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CARBURIZING COMPOUND

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1 Claim. (Cl. 148—30)

This invention relates to a carburizing compound, with particular reference to the class of materials using a carbonaceous base and employed in a closed box or chamber for case carburizing of steel, and it has for its purpose to provide a compound or composition of materials which is more economical, both from a standpoint of production as well as length of use, than materials heretofore produced for the purpose.

One object of the invention is to produce from granulated wood charcoal or other carbonaceous material a compound which can be used repeatedly with no substantial reduction in its carburizing efficiency, requiring the addition of but a small amount of fresh material at each new operation, owing to the fact that it does not disintegrate, ash, or undergo much loss of weight or volume as a result of the heat to which it is subjected. Another purpose of the invention is to afford a compound that need not be subjected to coking temperatures before it is used for carburizing, as with many materials heretofore used in which a base is covered with a carbon coating that has to be subjected to a high temperature to coke the covering, but with the present material, it is necessary only to dry the mass to bring about the proper binding of the carbonaceous and other materials, so that a considerable saving in cost of production is effected.

A further object is to afford a compound that can be made from finely divided wood charcoal held together through the instrumentality of a binder that will form a cold bond to unite the mass, the binder being intermingled with uniformly distributed material which acts to raise the fluxing point of the binder from around 1450° F. to above the usual carburizing temperatures of 1600° to 1800° F., so that the compound will not disintegrate, break down, or ash to any serious extent within the range of the carburizing temperatures when exposed to the air upon removal from the carburizing boxes, with the consequence that the life of the material is greatly prolonged and there is little loss at each operation.

Another purpose of the invention is to afford a compound which can be made from finely divided charcoal and formed into pellets of convenient size that will be sufficiently hard to withstand the abrasive action and physical handling to which they must be subjected without excessive breaking, crumbling, or powdering.

An additional object is to provide a compound having a minimum weight per cubic foot, or maximum volume per unit of weight, at a cost somewhat less than compounds heretofore used for the purpose, and which can be practically and effectively used for a longer period to treat a greater amount of steel, thus reducing materially the cost of the material for a given quantity of treated steel.

Another object of the invention is to afford a compound that permits of changing readily the proportions of the separate materials for the purpose of varying the shrinkage of the material in weight, or volume, or both, to meet different conditions and metals in actual processing.

A further purpose is to afford a compound that can be used in either granulated or pellet form, and which will not in any way damage or have a deleterious effect on the surface of the steel undergoing treatment or on the carburizing boxes in which the steel is treated.

Still an additional object of the invention is to afford a compound in pellet form which while capable of withstanding the shoveling, dumping, screening, and other physical handling it receives so as to prevent breakage, will nevertheless be effective and usable if broken into smaller particles, due to the fact that the several materials that go to make up the structure are thoroughly intermingled and uniformly distributed throughout every part of the pellet or other mass.

With these several objectives in view, the invention may be carried out in a variety of ways, and according to one successful procedure, a base of carbonaceous material is employed which may consist of wood charcoal, coal, coke, pitch, petroleum coke, or peat, either separately or in combination, and preferably in granulated form of about forty mesh or finer.

A suitable carbonate activating agent or energizer is added to the carbonaceous material, and this preferably consists of barium carbonate, sodium carbonate, or calcium carbonate.

To this mass is added a non-burning material such as clay, asbestos, or any argillaceous or siliceous material, which is intimately mixed with a suitable alkali metal silicate such as sodium silicate or potassium silicate, to form a granulated mass that is thoroughly intermingled with the carbonaceous material.

The dry granulated materials are thoroughly mixed so that the carbonaceous material, the activating agent or energizer, the non-burning material, and the alkali metal silicate are uniformly and thoroughly distributed throughout the entire mass, after which water is added in sufficient quantity to produce a body having the consist-

ency of dough, or the alkali metal silicate may be used in liquid form to give the desired dough-like consistency. The material can be air dried or tumbled in a temperature to form either a granulated mass or rounded pellets which can be carried through a drier subjected to temperatures of 200° F. to 500° F. for quicker drying if desired.

One practical embodiment of the invention can be manufactured from the following materials in the proportions by weight as indicated:

	Per cent
Wood charcoal, 40 mesh and finer	45
Barium carbonate, 65 mesh or finer	5
Fine ground clay such as rubber filler clay	12
Sodium silicate, 41 degree	38

In place of the carbonaceous and clay material proportions, as outlined above, it is possible to use 20% pitch with 20% wood charcoal, and 17% finely ground clay.

Various alkali silicate solutions can be used, and those which are employed generally as adhesives have been found satisfactory. Thus successful results can be had with solutions of $Na_2O:2.9SiO_2$, $Na_2O:3.3SiO_2$, $Na_2O:4SiO_2$, or $K_2O:4SiO_2$. Solutions of sodium silicates or potassium silicates of other ratios can also be used successfully, the concentration varying, depending on the kind of silicate, from 29° to 34° for $Na_2O:4SiO_2$, and from 35° to 43° for $Na_2O:3.3SiO_2$.

The percentage of carbonaceous material may be varied from 10% to 60% of the total; the percentage of carbonates or activating agent may vary from 2% to 15% of the total; the percentage of non-burning material such as clay may be from 5% to 20% of the total; and the percentage of alkali metal silicate binder may be from 5% to 70% of the whole. These relative percentages depend upon the possible shrinkage in volume and weight to be provided for, and the carburizing temperatures to which the steel is to be subjected, and it is thus possible by changing the proportions to vary the fluxing point of the binder and the disintegrating temperature of the carburizing material.

The material may be in the form of a granulated mass or pellets, or the dough can be permitted to harden, then ground and screened to any required size, though it is to be understood that the particular method of handling or forming the mixture does not constitute any part of the invention, except insofar as the drying of the binder takes place at evaporating temperatures and does not require coking of the mass.

While the invention has been disclosed in certain specific embodiments, it is not confined to the disclosure herein, and this application is intended to cover any other forms or departures coming within the purposes of the improvement or the scope of the following claim.

I claim:

A carburizing compound in the form of manufactured pellets including finely divided charcoal, an activator, and an inorganic binder consisting of an alkali metal silicate in substantial proportion to cause non-burning of the carburizer combined with an argillaceous non-burning material and having a fusing temperature above the usual carburizing temperatures, said materials being finely divided and uniformly distributed throughout the mass.

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