

UNITED STATES PATENT OFFICE.

WARREN R. VALENTINE, OF FORD CITY, PENNSYLVANIA.

BRIQUETING.

1,024,428.

Specification of Letters Patent.

Patented Apr. 23, 1912.

No Drawing.

Application filed April 27, 1911. Serial No. 623,708.

To all whom it may concern:

Be it known that I, WARREN R. VALENTINE, residing at Ford City, in the county of Armstrong and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Briqueting, of which improvements the following is a specification.

Many attempts have been made to briquet small pieces or finely divided material such as ore metal borings, turnings, etc., for charging furnaces but as far as I am aware these attempts have been unsuccessful principally for the reason that the binding material became inefficient at a comparatively low temperature allowing the broken or finely divided materials to fall apart and in such condition the material is subject to deterioration by the blast and gases. In the case of small metal scrap as borings, turnings, etc., the breaking down of the binder before the small scrap has become molten will permit the latter to become oxidized or combine with sulfur or other injurious substances. Some of the small pieces will drop down into the molten metal from other portions of the furnace charge in an unmolten semi-plastic condition and will not mingle with and lose their identity in the molten mass, and a casting formed from such metal will have hard spots, which render finishing by turning or planing difficult if not impossible.

The invention described herein has for its object the provision of a briquet or other coherent mass having its metal portions or ingredients bonded together in such manner as to retain its integrity at temperature not materially below the melting point of the metallic ingredients.

It is a further object of the invention to provide a binder for broken or finely divided material, of such character that when mingled with such material will rapidly harden or set and such mingling will result in the generation of sufficient heat to effect a drying out of the briquet or mass.

The invention is hereinafter more fully described.

In the practice of the invention the material to be bonded as for example borings, turnings or other forms of small or finely divided metal or metallic compounds as iron, steel, etc., is thoroughly mixed with a finely divided fluxing material as limestone fluor-spar, etc. These materials are

mixed in about the proportion of fifty pounds of flux to a ton of the material to be bonded, but these proportions may be widely varied. These mixed materials are then dampened with a solution of glutrin and soda ash or other material capable of combining with the other materials of the mass with the generation of heat. The glutrin which is concentrated waste sulfite liquor formed in paper making and soda-ash are dissolved in water in about the proportions of twenty-five pounds of glutrin, two and a half ($2\frac{1}{2}$) pounds of soda ash and twenty five gallons of water. While these proportions may be widely varied they have been found suitable for properly dampening and bonding a ton of the metal ingredients. While adding the solution to the materials which have been mingled with the flux as stated, the whole mass should be stirred so as to insure a uniform dampening and the formation of a semi-plastic mass. This mixture can be molded in any suitable forms by a suitable briqueting machine or may be compacted on a floor or board by a hand or pneumatic rammer. If shaped in a mold or flask the latter can be stripped off as soon as the mixture has been sufficiently compacted and the shaped mass allowed to set and harden which will take place at least to a degree to permit handling in six to twelve hours. This setting or hardening is accompanied with the development of considerable heat *i. e.* about ninety to one hundred degrees Fahrenheit, if the shaped materials have a large radiating surface compared to their mass but if piled together reducing the relative radiating area the temperature will rise forty or fifty degrees and will maintain a temperature of from one hundred and thirty (130) to one hundred and fifty (150) degrees Fahrenheit for twenty four (24) to thirty six (36) hours more or less. The internal and uniform heating of the compacted materials will drive off a large percentage of moisture rendering the compacted masses sufficiently dry and hard to permit of their being charged into a cupola or other furnace, without the employment of external heat. When thus dried and hardened, the briquets or compacted material resemble in hardness well burned brick or tile and may be broken into smaller bodies without any crumbling and can therefore be charged in a furnace or cupola with the other

materials forming the melting charge, without being crushed or materially broken up.

In using the briquets or compacted masses as a part of the charge of a furnace or cupola it is found that the binder will at a high temperature but below the melting of the metal soften somewhat and flux but will hold the briquet or mass together until the metal has melted. The binder will remain effective as such up to a temperature equal or approximately equal to the melting point of the metal. It is also found that the change from solid to plastic and fluid condition is the same as that of the other metal portions of the charge in the furnace *i. e.* the change occurs on the exterior as in the melting of any mass of metal. These briquets have been heated to a bright red heat and handled with tongs without any crumbling or breaking up and partially fused briquets have been recovered from the dumped charge of a cupola and been recharged and entirely melted.

When the binder softens and fluxes it forms a protective coating over the metallic surfaces preventing the absorption of anything injurious to the metal as sulfur and also preventing oxidation by the blast. The soda ash will reduce any rust or oxid present in the briquets to an amorphous condition which will be reduced to a metallic condition by the carbon of the glutrin or of the fuel of the charge.

It is characteristic of my improvement that by briqueting iron or steel borings, turnings, etc., as described and charging such briquets in a cupola with pig iron, etc., a homogeneous molten charge can be formed and that the borings and turnings as such cannot be mingled with the molten metal. Using my improved method it has been possible to use from ten (10) to fifty (50) per cent. of briquets in charging a cupola with very beneficial effect. The amount of borings, turnings, etc., that can be used successfully depends to some extent on the thickness of the castings to be formed and on the chemical constituents of the several ingredients of the charge. In ordinary foundry practice it is possible to use as high

as thirty per cent. (30%) and with light castings as high as twenty per cent. (20%) of the borings, etc., may be used without unduly hardening the castings.

It has been found that by the use of ten per cent. (10%) of the borings, etc., shrinkage cracks are prevented and also porosity due to shrinkage where light and heavy sections are joined in a casting. It is also characteristic of my improvement that although the briquets will take up water by reason of their porosity no disintegration will occur and no injurious effects are observed when dried out.

While my improved binder is especially advantageous in utilizing iron and steel borings, turnings, etc., it can be used with beneficial effects in forming briquets from ore and other materials where integrity of the briquet at high temperature is desired.

I claim herein as my invention:

1. A briquet having a binder containing an organic element and effective to maintain the coherence of the mass at a temperature approximately the melting point of the metallic elements of the briquet.

2. A briquet having in combination broken or comminuted material and a binder consisting of a flux, an alkali and an organic acid.

3. A briquet having in combination broken or comminuted material and a binder consisting of material adapted when mixed with the broken or comminuted material to combine and generate sufficient heat to eliminate a large percentage moisture from the mass.

4. The method of making briquets which consists in mixing the materials to be united with a flux an alkali and a solution containing an organic acid.

5. A briquet having in combination broken or comminuted material, soda ash, limestone and glutrin.

In testimony whereof, I have hereunto set my hand.

WARREN R. VALENTINE.

Witnesses:

ALICE A. TRILL,
THOMAS JOYCE.