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HUGH K. MOORE, OF BERLIN, NEW HAMPSHIRE.

CORE COMPOUND.

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106-38.35

To all whom it may concern:

Be it known that I, HUGH K. MOORE, of Berlin, in the county of Coos and State of New Hampshire, have invented certain new and useful Improvements in Core Compounds, of which the following is a specification.

This invention has for its object to provide what is termed a core compound; that is, an adhesive or cementitious material which may be used in connection with sand or earth for making cores such as are used in casting.

In the manufacture of sulfite fiber, after the contents of the digester have been discharged into the blow pit and the cellulose fibers have been separated from the waste liquors, the latter have usually been discharged into rivers and streams as worthless. These waste liquors comprise water, more or less sulfurous acid, various organic acids, lignone, organic sulfids or sulfonates and sugar-resembling compounds, largely pentoses. I have found that this waste liquor may be utilized in making core compounds, and thus I am able to utilize for commercial purposes what has heretofore been regarded as material substantially unfit for use. It has heretofore been suggested that this liquor can be used as a core compound, but its mode of treatment has been such that it has not been wholly efficient in that the proportion of compound to sand or earth required to make the cores was so great that it offered no advantages over such compounds as flour, molasses, etc. I have found that I am able to greatly increase the binding or cementitious qualities of the waste liquor by a mode of treatment which consists in evaporating at low temperatures and *in vacuo* the waste liquor and then adding to the resultant a relatively small quantity of sodium silicate or other equivalent compound. Of course it will be understood that, before the evaporation of the watery constituents of the liquor, the acids should be neutralized and this can be accomplished in any one of a variety of ways.

As an example of one way of practising the process which I have invented and of producing the improved product, I may cite the following. A small quantity of the digester liquor to be treated is first tested for the purpose of determining the presence of the free acids, and then to the liquor is added an exact quantity of an alkaline base for the purpose of exactly neutralizing the acids. As the alkaline base, I may use calcium hydroxid. The neutralization is secured by causing the acid to pass through the body of the base and agitating the liquor so that all of the acid will be brought into contact with the lime and be effectively neutralized. Care must be taken not to add too much of the base as this would cause the precipitation of the numerous organic materials contained in the liquor. The amount of the alkaline base which must be used will depend upon the condition of the liquor and this of course varies in different cases due to the temperature at which the sulfite fiber may have been cooked while in the digester and to the temperature at which the digester is blown. These conditions are familiar to those skilled in the art in the manufacture of sulfite fiber. After the liquor has been completely neutralized, it is subjected to evaporation *in vacuo* (28.5 inches—mercury) at a relatively low temperature, say 90° F., and the evaporation is continued until the liquor is at a specific gravity of approximately 1.3, the evaporation having the effect of driving off a large portion of the water and of the relatively volatile constituents of the liquor. At this time, the liquor is of a consistency resembling treacle, is somewhat oleaginous to the touch, and at the same time is more or less viscid and somewhat cohesive. The evaporated and neutralized liquor has now added to it a substance which, though soluble in water, is adhesive or sticky, and which will, when subjected to high heat, decompose and unite with the gases which are given off upon the decomposition of the organic compounds in the liquor. For this purpose, I utilize a soluble silicate, preferably sodium silicate, and this may be obtained on the open market at a consistency resembling molasses. Of this material I add substantially 1% to the resultant from the evaporation process. The whole is then subjected to thorough agitation and mixture to produce a substantially homogeneous mass which is sticky and of substantially the consistency of treacle. The compound, thus produced, may now be utilized in making cores by thoroughly mixing it with sand or earth. I find that, by means of the compound such as described, I am able to use

inexpensive sands or earths, such for instance as what is known as "gangway sand" and secure as excellent results as though higher grades of sands and earths were employed in making cores, and I further find that the compound may be used in the proportion of substantially 80 to 90 parts in volume of sand to 1 part in volume of the compound, whereas, so far as I am aware, the proportion in which the best compounds now on the market are used, is 1 part to 30 parts.

After the core has been made, it is subjected to baking in the usual manner and is thereafter substantially impervious to water, so that there is no danger of its absorbing moisture prior to its use in casting. The baking, of course, is accomplished at high tempertures to bring the cores to red heat, and, during such baking, the sodium silicate is probably decomposed, the sodium uniting with the sulfite gases given off by the decomposition of the organic sulfites or sulfonates of the liquor. The silicic acid given off during such decomposition is probably largely decomposed into silica and water, the latter evaporating as steam and the former acting as a binder between the particles of sand and the organic solids of the liquor. This is my theory of the action of the sodium silicate, although I have not been able as yet to verify it. I know as a practical matter, however, that the results seem to justify the theory.

When being used in casting, the core retains its form during the initial setting of the molten metal, but due to the high temperature to which it is raised, the silicate and the organic salts, with which it is united or bonded, are ruptured, as it were, so as to destroy their cementitious qualities and the core may be removed as ordinarily. (This likewise is theoretical, but, as before stated, the results apparently justify the theory.) As a result, there are no free gases given off which will cause the formation of blow holes, although as ordinarily there will be given off such gases as carbon monoxid, carbon dioxid, etc., but even these are given off in smaller quantities than heretofore where other compounds were utilized.

A compound such as herein described is not only more efficient than those heretofore used, but is very cheap on account of the utilization of the waste liquors.

Having thus explained the nature of my said invention and described a way of making and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, what I claim is:

1. The herein described process of making core compounds, which consists in neutralizing the acids in the waste liquors from the manufacture of sulfite fiber, evaporating the resultant at a low temperature, and mixing a soluble silicate therewith to form a homogeneous mixture.

2. The herein described process of making core compounds, which consists in neutralizing the acids in the waste liquors from the manufacture of sulfite fiber by the addition of an alkaline base, evaporating the resultant *in vacuo* at a temperature of approximately 90° F., and mixing sodium silicate therewith to form a homogeneous mixture.

3. The herein described core compound which consists of a mixture of neutralized waste liquor resulting from the manufacture of sulfite fiber and a soluble silicate.

4. The herein described core compound which consists of a homogeneous mixture of neutralized evaporated waste liquor resulting from the manufacture of sulfite fiber and sodium silicate.

In testimony whereof I have affixed my signature, in presence of two witnesses.

HUGH K. MOORE.

Witnesses:
E. BATCHELDER,
P. W. PEZZETTI.