

UNITED STATES PATENT OFFICE.

ABRAM BROODSKY, OF MONTREAL, CANADA.

PROCESS OF INDURATING PLASTER-OF-PARIS.

SPECIFICATION forming part of Letters Patent No. 696,410, dated April 1, 1902.

Application filed October 11, 1900. Serial No. 32,665. (No specimens.)

To all whom it may concern:

Be it known that I, ABRAM BROODSKY, a subject of the Czar of Russia, residing in the city and district of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Processes of Indurating Plaster-of-Paris; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a method of hardening plaster-of-paris and analogous substances, such as gypsum; and the object that I have in view is to quickly and thoroughly indurate objects made of plaster-of-paris, so as to render the same about like stone, such end being attained without any injury whatever to the article either as to any ornamentation or as to the color thereof.

I have discovered that articles of plaster-of-paris can be rendered as hard as stone throughout each and all portions thereof by subjecting the article to the action of boiling alum for a sufficient length of time for the alum to thoroughly impregnate the article.

My invention may be said to consist, therefore, in a process of hardening articles of plaster-of-paris and the like which consists in subjecting the article to the indurating effects of boiling alum.

In carrying my invention into practice I take a suitable quantity of alum which when reduced to a liquid condition by melting and boiling the alum forms a bath of boiling alum of sufficient quantity to cover the plaster-of-paris which is to be subjected to the indurating effect of the alum. This boiling-alum bath is composed essentially and solely of alum, as distinguished from a solution of water and alum in which the water is largely in excess of the alum, and good results have been obtained by me by immersing the plaster-of-paris in such a pure bath of boiling alum. It is found, however, that the boiling of alum drives off the water of evaporation. Hence the alum is reduced to a consistency of a thick syrup when it is kept at a boiling temperature for any considerable length of time, and to overcome this I find it desirable to add a liquid which will compensate for the loss of the water of evaporation and maintain

the alum-bath in a state of liquefaction proper to impregnate the plaster-of-paris. I prefer to employ as this liquid an acidulated solution composed, preferably, of an acid and very little water. The acid which I have used is acetic acid in the form of vinegar, the same being diluted by the addition of a small quantity of water; but the quantity of the water added to the vinegar depends upon the strength of the latter.

It is my practice to place the desired quantity of lump-alum (of commerce) in a suitable vessel, preferably an acid-proof vessel of an earthenware nature, and at the same time to pour into the vessel a small quantity of the acid. The vessel is now heated to a temperature sufficient to melt the alum, thereby producing a bath of melted alum which is kept at the boiling-point (a seething state) during the treatment of the article. Of course any suitable means may be adopted for heating the alum; but it is usual to place the vessel over a coal fire. When the alum has been reduced to a boiling liquid and a thin skim appears on the surface thereof, I proceed to immerse the plaster-of-paris article in the bath and to keep the article well covered with the liquid alum by holding the former below the surface of the bath. It is necessary to subject the article to the action of the boiling-alum bath for a period of an hour, more or less, depending upon the thickness of the article to be indurated. In some instances I have been able to obtain satisfactory results in less than an hour; but in other cases more than an hour is required to secure the desired impregnation of the article by the alum. During the boiling operation the alum is liable by evaporation of the liquid to turn to the consistency of a syrup; but it is necessary to prevent this in order that the alum may be kept in such a state of liquefaction as will insure its ready percolation into the plaster-of-paris article. This is accomplished by adding from time to time a small quantity of the diluted acid into the bath, preferably at a point a little to one side of the article. To prevent the freshly-added liquid from arresting the boiling of the alum, it is my practice to heat the liquid previous to pouring it into the boiling bath of alum. I may remark that the diluted and heated liquid is to be added

whenever the skim on the alum-bath becomes too thick or whenever the alum solution is itself about the consistency of a syrup, the latter condition being ascertained by dropping a little of the boiling alum.

The maintaining of the boiling alum in a seething state causes a more perfect action on the article than if the latter is placed in a bath of melted alum or a solution. This is due to the fact that the alum forming the bath being kept in constant ebullition prevents the formation of a surface coating until the alum has been driven by such ebullitions into the article to an extent where it can receive no more. Where such ebullitions are not present, there is a constant tendency of the formation of such coating prior to the thorough impregnation of the article, in addition to which the impregnation can only be accomplished by absorption, thus prolonging the operation and increasing the liability of the coating being formed prior to the thorough impregnation.

To assist others in using the process, I desire to say that one and a half pounds of commercial alum to four fluid ounces of diluted vinegar are the proper proportions for small articles; but of course the quantity used should be increased for larger articles in order that the latter may be covered with the boiling solution during treatment.

Previous to placing the article in the bath or solution I find it desirable to heat the latter for a short time—as, for example, by placing the article on a stove. After the article shall have had its surface heated it is placed in the boiling solution. This prevents chilling of the bath and any tendency to arrest the boiling operation.

My process may be used in connection with decorated articles of plaster-of-paris—such, for example, as articles which have been marbled by painting them in water-colors to resemble the veins in marble. It is found that the treatment of marbled articles of plaster-of-paris according to my process does not have any bad action on the water-color painting.

It is proper to explain, further, that the addition of the diluted and heated acid to the boiling solution should be made at different intervals during the treatment of the article; but it is not ordinarily necessary to add said liquid during the first half hour of boiling the alum, because the latter does not become too thick during this period.

Any kind of plaster-of-paris articles may be treated by my invention without changing the color of the article or in any way injuring the ornamentation on the surface or surfaces thereof. The article when finished has the strength and appearance of stone, because the indurating agent, alum, thoroughly permeates the article. This has been demonstrated by breaking into pieces articles treated according to my invention. It is well known that

articles of plaster-of-paris when broken present a soft interior which can easily be scraped with a knife; but my articles when broken immediately after removal from the bath and allowed to stand for five minutes or more become very hard and rigid to present the stony hardness which cannot be affected by scraping.

After the article shall have been treated and allowed to cool I may impart to the surface of the same a thin skin or film by momentarily immersing the article in the liquid-alum bath.

I would have it understood that my invention is not restricted to the exact proportions herein stated nor to the particular materials employed.

What I claim as new is—

1. The process of hardening plaster-of-paris which consists in subjecting the same to boiling alum maintained in a seething state during treatment, as and for the purposes described.

2. The process of hardening plaster-of-paris which consists in immersing the same in a bath of boiling alum, and in adding to the latter, from time to time, a suitable liquid which maintains the alum-bath in a state of liquefaction and compensates for the loss of the water of evaporation which is driven off by boiling the alum, as set forth.

3. The process of hardening plaster-of-paris articles which consists, first, in preparing an indurating solution by mixing diluted acid with alum and reducing the latter to a liquid condition by the action of heat; then immersing the article in the boiling alum for a proper length of time to thoroughly impregnate the same, and adding said diluted acid in a heated condition to the solution from time to time, as set forth.

4. As a new article of manufacture, a decorated and indurated plaster-of-paris article impregnated with alum during boiling thereof and having water-color decoration applied thereto previous to impregnating said article with the alum, as set forth.

5. The process of hardening plaster-of-paris which consists in boiling the same in a seething alum-bath maintained in a state of ebullition by the external application of heat, whereby the plaster-of-paris is saturated through and through all portions thereof by the indurating agent, as set forth.

6. The process herein described of hardening plaster-of-paris which consists in driving off the water of crystallization present in the article by immersing the same in a bath of boiling alum maintained in a seething state during treatment for a sufficient length of time to attain the desired end, and replacing such water of crystallization by melted alum which, as the indurating agent, impregnates the article through and through the same, as set forth.

7. The process herein described of harden-

ing articles of plaster which consists in im-
pregnating the article with melted or liquid
alum by immersing said article, for a proper
length of time, in a bath of melted alum
5 maintained throughout the operation in a
boiling condition by the continuous applica-
tion of heat, and adding to the boiling alum-
bath, from time to time, a substance which
compensates for the loss by evaporation and

maintains such bath in a proper state of liq- 10
uefaction, as set forth.

In witness whereof I have hereunto set my
hand in the presence of two witnesses.

ABRAM BROODSKY.

Witnesses:

H. F. BERNHARD,

JOHN F. DEUFTERWIEL.