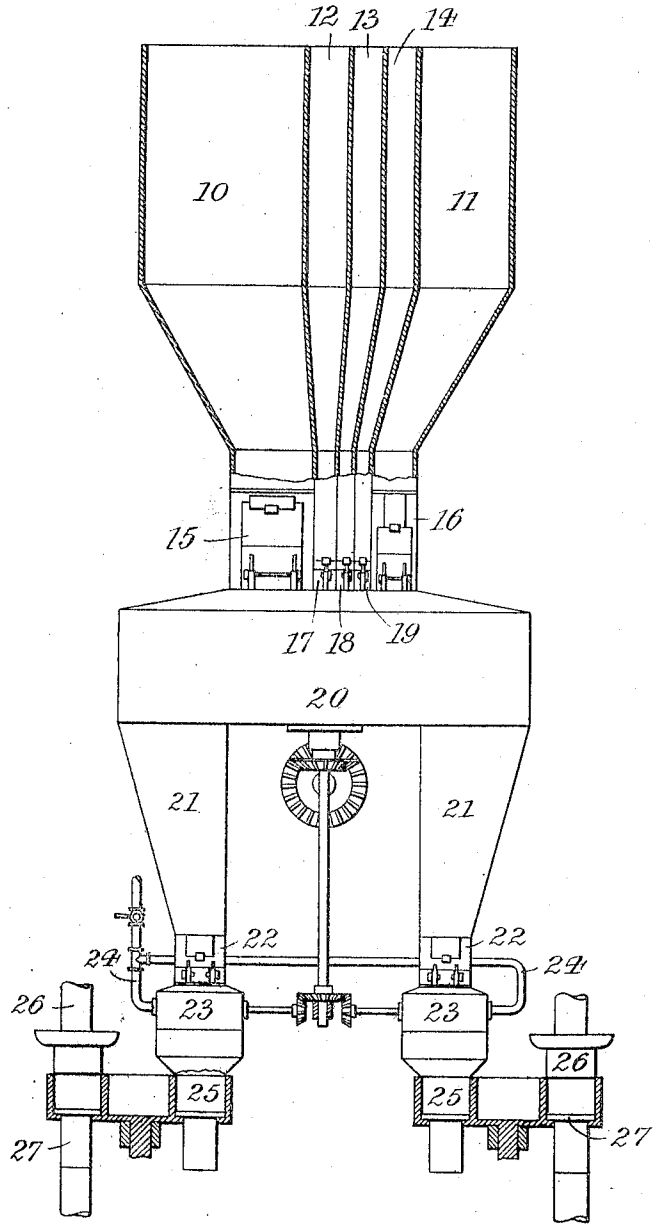
M. H. AVRAM.

METHOD OF MANUFACTURING ARTIFICIAL STONE.

APPLICATION FILED APR. 5, 1909. RENEWED DEC. 6, 1912.

1,102,851. Patented July 7, 1914.



Witnesses:
Edward Schorr.
H. R. Schulz.

Inventor
Mois H. Avram
By his Attorney
Arthur E. Gruyer

UNITED STATES PATENT OFFICE.

MOÏS H. AVRAM, OF NEW YORK, N. Y., ASSIGNOR TO STANDARD SILICA BRICK MACHINERY COMPANY, OF WILMINGTON, DELAWARE.

METHOD OF MANUFACTURING ARTIFICIAL STONE.

1,102,851. Specification of Letters Patent. Patented July 7, 1914.

Application filed April 5, 1909, Serial No. 487,920. Renewed December 6, 1912. Serial No. 735,316.

To all whom it may concern:

Be it known that I, MOÏS H. AVRAM, a citizen of the United States, residing at New York city, Manhattan, county of New York, State of New York, have invented new and useful Improvements in Methods of Manufacturing Artificial Stone, of which the following is a specification.

This invention relates to an improved method of manufacturing artificial stone or bricks from a mixture of sand, lime and cement to which a coloring agent may be added, if desired.

The invention comprises more particularly novel steps in the manufacture of such stones or bricks by means of which a superior intermixture of the several ingredients is obtained at a smaller expenditure of power so that stones of higher quality are produced at a lower cost than was the case with the methods hitherto employed.

The main object of my invention is to insure an easy and unobstructed conveyance of the mixed ingredients to the mold without any liability of the mixture to adhere to the feed channels, etc., or to harden before reaching the mold. In order to obtain this desirable result, I separate from a previously prepared intimate mixture of the dry ingredients such a quantity as to be just sufficient for the formation of one stone or brick. This separated quantity is carried to a small mixing apparatus in which the necessary amount of moisture is added while thoroughly agitating the mass. The moisture is introduced in the form of either steam or hot water so as to effect a proper heating of the mixture and to do away with all additional heating devices, while simultaneously any adhering of the mixture to the feed channels, molds and plungers is effectively prevented. I have further found that for producing a durable stone of great resistance to pressure and other influences, it is of considerable importance that sand be used which is composed of grains of a comparatively large size intermixed with particles of a smaller size. In this way, the cavities formed intermediate the larger grains are filled out by the grains of smaller size, such relative arrangement of the particles taking place when pressure is applied to the mass. I may here add that the sand obtained from one stratum or locality is usually of uniform grain. If there is found a stratum of fine sand, such sand would be intermixed with coarse sand obtained from another stratum or locality. If, however, a stratum of coarse sand is found, this coarse sand should be intermixed with fine sand. It is this non-uniformity of the sand particles that I want to attain when speaking of producing a mixture of coarse and fine sand. If the usual sand of but one grain is used, the amount of the binding agents employed is sufficient to completely fill the cavities between the grains, but by adding to the relatively coarse sand a quantity of fine sand or vice-versa, a homogeneous brick is obtained which is characterized by the entire absence of inner cavities.

In carrying my improved method into practice, I proceed as follows:—I prepare a suitable quantity of perfectly dried sand preferably of different fineness, viz., a quantity of relatively coarse dried sand and a quantity of relatively fine sand, both kinds of such sand being stored individually. I further prepare the necessary quantities of hydrated line, cement and a coloring agent, taking particular care that these ingredients are finely pulverized and in perfectly dry state. From these conveniently and individually stored materials, there are intermittently separated predetermined quantities which are thoroughly mixed until a uniform dry mass is obtained. From the latter, there is then separated precisely such a quantity as is just sufficient for the formation of one stone or brick. To this comparatively small mass, I apply the necessary moisture at high temperature by either adding a predetermined quantity of hot water or by introducing steam into said mass while thoroughly agitating the same. The amount of moisture used should be just sufficient to effect a perfect cohesion of the plastic material after compression takes place. After the moisture has been added and while the mass is still in its hot state, it is conveyed to the mold to be compressed without delay into the shape desired, whereupon the brick thus formed is carried to a steam chamber and subjected to the action of high pressure steam until it is perfectly hardened or steam indurated.

For producing a perfect stone, I prefer to employ the ingredients in the following proportions:—10 to 20 parts of coarse sand, 50 to 60 parts of fine sand, 8 to 10 parts of

hydrated lime, 2 to 5 parts of cement, 2 to 5 parts of water, to which mixture the necessary quantity of a coloring agent may be added according to the shade desired, though I do not want to limit myself to the above proportions. Also some of the ingredients may be omitted or substituted by others without departing from the spirit of my invention.

In the accompanying drawing, I have diagrammatically illustrated an apparatus which may be used for carrying out my improved method, although other devices may be employed for the same purpose.

Within suitable bins 10, 11, 12, 13 and 14, there are contained fine sand, coarse sand, hydrated lime, cement and a coloring agent respectively. All these ingredients are well dried, and the lime, cement and coloring agent should be finely pulverized. From the bins, the several materials descend into suitable measuring or weighing devices 15, 16, 17, 18 and 19, by means of which predetermined quantities are intermittently dumped into a dry mixer 20. The weighing devices may be of any convenient construction, for instance as shown in Patent No. 888,572 granted to me May 26th, 1908. The dry mixer may also have any suitable construction, such a mixer being shown, for instance, in Patent No. 875,234 granted to me December 31st, 1907. After the above ingredients have been intimately mixed, the mixture thus obtained is by chutes 21 conveyed to weighing or measuring devices 22, each of which separates automatically at certain intervals such a quantity from the mixture as is just sufficient for the formation of a single stone or brick. This separated quantity is then dumped into a miniature mixer 23. In this relatively small mixer, hot water or steam is added to the mixture through pipes 24. From each miniature mixer 23, the wet mass is fed into a mold 25 which, after having received its charge, is carried intermediate a pair of plungers 26, 27, where said charge is molded into the shape desired. The molded bricks are finally conveyed to a steam chamber (not shown), to become hardened or steam indurated.

It will be seen that by my improved method, important advantages over the methods hitherto used are obtained. The dry ingredients may be kept for any length of time before and after being intermixed, without the lime and cement losing their cementing properties. As the materials are in a perfectly dry state while being intermingled in the large dry mixer, and as but small amounts of the mixture thus formed are agitated in a wet condition, there occurs a considerable saving of motive power when compared with the methods heretofore employed which depended upon mixing the bulk of the mass in a wet state. It is also obvious that by introducing the moisture into a comparatively large mixture of dry ingredients, it will be quickly absorbed near its point of entrance into the mixture. As it is however practically impossible owing to the tendency of the powdery lime and cement to absorb and bind moisture, to subsequently withdraw said moisture from those parts of the mixture to which it has been excessively applied, and to convey it to the unsufficiently wetted parts, the result of moistening the mass in bulk would be to obtain an utterly uneven mass. By applying the moisture to small segregated bodies of the dry mixture contained in miniature mixers, a uniformly moistened mass results. By introducing the moisture in a hot state, it more readily penetrates said bodies and thus becomes evenly distributed therethrough, while with cold moisture there always exists the tendency to form lumps. Thus a more uniform mass is obtained which in turn results in the formation of bricks of even structure and increased strength. It is further obvious that by adding the hot moisture to the small amount of a segregated dry mixture, the moldable mass thus formed will more uniformly maintain its temperature until received by the mold, than if added to the dry mixture in bulk, which owing to its large surface will cool unevenly, so that the subsequently segregated small quantities will possess different temperatures which is obviously objectionable. Further, I have found that the hot moldable mass readily traverses the chutes between mixer and mold and does not adhere to the walls thereof. In this way exactly like quantities of material are always delivered to the mold, so that the resulting bricks possess even density. I may further add that a uniform high temperature of the plastic mass has the additional advantage that the latter is compressible to a higher degree than attainable with a cold mass, and furthermore the chemical reaction is greatest, at high temperature. Furthermore, as the majority of the various feed channels and other devices are traversed by dry materials, while the mass is moistened in the miniature mixer near the end of the entire operation only, there will not be formed any deposits on the walls of said channels and other devices. Finally, as the small quantity separated from the dry mixture is moistened with steam or hot water immediately before being molded, the materials have no time to set previous to the molding operation. In this way, a perfect product is obtained, time and labor is saved, and the power necessary for forming the stones is reduced to a minimum.

I claim:

1. Method of manufacturing sand lime

bricks which consists in mixing dried bodies of sand, hydrated lime and cement in sufficient quantities to form a plurality of bricks, the quantity of cement being materially less than that of the lime, consecutively segregating from the dry mixture fixed smaller bodies, each sufficient for making a single brick only, admitting to each segregated body a predetermined quantity of hot moisture and simultaneously thoroughly agitating said body, so as to form a plastic mass, compressing said mass into the shape desired whereby the cement effects a preliminary binding of the constituents of the compressed mass, and steam-indurating said compressed mass to effect a thorough silication of the same.

2. Method of manufacturing sand lime bricks which consists in mixing dried bodies of sand and hydrated lime in sufficient quantities to form a plurality of bricks, repeatedly segregating from the dry mixture a multitude of fixed smaller bodies, each of said bodies being sufficient for making a single brick only, admitting to said segregated bodies predetermined quantities of moisture and simultaneously agitating the same, so as to form plastic masses, compressing said masses into the shape desired, and steam-indurating said compressed masses.

MOÏS H. AVRAM.

Witnesses:
GABRIEL TISCHER,
ARTHUR E. ZUMPE.