the powder and allowed to stand until dissolved. It is then mixed until free from lumps.

Underglaze Colors

Underglaze color is a colored clay and has only a biscuit finish when fired. It must, therefore, have a glaze over it to give it the right effect.

The colors are prepared full strength and must be mixed with clay to give different values. About equal parts clay should be used to give the standard value of each color. In making tints, more clay should be used in proportion.

For painting, the color is mixed with the clay and sufficient water to make it the consistency of artist's oil paints and ground on glass with a spatula. For inlaying, the mixture should be of the consistency of modeling
clay. The color should be applied while clay is damp.

Plaster for Moulds

In preparing plaster for a mould, it is necessary to know about how many pints or quarts of mixed plaster is needed to fill the space. If four quarts of plaster are needed, two quarts of water are placed in the mixing pan, and the plaster carefully shaken in from a scoop, not allowing any lumps to fall in. When the water is filled to the top with plaster, letting it settle naturally, stir until well mixed and pour immediately.

Dope for Mould Making

Take one-half bar of a 5-cent cake of ivory soap and shave it into fine shavings. Pour one-half pint of boiling water over the soap and let it simmer until the soap is dissolved. While hot, pour in one-half pint of refined lard-oil, and it is ready for use.