

UNITED STATES PATENT OFFICE

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IMPROVEMENT IN THE MANUFACTURE OF ARTIFICIAL HYDRAULIC CEMENTS.

Specification forming part of Letters Patent No. **176,938**, dated May 2, 1876; application filed January 28, 1876.

To all whom it may concern:

Be it known that I, CLEAVELAND F. DUNDERDALE, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful improved process for the treatment and manipulation of the raw materials in the manufacture of artificial hydraulic cements, which process is fully set forth in the following specification.

This invention relates to that class of processes employed in the incorporation and amalgamation of the limes with the clay or clays and other mineral matters, and the separation therefrom of the moisture employed in securing such mixture or amalgamation, previous to the burning of the same in kilns or furnaces, for the formation of the double silicates of lime and alumina, and sometimes of iron, known as hydraulic cements; and it consists in the grinding or crushing of the materials, either separately or together, in water, with a suitable mill, like that known as the "wash-mill;" then passing the semi-fluid mixture between revolving millstones, dressed smooth, or through a mill similar to the device known as the "Bogardus mill," or other suitable reducing or pulverizing device; then into a tank large enough to contain the product of several grindings of the aforesaid mills, (this tank not being indispensable in the process, may be omitted,) and in which are revolving blades or other devices for agitating or mixing, whereby the ingredients in the semi-liquid mass are averaged in quantity throughout the whole. It is then allowed to flow onto a suitably-prepared floor or pan, which is heated by flues placed thereunder, through which heated currents of air are passing, whereby the moisture is driven off from the material, and it is made sufficiently dense or stiff to permit being pressed into suitable forms for burning in the kilns.

In carrying out my invention a wash-mill similar to those used by the English artificial cement-makers, or other suitable contrivance, is provided, in which the lime, either as a carbonate or in the caustic state, is placed, together with the clay, one or more or other mineral ingredients, and water filled therein, sufficient in quantity to render the mass of a semi-fluid state, which may be either heated or cold, the

mill being then allowed to operate, so that the materials may be crushed and amalgamated together into as thick a fluid or semi-fluid state as possible without interfering with its flowing qualities. After being reduced as fine as this mill will accomplish, it will still be full of fine particles in the lumpy state, which must be further reduced into an impalpable smooth semi-fluid or paste to secure a uniform product of cement. This I accomplish by causing it to pass between revolving millstones, smooth dressed, or a Bogardus mill, set to grind fine. The lumps when smoothed out, together with the liquid mass from the wash-mill, are allowed to collect in a large tank, or other vessel, in which are revolving arms, or other contrivances, for agitating and mixing the contents, whereby the semi-fluid escaping from the mills and contained therein is mixed and made into a general average of the several runs of the said mills. This, when full, is allowed to empty on a suitable drying-floor, heated to the proper degree, being such as is commonly used in the manufacture of fire-bricks for drying same, by means of which the water is driven off and the material made sufficiently stiff to enable it to be pressed into suitable forms by means of a proper pressing-machine of known forms—as a brick-pressing machine. After being so pressed it is burned in kilns; then ground and barreled for use.

By using the different devices aforementioned very little water, comparatively, can be made to answer in securing the finely-divided state and thorough incorporation of the ingredients, which are requisite to obtain a uniform and reliable result in the burning process in the kilns. The greater precipitation of any one of the ingredients, by virtue of difference in specific gravity, is likewise prevented by incorporating the ingredients in a dense semi-fluid state, and the process is shortened as to time occupied over other methods. This cannot be accomplished when the smoothing and mixing mills are left out in the process, and the wash-mill only used as a reducing means.

I am aware that the process of crushing the lime (or carbonate thereof) and clay with a wash-mill, in water, to the consistency of fresh cow's milk, then allowing the thin liquid to flow through a fine wire-sieve containing as

many as eighty wires to the lineal inch—whereby the fine particles or lumps are arrested and returned back to the wash-mill, the escaping particles suspended in the water flowing into large settling tanks or backs, wherein it is held until the said particles have precipitated and the supernatant water allowed to flow off, the material being then dried and pressed—is in use and practice in the manufacture of artificial cement in England; also, that a process is in use in Germany whereby the materials aforesaid are first ground to a powder, and then mixed in a dry state by mechanical means, then moistened slightly and pressed into form, and afterward burnt. But it has been found that the former method has the objectionable features of requiring large and expensive settling-tanks or backs, much area or space of land, considerable delay and time in getting rid of the excess of water used, and the separation by precipitation of the different ingredients in different stratas, according to the varying specific gravities of each, being facilitated by the thinness of the mixture and excess of water therein, which is requisite in that process to separate the impalpable particles from the coarser particles formed by the wash-mill. And in the latter process, it being very different to secure a perfect and thorough mixture and incorporation of the fine particles of the clay and lime in the combining proportions which are essential to secure in the kiln

the formation of the double silicates of lime and alumina and iron, which is the chemical character of true hydraulic cements of the best quality.

My process avoids the objectionable features of these processes now generally used, and secures the desired result in a uniform and certain manner.

I claim as my invention—

1. The process of crushing and mixing in water, with a suitable mill, the one or more clays and lime in a dense semi-fluid state, then flowing same directly onto a suitable drying floor or pan, for the purpose of expelling the water thereof, then pressing the same in any suitable device, and afterward burning the same in any suitable kiln, substantially as and for the purpose specified.

2. The process of crushing and mixing in water, with a suitable mill, the one or more clays and lime, or its carbonate, in a semi-fluid state, then causing same to pass between other known mechanism for completing the reduction of the particles thereof into an impalpable state of subdivision, thence directly onto a drying-floor, substantially as and for the purpose specified.

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Witnesses:

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