No. 676,806. Patented June 18, 1901.

A. WEBER, JR.

MAKING SAGGARS.

(Application filed July 19, 1900.)

(No Model.) 3 Sheets—Sheet 1.

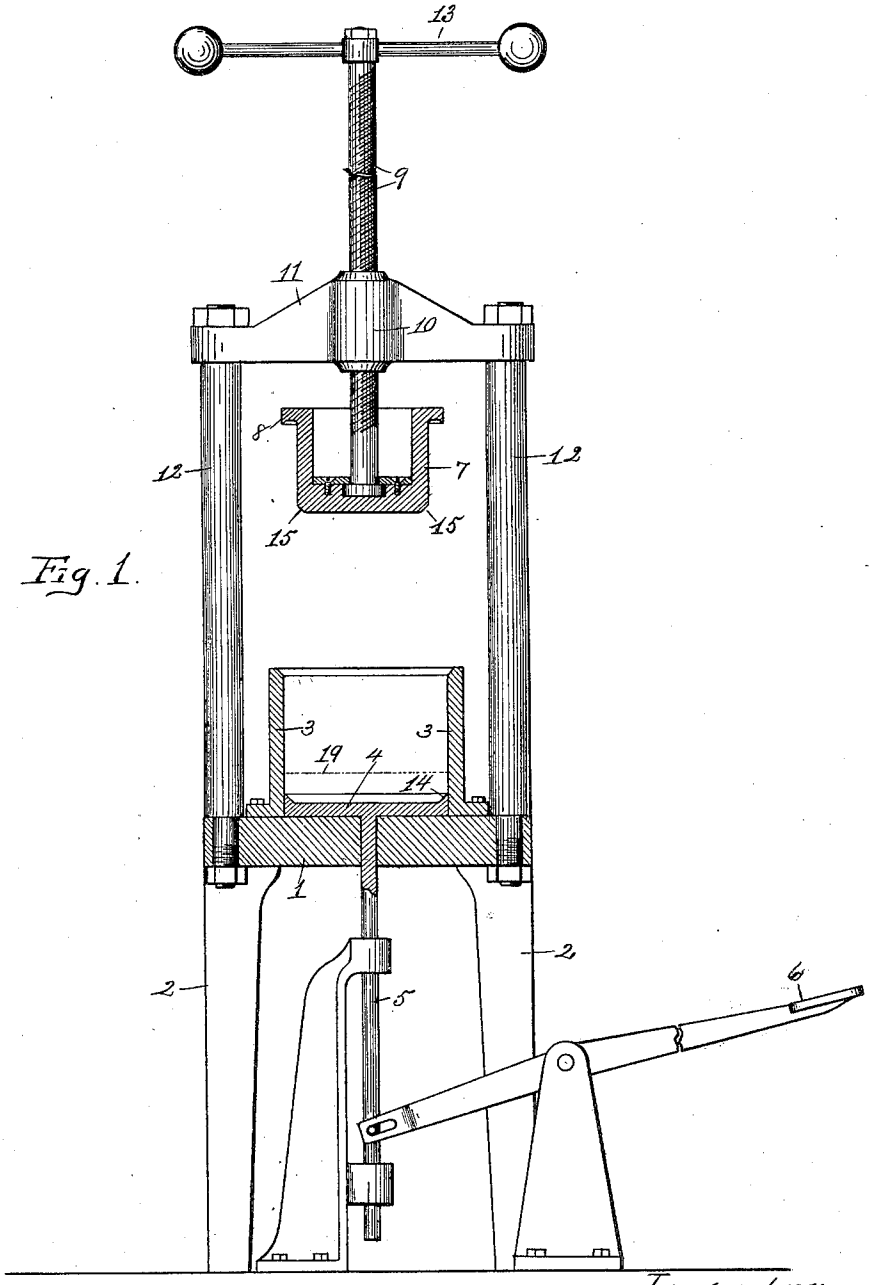


Fig. 1.

Witnesses:
G. H. Curtis
E. M. O'Reilly

Inventor:
August Weber Jr.
By Mosher & Curtis,
attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 676,806. Patented June 18, 1901.

A. WEBER, JR.

MAKING SAGGARS.

(Application filed July 19, 1900.)

(No Model.) 3 Sheets—Sheet 2.

Fig 2.

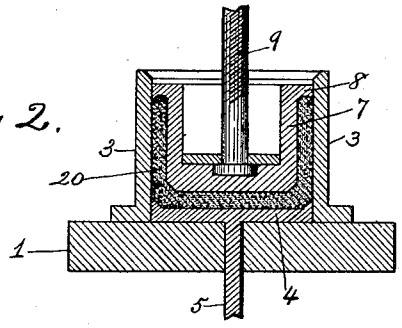


Fig. 3.

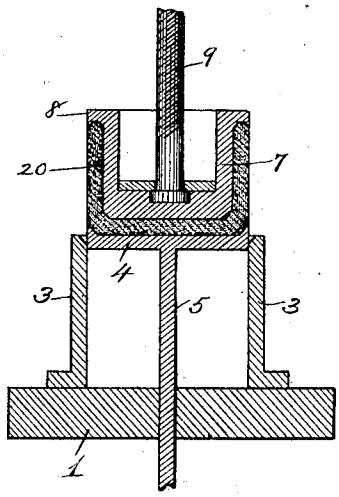
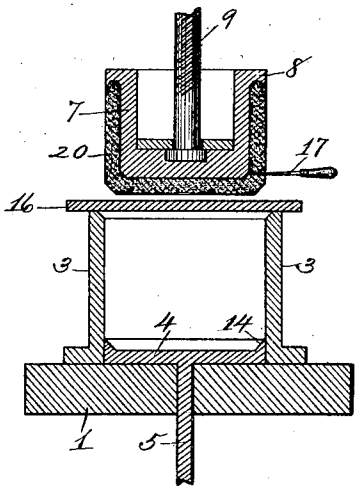


Fig. 4.



Witnesses:

E. H. Curtis.

E. M. O'Reilly.

Inventor:

August Weber Jr.,

By Mosher & Curtis

attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 676,806. Patented June 18, 1901.

A. WEBER, JR.

MAKING SAGGARS.

(Application filed July 19, 1900.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

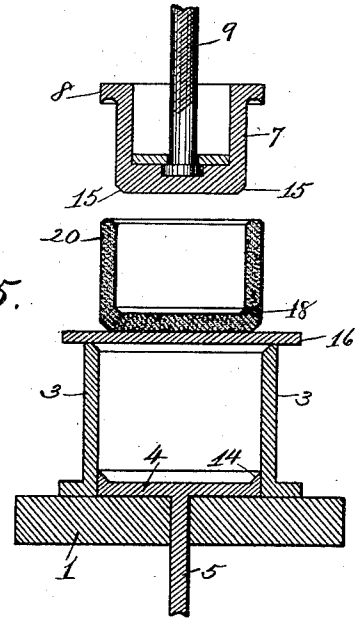
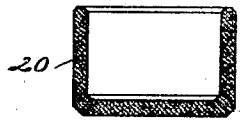


Fig. 6.



Witnesses:
G. H. Curtis
E. M. O'Reilly.

Inventor:
August Weber Jr.
By Mosher & Curtis
attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

AUGUST WEBER, JR., OF SCHENECTADY, NEW YORK, ASSIGNOR TO AUGUST WEBER, SR., OF SAME PLACE.

MAKING SAGGARS.

SPECIFICATION forming part of Letters Patent No. 676,806, dated June 18, 1901.

Application filed July 19, 1900. Serial No. 24,171. (No model.)

To all whom it may concern:

Be it known that I, AUGUST WEBER, Jr., a citizen of the United States, residing at Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Making Saggars, of which the following is a specification.

The invention relates to such improvements; and it consists of the novel construction and combination of parts hereinafter described and subsequently claimed.

Reference may be had to the accompanying drawings and the reference characters marked thereon, which form a part of this specification.

Similar characters refer to similar parts in the several figures.

Figure 1 of the drawings is a central vertical section of the molding apparatus used in carrying out my invention. Fig. 2 is a similar view of parts of the die portions of the apparatus in the operation of molding a saggar. Fig. 3 is a similar view showing the inner die with the molded saggar thereupon withdrawn from the outer die or shell. Fig. 4 is a similar view illustrating the manner in which the molded saggar is removed from the inner die. Fig. 5 is a similar view showing the die parts and the molded saggar fully separated from each other. Fig. 6 is a central cross-section of a saggar formed by my improved method.

In the manufacture of porcelain articles the articles are made to assume approximately the desired form by means of dies or other apparatus and are afterward hardened by firing or subjecting them to extremely high temperature in a kiln or furnace. In the operation of firing the porcelain articles, which while in a green state are delicate and frangible, are placed in vessels of various forms to protect them from the direct action of the circulating heated gases in the kiln. Vessels for containing such articles during the firing operation are commonly known as "saggars" and are made of infusible clay shaped to hollow form and hardened by heat, and it is to the manufacture of these saggars that my invention particularly relates.

In the firing operation a large number of saggars filled with porcelain articles are simultaneously exposed in the kiln, being placed one upon another in stacks and the stacks arranged side by side to the full capacity of the kiln. These stacks are many feet in height, depending upon the size of the kiln, and as the weight of such a stack or column of saggars and green porcelain is considerable the lowermost saggars in the stack particularly are subjected to a great crushing strain.

The material of which saggars are made is an infusible clay of the nature of fire-clay, which in its natural state can be mixed with water to form a plastic composition easily molded to any desired shape and which upon being exposed to a high degree of heat becomes of a more or less chalky nature affording little resistance to crushing force. Repeated firing or burning of such clay, however, greatly increases its hardness and strength, but destroys its plastic nature, so that precalcined clay cannot be formed into saggars without the addition of some plastic bond. For these reasons it is most desirable, if not necessary, in making saggars to meet the conditions above named to combine with a plastic mixture of natural clay and water a sufficient quantity of precalcined clay reduced to fragmentary form to impart to the saggar the desired strength, the plastic clay serving as a bond or union for the precalcined-clay fragments. Several methods have heretofore been employed in the manufacture of saggars, in one of which a fluid mixture of clay is poured into molds, where it is retained until the moisture is evaporated, which requires a long time, rendering the operation very slow. It is impossible by such a method to secure a uniform product if the mixture contains precalcined-clay fragments, for the reason that such fragments would not remain uniformly distributed in a fluid or semifluid mixture, such as is necessarily employed in this method. By another method the saggar is spun on a revolving table or potter's wheel in the usual manner of forming pottery hollow ware. In this method also the clay mixture must have a large percentage of water to enable it to yield readily to manipulation, which fact, as well as the usual difficulties of molding pottery, prevents the use of this method except

for comparatively shallow articles. In this method it is also impossible to use precalcined clay unless the same is reduced to pulverulent form, as the engagment of a sharp fragment of precalcined clay of any considerable size with the hand of the operator as the molded article is being rapidly rotated would tear away the surface of the article and numerous fragments of this kind would render the proper manipulation of the clay impossible. In the use of a precalcined-clay mixture the strength of the product depends to a great extent upon the size of the fragments to which the precalcined clay is reduced. By having the fragments of precalcined clay of considerable size or thickness depending upon the thickness of the proposed saggar-wall most of the fragments will contact with their neighboring fragments and materially strengthen such wall not only in resisting a crushing strain, but in causing the freshly-molded saggar to retain its shape if removed from its forming-die while the plastic bond is yet plastic and undried. By the use of such a mixture I am able to make repeated and frequent use of a single set of dies for molding the saggars, because the molded articles can be removed from the dies at once and dried while wholly free therefrom, producing a better unwarped saggar and largely increasing the producing capacity of a set of dies. Perhaps the most common method at present in use is that of beating out a stiff mixture of clay into a sheet, which is applied to the surface of a wooden drum to secure a cylindrical form, the ends of the sheet being oppositely beveled and overlapped, the cylinder thus formed being applied to a bottom disk formed of a similar clay mixture. The two parts thus assembled are placed upon a rotary platform and portions of the bottom and cylindrical side are worked together by hand to complete the body of the saggar. By this method much less water is used, which greatly facilitates the drying operation; but it will be seen that the cylindrical wall contains a joint or seam where its ends are bound together by simple adhesion of one to the other, while the bottom and sides are connected by a similar seam or joint. Saggars so made are capable of but limited use and almost invariably disintegrate along the lines of said joints and seams. In such a process it is possible to use fragments of precalcined clay of any considerable size; but when so used such fragments do not lap the joints in the body of the saggar and afford no assistance in strengthening the saggar at these its weakest points. It is also practically impossible to secure a smooth finished surface on saggars so made, as it is impossible to force the plastic clay and precalcined-clay fragments into perfect surface alinement on the body made by this method. I am also aware that earthenware articles have been molded in dies and dried while supported inclosed in a die member. Such a method is very slow in operation and could not be satisfactorily used in the manufacture of saggars such as I have described, for the reason that one surface of the molded article being protected by the inclosing surface of the die member, while the other surface of the article is freely exposed to the drying element, different parts of the article would shrink unequally in drying, causing a lack of uniformity in the texture of the product.

In the manufacture of saggars by my improved method I make use of a mixture of plastic clay with precalcined clay in non-pulverulent fragmentary form, the fragments being of considerable size and, if desired, of different sizes for different sizes of saggar, which mixture is so operated upon by the dies under pressure in the molding apparatus as to cause it to assume the desired form and to so distribute the fragments of precalcined clay throughout the body of the saggar that said fragments shall form textural lines extending continuously throughout the bottom sides of the saggar and the molded article when burned shall have a uniform texture throughout its bottom and sides.

Referring to the drawings, the apparatus for carrying out my invention comprises a bed or table 1, provided with supporting-legs 2, upon which bed is secured a shell 3, forming the outer die member of the molding apparatus. The interior surface-lines of this shell are parallel and vertical. The interior of this shell can be given any cross-sectional form which it is desired to impart to the exterior of the finished article. This shell is provided with a movable bottom plate 4, corresponding in form to the cross-sectional form of the shell and adapted to reciprocate vertically within the shell. This bottom plate is fixed upon a reciprocatory rod or spindle 5, to which reciprocating movements can be imparted in any known manner, as by the treadle 6. The upper inner die member is in the form of a plunger 7 of less cross-sectional area than the interior of the shell 3 and is provided on its upper end with a flange 8 of a size and form adapted to closely fit the interior of said shell. The body of the plunger 7 is adapted to form the interior of the saggar and the flange 8 to form the top of the side walls of the same. The plunger is mounted upon the lower end of a screw-threaded stem 9, which fits a similarly-threaded bearing 10 in the yoke 11, supported by uprights 12, erected from the bed of the apparatus. The screw-stem is provided with an operating-handle 13, whereby the inner die member is adapted to be reciprocated into and out of the chamber within the shell 3. The bottom plate 4 is preferably provided with a peripheral edge flange 14, which is beveled at an angle of forty-five degrees, and the bottom edge of the plunger 7 is similarly beveled at 15.

The operation of the apparatus is as follows: The desired quantities of plastic clay and precalcined-clay fragments having been mixed together to the consistency of a stiff

dough, a piece of the same containing sufficient material to form a saggar of the desired size is beaten or pressed out into a sheet or disk corresponding in contour with the shape of the interior of the shell 3, and the plunger 7 being raised said sheet or disk is placed within the shell in the position indicated by dotted lines 19 in Fig. 1, the bottom plate 4 resting upon the bed 1. The screw-stem is then operated by means of the handle 13 to force the inner die member within the outer die member or shell until the bottom of the plunger engages the plastic mass of clay. Further movement of the plunger causes the plastic material to be compressed between the plunger, bottom plate, and shell of the die, which material is then forced to flow upwardly around the plunger until it engages the flange 8 on the upper end of the plunger and entirely fills the mold-cavity, it being understood that the flange 8 is located within the shell and closely fits the same to prevent the inclosed material from escaping. By beveling or chamfering the edges of the bottom plate and plunger the flow of the plastic material is facilitated. By thus causing the plastic mass to flow from the bottom to the sides of the molded saggar the fragments of precalcined clay are caused to assume lines extending in the direction of the flow continuously from the bottom up the sides of the saggar such that when the saggar is afterward burned these lines of precalcined-clay fragments will form continuous textural lines in the finished saggar. The plastic mass being thus confined on all sides by the mold and subjected to pressure, the plastic clay and the precalcined-clay fragments therein are forced into perfect alinement against the surface of the mold or die, which surface being smooth imparts to the molded article a perfectly smooth finished surface regardless of the size or quantity of precalcined-clay fragments contained in the mixture. The saggar having been thus given the desired shape is removed from the molding apparatus by operating the screw to raise the plunger, while at the same time the bottom plate 4 is raised by means of the treadle 6 in unison with the plunger, thereby carrying the molded article 20, which remains upon the inner die member, upwardly through the chamber of the shell 3 and exteriorly of the same to the position shown in Fig. 3. The bottom plate is then withdrawn to the position shown in Fig. 1, leaving the molded article suspended upon the inner die member, as shown in Fig. 4, it being sustained upon said member by atmospheric pressure upon its exterior surface. The board or tray 16 is then placed on top of the shell 3 directly beneath the bottom of the molded saggar in position to receive the same when released from the inner die member. To quickly release the molded article from the inclosed die member, it is necessary to overcome the external atmospheric pressure, and this I accomplish by introducing into the hollow of the molded article between its interior molded surface and the molding-surface of the die fluid, as atmospheric air. This is preferably accomplished by forcing a small pin or awl 17 through the side wall of the saggar near the line of junction of the bottom and sides of the same, the small hole thus formed permitting air to enter when the awl is removed, thus equalizing the external and internal pressure upon the molded article and permitting the same to be released from the die member by gravity while yet in plastic form and deposited upon the tray 16, as shown in Fig. 5. The saggar is then removed by means of the tray 16 to be dried in any known manner entirely free from the molding apparatus, while the molding apparatus can be immediately used in repeating the process of manufacture. The hole 18 formed by the awl is so small that its existence does not interfere materially with the use of the saggar for all practical purposes; but, if desired, a small plug of clay can be inserted therein to fill the same. The molded saggar after being subjected to currents of highly-heated air until the apparent moisture is evaporated is subjected to a firing or burning process, which expels all moisture therefrom and causes the plastic clay to harden and form a bond or union between the precalcined-clay fragments, thereby producing a saggar without joint or seam and of uniform texture throughout its bottom and sides and which being formed in large part of precalcined clay has maximum strength and durability. Saggars so made are able to withstand repeated firings.

By removing the saggar from the mold in plastic condition I am able to greatly expedite its manufacture and can repeatedly use the same apparatus for successive molding operations without any delay. The mold-cavity being wholly inclosed with no exit for the escape of superfluous clay, the entire contents of the mold must be incorporated in the molded article. It will thus be seen that by introducing uniform quantities of plastic material into the mold uniformity in the dimensions of the product will be secured. The quantity of material can be exactly measured by weight.

The construction of the apparatus is such that by using the same die members the thickness of the bottom of the molded article can be varied as desired by using a greater or less quantity of plastic material.

By the term "precalcined clay in fragmentary form" I wish to be understood as referring to non-pulverulent broken fragments of precalcined clay.

What I claim as new, and desire to secure by Letters Patent, is—

1. A saggar or the like molded without joint or seam from a mixture comprising a bond of plastic clay and non-pulverulent broken fragments of precalcined clay, the molded arti-

cle being burned and of uniform texture throughout its bottom and sides, substantially as described.

2. A saggar or the like comprising a hollow body having integral bottom and sides molded without joint or seam from a mixture of plastic clay and non-pulverulent broken fragments of precalcined clay, the molded article being burned and having textural lines of precalcined-clay fragments extending continuously from said bottom up said sides and bound together by the burned plastic clay, substantially as described.

3. That improvement in the art of making die-molded saggars, and the like, which consists in removing the molded article from contact with the molding-surfaces while yet plastic and undried, and drying the molded article free from contact with such molding-surfaces, substantially as described.

4. The method of separating the die and the article molded thereby consisting in puncturing the body of the molded article and admitting fluid directly through such puncture between the contacting surfaces of the die and article.

5. That improvement in the art of making saggars, and the like, which consists in mixing with plastic clay non-pulverulent broken fragments of precalcined clay and molding the mixture to hollow form by die-pressure, substantially as described.

6. That improvement in the art of making saggars, and the like, which consists in mixing with plastic clay non-pulverulent broken fragments of precalcined clay, molding the mixture to hollow form by die-pressure, wholly relieving the molded article from contact with die-surfaces while the plastic clay is yet plastic and subjecting the molded article to heat, substantially as described.

In testimony whereof I have hereunto set my hand this 12th day of July, 1900.

AUGUST WEBER, JR.

Witnesses:
FRANK C. CURTIS,
GEO. A. MOSHER.