UNITED STATES PATENT OFFICE.

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TRANSPARENT WATERPROOFING.

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To all whom it may concern:

Be it known that I, AARON C. HORN, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Transparent Waterproofing, of which the following is a specification.

This invention relates to the waterproofing of concrete and relates in particular to the application of transparent coatings to concrete or other masonry structures such as brick, stone, stucco and the like, and to the product of such treatment, namely, masonry or other shaped masses of these materials having one or more surfaces waterproofed or rendered substantially impervious to the ingress of water.

The invention also comprises certain waterproofing agents specially adapted to carry out the foregoing; all as more fully hereinafter described and as claimed.

In the waterproofing of masonry by the surface application of waterproofing agents to the shaped structure it has been observed that siccative oils, such as linseed or Chinese wood oil, change the color of the surface causing it to appear darker, substantially as is the case when the surface is moistened with water. This is frequently objectionable as oftentimes the natural color and appearance of the material are required to be maintained, while the surface must be rendered fairly resistant to the ingress of moisture. To this end it has been proposed to form water-insoluble soaps in the surficial layers of the masonry. An application of ordinary water-soluble soap followed by an alum wash is an example of this method of treatment. The disadvantage of this method, in particular, is the streaky appearance of the surface after treatment, because of the very irregular deposition of the alum soap in the pores of the structure as well also as is the subsequent trouble from efflorescence due to the introduction of water-soluble salts. With ordinary sodium soap, for example, reaction with alum forms sodium sulfate, which causes saltpetering and in consequence an unsightly surface.

Water-insoluble soaps of drying oils have been formed in the same manner and are open to the same objections. Then, too, the deposition of these soaps from aqueous solution does not, apparently, afford waterproofing effects in the highest measure, perhaps owing to the retainment or inclusion of water-soluble salts.

For the integral waterproofing of concrete masses the use of calcium stearate is customary; and in practice, the stearate in a finely divided condition is well mixed with the dry cement and other materials, from which mixture, mortar is prepared by the addition of water. Such a method of waterproofing is satisfactory when constructional work is in hand, but in the case of a completed structure the calcium stearate integral method of waterproofing cannot be employed, nor is it feasible to coat the masonry surface with calcium stearate preparations to secure a suitable transparent coating.

In the present invention I make use of the stearate of aluminum dissolved in a hydrocarbon or similar solvent, as will be more fully set forth below. Unlike calcium stearate, the corresponding compound of aluminum is readily soluble in certain hydrocarbon solvents, particularly the lower hydrocarbons of the aromatic series; benzol being very well suited for this purpose. Aluminum stearate is however but very slightly soluble in the petroleum hydrocarbons, such as benzin and in this menstruum it appears to have a physical character different from its condition in benzol and the like. The benzolic solution has a high degree of viscosity which is sometimes undesirable owing to a too slight degree of penetration of the composition into masonry. The addition of benzin to the benzol solution modifies the viscosity and gives rise to a new result, so far as I can determine which is of importance in the waterproofing art, namely, the enhancing of the degree of "transparency" to such a degree that I am enabled to introduce into the composition a quantity of aluminum tungate or other water-insoluble, benzol-soluble compound of a similar character without causing discoloration when applied to concrete or other masonry.

The lime and aluminum soaps of Chinese wood oil under ordinary conditions of application to structures of concrete and the like have, as indicated, a darkening effect. Blended with the aluminum stearate, the darkening does not occur even when moderate quantities are used. Aluminum tungate has an action on the stearate which is also of importance. Aluminum stearate in solution has a tendency to change in viscosity or

body on standing in containers for a considerable time. This change in consistency is undesirable, as a composition intended for a masonry structure of a certain degree of perviousness and porosity may on standing for a time be quite unfitted for the particular purpose. Just what the change taking place in these stearate compositions on standing may be, I cannot definitely state, but I believe certain oxidation phenomena may be involved, and the oxygen in the air of the container may therefore have a cumulative action resulting ultimately in the change of body noted. The addition of the aluminum compound of a drying oil of the type of Chinese wood oil may by absorption of the oxygen of the container render the aluminum stearate more stable as regards viscosity.

A further feature of my invention is the use of a stearate of aluminum carrying free stearic acid or other stearic compound, such for example, as sodium stearate in moderate quantity, intimately incorporated or combined with the stearate of aluminum. The coprecipitation of an aluminum and sodium soap of the stearate type enables me to secure such compounds. For example, I may add to a solution of sodium stearate in water, a quantity of alum sufficient to combine with two thirds of the stearate. The free acid of the alum sets free a little stearic acid, and the alumina combines with the stearate radical forming a double stearate of aluminum and sodium, or potassium, as the case may be. I am unable to state whether or not these double stearates are actual chemical compounds or whether the occlusive action of the precipitating aluminum stearate is responsible for the composition of the resulting bodies. The action may be chemical or adsorptive. Such compounds or mixtures are better adapted to form stable solutions in the solvents mentioned than simple aluminum stearate, and, if the proportion of the sodium compound is not too great, there is no trouble from saltpetering. Usually less than one third of the composition may consist of sodium or potassium stearate. The addition of stearic acid to the solution of the stearate in benzol is desirable in that it tends to remove the composition from a basic to an acid condition; which is useful in the waterproofing of concrete. On application to concrete the sodium stearate as well as the stearic acid gradually react with the lime of the concrete, forming *in situ* the stearate of lime.

The compositions embraced under my invention are therefore those which comprise aluminum stearate, preferably intimately associated with alkali stearate in lesser proportion, preferably acid or acidified by means of a fatty acid such as stearic acid; all mainly dissolved in a solvent of good dissolving qualities, such as benzol, in conjunction with a thinner of poor solvent qualities, such as benzin: the latter also functioning to augment the transparency of the coating derived by application to masonry; and the composition preferably containing a small quantity or modicum of the lime or aluminum soap of Chinese wood oil as a stabilizer.

I realize that the composition may be greatly varied and still satisfy the specific conditions mentioned above, and all such variations I regard as within the scope of my invention.

The process of applying the foregoing composition and the specific formula hereinafter given, involves allowing the concrete or other masonry to dry out to an extent sufficient to permit of satisfactory penetration of the waterproofing composition and in then forcing the solution of the stearate into the pores of the structure by means of a spraying device using air under pressure or in other ways. The composition may also be applied with a brush. One or more coats may be applied, and in case the composition contains stearic acid or alkali soap a short time may elapse before the maximum waterproofing effect is obtained. The product of the operation is a shaped mass of concrete or other shaped piece of masonry having one or more surfaces superficially impregnated or coated with the stearate composition.

A formula illustrative of the present invention is the following:—25 lbs. of stearic acid and 5 lbs. of caustic soda are boiled with 50 gallons of water for a short time and to this is added a solution of 12.5 lbs. of alum dissolved in 25 gallons of water. The precipitate is collected and dried. It is then warmed with benzol for some time until a nearly saturated syrupy solution is secured. To one gallon of the heavy syrup, I preferably add 4 ounces each of stearic acid and aluminum tungate, the latter if desired being first dissolved in a small quantity of benzol or turpentine. One half gallon of benzin is finally added in a gradual manner with careful stirring, when the composition may be allowed to clarify by deposition, if desired, and it is then ready for use.

In place of benzol in the foregoing formula a solvent such as toluol or carbon bisulfid may be used. Thinning materials having the special function of regulating the rate of evaporation and in a predetermined manner, and of controlling the physical condition of the stearate as the solvents evaporate in or on the masonry to produce the maximum degree of transparency, are mainly the petroleum hydrocarbons such as light or heavy benzin, carbon tetrachlorid and the like. Turpentine and wood turpentine also may be used in variable amounts although preferably only small additions should be employed because of a tendency

to influence the degree of transparency in an unfavorable manner.

While I do not recommend the use of the oleates or palmitates because of their lack of stability and for other reasons, I do not wish to limit myself exclusively to stearate material but may employ for example small additions of aluminum palmitate, especially in conjunction with a goodly proportion of a suitable viscosity stabilizer.

What I claim is:—

1. A shaped mass of concrete or other masonry a portion at least of whose surfaces is superficially impregnated with a transparent waterproofing medium comprising aluminum stearate; such concrete or other masonry being characterized by having its surfaces substantially identical in appearance, color, texture, light refracting properties and porosity to normal concrete or other masonry, but being water-repellent to a high degree so that the porous surface although seemingly of a capillary nature exerts no capillary action on water.

2. A shaped mass of concrete or other masonry a portion at least of whose surfaces is superficially impregnated without discoloration with deposited aluminum stearate and aluminum tungate; such concrete or other masonry being characterized by having its surfaces substantially identical in appearance, color, texture, light refracting properties and porosity to normal concrete or other masonry, but being water-repellent to a high degree so that the porous surface although seemingly of a capillary nature exerts no capillary action on water.

3. A shaped mass of concrete or other masonry a portion at least of whose surfaces is superficially impregnated without discoloration with deposited aluminum stearate and a modicum of aluminum tungate; said coating being characterized by a high degree of transparency; such concrete or other masonry being characterized by having its surfaces substantially identical in appearance, color, texture, light refracting properties and porosity to normal concrete or other masonry, but being water-repellent to a high degree so that the porous surface although seemingly of a capillary nature exerts no capillary action on water.

4. A shaped mass of concrete a portion at least of whose surfaces is superficially impregnated without discoloration with a continuous layer of deposited aluminum stearate and a modicum of aluminum tungate; said coating being characterized by a high degree of transparency; such concrete or other masonry being characterized by having its surfaces substantially identical in appearance, color, texture, light refracting properties and porosity to normal concrete or other masonry, but being water-repellent to a high degree so that the porous surface although seemingly of a capillary nature exerts no capillary action on water.

Signed at New York city, in the county of New York and State of New York, this 4th day of April, A. D. 1912.

AARON C. HORN.

Witnesses:

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