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Plaster mold making techniques and their implications for the artist potter

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BOSTON UNIVERSITY
SCHOOL OF FINE AND APPLIED ARTS

Thesis

PLASTER MOLD MAKING TECHNIQUES AND THEIR IMPLICATIONS FOR THE ARTIST POTTER

Submitted by

Russell Joseph Doucette
(A.B., Boston University, 1947)

In Partial Fulfillment of Requirements for the Degree of Master of Fine Arts

1958
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CHAPTER I
THE PROBLEM

1. Statement of the Problem

Should the studio potter use plaster molds or not? This question continues to be a subject for caustic debate among art potters. It seems all potters have very strong, but not always realistic opinions in regard to this topic. The craftsman often arrives at his views on some sort of emotional basis. A great number of our studio potters believe that all ware should be formed by hand or on the potter’s wheel. They are apt to believe that the mold made article is uncreative, of little value, and even unethical. Other potters who use and understand molds, realise their possibilities and will argue strongly in favor of them. So, the controversy grows almost to becoming two separate traditions. The writer believes these differences are not real. It appears that investigations and evaluations of these arguments conducted on an unemotional basis could help to reconcile them. The problem then is to induce potters to understand all the implications of the mold as a method of production and to assess it for its true value.

2. Methods Employed

The two tools used. -- It was determined that the
solution to this problem depended to a considerable degree on informing the potter on the uses of plaster molds in the studio. A better knowledge of this work would breed a tolerance for the mold. In an effort to accomplish this, the writer decided to compile a manual of plaster methods for the studio potter. To help further in the investigation, the writer constructed an inquiry form which was sent to the leading potters in the United States and Canada. Copies of the inquiry form and the covering letter are in the appendix.

3. The Discussion of the Inquiry Form

The inquiry form was sent to fifty artist potters, ranging in locations from Massachusetts to California, and from Quebec to Texas. Forty potters answered giving an 80 per cent return. Although all the respondents listed themselves as studio potters, many indicated that they were professors of ceramics or heads of pottery departments in crafts centers as well. The replies were generously augmented with poignant letters, notes, and comments. John Emery, the Chairman of the New Hampshire Potters' Guild, made a special trip to Boston to discuss his reactions. In subsequent interviews, the writer was able to discuss most of the replies with the New England respondents in person. These interviews and the opinions from the inquiry forms provided a wealth of important information. The following pages of this section contain
the results of the inquiry form as well as the author's interpretations of them.

Table 1. Geographical Distribution of the Replies to the Inquiry Form

<table>
<thead>
<tr>
<th>Geographical Division</th>
<th>Number of Replies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>California</td>
<td>1</td>
</tr>
<tr>
<td>Connecticut</td>
<td>2</td>
</tr>
<tr>
<td>Florida</td>
<td>1</td>
</tr>
<tr>
<td>Indiana</td>
<td>2</td>
</tr>
<tr>
<td>Kansas</td>
<td>1</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>14</td>
</tr>
<tr>
<td>Michigan</td>
<td>2</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>5</td>
</tr>
<tr>
<td>New York</td>
<td>5</td>
</tr>
<tr>
<td>Ohio</td>
<td>2</td>
</tr>
<tr>
<td>Quebec (Canada)</td>
<td>1</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>2</td>
</tr>
<tr>
<td>Texas</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

The creative implications.-- In table 2 there are ten statements which the potters were asked to check if they believed the statements to be usually true. Probably, the most significant reaction to the whole inquiry form appears in this table. All the respondents indicated that they agreed with statement 2, that creativity depends more on the craftsman than on the method used. It would seem to follow that a craftsman who had mastered plaster mold work should be able to create with it.
The second highest percentage was for statement 9, indicating that the potter could use the limitations of the mold to his advantage. Most potters appear to believe that the limitations of the mold could be an advantage in creating aesthetic ware. Statements 5, 6, and 10, demonstrated that most potters felt that mold work is not basically uncreative, it is not philosophically wrong, and it does not have a detrimental effect on creativity.

Table 2. The Percentages of Responding Potters Who Indicated "True" to the Statements on the Creative Implications

<table>
<thead>
<tr>
<th>Statements</th>
<th>Percentage Indicating &quot;True&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>1. The studio potter often associates mold use with the hobbyist.</td>
<td>19</td>
</tr>
<tr>
<td>2. Creativity depends more on the craftsman than on the method used.</td>
<td>100</td>
</tr>
<tr>
<td>3. Ideas conceived for clay lose something when plaster is involved in the process of execution.</td>
<td>45</td>
</tr>
<tr>
<td>4. Mold making may set up aesthetic barriers.</td>
<td>30</td>
</tr>
<tr>
<td>5. Plaster work is basically uncreative.</td>
<td>12.5</td>
</tr>
<tr>
<td>6. Molds are philosophically wrong for the potter.</td>
<td>15</td>
</tr>
<tr>
<td>7. When the potter thinks of molds he often thinks of those made by someone other than the user.</td>
<td>25</td>
</tr>
<tr>
<td>8. Reshaping the cast would make it more acceptable aesthetically.</td>
<td>12.5</td>
</tr>
<tr>
<td>9. The potter could use mold seams and other natural limitations of the mold to his advantage.</td>
<td>67.5</td>
</tr>
<tr>
<td>10. Mold work has a detrimental effect on creativity.</td>
<td>10</td>
</tr>
</tbody>
</table>
An appreciable number signified statements 3 and 4 to be true. While this number was in the minority, it shows that many craftsmen believe that ideas conceived for clay do lose something through the plaster process, and that mold making might set up aesthetic barriers. This conclusion is drawn probably because plaster mold work is very exacting and time consuming. The intermediate plaster step between the conception and the finished piece may interfere with the free and spontaneous qualities contemporary artists value so highly. The writer believes that the 19 per cent who agreed that the studio potter associates mold use with the hobbyist is a sufficiently large percentage to cast a psychological shadow on the use of molds for the professional craftsman.

The technical implications.-- To investigate the technical implications that deal with the attitudes of the potter towards plaster mold work, the respondents were asked to indicate the statements they believed to be generally true. The results are in table 3. Less than one half of the respondents agreed that plaster is a mechanical medium. This mechanical quality that plaster is often considered to have, is one of the factors that deters artists psychologically in this medium. Apparently, the belief is not as wide-spread as is usually assumed. According to statement 2, only 30 per cent believe plaster mold work leads to tightness, another cardinal reason often
advanced against mold work. However, 45 per cent agreed that the craftsman avoids plaster mold work because it is unfamiliar to him, and 62.5 per cent admitted that the average potter does not know enough about it. These self evaluations are significant to the study, as they come close to agreeing with the writer's concepts on these issues. The 32.5 per cent who indicated that technical knowledge of plaster work is often difficult to obtain, was not a disappointingly low percentage to the author.

Table 3. The Percentages of the Responding Potters Who Indicated "True" to the Statements on the Technical Implications

<table>
<thead>
<tr>
<th>Statements</th>
<th>Percentage Indicating &quot;True&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Plaster is a mechanical medium......</td>
<td>42.5</td>
</tr>
<tr>
<td>2. The limitations of plaster lead to &quot;tightness&quot;...</td>
<td>30</td>
</tr>
<tr>
<td>3. The craftsman avoids plaster work because it is unfamiliar to him.....</td>
<td>45</td>
</tr>
<tr>
<td>4. The average potter does not know enough about mold work...............</td>
<td>62.5</td>
</tr>
<tr>
<td>5. Technical knowledge of plaster work is often difficult to obtain......</td>
<td>32.5</td>
</tr>
</tbody>
</table>

It is believed that most potters are unaware of how little is written about the more advanced problems of plaster mold work. As evidence of this, many respondents made comments about their personal limitations in this area. In general, it seems apparent they know so little
about the plaster mold work that they do not question what information is or is not available.

The mass production implications.-- Table 4 carries the responding potters' reactions to the mass production implications of plaster mold work. The writer believes that limited mass production can be a very vital force in bringing good design to many people who otherwise could not have it. Of the potters asked, 87.5 per cent concurred that good design is possible in limited mass production, and 65 per cent agreed that through limited mass production good design could be brought to many people. That Scandanavian cast ware is good pottery was accepted by 87.5 per cent. Since this ware is the product of the mold, the percentage of approval is encouraging. Only 10 per cent felt that an item that is duplicated loses its quality, but 52.5 per cent felt that the mold produced item is associated with cheap articles. This is probably due to the fact that much inferior cast ware is always present in gift stores selling cheap items. Of course, there is much poor hand-made ware about, but fortunately it seldom reaches the market.

The necessary knowledge.-- In this section the writer attempted to determine the importance the potters placed on the various mold techniques. Table 5 shows these reactions. A large majority indicated that the drain mold was either important or very important. This
is the mold that is most familiar to them. It is however, the least imaginative and the most sadly-limited of all the molds. On the three template methods, about half indicated that they are either very important or important, while the other half signified the methods to be unimportant. In most instances, the respondents finding the template methods unimportant appear to be those who have not experimented with these methods.

Table 4. The Percentages of the Responding Potters Who Indicated "True" to the Statements on the Mass Production Implications

<table>
<thead>
<tr>
<th>Statements</th>
<th>Percentage Indicating &quot;True&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. By using limited mass production methods, the studio potter can bring good design to many people.</td>
<td>85</td>
</tr>
<tr>
<td>2. We can have good design in limited mass production.</td>
<td>87.5</td>
</tr>
<tr>
<td>3. An item that is duplicated loses its quality.</td>
<td>10</td>
</tr>
<tr>
<td>4. The mold produced item is apt to be associated with cheap articles.</td>
<td>52.5</td>
</tr>
<tr>
<td>5. The Scandinavian cast ware we see in exhibitions usually is good pottery.</td>
<td>67.5</td>
</tr>
</tbody>
</table>

It was surprising to learn that about half of the potters indicated that jiggering, and the block and case, were important, as these are very mechanical processes. The majority agreed that the press molds and the drape molds were either important or very important. This is
a natural reaction as these molds allow for an appreciable share of artistic license. Also, these molds are often easy to make and use. The sprig mold did not get a majority, probably because many of the craftsmen do not know what it is. A little more than half regarded the hand working of plaster as either important or very important. This result was surprising and encouraging to the writer, as he believes very little hand working in plaster is done by potters. This may indicate that the prejudices against the material are beginning to disappear.

Table 5. The Importance of Various Plaster Techniques as Rated by the Responding Potters - expressed in percentages

<table>
<thead>
<tr>
<th>Technique</th>
<th>Most Important</th>
<th>Important</th>
<th>Unimportant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drain molds</td>
<td>50</td>
<td>27.5</td>
<td>22.5</td>
</tr>
<tr>
<td>2. The pin template</td>
<td>7.5</td>
<td>42.5</td>
<td>50</td>
</tr>
<tr>
<td>3. The horizontal template</td>
<td>5</td>
<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>4. The free form template</td>
<td>7.5</td>
<td>32.5</td>
<td>60</td>
</tr>
<tr>
<td>5. Hollow and solid cast molds</td>
<td>32.5</td>
<td>40</td>
<td>27.5</td>
</tr>
<tr>
<td>6. Jiggering.</td>
<td>17.5</td>
<td>32.5</td>
<td>50</td>
</tr>
<tr>
<td>7. The block and case</td>
<td>20</td>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>8. Press molds</td>
<td>25</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>9. Sprig molds</td>
<td>12.5</td>
<td>30</td>
<td>57</td>
</tr>
<tr>
<td>10. Drape molds</td>
<td>30</td>
<td>37.5</td>
<td>32.5</td>
</tr>
<tr>
<td>11. The hand working of plaster</td>
<td>30</td>
<td>23</td>
<td>47.5</td>
</tr>
</tbody>
</table>

The request for additional information.— Section IV of the inquiry form asked for additional materials that the
respondents used or had available. Specifically requested were course outlines, bibliographies, technical publications, or any other aids deemed to be useful. Nothing new to the writer was submitted. Dorothy Perkins' articles, and the books by John Kenny, and F.H. Norton were suggested. Dorothy Perkins personally suggested the U.S. Gypsum publications. All these works already were surveyed by the author. These facts strengthen the conviction that there is not adequate literature on the subject. Lucia Comins stated in a letter accompanying her reply, that a handbook on plaster mold work written in non-technical language would be most helpful to the studio potter.

Also, in Section IV a copy of the summary of the study was offered to the persons completing the inquiry form if they desired it. For the most part, the potters accepted the inquiry form with great enthusiasm and all requested a copy of the results. This attitude demonstrates that the craftsmen are deeply concerned about this matter, and are anxious to have the reactions of their fellow potters to this problem.

4. Conclusion of the Inquiry Form

The inquiry form concluded with a request for additional comments. These came in floods from many of the respondents, taking the form of annotations, comments,
and long letters. A few potters wished to remain purists, and would have nothing to do with anything but the hand making of ware. The majority accepted the use of the mold as a valid process within limitations. These limits of employment varied from very restricted use to a very wide use. Some use only one mold technique, while others utilize all the mold techniques. The varied reactions are well illustrated by the following quotations. These were taken from the comments accompanying the returns.

"I am very interested in the research you are doing. I think the subject, with others of the same type, is becoming a problem that more people should help to solve for society's benefit."
Gaetan Beaudin
North Hatley, Quebec

"Free form dishes and the like are best produced with the aid of plaster - they are free and creative. I believe most potters know about molds and use same."
J. David Brodu
Head of the Art Department
Endicott College, Beverly
Massachusetts

"I believe however in the freedom we ought to give to any artist to think or feel like a Pre-Raphaelite or a Picasso as he chooses. The great wrong is to restrict."
John Butler
Owner
Ossipee Pottery, Ossipee
New Hampshire

"Look at the best pottery from Peru and China. Both figurines and functional vessels; many of them are mold made but how beautiful!"
Fong Chow
Far Eastern Department
Metropolitan Museum of New York
"I have a great deal of respect for the designer potter who works in the casting medium. I feel that there is a great deal of unjustified snobbery among studio potters about wheel thrown forms."

John T. Emery
Chairman of the New Hampshire Potters' Guild

"All our items are cast. Twelve items in the last ten years have been in various museums. Our cast fruit bowl won the $100 Harper Furnace Award in the 15th Ceramic National at Syracuse Museum."

Oliver W. Greene, III
Kingston Kilns
Kingston, Rhode Island

"My thoughts on plaster of Paris and its uses for the potter are set forth in my book on pottery making at the beginning of Chapter IV. Plaster of Paris is a tool; something that a craftsman can use to produce things in other materials. It is also a material with which a craftsman may create. I cannot see how rules could be established concerning the ways or the extent to which the craftsman may use it.

The artist makes use of any tool that he needs. If he is a true artist he uses the tools creatively and the results are good. I believe there is hardly any tool which has not been misused at some time by some people, but such misuse would be no reason for attempting to limit the use of the tool."

John B. Kenny
Author of "Complete Book of Pottery Making"

"Thanks for the enclosed inquiry and questionnaire. It is encouraging to know that someone is interested in bringing plaster work back to respectable esteem from its decades of banishment by Upper-Bohemian snobs."

Betse Lewis
Lewis Workshop Studios
Warren, Michigan

"I doubt if the process of mold making itself is as much of an aesthetic barrier as the potter's lack of knowledge and inexperience with the process. A potter is not likely to use plaster if he is not skilled in its use."

Karl Martz
Asst. Professor of Ceramics
Indiana University
"Model and mold-making should, I believe, be a part of every studio potter's background of experience and knowledge, providing a broader basis for the development and expression of his ideas. To overlook the many possibilities offered by these methods is to limit one's self."

Dr. Dorothy W. Perkins
Ceramic Department
Rhode Island School of Design

5. Summary of the Findings of the Inquiry Form

There are some very important and pertinent facts emerging from this inquiry. The fact that all the potters felt that creativity depends more on the craftsman than on the method employed, appears to indicate that the craftsman can use the mold if he desires. Other statements on the creative implications seem to demonstrate that while the potter may be categorically opposed to mold work, his reasons for this aversion are not really on aesthetic bases. According to the potters' own evaluations, it appears that the fear of the mechanical aspects of plaster mold work and the lack of knowledge of the techniques, are the real reasons behind the aversion. Refer to tables 2 through 5. The little irritations caused by the hobbyist's use of molds, the association of cheap ware with the mold, and the preciousness of the one of a kind article, cloud this issue. However, most of the potters replying apparently did not think these were valid reasons for restricting the use of molds.

The fact that the majority did not indicate that
technical knowledge in this field is hard to find, does not indicate that the contrary is true. It is the writer's contention that the craftsman has done so little research in this field, that he is unaware of the dearth of information. Whenever the author challenged those who claimed information was readily available, he found that the potter had few or no sources to offer. Also, the preliminary investigations of the writer uncovered very limited source material.

Recommendations.-- It seems evident that a manual on plaster mold work for the artist potter is necessary, and the writer offers such a manual in the following chapters. The remainder of this chapter will justify the manual and explain its scope.

In the returned inquiry forms, more information is available than could be employed in this thesis. Possibly, additional studies could be made from it. For instance, it might be interesting to break down these replies into groups that teach, make molds, or those who are studio potters only. Some interesting psychological comparisons could be made. Also, a follow up study might be made to investigate the reasoning behind many of these statements. Some of the statements in the inquiry form suggest subjects for theses and would make interesting investigations.
6. The Discussion of the Manual

Justification for the manual.-- Upon preliminary investigations, it was established that the studio potter found it difficult to locate information on mold work. Also, there were no incentives actively encouraging him to try the plaster mold possibilities. The author determined many reasons to justify the composition of a plaster manual for the studio potter. The following are the most important ones:

1. The material is not now published in book or outline form.
2. The most dependable published material is in magazines, covering only one method at a time. Often, an involved procedure is carried over a two or three month span, making it difficult to maintain continuity of thought.
3. The available magazine articles may be difficult for the potter to procure.
4. Often, the literature does not cover the best methods, is incomplete, or hit or miss in presentation.
5. Ceramics courses designed for the artist potter usually contain little training in mold work.
6. Until very recently, mold making was considered entirely to be in the "trade secret" category, in industry. The knowledge was well guarded. In
most potteries this condition still exists. People who are specialists in mold work are not willing to share their knowledge.

7. It would seem that if the potter had this knowledge, he could produce molds that would be suitable to his production and not to industry.

8. The editor of Ceramics Monthly magazine made the following statement when introducing the Dorothy Perkins' articles: "When the series has been completed, the reader will have acquired the most detailed and authoritative information available on the subject." Dr Perkins' articles are excellent, but they do not cover all the methods and do have the disadvantage of not being complete in any one publication. It is evident that what the editor appears to believe is the best available, is not complete enough for the studio potter.

It was decided that since a manual was needed it could best be produced by surveying the literature on the subject, interviewing authorities in the field, and visiting studios as well as commercial potteries. Also, courses in mold work offered by colleges were studied, particularly those offered by Alfred University, The Rhode Island School of Design, and the Massachusetts School of Art. The writer

drew on his own education here and in Australia, as well as on his teaching experience in this field. This manual has been compiled and presented in the following chapters of this thesis.

The scope of the manual.-- This manual covers specific areas of mold work. The work in this thesis has the following limitations: It is not intended to be a text on casting ceramic ware. The methods of making and pouring clay slip as well as the handling of the clay casts are not an important consideration here. It does not deal with the problems of industry or those of the hobbyist, but is concerned chiefly with the artist potter. It is interested in the methods capable of producing aesthetic ware only. Finally, the paper does not claim to treat fully the subject of casting ceramic sculpture, which the writer feels should be treated completely in a paper devoted to the casting of sculpture in general.

7. Discussion of the Related Literature

As explained in the justification of this paper, the literature on this subject is as yet, incomplete. There are a few periodicals that are helpful. These are Ceramics Monthly, Ceramic Age, Ceramic Industry, and the Bulletins of the American Ceramic Society. The first mentioned continues to be very useful to the artist potter. The others become more technical and industrial in nature, particularly in the last few years. Also, the United
States Gypsum Company has issued a few pamphlets that are good. Among the books are those written by John Kenny, F.H. Norton, Horace Jenkins, and C.F. Binns. While her writings do not appear in books, Dorothy Perkins is one of the best informed authors on the subject. Complete references for these sources are listed in the bibliography.

In this work, a discussion of the related literature has been added to the end of each chapter division. This was done to maintain continuity of thought for the reader. The literature concerning specific procedures is discussed in conjunction with these procedures.
CHAPTER II
GENERAL NOTES AND SIMPLE PLASTER MOLD WORK

Part One: Some General Notes

1. The Nature of Plaster

To make plaster, Gypsum rock is roasted in a calcining kiln. Part of the water of crystallization is driven off, giving Gypsum plaster as the product. The action is illustrated by the formula: \( \frac{1}{2} \text{CaSO}_4 \cdot 2\text{H}_2\text{O} \rightarrow \text{CaSO}_4 \cdot \text{H}_2\text{O} \cdot \frac{1}{2}\text{H}_2\text{O} \). When water is added to plaster, the water is absorbed to produce a substance similar to the rock it came from. The formula is reversed. There are many types of plasters available. Some are too hard and too non-absorbent for mold use. A special plaster, "pottery plaster", is made for this purpose. Such plasters as molding plaster, superfine casting plaster and other soft plasters may be easier to procure and will serve when pottery plaster is unavailable. The plasters sold under trade names such as Hydrocal, Hydrostone, Ultracal and others, have great strength and can be used for models or castings requiring strength but not absorbency. The lack of absorbency is valuable in model work because it makes the job of sizing much easier. Still other plasters are available for

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specific purposes but are thoroughly unsatisfactory for ceramic work.

Procedures.-- Outlined below are some basic procedures for working with plaster and its products. These may be repeated again, in part, under specific problems for the sake of emphasis and clarity.

2. Mixing the Plaster

The way plaster is mixed has much to do with successful mold making. The amount of plaster necessary to cast a particular shape must be determined before mixing is begun. A convenient method which is widely employed is suggested. It has been determined that better molds result when the water content is kept low. The most generally accepted mix is in a proportion of 2.75 pounds of plaster to one quart of water. This combination will yield 81 cubic inches of mold consistency plaster. Knowing these facts, the potter can determine the amount of plaster required for any given volume desired. Other proportions are easily worked out, if the craftsman wishes to work in larger or smaller quantities.

After the plaster and water are measured out, the plaster is sifted through the fingers over the surface of the water, allowing the water enough time to absorb the plaster. When this operation is completed, the mixture is allowed to set for two to three minutes. This is called
the "Slaking" period. Now, the plaster is stirred for a few minutes until the fingers leave a faint trail when they are drawn across the surface of the mixture. The container should now be jarred to release any trapped air bubbles. These in turn are scooped out of the mix. The plaster is then ready for pouring. The pouring should be done slowly but steadily to prevent the development of air bubbles. The mold is jarred to release any air bubbles from the face of the model, and the plaster is allowed about twenty minutes to set. It will take several days for the plaster to acquire its full strength and to loose all its free water.

The plaster can be mixed by hand or mechanically. In the Studio section of this Chapter, a rig made from an electric drill is described for mechanical mixing of the plaster.

The slow and fast mix.-- In Chapter III of this paper, the writer refers to a slow and a fast mix. The more plaster is stirred, the faster it sets. Considerable stirring then will produce a fast mix. However, the set can be delayed by only stirring the plaster enough to keep it in suspension, thus making a slow mix. This is a very useful condition when one wants to work for some time with the mix in a plastic state, the so-called period of plasticity. The setting time of plaster may be hastened by adding salt (NaCl), or by using hot water.
The setting time may be delayed by introducing other additives, such as vinegar. Cold water can be used to delay the action. These procedures usually are not recommended for they cause other characteristics to develop in the mix.

3. Separators

**Stearic acid.**—If plaster is to be cast on plaster, a separator is necessary to prevent the second cast from adhering to the first. Many materials are used for this purpose. If the cast will never be used for clay casting work, a mixture of one part stearic acid to three parts kerosene makes an excellent separator. A very thin coat of this mixture is applied with a brush to the parting surface of the plaster. It is almost infallible.

**English Crown soap.**—For the separation of surfaces that will later be used in contact with clay, English Crown soap is the standard for general use. About one part soap is added to two parts of boiling water (by weight). This solution is applied to the dampened surface of the plaster and whipped into a lather and then wiped off. The procedure is repeated until the surface is sized and a drop of water on it does not penetrate the plaster. When the surface is adequately sized, it has a slight sheen on it. Adding the soap produces an insoluble calcium oleate with the surface of the plaster. For this reason, it should never be placed on a surface that is to

Presents a very thorough discussion of the nature of plaster and its relationship to the ceramic industry.


Chapter IV contains some good notes about the mixing of plaster.


This article discusses the slow and fast mix, as well as, other mixing and pouring data.


A concise discussion of plaster separators and their specific uses.

Part Two: The Materials and Equipment

Needed for Plaster Work in the Studio

The mold shop.-- In potteries where extensive mold work is constantly in progress, much space and equipment is necessary. The United States Gypsum Company suggests how such a shop should be set up. However, a much more modest arrangement would suffice for the studio potter. It is desirable that plaster work be kept isolated from the clay work. The materials necessary are not expensive, and most of the equipment can be improvised.

The casting bench.-- A good work bench is necessary. This might be made utilizing any heavy table or bench. The top must be level, smooth and waterproof. A slab of marble, slate, plate glass or treated hardboard may be used. Polished granite surface plates are considered to make the best available surface. Figure 2-1 shows the method of preparing the bench top.

The mixer.-- While plaster can be mixed by hand, it is more convenient to use a mechanical mixer. A quarter inch electric drill can be adapted for this purpose.


2/Ibid., p.9.

A rubber disc is mounted on a quarter inch rod of a suitable length. This disc when rotated will stir the plaster and will do no damage if it strikes the side of the mixing container. The drill should be connected to a ground to avoid a dangerous shock. See Figure 2-2 below for a sketch of this arrangement.

![Diagram](image)

**Figure 2-1. The Casting Bench Top**

![Diagram](image)

**Figure 2-2. A Plaster Mixer**
The sink.—A sink with running hot and cold water is necessary. It should be provided with a plaster trap and a removable stand pipe. (The writer has seen a tin can opened at both ends used effectively as a stand pipe). If the potter is careful, the stand pipe alone would provide protection against plaster setting in the drain pipes. Figure 2-3 illustrates the sink arrangement.

A wash barrel.—A very useful adjunct to the plaster sink is a washing barrel. For this purpose, a 55 gallon drum with an open top is very useful. The drum is half filled with water and is used to rinse the plaster out of the mixing containers. This takes care of most of the live plaster, preventing it from ever getting into the drains. When this barrel becomes half full of dead plaster solution, the free water is syphoned off, and the solid can be disposed of as rubbish.

Figure 2-3. The Plaster Sink
**Containers.**-- A number of mixing containers from small dish pan size to wash tub size is useful. These utensils are best when porcelain coated. Soft plastic containers are preferred by some workers, while professionals often use specially made brass buckets and bowls. It is important that the containers be easily cleaned.

**Miscellaneous equipment.**-- The following is a list of additional useful articles for the shop. They need not be laboratory-type equipment but rather hardware or kitchen items:

1. One set of pound scales; at least 25 pound capacity
2. One quart measure
3. A few natural sponges of various sizes
4. A shaving brush for applying soap
5. A large cellulose sponge
6. A bristle scrub brush
7. A selection of plaster turning tools and scrapers
8. An old saw with large teeth and wide set
9. Spatulas and spoons of various sizes
10. Carving tools as needed
11. Angle plates and cottles
12. Cutting and filing equipment for template making
13. Large rubber bands (made from automobile inner tubes) and heavy cord for securing mold parts together.
Expendable materials. -- The following is a list of materials needed:

1. A supply of pottery or grade A molding plaster
2. Hydrocal plaster as needed
3. One or two pounds of stearic acid and one gallon of kerosene
4. One or two pounds of English Crown soap
5. A supply of sandpaper and wet or dry abrasive paper of various grit sizes
6. Scrap boards, plywood, linoleum, sheet metal, and/or roofing paper for making cottaes, templates and mold boxes.

All the equipment and materials above should be purchased or procured as needed as it is not necessary to have all the items at one time. Plaster, especially, should be purchased in quantities that will be adequate for immediate use. Plaster must be stored off the floor in a dry place.

The related literature. -- John Kenny explains some of the equipment needed for plaster work in Chapter IV of his book. The references in foot notes 1 and 3 page 24 contain the best references available. Although little is written on this aspect of plaster work, the beginner will be able to adjust to his own situation with a little help from one or two of the above references.

Part Three: A Basic Plaster Problem

Making a Wheel Bat

1. The Cottle Form

Basic procedures.-- The basic procedures for the proper use of plaster in the studio can be learned by casting a simple form such as a wheel bat. This bat will be ten inches in diameter and one and one half inches thick. A circle ten inches in diameter is cut from a piece of plywood to form a base for the mold form. A strip of linoleum is wrapped around the plywood to serve as a retainer for the poured plaster. This is called a cottle and may be made of sheet metal or heavily tarred building paper. The cottle is secured with rubber bands, and carefully bound with heavy string. All seams are caulked with soft clay to prevent leaks. The plywood is coated with grease or soap. Figure 2-4 illustrates the method of assembly. The form is now ready for use.

![Diagram of Cottle Assembly](image)

Figure 2-4. The Cottle Assembly for Making a Wheel Bat.
2. Calculating the Plaster Required

The formula used.-- The wheel bat to be produced here is a low cylinder in respect to its geometric shape. Therefore, we must use the formula for the area of a cylinder, which is $\pi r^2 h$. In this case $w = 3.14$, $r = 0.5$ inches, and $h = 1\frac{1}{2}$ inches. Substituting in the formula, we have the following result which is the required amount of plaster in cubic inches: $3.14 \times 25 \times 1 \frac{1}{2} = 117.75$ or approximately 118 cubic inches. The best ratio of water to plaster for mold making is one quart of water to 2.75 pounds of dry plaster, which when mixed will yield 81 cubic inches of cast plaster. This combination makes a convenient unit for calculating the plaster and water necessary for any plaster mold project. To determine how many units are needed, divide the volume of the desired cast by the volume of one unit of plaster. In this case, divide 118 by 81, which gives 1.45 or approximately 1\frac{1}{2} units. When rounding off, it is best to do so in the manner which will add more plaster. It is better to have a little too much plaster than too little. In this respect, for easier calculations it is safe to consider this unit to yield 80 cubic inches. Since 1\frac{1}{2} units are required, it is necessary to measure out 1\frac{1}{2} quarts of water and 4.125 (4 1/8) pounds of plaster.

Weigh 4 1/8 pounds of plaster. Place 1\frac{1}{2} quarts of water into a clean container large enough to permit mixing the batch. The water is best at about room temperature.
Either cold or hot water has undesirable effects.

3. Mixing and Pouring the Plaster

The plaster is always added to the water. Better results are usually attained if the dry plaster is first sieved through a 50 mesh sieve to break up any lumps. The plaster is sifted through the fingers slowly, over the surface of the water, allowing ample time for the plaster to be absorbed by the water, or a lumpy mass will result. The plaster must now be allowed to soak without agitation for two or three minutes. This is called slaking, and is very important to the smoothness of the mix. Now, the plaster can be mixed by hand for about three minutes or until the mix begins to feel creamy and leaves a slight imprint when the fingers are drawn across its surface. The mixing can also be done with the electric mixer described in Chapter I. Every attempt should be made to remove the bubbles from the mix.

Pouring the plaster.--The plaster is now poured slowly and without splashing. If a helper is present, pour the plaster into the cottle over the helper's hand and thus prevent splashing and the formation of air bubbles. The cast is checked for leaks. If small ones occur, they can be stopped with a wad of soft clay or dry plaster applied to the outside of the cottle. The cast is gently vibrated to release any air bubbles at the surface. The mixing bowl must be washed immediately in
a tub of water. Washing the bowl in the sink would clog the drain with setting plaster.

4. Removing and Finishing the Cast

About twenty minutes after pouring the plaster will set releasing considerable heat. When the peak of this heat has passed, the cottle may be removed. In an hour the casting may be removed from the base. Any scraping or finishing should be done at this time as the plaster is quite soft and easily cut. Sharp edges should be bevelled to prevent chipping and to aid in handling.

Drying time varies with the heat and humidity. Plaster can stand drying temperatures up to 145°F while it contains water, but temperatures over 120°F will burn the cast after it has lost its moisture. Plaster should be dried with proper support or warping may result. If the worker has mastered all these steps, he has learned the basic principles of plaster work.

5. The Related Literature


Presents an excellent discussion of a basic plaster problem at the beginning of Chapter XIX.


Discusses simple plaster problems in Chapter IV.

\[1/J.J. Svec, \text{(Editor), Pottery Production Processes, Industrial Publications, Inc., Chicago, 1946, p.12.}\]
Part Four: Making a One Piece Mold

Uses and limitations.-- This mold is probably the most widely used of all molds. It is suitable for making cups, bowls, flower pots, tumblers and vases where the greatest diameter is at the top, and where no undercuts prevent the cast from dropping out of the mold. Also, as in all drain molds, the inside shape follows the outside shape. A high foot would show as a channel on the inside of the cast.

The model.-- The model for a one piece plaster mold could be made from a variety of materials. For our purpose we shall make a bowl shape of solid clay. The model is wheel thrown and formed upside down on two concentric rings; the first one is larger than the model, and the second ring is larger than the first ring to simplify the process of casting the mold. Figure 2-5 will clarify this arrangement. The whole complex is thrown from one lump of clay. The wall of the lower ring should be vertical-sided, and will serve to hold the cottle in place. The upper ring should have its wall tapered slightly towards the bowl form to insure easy release from the mold. The upper ring will form the trim shelf in the mold. When the clay form becomes leather hard, it may be tooled to the exact shape desired.

Pouring the mold.-- The mold can be made directly on the wheel head, or the model may be moved to the casting table. The cottle is wrapped around the model, tied
Figure 2-5. The Clay Model

Figure 2-6. The Cottle Arrangement

Figure 2-7. The Mold
securely, and all the joints are sealed with soft clay. The cottele must be at least $1\frac{1}{2}$ inches above the model to assure the minimum depth of plaster over the model. The side walls of the mold must be at least one inch thick.

As indicated in the previous chapter, the proper amounts of plaster and water are calculated, mixed and poured into the cottele. The cottele is removed after the plaster has set. The mold is finished and set aside to dry for several days before using. Figures 2-6 and 2-7 illustrate the cottele arrangement and the finished mold respectively.

The related literature.-- This type of problem is well presented in John Kenny's book mentioned earlier in this chapter. However, almost all general text books on ceramics treat this kind of problem as part of their plaster work presentation. Some good references are as follows:


CHAPTER III
PRODUCTION OF MODELS AND MOLDS

Part One: The Pin Template

1. The Design of the Template Jig

Uses and limitations.-- This machine is used for making circular models for drain cast molds. It is limited to the making of cups, vases, bowls and similar shapes where the greatest diameter is at the lip. Shallow bowls and plates are best made from solid cast molds. The solid cast mold can be made with the aid of the pin template and will be discussed separately. Rather precise results are obtainable with a studio-made jig, although accuracies to .005 inch are possible with professional equipment. Such tolerances are seldom necessary for the studio potter. The more accurate equipment is usually reserved for industrial tooling of molds and models.

Components of the jig.-- The jig is made up of six important parts:

1. The base
2. The pin
3. The sled

1/United States Gypsum Company, Industrial Sales Division, Industrial Tooling with Hydrocal Gypsum Cements, IGL Bulletin (undated) number ITT-100-D, Chicago.

-36-
4. The template
5. The template backing
6. The sled to pin link

Each of these parts will be considered separately. The drawings, Figures 3-1 through Figures 3-3 on page 40 will aid in the understanding of the instructions.

The base.-- The base may be made of three quarter inch plywood, a metal plate or a table top. An iron plate is not satisfactory because of the rusting problem. Brass, copper or aluminium would be excellent metals but very expensive. A suitable size for use in the studio is about 16 inches by 16 inches. A hole is drilled in the center to accept the pin. If a plywood base is used, a counter-sunk hole on the underside is necessary to accommodate the pin nut. The base will then set flat on the table. The hole can be tapped in a metal base and the threaded pin screwed into it.

The pin.-- The pin may be fashioned from a bolt, one quarter to three eighths of an inch in diameter and six to eight inches long. The head is cut off the bolt, and the head end is filed down or turned down on the lathe until it is one eighth inch in diameter and three eighths of an inch down the shank. The threaded end of the bolt is now affixed to the base as indicated in the diagram. It is

Refer to Figures 3-1 through 3-3.
imperative that the pin be rigid when set in the base. If a wooden base is used, several coats of shellac or another good sealer should be applied to prevent warping and deteriorating.

The sled.-- The sled is made of pine or three-quarter-inch plywood. The length of the arm must be a little less than half the diameter of the base. To form the sled, two pieces of plywood are fastened at right angles. One piece about eight inches square forms the arm. A segment is cut out of the arm to permit the arm to revolve around the model. Another piece of plywood about eight inches by eight inches makes the runner.

The template.-- The template is cut from sheet metal. Large motor oil cans provide metal of approximately the correct gauge (26-30 gauge) and size. One half the cross section drawing of the piece is traced onto the metal. Also, the profile of the trim shelf and the cottle support shelf is drawn on the metal, if this is for a one piece drain cast mold. For a solid cast mold only the cottle support shelf is necessary. However, two templates, one each of the inside and outside profiles are necessary for the solid cast mold. The templates are cut out with tin snips. The cutting edge must be filed and sanded smooth because minor imperfections on the template are very

1/Refer to Figures 3-1 through 3-3.
noticeable on the model. Smoothness of the edge may be tested by running the thumb nail along its surface. It is also necessary to cut off a piece of the template one half the diameter of the pin, or the model will be larger than the drawing by the diameter of the pin.

The template backing.-- The template is now traced onto one quarter inch plywood backing. The plywood is cut in such a way that its leading edge is about one quarter inch behind the leading edge of the template. The template is tacked to the plywood with number two tacks and is ready to be attached to the sled. The plywood backing serves as a stiffener for the template and a means of attachment for the template to the sled.

The sled to pin link.-- To join the sled to the pin, a link can be made from a piece of light strap iron bent at a right angle. Corner re-enforcing angles work well for this purpose. This angle is attached to the pin end of the sled arm. A one eighth inch hole is drilled, one quarter inch away from the sled end of the link to compensate for the thickness of the plywood template backing. This distance is important because if it were not done this way the template would cut with difficulty and inaccuracy.

The assembly.-- The sled is now mounted on the pin.

Refer to illustration on page 40.
Figure 3-1. Assembly of the Pin Template

Figure 3-2. The Template

Figure 3-3. The Sled
The template and backing are attached to the sled with "c" clamps. For less cumbersome attachment, one quarter inch bolts and wing nuts can be used. The whole assembly is tried for smoothness of operation. After any necessary adjustments are made, the machine is ready for production.

2. The Production of the Model and Mold

Mixing the plaster.-- Since it is not necessary for the model to be solid, a clay core is built up around the pin to within three quarters of an inch of the template. Plaster for the project is measured out in the ratio of three pounds of plaster to one quart of water. The plaster is mixed in the usual way, except that after slaking the mix is divided into two parts. One part is stirred in the usual way and is called a "regular mix". The second mix is stirred only from time to time to keep it in solution. This is called a "slow mix" and will set much more slowly than the "regular mix".

Forming the model.-- The regular mix plaster is built up over the core, approximately to the height and contour of the model. The sled is rotated several times around the pin screeding and shaping the plaster. It is necessary to clean the template and the base often to insure accuracy and sharpness in the model. A bucket of water close by is convenient for this operation as well as for keeping the operator's hands clean. When the regular mix is all used
the slow mix will be at the proper consistency for use and is used to fill any voids or imperfections in the model. This procedure is repeated until the detail of the model is completely built up. If the template is a perfect one, the model may not require any additional smoothing. However, should smoothing appear necessary fine "wet or dry" sandpaper is used. Water is poured liberally over the model during this smoothing to help carry off the sludge from the model.

Pouring the mold.-- If this is to be a simple one piece drain mold, the form may now be removed from the pin and placed on the casting table. Refer to Chapter II, page 33, for characteristics of a drain mold. The hole in the model left by the pin is filled with clay or plaster. The model is soaped and the cottle is fastened around it. Figure 2-3 shows the assembly. Refer to Chapter II, page 22, for soaping instructions. A mold mix of plaster is then poured over it. Refer to the wheel bat problem for the procedure. After twenty minutes, remove the cottle and trim the mold. In one hour the mold can be opened by inserting the edge of a butcher's knife in the seam and tapping it with a hammer at several places along the length of the seam. After drying, the mold is ready for use.

The solid cast mold.-- When a cast must have its inside contour different from its outside shape, a solid
cast mold must be made. Refer to Chapter IV for nature of solid cast mold. On the pin template, this would be accomplished in the following manner. The cross-section drawing is made showing both inside and outside profiles. Each profile is traced onto the metal as before, cut out and mounted on plywood backing. The inside template is cut to allow for the making of a cottle support shelf. The outside template also is cut so it will ride around this shelf.

The inside template is used first producing the core or male mold. This is soaped and the outside template is used, producing a model of the desired cast. Then this is soaped. A cottle is secured around the cottle support shelf and the last part of the mold is poured. Here a proper mold mix of plaster is used as this part can serve as an actual section of the clay casting mold. Having these three parts (illustrated by Figure 3-4.), it will be seen that any one part can be made from the other two.

For a complete clay casting mold, it is necessary to recast the first core form with a proper plaster mix. It is advisable to keep the whole complex as a unit so future molds can be made from it. The core and the outside form make the clay casting mold when the plaster model of the cast is removed. A hole or holes in the outside form must be cut, through which the slip (liquid clay) will be poured.
Figure 3-4. The Solid Cast Mold

Figure 3-5. The Drain Mold
3. Notes on the Available Literature
Concerning the Pin Template

The writer's method.-- The method presented in this paper is the one used by the writer in teaching this process at the Massachusetts School of Art. It was evolved from study at the Central Technical College, Brisbane, Australia; lecture notes from Alfred University, New York; suggestions from Professor Charles Abbott, Massachusetts School of Art; and the writer's own experiences. The author is also influenced to a lesser degree by the writings of:


2. The United States Gypsum Company's bulletin mentioned in the footnote one on page 36 of this chapter.


As far as can be determined these four sources seem to comprise the total literature on the subject.

Dorothy Perkins.-- For the studio potter, Dorothy Perkins' articles are probably the best published as yet.
The illustrations are good and reasonably complete. This paper was published in Ceramics Monthly Magazine, in four installments in the April, May, June and July, 1955 issues. Since the work is not published as a complete paper, this is a weakness. Complete files of this magazine are now very difficult to find, making reference often impossible for the average craftsman. Also, the transition from one month to the next is not always smooth. Information on soap sizes and plaster mixes is included and is very worth while.

The United States Gypsum Company. -- The United States Gypsum Company's Bulletin, Industrial Tooling with Hydrocal Gypsum Cements, is presented in an excellent manner. It is intended for industry but would be helpful to the studio potter. A jig similar to the one used in this chapter is demonstrated, but in this case it makes an industrial mold. Also demonstrated is one of the professional jigs where the template is held rigidly and the table rotates on bearings under it. An enterprising craftsman might attempt the making of such a jig. All the information in this paper is very well illustrated with photographs.

He presents some sketches which are interesting but not complete enough for the beginner in this method. Four photographs are offered which are helpful. The negative criticism here is the lack of detailed information. The positive criticism is easy reading, almost in a "do it yourself" vein.

R. Horace Jenkins.-- The last reference is to Horace Jenkins' book, *Practical Pottery*, page 41. The method he describes is closely related to turning jigger molds and could be used for that purpose. It involves using a potter's wheel and a stationary template. This article is well presented as Mr. Jenkins' work always is. It probably would not be used by the studio potter, but might be worth his consideration.
Part Two: The Horizontal Box Template

1. The Design of the Jig

Uses and limitations.-- This machine works on the principle of a lathe turned by hand. Models which are turned more easily horizontally than vertically are done on this machine. The models from this jig would be those requiring more than one piece in the mold. Such tall shapes as lamp bases and cylindrical forms are well suited for this method. Also, models with undercuts that would prevent forming on the pin template would be made here. The machine can be purchased commercially, but a studio made one will serve well.

Components of the jig.-- The jig is made up of three major parts:

1. The box frame
2. The turning rod
3. The template.

Each of these parts will be considered separately.

The box frame.-- The size of the box would be determined by the size of the models to be made on it. It must be three or four inches longer than the largest model to be made on it, and about four inches wider than the greatest diameter of the model. A useful size for a box is eight inches by 16 inches (inside measurements). It is made of pine boards six inches wide. One long side of the box will be cut down to four inches wide to permit easy
handling of the template. The box then will be made up of two sides each being 19\(\frac{1}{2}\) inches long; one is six inches wide and one is four inches wide. The ends will be made up of two boards each being eight inches long and six inches wide. These are nailed or screwed together. In Figure 3-6 the box assembly is illustrated. It will be observed in the sketch that two slots are cut into the short sides of the box. These are to support the turning rod. Also, two cleats are fastened to the insides of the short ends of the box. These will support the template. The measurement and positions of all these parts must be well-calculated, or the machine will not operate accurately.

![Figure 3-6. The Box Assembly](image-url)
The turning rod.-- The turning rod is a shaft that goes across the box parallel to the long axis of the box. Solid iron curtain-rod three eighths of an inch in diameter is very satisfactory for this purpose. A piece about three feet long is required. The shaft part that crosses the box would have to be at least 21 inches long; the remainder of the length is bent to form a crank handle for turning the shaft. Consult Figure 3-8 for an illustration of this part. In industry this rod would be made of tapered steel stock to allow for easy removal of the model.

The template.-- The template is made of light sheet metal about 26-30 gauge. One half the longitudinal profile of the desired model including the trim shelf is traced onto the metal. The metal is cut with tin snips. One half the thickness of the rod is cut from the width of the template to insure the accurate size of the model. File the cutting edge of the template, and test for smoothness with the edge of the thumb nail. Trace the template onto the plywood support, and cut the plywood so that the leading edge will be ¼ inch behind the leading edge of the template. The writer recommends using three eighths inch plywood for the template backing. Tack the template to the plywood with the metal facing upwards. Now, string is wrapped loosely around the turning rod in the area to be covered by the model. The template is placed in position for operation. See Figure 3-8 for the assembly.
The turning rod

The template

Figure 3-7. The Horizontal Box Template Assembly
2. Production of the Model and Mold

Forming the model.-- A small batch of plaster is mixed and applied to the rod. The crank is turned towards the top side of the template, cutting the model. This procedure is repeated until the form is completely built up. Some workers divide each batch of plaster into a slow and fast mix to save time in forming. See page for plaster mixes. When the model is completely built up, it is smoothed with "wet or dry" sandpaper. The model should be treated liberally with water during this operation to carry away the sludge. If necessary, a foot can be turned into the bottom of this form.

If a foot is turned in the base of the model, a three piece mold must be made. A two piece mold is sufficient for a model with a flat base. In this case, it will be assumed that a foot has been turned on the base. The vertical dividing line must be established on each side of the model. If the template has remained unwarped, this is easily accomplished by placing the model in position in the box and tracing along the template edge on one side, then rotating the model through 180° and tracing along the template edge on the other side. The model is now equally divided. Finding this dividing line is very important because if it is not correct the model is divided into two unequal parts. The larger side will then form an undercut
in the mold, making it impossible to remove the model from the mold.

**Pouring the first section of the mold.**—The form is now removed from the rod and placed horizontally on a clay base, and the center line levelled both lengthwise and across with the aid of a carpenter’s level. This helps insure a square mold. Clay is then built up along each side of the model to a level even with the center line. The width of this bed must be at least 1 1/2 inches from the model at any point. When the bed is smooth and squared, it is ready for the mold form or box to be built around it. This is conveniently made of plywood and should protrude at least 1 1/2 inches above the model. The model is soaped and the form is sealed at all seams with soft clay or plasticine. The necessary amount of plaster is calculated, and the first half of the mold is poured. Refer to Figure 3-8.

![Clay bed, Model, Mold box diagram](image)

**Figure 3-8. Ready for Pouring**
The second section of the mold.— After the plaster has set, the mold form is stripped off the mold and the unit is turned over. The clay is removed and hemispherical holes are cut into the face formerly covered by the clay. These are called natches and will form keys for holding the parts of the mold together. The exposed sides of the model and mold are soaped properly. The mold form is put in place again as before, and the second half of the mold is poured. When this has set, the form is removed again, and the whole unit is placed on the casting table with the foot of the model upwards. The mold form is placed around the unit protruding at least 1½ inches above it. Natches are cut in the exposed mold face. The exposed area is soaped again, and the last section of the mold is poured. After setting, the mold is opened and the three parts set aside to dry. Great care should be taken to fasten the mold forms securely and seal all the seams before pouring.

3. The Related Literature

This method of producing a model has been a very popular one possibly because of the relative simplicity of the jig. Many authors on ceramic processes have included it in their work. The writer offers several references he has found useful. All of these expositions are clear and well illustrated. Since the methods in all cases are essentially identical, the reader is advised to use any of the following:


Part Three: The Free Template Method

1. The Design of the Jig

Uses and limitations.-- The free template jig is excellent for making rectangular, oblique, and irregular shapes. A model for a one piece mold may be made using only one template. By using two templates, an inside and an outside profile, a solid cast mold may be formed. This jig, while sometimes called a free-form jig, is limited in the free-form shape produced. The lip of the model must always be parallel to the base of the model. The cast can have a horizontal lip only, unless the model is altered by hand after forming on this jig. Also, the wall profile of the model cannot be modulated. However, an endless number of beautiful models can be created with this method.

Components of the jig.-- The jig is made up of four parts:

1. The base
2. The guide slab
3. The sled
4. The template or templates

The drawing, Figure 3-9 illustrates these components and will aid in understanding the jig.

The base.-- Waterproof plywood three quarters of an inch thick makes an excellent base. A base about 18 inches by 18 inches makes a convenient size, but it could be
larger or smaller to suit the job. The base should be sealed with shellac or lacquer.

**Guide slab.**—This slab can be made of waterproof plywood one quarter inch thick. The outline of the top of the piece is drawn on the plywood. The plywood is cut to this shape, smoothed and sealed. This in turn is fastened to the center of the base with brads.

**The sled.**—The sled is made of pine boards. It is made up of three parts: two runners and a center arm. One runner is screwed to each end of the center arm. The runners must be smooth and should set level on the slab for fluent operation. The total length of this unit must be shorter than the length of the base, but the center arm must be a little longer than the greatest dimension of the model. The center arm is cut away on the underside to allow clearance over the model. Figure 3-9 shows the construction of the parts and their relationship.

**The template.**—Only an outside template is needed for a one piece mold. For a solid or hollow cast mold, an inside and an outside template would be required. The templates are made in the same manner as described in the pin template problem, page 38 of this paper. The template is cut so as to reach the center of the model's base at all positions along the guide slab. Also, the thickness of the guide slab must be considered in order not to lose the true height of the model. The template is attached to the sled.
Figure 3-9. The Free Template Jig
with clamps for easy adjustment. The whole assembly is tested for easy running and whatever necessary adjustments are made.

2. Production of the Model and Mold

**Running the model.**-- The slab is greased with stearic acid. Plaster is mixed and poured onto the guide slab as in the pin template problem. The sled is passed along the side of the guide slab, while the template end of the slab is held firmly in contact with the guide slab. The template metal should be cut back far enough in the area of the guide slab so it does not ride the guide slab. The operation is repeated until the whole model is filled and smooth. If a solid or hollow cast mold is desired, the inside model is cut first. The model is sealed and the outside shape is cut. Now, a solid inside model and a plaster shell exactly like the finished piece are produced. This operation is similar to the procedure in the pin template method.

**Pouring the mold.**-- The cattle is arranged around the model and the mold is poured. It should be remembered, if a solid cast mold is being poured, the inside shape has to be recast using the shell and the outside mold as models. In Chapter IV, the solid cast mold is discussed in detail. In the completed mold, a hole is cut through the base in the most advantageous place for pouring the slip. The slip in these molds is usually poured through the base of the cast.
One usually refers to this procedure as pouring a mold upside down.

3. The Industrial Use

This jig is used extensively in industry, inside and outside of the ceramic field, particularly for rectangular shapes. As is usually the case, the industrial application involves more elaborate equipment. A new sled is often used for each problem. The base is on a pivot, making it easy for the operator to work around all sides. A semi-automatic machine is also used for rectangular shapes. The Sterberg pattern maker has a base that turns, and a bridge that moves back and forth simultaneously. Many electronic parts, lighting fixtures, automobile parts, and similar models are made on this machine. The U.S. Gypsum Company has described this use of the jig in industry.

4. Notes on the Available Literature

The method presented here is the one used by the writer. There are two other good sources; one being the unpublished notes on the subject by the Ceramic Department at Alfred University; the other a publication by the United States Gypsum Company, noted in footnote one on this page.

1/United States Gypsum Company, Industrial Sales Division, Industrial Tooling with Hydralcal Gypsum Cements, IGL Bulletin, (undated), number ITT 100-C, Chicago.
The Alfred University notes.-- The method used at Alfred University differs only in the base and the guide slab. These are made of cast plaster slabs joined together with shellac. The disadvantage here is that it would be difficult to use these units a second time. Also, plaster is a fragile medium for the working parts of a jig. The notes are rather brief and incomplete for a stranger to the method. Also, copies of these notes may be difficult to procure.

The United States Gypsum publication.-- The publication has a sub-title, "Square, Rectangle and Oblique Shapes." This is obviously for the industry. It treats the making of a square shell pattern. The photographs are excellent, the publication actually being a picture story. It is not slanted at ceramics, but the potter would be wise to read the pamphlet. This can be procured from the nearest office of the United States Gypsum Company.

Conclusions.-- There is little literature available for the potter working on this problem. By improvising, and trial and error, the author devised his method. In the Plaster Apprentices School in Brisbane, Australia, a jig of this kind was used, but it was so complicated that it would be useless to the studio potter. Dorothy Perkins at the Rhode Island School of Design uses a similar method, but her method has not yet been published.
CHAPTER IV
ADVANCED AND SPECIALIZED MOLD APPLICATIONS

Part One: The Block and Case

The model.-- In industry nearly all ware is produced from plaster molds of one sort or another. It is necessary to produce exact duplicate molds. For this purpose, a model together with blocks and cases is used. The original models are usually made from a designer's sketch by a professional modeler, working in clay, wax, wood or plaster. Most round models are made from a cylinder of plaster, cast on a wheel head and turned down to shape. On irregular shapes, the modeler usually resorts to more sculptured methods, working by hand directly in plaster.

The block and case.-- The block may be considered to be a master mold cast about the model. The case is a cast taken off the working surface of the block. It should be understood that a separate case is necessary to produce each section of a working mold. To a beginner, the making of a block and case is one of the most perplexing operations in plaster mold work. However, if one keeps in mind a simple definition for each of these parts, and their step by step relationship, there will be little confusion. Figure 4-1 will aid in understanding the relationship of these parts.
The model

A model and mold section

A case

Figure 4-1. The Block and Case
The procedure.-- In commercial mold making simplicity is most important for reasons of economy and production methods. J.J. Svec states: "Simplicity is imperative in mold making; a two-piece mold is the most desirable, and four pieces are ordinarily the most complicated mold allowable for production reasons." It is possible for the studio potter to make more complex shapes if he deems it worth while. This gives the studio potter another advantage over the industrial potter, but he should not allow himself to become over complex in design. The following is the procedure for making a block and case of a simple shape:

1. The model is made and properly finished.
2. A mold is cast around the model in the manner it was described under the horizontal template problem in Chapter II of this paper.
3. This mold is the master mold and is known as the block. It is always retained with the model and is available whenever new cases for additional mold making may be required.
4. Each piece of the block is set on the casting table with its working face turned upward. A cottle is built up around it and plaster is poured over it forming a case. Actually this case will

result in a male form in the mold in most instances. Obviously, a case will be required for each section of the block.

5. At this point, casts may now be taken from each case section to produce the working molds. These cases are best protected in storage by placing each case section in a corresponding working mold section and binding them together with large rubber bands.

Cottles for cases.— Many industrial potters also cast a set of plaster cottles to go with their cases. This facilitates setting up the cases for casting additional molds. By keying these cottage sections together with one another, and with the mold, a very reliable, quick, and uniform cottage wall is produced. These are calculated to give the correct thickness as well as size to the particular working mold section. This whole assembly, the case with the corresponding mold section around it, and the cottage section about the mold section, provides safe storage and keeps all sections ready for work at any time with almost no preparation.

Adapting for the studio potter.— The studio potter making many repeat molds may follow this procedure completely, but most craftsmen would wish to simplify the process. To accomplish this he might adopt the following procedure. First of all, a model and a master mold is made as above. Secondly, the model is encased in the mold.
Next, one mold section is removed from the model exposing an assembly that looks very much like a case, except that it is not all one piece. A cottage of the correct height is placed around this set-up, and that section of the working mold is poured. This process is repeated for the other sections of the working mold. This is a quick method. It does not require keeping special blocks and cases, and completely eliminates the case making step. However, heavy production in this manner would cause excessive wear on the model and block.

Notes on the available literature.—There is very little written on this particular subject. The only references one finds might deal with the storage of the blocks and cases, the production costs, the life expectancy of the molds, and such; but virtually nothing on the making. It is suggested that the reader visit an industrial pottery to see these procedures in operation. In Massachusetts, Dorchester Pottery, Dorchester, does this kind of work.

J.J. Svec has a short section on the block and case in his book mentioned in footnote one page 64 of this chapter. The work is only a summary and is not recommended for the beginner.
Part Two: The Solid Cast Mold

1. The Uses and Limitations

The solid cast was employed in the pin template problem of this paper. This mold permits the making of casts with an uneven wall thickness. Often, these shapes could be produced by jiggering or ram pressing, but these methods might be impractical for the studio potter. Also, many designs are possible in the solid cast mold that are impossible with other processes. In the case of the drain cast mold, there is only one working face, so the cast inside and out repeats the same design. The cast is of uniform thickness too. In addition to giving control over the inside and outside surfaces of the cast, the solid cast mold allows for irregular lip treatment. Bearing this in mind, the solid cast method suggests itself as the best possible method for casting free-form or irregular shapes which will be considered in this section.

2. The Model

The model can be formed in clay or plastigene. Almost any shape is possible if care is taken to design within these limitations. Although deeply recessed shapes are possible in this method, the sides should not be too steep so as to produce a difficult draw.

Another consideration as in all molds is the undercut. In the case of the free-form, the undercuts can be very
subtle and elusive to the eye. The potter must consider how his mold pieces will be withdrawn from the cast on each side of the parting line. This means viewing the model critically from all angles, particularly in the direction of the draw.

When the mold is completed, the slip must be poured in at the thickest point of the cast and so run down to the thinnest section. This usually sets up a condition where the base is the thickest section and the lip the thinnest section. If this were not done and slip was poured through a thin section, that section would seal off the rest of the wall before the cast was solid. This would produce disastrous air pockets or dimples. Figure 4-2 illustrates this point. With these limitations in mind, the model is formed from a lump of clay. When the clay is leather hard, it can be finished with scrapers and a wet sponge.

3. The Waste Mold

It is possible to make the working mold directly from the clay model if that model is perfectly finished. Careful workers make a plaster casting of the model from a waste mold. This is done in the sculptor's method. The parting line is determined, and a three quarter inch high and about half inch thick clay wall is built up along it as a cottle. A thin wall of plaster is poured over the first half section of the clay model. The clay cottle is removed and the
Figure 4-2. Sections of Solid Cast Molds
model is turned over. The exposed edge of the waste mold is sized, and a thin wall of plaster is poured over the second face. When this is completed the clay model is removed. The casting faces of the waste mold are sized. A pouring hole for plaster is cut at a convenient place into the mold, and it is sized. The waste mold is re-assembled and secured with string or rubber bands. Plaster is poured into the waste mold producing a plaster cast of the model. This model can now be refined and finished to a much greater extent than a clay model would permit.

4. The Working Mold

The plaster model is sized and placed face down on the casting table with the thickest section at the highest elevation. A clay bed is built up to the parting line and tapered away from the model. The clay bed is squared off and the cottle is erected around it. The first half of the mold is poured. After setting, the assembly is turned over and the clay is removed. The parting surface of the mold can be refined at this time, but pains must be taken to avoid damaging the model. It is best not to remove the model during this operation. Now, the natches are cut into the parting surface, and it is sized. The cottle is built up again and the second section of the mold is poured.

Cutting the pouring opening. -- When the plaster has set, the slip pouring opening is cut in the base section.
The hole should have a taper narrower at the outside than the inside, so that the cast can be easily removed. The size of this hole is important. If it is too small, it will seal off before the mold is cast solid. If it is too wide, it will cast too slowly in the area of the opening and leave a poorly finished depression in the cast. See Figure 4-2. It is best to err on the side of being too small as the hole can always be made larger. The mold is now lightly sanded with "wet or dry" sandpaper and is ready for use when dry.

5. Variations

There are at least two very useful variations of this method. The first one is used where the inside shape is quite different from the outside shape, suggesting a very thick section. Such a piece would be very difficult to cast solid and would probably be much too heavy. In this case, the mold would be made in the same way but the cast would be a hollow one. Actually any solid cast mold with a fairly thick section could be hollow cast by pouring the casting slip out of the mold earlier than usual. Some artists believe that it is dishonest to make a pot that appears heavy and solid and yet is actually light and hollow. The individual must settle this matter in his own conscience.

A second variation.— The second method is one suggested
by Dorothy Perkins. Here the problem was to produce a mold that casts an irregular lip. This was accomplished by making a solid model whose outside profile received all the attention. This could be considered to be a dish with an attached lid. A two piece mold is cast around this solid model and a pouring hole cut into the bottom of it. This mold produces a clay cast that is a hollow replica of the solid model. This cast can be cut along the irregular parting line producing an irregular open cut. If this top has an interesting shape, openings can be cut in it in a variety of interesting ways producing wonderful pots for planters or similar containers. Refer to Figure 4-3. The writer has used this method to produce ceramic Christmas tree ornaments.

6. Literature on the Method

Dorothy Perkins' articles on these methods in Ceramics Monthly are excellent. In the writer's opinion, Dorothy Perkins is the outstanding authority on free-forms and their casting, in this country. Her writings are clear, and well-illustrated with photographs.

Vernon Sealy's article treats the making of a bowl-shape. His work is directed to the hobbyist but may be helpful to the potter.

A closed cast

Variations from a closed cast

Figure 4-3. Closed Casts
F.H. Norton has a few terse comments and a good diagram about solid casting. It is not complete enough in itself.

John Kenny discusses a typical rectangular dish application quite thoroughly, but he does not consider the possibility of the irregular shape completely.

This is a relatively new casting idea and has not been widely used as yet. For this reason there is not much literature of any note with the exception of the Perkins' articles. The following are the available references:


Part Three: Jiggering

1. Uses and Limitations

This machine is used to form identical, circular shapes. In industry it is used to produce flat ware such as plates and saucers. To make hollow ware such as bowls and cups, industry uses a special machine called a jolley. In the studio, both operations could be accomplished on an improvised jigger wheel. The principle of the machine is a revolving mold on a wheel head over which a template descends, cutting and forming a shape in clay.

2. Adapting the Potter's Wheel for Jiggering

A commercial jigger wheel can be purchased but it is very heavy and expensive. However, the studio wheel can be adapted for jigger work. This has been done in many ways by various potters. One of the simplest is the arrangement explained by John Kenny, while another by F.H. Norton, is almost as simple and quite adequate. Sketches of both arrangements are shown in Figure 4-4, page 76. The jigger attachment must provide: (1) the jigger arm, (2) a stop for the jigger arm, (3) a template board, and (4) a jigger bat. These parts are assembled as follows:


After Kenny

Figure 4-4. The Jigger Arrangement
The jigger arm.— The arm should be made of a stout piece of hard wood at least one and one half inches by three inches in thickness. If the wheel is placed against the wall, the arm might be attached to the wall; if not, it must be attached to the wheel frame. This arm must be placed so as to be capable of descending over the center of the wheel head. A very simple method would involve attaching the arm to the frame or to the wall by means of a heavy hinge as in the sketches in Figure 4-4. Often this is accomplished by pivoting the arm on a post and counter balancing it at the end opposite the working end. This arm must have slots or holes through which the template board will be bolted.

The stop.— The stop is merely a means for securing the template in the proper position in relation to the wheel head. Consult Figure 4-4. This could be a turn screw or a slot in a strong board which would limit the travel of the arm.

The template and template board.— These units are very similar to those used in the pin template problem and should be made with the same care. The backing board here is usually a three quarter inch board, but the template itself is made in the same manner as before. Vertical slots must be cut across the backing board to allow for adjustment after being bolted to the jigger arm.
Inside template profile

Bat

Cutting the jigger bat

Outside profile

A counter-balanced assembly

Figure 4-5. Jigger Parts
The jigger bat.-- This is the plaster mold or pattern on which the ware will be formed. Figure 4-5 will clarify the design of this part. Some means must be provided for securing the bat to the wheel head in the same position each time it is used. This can be accomplished by using a drop head wheel head or by bolting a bar to a flat wheel head to act as a key into the bat.

3. Forming the Jigger Bat

The templates.-- In jiggering, two templates are needed for a cast to be produced. One template has the profile of the inside of the cast, and the other the outside of the cast. For the sake of clarity in this discussion, it will be assumed that a plate is being formed. In this case the template bearing the inside profile of the plate would be used to cut the jigger bat only. The outside profile would be used to form the clay plate. It will be seen that flat ware is formed upside down while hollow ware is turned right side up.

To form the jigger bat, the template is arranged on the jigger arm so that the inside end of the template is exactly over the center of the wheel head. The arm must travel precisely across the diameter of the wheel head. Plaster is piled on the wheel head. The head is rotated and the arm is brought down onto it, cutting the jigger bat to shape. After finishing, this bat can be used for
forming casts or may be kept as a master bat from which other duplicates are made. The block and case problem in this paper explains how duplicates of a mold are made.

4. The Jiggering Operation

The jigger bat for the plate is placed on the wheel head. The bat template is replaced by the jiggering template. This template must be aligned over the wheel head as the bat template was, and the necessary clearance allowed for the thickness of the plate. A bat of clay is pounded out a little thicker and a little greater in diameter than the desired plate. This is thrown onto the center of the bat. The wheel is rotated and the clay smoothed down by hand. No air must be trapped under the clay. Now the jigger arm is lowered over the clay, slowly cutting the outside profile of the plate and forming the inside profile over the jigger bat. The excess clay is cut away with a wooden modelling tool and the cast is finished with a wet sponge. The bat and plate are removed from the wheel head and set aside to allow the clay shape to stiffen, after which it is removed from the bat. Another bat can now replace the first bat and the production continued.

It should be observed that when working with hollow ware, the procedure is reversed. In making hollow ware the outside profile template is the one used to cut the plaster
jigger bat while the inside template will cut the inside profile in the clay cast.

**A point of caution.**—Jiggering is more difficult than it sounds. It requires practice and skill. However, there is a considerable amount of good literature on the subject. The potter with a little ingenuity can master the process.

5. Notes on the Literature

Many articles have treated this subject in the literature. One should read several to get a variety of points of view and ideas. Among the most helpful writers are the following:

   General comments on industrial applications.

   This is a book by an old teacher, one of the fathers of modern American Ceramics. It is old, first printing in 1910, but demonstrating methods used by good craftsmen. Has a few good drawings.

   Presents a very thorough discussion of jiggering for the artist potter. Contains a series of excellent photographs. This is considered to be the best reference by the writer of this paper.

   This work is not as thorough as that of Dougherty. It does have useful photographs and drawings. It
illustrates a jigger arm that attaches to the wall. Has notes about commercial production.


Offers many simplified drawings and photographs. Probably the simplest exposition to understand. Has recommendations on the making of duplicate bats.


The treatment here is rather summary in fashion but accurate. Has some very fine photographs and drawings. Has a good illustration of a simple jiggering attachment on page 286.


This is a good reference for specific production problems in industry. Does not treat the subject as a complete process.
CHAPTER V
MISCELLANEOUS MOLDS

Part One: The Press Molds

1. General Comments

The press mold is certainly one of the oldest methods. It was used by the ancient civilizations of the Near East. The clay records in cuneiform script were made with this mold. The beautiful signet rings of the Romans were variations of this mold. At one time or another, the pottery of nearly all civilizations was made using this device. The basic principle of this mold is to press a modelled form into a piece of soft clay, or it might be considered that the soft clay is pressed into the mold. A cookie press or butter patty press works in the same manner. This is one of the simplest of molds. It has a variety of applications and variations. Potters use this method very little today. Industry is beginning to use it again in their ram press process.

Uses and limitations.-- These molds are best limited to simple shapes without Undercuts. However, under some circumstances, large and intricate shapes can be cast by this method. These molds may be classified under three headings: the one piece press mold, the two piece press
mold and the multipiece press mold. These molds are used for jewelry, tiles, masks, handles, and appendages, sculpture, sprigging and stamping.

2. The One Piece Press Mold

This mold will press tiles, masks, jewelry, buttons, and sprigs. The model is made in any medium suitable for plaster casting. Plastcine is excellent for a model. In all these applications, only the face side will have modelling.

To make the mold, the model should be made to look exactly like the desired finished cast. This model is adhered to a smooth surface such as a glass slab. A low cottle is built up around it, and the plaster is poured over it. After the plaster has set, the model is removed and the mold finished. The mold is now ready to use. To use the mold, clay is merely pressed into the mold until it is filled. The clay is rubbed down with a spoon or similar instrument until it begins to lift, then it can be removed and finished off by hand.

Alternate techniques.-- The various methods and uses of these molds are limited only by the imagination of the artist. For example, one may make these molds by carving directly into a block of plaster in intaglio fashion. This direct method often produces a cast with more artistic character.
2. The Sprig Mold

Another one piece mold is the sprig mold. This is the mold that made Wedgewood's Jasper ware possible. The mold is like any other one piece press mold, except it is usually smaller. The casts are used for relief decoration on other pieces of ceramics. In some cases the clay is rubbed into the mold which before hand was made to conform with a particular cast piece. Then the mold is applied to the still plastic pot and the sprig is thereby attached to the pot. The more common way of attachment is to remove the sprigs from the sprig mold and apply them to the pot. This is done by moistening the surface of the pot and carefully pressing the sprig to it. Slip may be used for adhering this sprig, but it is difficult to clean the surface of the pot after using it. In the first method, large sections of the pot may be done at one time, and in the second method, only small bits are done at a time.

If buttons, jewelry or masks are made in these molds, a means for attachment must be considered. Masks are pressed so that the inside is hollow. This is a natural result when the clay pressing is kept at one quarter to one half an inch in thickness. Tiles are best pressed thicker than commercial tiles, and grooves are cut in the back to prevent warping.

3. The Two Piece Press Mold

The common uses for this mold are for jewelry, handles
and simple sculptures. This mold will produce a cast in the round, but it is usually a solid cast.

The usual two piece press mold is normally made in the following manner. Should the project be for a cup handle, the profile of the handle is drawn on paper and transferred to a block of plaster about three quarters of an inch thick. The profile is cut out with a jig saw, and then carved to the desired shape. It is necessary to allow for the proper draw each side of the dividing line. When the plaster handle is finished and sized, it is embedded in clay up to the center line. A cottle is built up around the unit and plaster poured over it. When the plaster sets, the whole assembly is turned over and the clay bed removed. Natches are cut into the mold a little deeper and larger than usual and with two of them fairly close together. This provides easy alignment of the two halves of the mold and helps prevent breaking off of the noggles. Now, the second half is poured. Up to this point, the mold is much the same as a slip mold except that the model is completely surrounded by the mold. There are no openings. A shallow groove is cut all around the periphery of the handle. This allows excess clay to be collected during the pressing process. Consult Figure 5-1, page 87, for illustrations of the various press molds. To use the mold, a coil of clay a little larger than needed to fill the mold is placed in the handle section. The two pieces are aligned and pressed
Sprig mold

A handle mold

Figure 5-1. Press Molds
together. The excess clay if forced into the grooves may be cut away. The operation must be repeated until the handle is perfectly formed and all the excess clay is removed. The handle is now trimmed, finished and applied to the cup.

4. Variations

Kenny's variation.— Kenny uses a variation of this in his article for Ceramics Monthly. Instead of embedding the model in clay, he splits the model in half along the dividing line. He makes his first side of the mold as in the one piece press mold problem. Then, he turns the whole thing over and places the cut off piece back onto its corresponding piece in the mold, and casts the rest in the usual manner. It would seem that this method could easily lend itself to many troubles.

Norton's variation.— A variation of this method allows for hollow casting of sculpture. Here the mold is made in the same manner, except the grooves are not necessary, but an opening in the base is. Clay slabs are pressed into each side of the mold separately. The two sides are placed together, and the joint is sealed with a


modelling tool working on the inside of the mold. The mold is allowed to stand for a time, then opened and the sculpture removed.

It will readily be seen that small sculptures and pieces of jewelry in the round can be made in this manner. One must be careful to keep his models simple enough so that no undercuts are present.

5. The Multipiece Press Mold

This is another variation of the press mold that permits the casting of large pieces of ceramics such as sculpture and garden pottery. The advantage here is that plastic clay can be used instead of the slip usually employed in casting. Clay containing large quantities of grog or other non-clay additives are possible. The various pieces of the mold must be bound together securely. A casting mold is often poured over the top of the multipiece mold to accomplish this. The clay in the form of slabs or in small pieces, is pressed into the mold. After allowing time for the clay to become stiff, the cast is removed by taking the pieces of the mold away. Sometimes the clay is pressed into each section of the mold. The mold is then assembled and the joints are finished on the inside. The outside joints are finished after the piece is removed from the mold. These methods provide an excellent means for the sculptor to get a hollow cast with a more or
less uniform thickness.

6. The Industrial Uses of the Press Mold

In recent years, a whole new field in casting has opened up in industry. This is called ram pressing or dry pressing, depending on the particular application. Great mechanical presses with pressures of 25 tons or more are used to produce flat ware. This includes dinner ware, free-form shapes and many other commercial forms. There are distinct advantages here. The clay used has only enough water in it to hold it together. This minimizes shrinkage and warpage. A great deal of time is saved as compared with solid casting and jiggering. One machine can turn out hundreds of perfect casts per day. It would seem that the studio potter could adapt this method with the use of a kick press or hydraulic jack for a more limited production.

7. Stamping and Pressing Decorations

Another method of decoration by stamping and pressing to be included here is closely related to the above methods. The stamp can be cut from a simple cube of plaster about one inch on each side. On the working face is cut the design, the reverse of the decoration desired on the clay work. This is then stamped onto the soft clay as a single decorative unit or used to make a repeat pattern.

Other variations.-- Closely related to the stamp method is the use of a textured paddle which leaves a
decorative pattern when the clay work is struck by it. Still another variation is to line the mold with string, wire gauze, coarse cloth or any texture material. Then, clay is pressed into the mold resulting in a textured cast. This same texture could be had on the outside of a plastic clay form by pressing these texture materials directly on the surface.

8. The Literature on the Subject

There has been a fair amount written on this subject. The material available is often for the hobbyist, but the following authors have made professional contributions:


In his articles for Ceramics Monthly:

These articles are among Kenny's best. The illustrations and photographs are excellent. The sprig mold, solid cast, sculpture and handle molds are well-discussed.


Norton discusses masks, tiles, sculpture, and English
sprigging. The work is scholarly and well-illustrated with photographs and drawings.

Most authors of ceramics books have something to say about press molds which may be helpful. John Wolfe Dougherty, and R. Horace Jenkins are among the best of them.
Part Two: Drape Molds

The description of the drape molds.-- In this method, a slab of clay is draped over a mold. It is allowed to stiffen and then finished to a desired shape. There are many variations of this mold. The most widely used type is the plaster hump mold. Next in importance would be the recessed mold, into which the clay is dropped. There are less important ones, such as the sling, the sand box, clay forms, cardboard, beach stone supports and many others that the imaginative person could design for himself. There is one limitation. The mold must get larger from the base to its lip so that it will release the cast.

1. The Plaster Hump Mold

As the name implies, this is merely a hump of plaster. It should be a fairly interesting shape. This hump can be made by piling setting plaster on the table and forming it while the plaster is still soft. After setting, the shape can be scraped and smoothed to a good surface. Also, the hump mold could be made from a piece of dry plaster by cutting and reforming. The writer has had excellent results using sections of old plaster models. If models are not available, a plaster solid could be cast from an old drain mold and used as a hump mold.

2. The Recessed Type

The mold could be an open drain mold. Such an open
mold might easily be made by pouring plaster over an existing hump mold. Another alternative is to gouge a hollow in a block of plaster. This is in effect a kind of press mold and the clay slab is pressed into this mold. These are the two main types. In the hump mold, a clay slab is draped over the mold. In the recessed type, clay is draped into it. All other drape molds are variations of these. Plaster molds are the ideal ones because they do stiffen the clay more quickly and produce an excellent surface. In general, the plaster mold permits more variations in the cast.

Using the drape molds.-- A clay slab is rolled out with a rolling pin. If the clay is rolled on a piece of cloth, moving the clay slab to the mold is a much easier process. The cloth acts as a support under the slab and can be removed later. Also, the danger of the clay sticking to the table top is obviated. The thickness of the clay would depend on the size of the piece to be made and the preference of the potter. Probably, one eighth to three eighths of an inch would be considered normal working limits for thickness. The clay is smoothed onto the hump. As soon as the clay stiffens a little, it can be trimmed while still on the mold. Feet or decoration could be added before removing the cast from the mold. This must be done just before reaching the leather hard stage. The shape is turned right side up and clay may be added to get varying
thickness in the walls and lip of the form. The inside is finished and the cast is complete.

The recessed mold is used in a similar manner, but the procedure is reversed. A clay slab is pressed into the hollow mold. In this case, the inside is completed first. This is particularly useful where the inside must be built up as in the case of an ash tray with a cigarette rest, or relish dish with dividers. When the clay has stiffened, the cast is removed, and the outside and lip is completed. The writer has found drape molds to give quick, easy, and artistic results. Also, each cast from a mold is different, giving each cast a hand made quality. This method is excellent for teaching in adult education classes and children's classes. These people are able to create something that has originality and good quality while not being too dependent on a mold. They could even make their own molds in this problem. The drape mold is certainly one of the simplest and yet most versatile of the mold methods, and no slip is necessary. Care must be taken not to follow the form of the original mold too closely. It should be altered so that originality is not lost. Also, the education value would be sacrificed if a student was to merely accept the shape as removed from the mold.

3. Variations of the method

There are three important variations of the method
described above. From these, other variations can be devised. The three are: (1) the sling, (2) the sand box, (3) the beach stone.

The sling.-- In this method a piece of cloth or burlap is loosely stretched over the opening of a box or basket. This cloth could be nailed at three or four points on the box or tied to the rim. The cloth or sling now hangs into the box somewhat. The depth and shape of the sling can be controlled by changing the points of attachment and the tightness. A clay slab is dropped into the sling, trimmed to an interesting shape and permitted to harden. From this point it is treated as any other shape. This method is particularly useful for larger shapes. It also allows for a wide selection of contours by merely manipulating the cloth support. It is very flexible.

The sand box.-- This also is a very simple method. A box of suitable size is filled with damp sand. The sand can be built up to form a hump mold or dug out to provide a recessed mold. The sand is usually covered with very thin cheese cloth to keep the sand out of the clay slab. Some workers enjoy the sand texture and do not cover the sand. Here again, a wide variety of shapes are possible from one simple sand box.

The beach stone.-- Stones picked up at the beach often have beautiful contours provided by the erosive forces of nature. These can be used as hump molds. Cheese cloth
might be used here to prevent the clay from sticking to the stones. As in all these methods, it is not necessary to use the whole shape of the mold.

Potters have used many other things for drape molds. Both plastic and bisque clay shapes have been used. Cardboard supports have been made. Bottles, rolling pins, gourds and even balloons have been utilized. These possibilities seem endless. It is not so much the method employed but rather what the artist can do in using these shapes as a point of departure.

4. The Literature on the Subject

Much has been written on this subject, all the way from pure hobby articles to serious professional ones. The following are good articles treating various aspects of the subject in Ceramics Monthly magazines. The article by Tom Sellers is probably the best.


Little or nothing will be found in ceramics books, possibly because this method has had its popularity in recent years only. The articles above cover the subject adequately.
APPENDIX
INQUIRY CONCERNING THE MAKING AND USING OF
PLASTER MOLDS BY STUDIO POTTERS

by

Russell J. Doucette, Assistant Professor, Massachusetts School of Art, Boston, Massachusetts

I. Data for Purposes of Identification, Comparison, and Classification

A. The person completing the inquiry form:

1. Name___________________________________________

2. Official Position____________________________________

3. Location, or address__________________________________

4. The following are the duties I perform: (Check one or more)
   a. Teach ceramics ( )
   b. Studio potter ( )
   c. Make molds sometimes ( )
   d. Teach mold making ( )
   e. Other related duties ( )

II. The Studio Potter's Attitudes towards Plaster Mold Work

A. Many studio potters have an aversion towards plaster work. The following questions have been compiled to explore the reasons behind this, as well as to get a general evaluation of plaster work in the studio.

   1. The creative implications

      a. Check the following statements you believe to be true

         (1) The studio potter often associates mold use with the hobbyist ( )
(2) Creativity depends more on the craftsman than on the method used

(3) Ideas conceived for clay lose something when plaster is involved in the process of execution

(4) Mold making may set up aesthetic barriers

(5) Plaster work is basically uncreative

(6) Molds are philosophically wrong for the potter

(7) When the potter thinks of molds, he often thinks of those made by someone other than the user

(8) Reshaping the cast would make it more acceptable aesthetically

(9) The potter could use mold seams and other natural limitations of the mold to his advantage

(10) Mold work has a detrimental effect on creativity

2. The technical implications

a. Check the following statements you believe to be true

(1) Plaster is a mechanical medium

(2) The limitations of plaster lead to "tightness"

(3) The craftsman avoids plaster work because it is unfamiliar to him

(4) The average potter does not know enough about mold work

(5) Technical knowledge of plaster work is often difficult to obtain

(6) Other comments

3. The mass production implications

b. Check the following statements you believe to be true

(1) By using limited mass production methods, the studio potter can bring good design to many people

(2) We can have good design in limited mass production
III. The Necessary Knowledge

The studio potter should be familiar with the following: Under-score twice the most important, once the important, do not underscore the unimportant

1. Drain molds
2. The pin template
3. The horizontal template
4. The free form template
5. Hollow and solid cast molds
6. Jiggering
7. The block and case
8. Press molds
9. Sprig molds
10. Drape molds
11. The hand working of plaster
12. Others (name them)

IV. Suggested Enclosures and Summary of this Study

A. It would be helpful if you would send any material you use relative to this study, such as course outlines, bibliographies, technical publications or any other aid you deem useful. Postage or mailing charges will be paid if requested.

B. The amount of postage and mailing charges due you ______.

C. In return for your help, a copy of the summary of this study will be sent to you upon completion. Please check here if you desire a copy ________.

V. Any additional comments
4 March, 1958

Mr. Edwin Scheier
University of New Hampshire
Durham, New Hampshire

Dear Mr. Scheier,

I am doing a research paper on plaster mold work among studio potters. To help investigate the attitudes and needs of these craftsmen, I have developed the enclosed inquiry form. It will take a few minutes to fill out. In the case of debatable questions, please give the answer you feel to be usually true.

Your completed form may be returned in the enclosed self-addressed, stamped envelope. An early reply will be more than appreciated as I value your opinions. A summary of the findings will be sent you if you wish it.

Sincerely yours,
BIBLIOGRAPHY


3. Bulletins of the American Ceramic Society.


