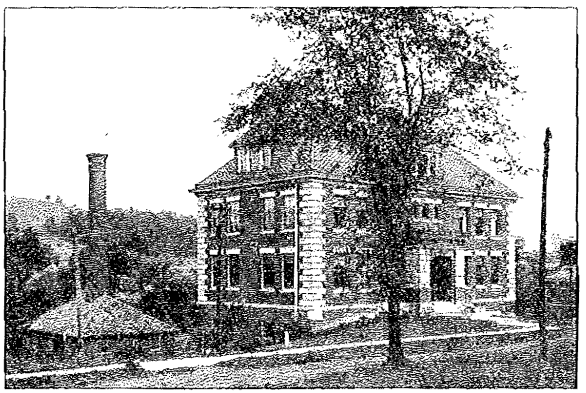
UNIVERSITY PUBLICATIONS SEVENTY-FIFTH YEAR, No. 2A

The New York State School of Clay-Working and Ceramics



Alfred, New York

BULLETIN A

The Importance of the Clay-Working Industry and the Value of Technical Education in Ceramic Science . . . .

PUBLISHED BI-MONTHLY BY ALFRED UNIVERSITY
MARCH, 1911
Entered January 25, 1902, as second-class matter, Post Office, Alfred, N.Y.
Under Act of Congress of July 16, 1894

A Catalog of the School, giving details of entrance requirements and courses of study, will be mailed upon application to

CHARLES F. BINNS, Director.

Clay and its Uses

Clay is one of the most abundant substances in the earth. It underlies vast areas of land and sometimes outcrops on the hill sides in large masses. In color it may be black, brown, red, blue, yellow and even white, but white clays are quite uncommon. Clay is sometimes stratified or formed in layers, sometimes massive or formed in blocks or lumps. The former condition is likely to yield the better clay for the massive condition is often accompanied by stones and fragments of rock.

In its origin clay is ground rock. Various agencies such as moisture, frost, or the movement of the great ice fields in a by-gone age have slowly broken up the rocks and have ground the particles down to a fine powder. This has been washed away by rains and flood waters and carried off into quiet pools where it has gradually settled down in the water. The pools themselves were drained off long ago but the clay sediment has remained. Shales are clays which have been compressed by their own weight and by masses which have been deposited above them until they have formed the hard, laminated accumulations which are well known throughout the state. Shales are often more valuable than clays because they are found, usually, in very large deposits which are of nearly the same composition throughout. When ground in the process of manufacture they become quite plastic and are easily worked.

The value of a deposit of clay or shale depends upon several things. No ordinary material can be profitably shipped for manufacture elsewhere and therefore the location is of prime importance. To be of service commercially it must be near a railroad. A claybed is of almost no value unless it is so located that the product can be easily brought to market. A long haul to the railroad is out of the question. Then the distance to market must be considered. The larger towns are the only profitable markets and the more ordinary clay products cannot be shipped over long distances owing to freight charges.

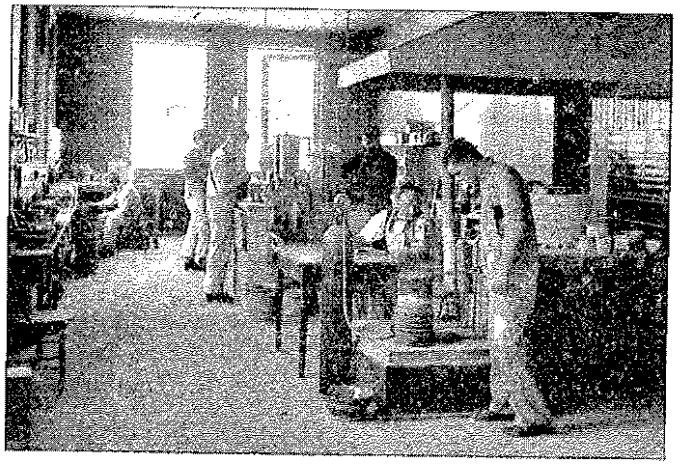
Water supply is very important. Good and abundant water is most necessary in any kind of clay manufacture.

If these points should be settled in a satisfactory manner the clay itself may be considered. The bed, in order to be profitable, should be both large and thick. Clay is apt to occur in pockets or small masses which look well at the exposure but in which there is not enough material to keep a manufactory going for a year. Even a small plant for the manufacture of brick will need from fifty to eighty tons of clay a day and it does not pay to invest capital for only a few years' output.

These things are here pointed out in order to prevent disappointment. If the conditions are favorable the State School of Clay-Working is prepared to make tests and to advise as to the use of clay and no charge is made for the examination of materials found in the state, the school facilities, however, should not be used merely to gratify curiosity.

In taking a sample from the deposit care should be observed that a fair average be obtained. Not the best part of the clay but a mixture of good and bad should be taken and about five pounds of this sent to the school. If the tests on this quantity prove satisfactory a larger quantity may be sent and the actual goods will be manufactured, but it saves expense to send the small sample first.

The most general use of clay is for manufacture into brick. A great many clays are suitable for common brick, but as already pointed out, these are only used in large quantities in the cities. Face brick, or brick so well finished that they can be used as veneer on a frame house, find more or less demand everywhere, but unless there should be many used in one locality it will not pay to manufacture them. Drain tile can be made from almost any clay and their use should be encouraged, but it will hardly pay a farmer to make his own tile. In a large farming community a co-operative plant might be established, each farmer being thus enabled to procure his tile at the cost of manufacture; but this would be rather a saving of money than the making of a profit. All things being considered, then, it is evident that a bed of clay is not necessarily equivalent to a gold mine, but on the other hand, if a deposit of clay be well located and proves to be of good quality, there is a permanent and regular market for the wares which can be made from it.

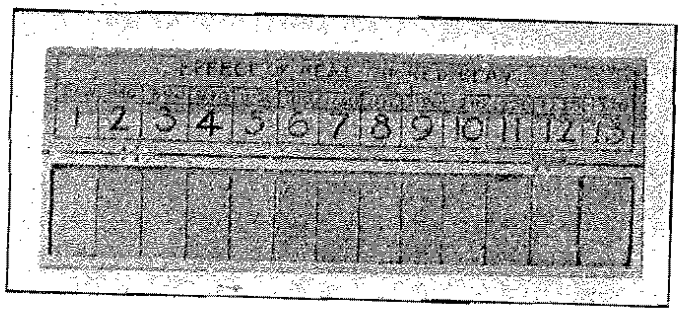


The Department of Clay Testing

The testing of clay involves a complete understanding of the operations of the clay-working industry and a wide experience as to the possible uses of clay.

The first necessary property in a clay is plasticity. Obviously a clay is of no value unless it can be so worked in the usual machines as to produce satisfactory wares. The plasticity is tested by working up a sample of the clay with water so that its working quality may be estimated. No machine can do this, the experience of the worker is the best guide. A certain amount of sand or grit is desirable because a clay so constituted will dry and burn more safely than when this is absent, but too much sand will make the material short and cause it to crumble. The plastic quality, being sufficient, the shrinkage or contraction of the clay in drying is measured. This is a very variable quantity. Some clays will shrink as much as one sixth as the water is dried out. This would make them unsuitable for manufacture. It is generally considered that about one inch to the foot, or one twelfth, is as much as a clay ought to shrink on drying.

Then the dried clay is passed on to the furnace or kiln for the final trial. This is the supreme test, for a clay may pass all the others and fail in this one. In the heat of the furnace a clay first loses its chemical water—water which cannot be expelled by drying, but which is present even in a perfectly dry clay. It is combined in the clay itself and can only be driven off at a red heat. This being accomplished, the clay gradually changes color and begins to shrink. It grows denser as the heat increases and reaches the solidity which is expected of a building brick, being at this time the brightest red that the clay will show. From this point the color grows darker and the clay more solid until it acquires the hardness of a paving brick. This is the point at which quality ceases to be developed for any increase of heat will cause the clay to swell up and finally to become bloated. It is then on the point of melting down, and in a little hotter fire it will flow like molasses. The fire test determines the usefulness of a clay because some clays will melt very readily while others will successfully resist a long and severe fire.



The illustration shows a good sample of shale at the various stages of burning:

No. 1.	is the unburned clay,				the color a greenish yellow
No. 2.	Temperature	680	degrees	Centigrade,	Light salmon
No. 3.	"	890	"	"	Salmon
No. 4.	"	970	"	"	Dark salmon
No. 5.	"	1030	"	"	Light red
No. 6.	"	1090	"	"	Medium red
No. 7.	"	1130	"	"	Finish red Building brick
No. 8.	"	1170	"	"	Dark red Sidewalk brick
No. 9.	"	1190	"	"	Brown, paving brick
No. 10.	"	1210	"	"	Chocolate, overfired Swelling begins
No. 11.	"	1230	"	"	Swelling continues Brick is honeycombed
No. 12.	"	1250	"	"	Brick is bloated and mis-shapen
No. 13.	"	1370	"	"	Brick on the point of melting

From a series of tests such as this it is easy to select the quality desired in the finished product and to fire the kilns to the proper point.

Clay Working as a Business

One of the objects which the State had in view in establishing a school of Clay-Working, was the training of young men and women in the mysteries of the craft.

The industry of clay manufacture is a very important one. The report of the National Government states that the value of the clay products in New York State was $12,000,000 in a single year and this amount is steadily growing larger. The movement for the conservation of the forests finds an important ally in the production of Clay Wares, for as lumber decreases, brick, tile and terra-cotta must increase.

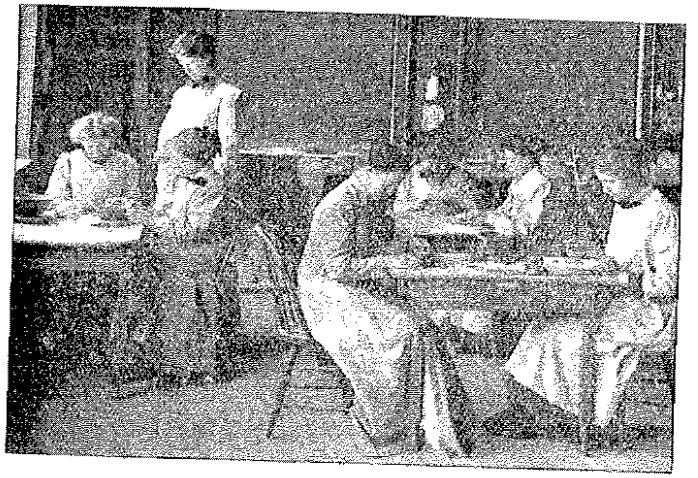
Education is now being pushed into fields of industry on every hand. The state affords opportunities to farmers and other specialists who were at one time left to get along as best they could, and the manufacture of clay-wares is a very special industry indeed. Several states have recognized this and there are now state supported schools in Ohio, New Jersey, Illinois, Iowa and Kansas, besides New York, while several other states are making enquiry as to the best way of establishing similar schools.

For bright, active, young men, who are willing to do the work, there are few fields which offer more attractive opportunities. The man who desires to excell as a clay worker should be of a scientific turn of mind. He should enjoy the study of chemistry, physics and mathematics and should be interested in machinery. If he has a good High School course he can take the four years' work in the school of Clay-Working with almost a certainty that he will be able to secure a good position.

For young women the work is somewhat different. The largest opening for them is as teachers of design, modeling and clay work in the grades or High Schools, and the studies which are set before them are especially directed to this end. Some have begun the making of pottery on their own account and have done well.

The school is connected with the University at Alfred, Allegany County, where also is located a State School of Agriculture. Tuition is free to residents of the state.

It is said that young people on leaving College may be divided into two classes. The first consists of those who are able to "accept positions," the second, of those who are compelled to "hunt jobs." It is a matter of record that the larger number of those who graduate from Alfred belong to the first named class.



The Department of Modeling and Design

One of the purposes for which the school exists is the training of teachers of clay-working. This can not be separated from drawing and design however, and so full courses in both these subjects are given along with the technique of clay-modeling, pottery-making, glazing and firing. Students may enter the school after completing their High School course and they come therefore with ability to handle pencil and water color, to make simple designs, to draw common objects, and upon this foundation can be built a broader knowledge of drawing and design with special emphasis on designing for clay.

The design lesson, for instance, may be at one time the filling of a square with lines and spaces to form a pleasing pattern and instead of leaving it as an abstract problem a tile for teapot or flower pot is made in clay and the design used to embelish the surface. Or the problem may be a border design using an animal motive. For the sake of comparison this same border may be adapted to a cross stitch border for a child's apron, a stencil for a curtain, a wood block for a table cover, or it may be cut into the surface of a clay bowl or painted with liquid clay on the pottery form.

All children love to use clay whether it be simply making mud pies in the back yard or building up bit by bit a flower pot in which to plant a bulb. It is easy to find the reason for this fascination. Clay responds so readily to the slightest pressure, the moment the cool soft mass is touched the possibilities are perceived. No tools are necessary beyond the ten fingers. The reality of objects modeled in clay appeals to the child. Clay animals will stand, provided the legs are put in the right position, the heads can be made to turn, the feet to move, the creatures seem to be almost alive. It is this sense of reality in the work accomplished which is so stimulating to the child's interest and which sharpens his power of observation. He must notice just where a duck's legs are before he can make his clay duck stand; he must see, or remember, just where a rabbit's ears begin to grow before he can model it so. The child who has modeled any object will draw the same object very much better for having tried to represent it in three dimensions. But besides this imitative modeling which should accompany drawing in the art education of any person there is the making of pottery by hand. And here again the feeling of reality comes in, for even the crudest pottery may be made strong and usable by burning in a kiln. Even the little children can make simple bowls in Indian fashion by coiling their rolls of clay round and round like the coils of a basket. From being at first a purely imitative process the work may be developed right through the grammar grades until, in the High School, pottery of a high degree of technical excellence may be made. The younger children will be so occupied with learning how thick to make the clay coils, what to do when the edge of the piece tends to crack, how to prevent a bowl growing larger in the wrong direction, that they must make only the simplest shapes, low cylinders, broad low candlesticks and so on. The decoration of this pottery must be limited to lines cut into the clay with a sharp stick or pressed in with the fingers. In the upper grades and High School the earlier stages of technique safely passed the pupil may design the form on paper beforehand and may carry out the decoration in colored clays and colors under the glaze.

It is believed that a more general introduction into the schools of clay modeling in connection with drawing and pottery-making as a form of manual training will result in a keener observation of nature and a clearer appreciation of beautiful form.

The Comparative Cost of a House of Moderate Size

When Constructed of Wood, Brick, Cement or Hollow Block

J. Parker B. Fiske, New York, (Reprinted from "Brick")

There can be little doubt, even in the mind of the casual observer, that brick is a most desirable material with which to build a house. The public is gradually coming to understand the enormous loss from fire, the excessive repairs, the rapid depreciation and the discomfort in both summer and winter arising from the use of frame construction, and to appreciate the fact that the house of brick is not only fire-proof, but that it requires no painting, that it does not decay or depreciate and that, of all types of construction, it is the most beautiful.

How is it then, that America still continues to build her houses largely of wood, while the older countries of Europe have long ago abandoned this type of construction? The answer may be found in conversation with almost any intelligent man or woman,—"The first cost of the brick house is prohibitive."

The writer must admit that he has made until recently, no great study of this question, accepting the common verdict that the house of brick, while most desirable and most satisfactory in the long run, is expensive in its first cost. Perhaps it is natural that we, who were born and have grown up in a land of wooden houses, should take this type of construction for granted. America, however, is the land of progress, the land of new inventions, the land whose people enjoy to the largest extent the benefits of human ingenuity and skill. It is high time that America found out the truth of this important matter.

But every man in our busy modern world is occupied with his own affairs; the banker, the manufacturer or the merchant has no time and little inclination to investigate all the ramifications of a complicated problem like this, which comes to him at most once or twice in a lifetime. He will build his house of the material which has impressed him, by observation and superficial inquiry, as the best. Some one whose interest is vitally at stake, whose very business success depends upon the increased prestige of brick, must undertake to determine the final facts in the case and to teach them to the public. This man is the brickmaker himself—for the elimination of wood and the substitution therefor of brick would mean an enormous increase in his business with a corresponding increase of his profits.

Believing that no question is today of greater importance to the American brickmaker, than a thorough knowledge of the comparative cost of the house of brick and one of wood and cement. The writer has undertaken to determine something definite regarding this matter and now offers the results of his investigations.

Before entering into a detailed discussion, it may be well to consider for a moment what is meant by the cost of a house. Building construction has never been reduced to an exact science, and its cost can never be foretold with the accuracy of a mathematical problem. No two contractors, even of equal skill and experience, will figure exactly the same cost on a given set of plans and specifications. Elements of chance must be considered, such as fluctuations in the market price of material and labor, weather conditions and unexpected difficulties in construction. Moreover, each man's figure will be influenced to some extent by the measure of his desire to secure the contract in question; in fact, it is doubtful if the same contractor would bid exactly the same on different occasions even for precisely the same structure. Moreover, if these variations are encountered in obtaining the cost of a given building in a given place, still wider differences will arise in obtaining bids for different localities where the price of material and conditions of labor are different. For this reason a certain amount of discrepancy between different authorities must be accepted as inevitable and must not be allowed to throw suspicion on the figures

With this explanation let us proceed to the consideration of a specific case. It was decided to procure plans and specifications of a given house and to ascertain by actual bids from a number of reliable contractors its difference in cost when constructed of frame, brick, cement or hollow block. For this purpose a small modern eight room house of good design and excellent arrangement was chosen, the original having been actually built at Beverly Farms, Mass., under the direction of Thorndyke & Kiessling, architects. This house is typical in size, arrangement and cost of thousands of houses which are being erected throughout the East. Mr. Kiessling was commissioned to prepare the plans and specifications necessary for obtaining bids for this house when built with the following types of exterior wall construction, all other details being common to all types:

Description of Various Types of Outer-Wall Construction

Type No. 1—Frame covered with boards and finished with clapboards over building paper; inside surface furred, lathed and plastered.
Type No. 2—Frame covered with boards and finished with shingles over building paper; inside surface furred, lathed and plastered.
Type No. 3—A 10-inch brick wall, i. e., two 4-inch walls tied together with metal ties and separated by a 2-inch air space; inside surface plastered directly on the brickwork.
Type No. 4—A 12-inch solid brick wall, inside surface furred, lathed and plastered.
Type No. 5—Eight-inch hollow terra cotta blocks, stuccoed on the outside and plastered directly on the inside.
Type No. 6—Six-inch hollow terra cotta blocks, finished with a 4-inch brick veneer on the outside and plastered directly on the inside.
Type No. 7—Frame covered with boards and building paper, furred and covered with stucco on Clinton wire cloth; inside surface furred, lathed and plastered.
Type No. 8—Frame covered with boards (building paper omitted) and finished with a 4-inch brick veneer on the outside; inside surface furred, lathed and plastered.
Type No. 9—Frame finished on the outside with a 4-inch brick veneer tied directly to the studding (boarding omitted); inside surface furred, lathed and plastered.

A separate drawing showing the details of each type of outer wall construction was prepared and each was accompanied by a set of complete specifications for the entire house.

Everything about the house, except the outer wall construction, was identical in all nine types and may be briefly covered by the following tables:

Details Common to All Types

A: Foundations—Local stone.
B: Cellar Floor—Finished with 2-inch concrete of Portland cement.
C: Chimney—Faced with brick costing $17.50 per M.
D: Fireplaces—Faced with brick costing $17.50 per M.
E: Plastering—First class "two coat" work
F: Exterior Finish—Cypress.
G: Blinds—White pine.
H: Screens—Copper bronze on white pine frames.
I: Window Frames—Hard pine
J: Floors—Double floors throughout with paper between, except in unfinished attic; Georgia pine upper floors; main hall on first floor of oak.
K: Inside Finish—North Carolina pine.
L: Doors—Washington cedar.
M: Hardware—Bronze finish of ordinary type, costing $60.00 for the job.
N: Wood Mantels—$45.00 each.
O: Conductors—Copper
P: Flashing—Tin.
Q: Electric Fixtures—Costing $80.00.
R: Hot Water Heating—Costing $250.00 complete.
S: Wiring—Costing $68.00
T: Plumbing—Costing $370.00
U: Painting—Exterior and interior; clapboard house $225.00; other houses $130.00.
V: Glazing—Double thick German glass.

Five contractors of well known reputation and experience were then selected. Each was fully advised of the object of this investigation and was asked if he were willing to undertake the preparation of figures which should truthfully set forth, to the best of his ability, the cost (including his profit) of a house to be built within ten miles of Boston according to these plans and specifications. Each was told that we desired to know the exact truth; if, as alleged by some contractors, the cost of a brick house is 25 to 30 per cent more than one of wood, then we wished to know it, as nothing could be gained by an investigation of this kind which was biased or influenced by any favoritism for one type of construction over another.

Each contractor entered into the spirit of the investigation heartily and agreed to figure out the cost fairly, to the best of his ability.

The following are the bids submitted by the five contractors in question:

Comparative Bids

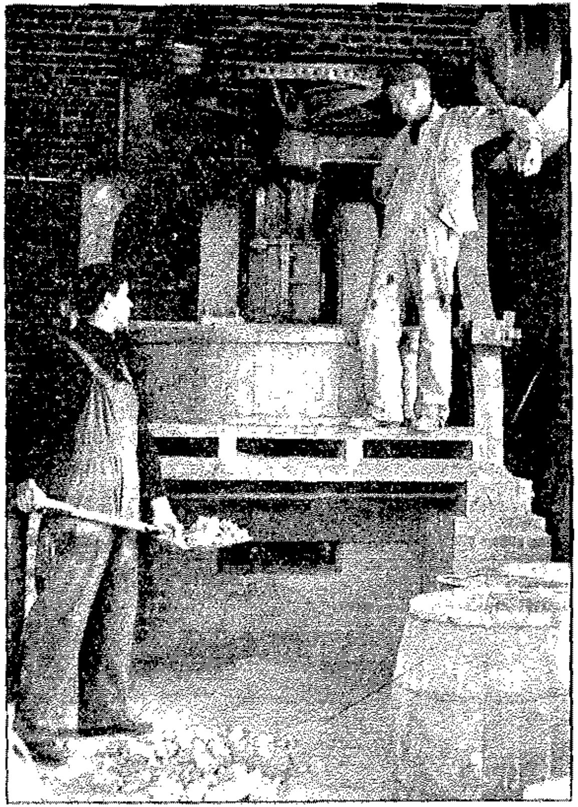
Type No.	1	2	3	4	5	6	7	8	9
Description	Clapboard	Shingle	10-inch Brick Wall, Hollow	12-inch Brick Wall, Solid	Stucco on Hollow Block	Brick Veneer on Hollow Block	Stucco on Frame	Brick Veneer on Boarding	Brick Veneer on Studding
Bid No. 1	$6732		$7572		$7116	$7777	$6857	$7139	$7086
Bid No. 2	6435	6370	6736	7105	6491	6762	6430	6736	6664
Bid No. 3	6992	6786	7118	7418	7179	7238	6847	6970	6805
Bid No. 4	6630		7496	7801	7202	7648	7000	7496	7420
Bid No. 5	7450	7150	7949	8230	7650	7900	7050	7790	7710
Average of Bids	6739	6808	7372	7641	7187	7485	6952	7226	7153

Taking a general average we have the following:

Comparative Bids—Average Figures

Type	Description	Average Bid	Excess Over Clapboards	Percentage Excess Over Clapboards
No. 1	Clapboard	$6759.05		
No. 2	Shingle	6868 80	$108 85	1.6
No. 3	10-inch Brick Wall, Hollow	7372.48	612 51	9 1
No. 4	12 inch Brick Wall, Solid	7611.00	851 05	12.0
No. 5	Stucco on Hollow Block	7187 65	427.70	6.3
No. 6	Brick Veneer on Hollow Block	7483 16	723.31	10 7
No. 7	Stucco on Frame	6952 90	192.95	2.9
No. 8	Brick Veneer on Boarding	7226.14	466 49	6 9
No. 9	Brick Veneer on Studding	7153 98	344 03	5.8

The writer believes that these comparative costs are not unduly favorable to brick, in fact, they are not as favorable to brick as figures which could be obtained under similar conditions in many other cities.



ALFRED
PRESS