

UNITED STATES PATENT OFFICE.

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CONCRETE-HARDENING.

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No Drawing.

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94-21

To all whom it may concern:

Be it known that we, CARLETON ELLIS and HERMAN S. RIEDERER, citizens of the United States, and residents, respectively, of Montclair, in the county of Essex and State of New Jersey, and New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Concrete-Hardening, of which the following is a specification.

This invention relates to concrete aggregates or concrete structures and surface finishes and relates particularly to the production of hard surfaces of cement or concrete especially suited as floor structures and the like, all as more fully hereinafter described and as claimed.

One method of securing hard surfaces from cement materials is by the incorporation of iron filings and the like in the aggregate, or by surfacing concrete with fragmentary iron material. Floors and sidewalks prepared in this manner have given more or less trouble especially under severe service conditions by rusting, thus staining the concrete an unpleasant brown color or making the surface mottled and streaky.

The present invention has for its object the production of a cement structure which is not open to the objectionable feature of pronounced corrosion of the metal material and yet which will afford a firm hard floor composition capable of resisting wear satisfactorily.

According to the present invention in its preferred form, iron borings or turnings or other fragments of iron, preferably of rough jagged character or any other suitable form of iron or steel are coated with a layer of copper or other similar metal by any suitable galvanoplastic, or chemical method or otherwise. Electroplating methods may be employed, using any suitable solution of copper for this purpose. By dipping the iron fragments into a solution of copper sulfate, the copper is desposited over the surface of the iron and a satisfactory coating is obtained. To secure the best results in this manner the iron or steel fragments or granules should be freed from grease or foreign matter by washing with a solvent or by heating to burn off the greasy material, which may be conducted if desired in a non-oxidizing or in a reducing atmosphere. A relatively small amount of copper material

suffices to effect the coating desired and the jagged grains of iron, copper plated in this manner, when introduced into concrete material give to the surface a hardness and durability which is not easily obtainable by more perishable material such as has been heretofore employed in the art. The copperized grains adhere with great tenacity to the concrete and yet there is no deterioration of the surface due to oxidation or changes of an undesirable character or of undesirable degree.

Other metals of a less electropositive character than iron may be plated chemically on the iron surfaces to form a composite fragment or duplex metallic grain sufficiently coarse to form a substantial part of the wearing structure of the concrete and yet fine enough to be readily incorporated with the flooring material without unfavorably modifying its texture.

When depositing the copper from copper sulfate solution by chemical exchange, it is desirable after removing the copper plated fragments from the treating solution to keep the material away from air until the fragments have been freed of the acid liquor and dried. In the presence of sulfuric acid oxidation takes place and consequently washing and drying should preferably be conducted promptly in order to secure the preferred form of the composition bright coppery looking metal fragments which in the case of the jagged rough form of turnings or borings possess a fairly uniform and well distributing coating of copper over the projection or filaments of the jagged particles. The copper plated particles may be washed with alcohol or with dilute sodium carbonate solution to prevent oxidation. In reference to the latter it should not be inferred that very coarse turnings are employed, as these are usually undesirable. A medium coarseness perhaps represented by about 10 to 30 mesh material is ordinarily satisfactory as by using such material the fine dust which is ordinarily undesirable is removed and the coarser materials which would affect the texture of the floor unfavorably are not present. The metal basis prepared in this or any other suitable manner may be incorporated with the aggregate forming a layer of any desired thickness but preferably a mass of aggregates such as a floor of concrete is formed

in the rough and is finished with a thin layer of the copperized iron material which may be troweled onto the freshly laid surface. Or the copperized iron may be mixed
5 with concrete or with dry cement sprinkled over the surface or applied with the trowel as the case may be and troweled into the surface in any suitable manner.

In using the term iron herein it is understood that iron and steel or equivalent material is indicated and that the product of the present invention comprising such material has incorporated with it preferably as a coating over the surface copper or similar less electro-positive element or other dissimilar metallic material.
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A specific example of an illustrative method of procedure in connection with the present invention is the following:

20 20 lbs. of iron granules of approximately 15 to 25 mesh are immersed in a solution consisting of 1 lb. of copper sulfate crystals dissolved in 8 quarts of water. The iron material is raked to and fro for a
25 period of 5 or 10 minutes is then removed, washed, first in water and then given a final rinse with a solution of 1 lb. soda ash in 4 gallons water, and then is quickly dried. It is applied to a mass of concrete having a
30 wearing surface of 100 square feet. A coating consisting of about equal parts of this copperized material and neat Portland cement is applied by troweling and the mixture applied to such aggregate forms a finish surface which when dry and set has so
35 far as we can observe a hardness and durability and freedom from oxidation, stains and the like that render such aggregate especially adapted for floors in office buildings and high grade structures where discoloration is objectionable.
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The advantages of copperized iron for cement hardening are first cheapness, second satisfactory hardening qualities and third
5 the desired effective bonding action. In a similar manner iron may be electrically

plated to form granules having a zinc coating which give a product comprising a strongly electro positive metal coated on an electro negative metal. In the case of copper this action is reversed which ordinarily is advantageous from the standpoint of the bonding action, that is to say, the more strongly electro positive material used for the support for the electro negative material. The latter condition and product represents the preferred form or embodiment of our invention as illustratively set forth herein.

The term granules is used herein to embrace chips, turnings, filings and other irregular fragments of material operative in accordance with the present invention.

What we claim is:—

1. A structural mass of concrete formed with Portland cement and containing a superficial layer carrying distributed therethrough copperized granules of iron of a fineness approximately between 15 and 25 mesh.
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2. A structural mass of concrete having a superficial layer containing distributed therethrough copperized iron granules of a size between 10 and 30 mesh and being substantially free from fine dust and being sufficiently coarse to form a substantial part of the wearing structure of the concrete yet fine enough to be readily incorporated with the concrete material without unfavorably modifying its texture.
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3. A structural mass of concrete containing a superficial layer carrying distributed therethrough fine particles of copperized iron.

Signed at Montclair, in the county of Essex and State of New Jersey, this 22nd day of March, A. D. 1915.
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HERMAN S. RIEDERER.

Witnesses:

W. O. HENKE,
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