UNITED STATES PATENT OFFICE.

288,262

JAMES L. ROWLAND, OF NEW YORK, N. Y.

COMPOSITION TO BE USED IN THE MANUFACTURE OF ARTIFICIAL STONE.

SPECIFICATION forming part of Letters Patent No. 288,262, dated November 13, 1883.

Application filed September 19, 1882. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES L. ROWLAND, a citizen of the United States, residing in the city, county, and State of New York, have invented a new and useful compound of matter for use in the manufacture of artificial stone, and also a new and useful process of treating such composition after the same has been molded into proper form and solidified; and I do hereby declare the following to be a full, clear, and exact specification of my said invention.

Many methods have been essayed to manufacture artificial stone or marble of hydraulic cements and other materials suitable for mantels, table-tops, furniture-slabs, and various other articles which are made of the natural marble, but from want of cheapness, efficiency, or practicability none have given such satisfactory results as to be extensively adopted.

My present invention is for the purpose of obviating previous objections; and by it I can cheaply manufacture an article closely resembling either natural marble or slate, but possessing more the character of the latter, and which, therefore, I shall herein designate by the name "artificial slate." This artificial slate is suitable both for such articles as are made of natural marble or slate, and for receiving similar treatment in the way of having lines, grooves, and designs cut in its exterior surfaces, and surface-coatings, as of paints, varnishes, or the process of marbleizing applied to it. The latter achievement—to wit, the production by a practicable and cheap method of an article of manufacture suitably adapted in quality of grain, texture, strength, and otherwise for the articles that may be made of the same being treated the same as similar articles made of natural slate or marble, as being stained or painted with colors, varnished or marbleized, and having lines, grooves, and various designs cut in their exterior surfaces, and with equal efficiency and perfection—is one of the special objects and aims of my present invention.

The invention consists, first, of an improvement in artificial stone or marble compounds effected as and by the means set forth herein; next, of a new article of manufacture—to wit, a calcareous slate resembling and partaking of the character of a natural slate produced artificially, and as described; and, finally, of a process for improving the exterior surfaces of articles made of such materials and combinations thereof as are herein described.

The composition of the compounds as compounded for this slate, any one of which may be used as may be preferred in its manufacture, is as follows: Ground or pulverized slate, one or more such as may be selected for the purpose, of the following named materials: hydraulic cement, hydraulic lime, hydrate of lime, quicklime, (ground,) talc, (finely ground,) limestone, marble, or sand, ground or finely pulverized, or fine sand in its natural state, and water. The foregoing ingredients are combined as and in such various proportions or qualities of each as is hereinafter set forth, though the specification will not be of such extent as to represent all the various compounds suitable for the manufacture of articles under this invention that may be found by the modes of combining these materials, such description being quite unnecessary.

I shall now state a mode of preparing or adapting in state or condition three materials for compounds, the special end or purpose some of them serve in the same, and such formulæ as may serve for forming compounds, any one of which may be used as may be preferred, for the manufacture of this slate, together with a mode of making up the compounds as formulated, and forming articles thereof; and, also, a process of improving the exterior surfaces of the articles.

I intend to give such a full and complete description and illustration of this my invention as to make it known to others, and to enable workmen who are skillful and have experience in the art to which it pertains to fully comprehend and practicably and successfully perform and carry out the same.

Formula for compound No. 1: By measure, four parts ground slate, four parts Portland cement, one part (or any quantity from one-half of one part to one) of hydrate of lime, and water, the latter in quantity sufficient to form with these a homogeneous and compactly-compressible paste or mortar.

The mode of making up and forming articles is as follows: Mix the hydraulic cement and hydrate of lime intimately with each other, as by passing them together through a proper sieve, add the ground slate, and mix till the

whole mass has a uniform shade of color, then apply the water, (preferably in the form of vapor or spray through a vase having many fine holes,) intermixing in the meanwhile with suitable iron rakes, or otherwise as may be most efficient for the purpose, continuing the application of the water and the intermixing till the entire mass has become sufficiently homogeneous and of proper consistency to be packed or compressed compactly. Then tramp or compress this resultant mixture in molds of suitable construction and shape to give articles the form desired, using proper care in the operation to effect throughout the articles thus formed, so far as may be practicable, perfect contact and connection of the particles with one another and with the mold. When relieved of the mold, the articles are indurated and solidified, and this is speedily and quickly accomplished either by treating them with proper applications of water saturated with or holding in solution carbon dioxide, or subjecting them in a closed chamber to any one of the other carbonating processes described in the patents for "improvements in the manufacture of artificial stone," heretofore issued and granted to me; or they may be gradually hardened and matured, but not with the same efficient results, by the carbonic-acid and water vapor of the atmosphere and suitable applications to them of water from time to time.

Formula No. 2: Same ingredients and quantities or proportions as given in the preceding formula, with this exception, one part (or any quantity from one-half to one part) of finely-ground quicklime or one part of hydraulic lime (lime of tiel) is to be substituted and used in the place of hydrate of lime. The mode of making up and forming articles is the same, care being used to perfectly slake the ground quicklime in the operation of making up the compound.

Formula No. 3: Four parts ground slate, four parts, or two parts, very fine clearly-washed sand, eight parts Portland cement, two parts, or one part, hydrate of lime, or one part ground quicklime, and water in quantity as stated. Mix the powdered slate and sand intimately with each other, and then proceed as stated.

Formula No. 4: Four parts ground slate, four parts finely-pulverized limestone or marble, or two parts fine sand and two parts pulverized limestone or marble, eight parts Portland cement, one part (or any quantity from one part to two parts) of hydrate of lime, or one part of ground quicklime, and water in quantity as stated. Mix the ingredients powdered slate and pulverized limestone (and sand or any other equivalent material used) intimately with one another, and then proceed as stated.

Formula No. 5: Four parts ground slate, four parts Portland cement, water in quantity as stated. Mix the cement and slate intimately with each other, add the water, and proceed as stated.

Formula No. 6: Four parts ground slate, two parts fine sand, or two parts sand and two parts pulverized marble or limestone, eight parts Portland cement, and water in quantity stated. Mix all the solid materials with one another till the mass has a uniform shade of color, then add the water, and proceed as previously stated. As to the mode of preparing these materials and the special end or purpose some of them serve, I may state that for obtaining the most efficient results they should be in a fine state, and all coarse grains or parts excluded from them, those in the hydrate of lime being usually gritty and partially slaked parts, and in the hydraulic cements and limes portions of overburned material or aggregations of injured particles and deleterious to a composition. I usually, therefore, pass the hydrate of lime through fine bolting-cloth, and the hydraulic cements and limes through a sieve having meshes sufficiently fine to exclude such parts, and in like manner screen all the other materials used.

The ingredient ground slate, upon the introduction of which into a calcined calcareous compound my invention chiefly depends, and by the use of which the artificial slate is produced in the manner hereinbefore described, is to be of the best quality and finely ground.

The hydrate of lime, (slaked quicklime,) so, also, the ground quicklime, (after being perfectly slaked in the mixture,) besides serving, on becoming indurated in the manufacture, as a cement, serves previously to this, in its moistened state, in the operation of compressing or compacting the composition in the mold in forming articles, as a lubricant to the grains or particles of the solid materials with which it is combined, whereby greater strength and density are effected in the articles. This is to be in the state of an exceedingly fine or impalpable powder.

The hydraulic cements and hydraulic limes to be used are not necessarily of the kinds particularly named in the formulæ or compounds herein given, as other hydraulic cements and limes may be used efficiently; and if, for any reason—as cheapness or the obtaining of a particular color—it be deemed desirable, some of any one of our native hydraulic cements of well-known merits—as the Rosendales or Louisville, or some of two or more of them—may be mixed with an equal quantity of Portland cement, or in other proportions, and this resultant mixture be used in the same proportions with the other ingredients as a Portland cement. Also, the lime of tiel may be mixed with an equal quantity of Portland cement. So, also, in like manner the ingredients ground quicklime and the lime of tiel, or the hydrate of lime, may be mixed with one another and the resultant mixture be used as a hydrate of lime in the same proportions with the other materials. I deem this method of combining these limes and their use in a compound as highly advantageous, provided they are perfectly slaked in the compound before proceeding to form articles of it.

The ingredients hydrate of lime and ground quicklime may also be used efficiently in larger quantities than are represented in the formulæ given, as a quantity, say, from twenty-five to one hundred per cent. greater.

The sand, pulverized limestone, or marble, or other equivalent material are not usually made ingredients in this compound, except when desired to imitate more closely a marble or reduce the cost of articles.

To obtain in articles a color different from those that may be obtained with some one or some of two or more of the various hydraulic cements of different shades of color, in combination with the other materials, suitable mineral paints—as the metallic oxides in a finely ground state—may be used for this purpose by ultimately mixing these with the other ingredients of the compound in proper quantities or proportions to give the color desired.

In articles which are to have a fine quality of grain and close texture, the purpose to this end is served by preparing the solid materials, as described; and having all these in a finely pulverized state, being well understood, it only remains to state that when an article is to serve for any special use requiring it the composition or compound for such article is to be formulated specially in view of such use, such materials and proportions being selected for combination with the ground slate as may be most suitable for the article, or some one of the formulæ herein given adapted to this purpose by altering the proportions of some one or more of its ingredients—as, for instance, for tile for floors and areas. These articles requiring unusual strength and hardness, from twenty-five to one hundred per cent. more hydraulic cement is to be used than is expressed in the formulæ herein given; or, in the case of articles for mantels, wainscoting, and other uses, should greater hardness be desired, an additional quantity of hydraulic cement is to be used, proper care being taken when they are to receive certain treatment—as the process of marbleizing—not to use such excess of the cement as to cause any degree of heat to which they are to be subjected in the operation to produce surface-checking or cracking.

Some articles, when for any reason it may be deemed desirable—as, for instance, the reduction of the cost—need not necessarily be made wholly, but in part only, of such compounds as are indicated by the formulæ given in order to serve efficiently the uses for which they are intended, and such articles may consist of a facing of suitable thickness made of some one of these, and a backing suitable to complete the thickness and strength required in the article, made of some coarser and cheaper composition—such as four parts sand, four parts, or any quantity from two to four parts, hydraulic cement, one part hydrate of lime, suitably tempered with water; or this backing may be made of any of the usual calcareous concrete compositions that may be suitable for the purpose. I may state that some articles made in this manner—such as tiles for floors and areas and wainscoting, and some others which are to be placed or embedded in mortar, cement, or plastic, and held in place by the same—are perfectly made with a backing of the coarser composition, because the mortar or plastic more readily and firmly adheres to such composition. In making an article, moreover, in this manner, with a composition of the kind stated for a facing and a coarser composition for a backing, sufficient care must be taken to join or incorporate most perfectly the former with the latter at the contact-surfaces. In forming articles in this manner—as, for instance, tiles for floors and other uses—I usually proceed as follows: I put lightly and evenly in the mold a quantity of the composition intended for a facing, leveling it without compression, and, if deemed desirable, slightly corrugating or indenting the same in a manner most suitable for incorporating with it the material for a backing, which is next to be put in the mold. Then I put lightly and evenly in the mold such a quantity of the composition intended for backing as will give, without any additional supply, the thickness required, and then with hydraulic or other suitable mode of compression form the article.

The process of improving the exterior or face surfaces of articles made of such compounds as described, thus adapting them for receiving a polish or paints and varnish, or the process of marbleizing with the greatest efficiency, this process of improvement being intended also for all articles to which it may be applicable, and to which its application may be in any way or for any use or purpose useful or advantageous, of whatever composition made, is as follows: I take hydrate of lime, (quicklime perfectly slaked,) prepared usually as hereinbefore stated, the same being free from all gritty or unslaked particles, and by intermixing this with water form a calcareous liquid sizing of proper consistency for being freely applied, and so far as may be practicable freely absorbed by the surfaces to which it is to be applied. I then coat the surface or surfaces of the articles which are to be improved in this way with this sizing, doing this in any manner suitable for adapting the coating to the treatment it is subsequently to receive in the process. A simple mode of applying the sizing to the surfaces is to make the applications with a woolen cloth gathered into a bunch, dipping a portion of this into the sizing as frequently as the operation may require, and rubbing the portion thus taken up to the surface, going over the entire surface or the portions which it is desired to impress in this way. The application thus made is then rubbed to the surface, being kept suitably moistened with water to prevent its drying too rapidly in the operation for its proper adhesion to the surfaces, and finally gently smoothed to and made to conform with the surface. Prior to applying the sizing, it is

sometimes necessary to first slightly rub the surfaces with fine sandpaper, and when such surfaces are in condition the sizing is applied with a sponge or woolen cloth gathered into a bunch. When the sizing dries too rapidly for its proper adhesion to the surfaces, it must be moistened with water. The application thus made is rubbed into the surface, and, being kept properly moistened with water, is smoothed to and made to conform with the surface. After the coating has attached itself to the surfaces with sufficient firmness for the next step in the process, as it will quickly do when the articles to which it is applied are submitted to any of the carbonating processes hereinbefore referred to for rapidly indurating and solidifying articles made of a calcareous composition, or as it will gradually do in drying and hardening in the atmosphere, but not with the same efficient result, I proceed, using proper tools, usually a stone with a true surface or suitable in shape for the purpose, such stone being very fine without grit, to rub down the application uniformly and to such extent as may best fit the articles for which they are intended, or for receiving any subsequent treatment which it is intended they shall have, it being understood that water is used in such quantities as may be desired. This accomplished, the articles are promptly dried, and such as are to have coatings, as of paints and varnish, or the process of marbleizing applied to them, may then be treated in making such applications the same as similar articles made of natural slate or marble. When grooves or designs are to be cut in the articles, this is done usually before coating with the sizing. In this operation of rubbing down a coating of the sizing, care is to be used not to penetrate the surface with which it is incorporated, and this is easily to be avoided, since water, when used in proper quantities and not too freely, forms with the particles detached from the coating by the rubbing a slippery substance that serves efficiently to this end. Such coating, properly applied to articles having surfaces in quality and otherwise suitable for its application, may be rubbed down to such an extent as to appear as slight aggregations of particles of the sizing, filling intersticial spaces and defective portions in the surfaces, and this mode of treatment of the coating, by reason of its effecting very great smoothness in the surfaces, and also rendering them but slightly non-absorbent of water and other fluids, I find to be highly efficient and practicable for adapting surfaces of articles which are to be marbleized for receiving the process with general efficiency. In the case of articles made of the coarser artificial stone composition, the filling of the intersticial spaces and defective portions of their exterior surfaces in this way renders them nearly non-absorbent or impervious of water or other fluids.

In forming the sizing, if it be desired to facilitate the hardening or indurating after its application to the articles, a hydraulic cement in a very fine state may be combined with the hydrate of lime, but not in such quantity as to affect the efficiency of the sizing for the purposes for which intended.

Having thus fully described my invention, I may state that I do not intend to confine my invention to the precise proportions of the materials and combinations represented in the compounds or formulæ herein given, having, on the other hand, provided for some changes in these in some other cases, as stated; nor do I intend to lay any claim herein to the mode of preparing the materials for compounds, or the mode of making articles, consisting of a facing of a fine composition and a backing of a coarser one, or the mode of rapidly indurating and maturing articles herein described, as all these have been previously set forth and described in some one or more of the various patents for improvements in the manufacture of artificial stone heretofore issued and granted to me.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described composition for the manufacture of artificial stone, which consists of ground or powdered slate mixed with a calcined calcareous base, substantially as described.

2. The herein-described process of improving the surfaces of artifical stone, which consists of applying a solution of slaked or hydrate of lime to such surfaces, substantially in the manner specified.

JAMES L. ROWLAND.

Witnesses:
EDMUND H. RAE,
EDW. KENT, Jr.