

UNITED STATES PATENT OFFICE.

LUDWIG WEISS, OF BUDAPEST, AUSTRIA-HUNGARY.

METHOD OF PRODUCING SOLID HARD PIECES FROM PULVERULENT MATERIAL OF ANY ORIGIN.

No. 899,581.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LUDWIG WEISS, civil engineer, a subject of the King of Hungary, and residing at No. 17 Kemnitzerutca VI, in the city of Budapest, Empire of Austria-Hungary, have invented certain new and useful Improvements in the Methods of Producing Solid Hard Pieces from Pulverulent Material of any Origin, of which the following is a full, clear, and exact specification:

It is known that pulverulent material of any origin can be made into solid, hard pieces by moistening the material with lime-water and subjecting the same to the action of warm smoke-gases. It is true that when the material has been subjected to the action of the smoke-gases for a longer period, solid pieces or briquets can be produced, but their compactness is only due to an external hard crust, as the pieces retain their inner loose pulverulent structure and fall into dust when this hard crust is destroyed. This phenomenon may be due to the fact that the warm smoke-gases in the presence of moisture, convert the lime-water, used for producing the pieces, into carbonate of lime, but this conversion can only take place superficially and not penetrate sufficiently into the pieces, because on the one hand the warm smoke-gases superficially dry the pieces before the carbonic acid has penetrated into the interior of the pieces and consequently annul the conditions relative the formation of carbonate of lime and on the other hand the carbonate of lime formed in the solid crust prevent the further penetration of the carbonic acid into the interior of the pieces. The external hard crust will, however, be very easily damaged in consequence of the various external influences. For instance, the solid crust of the fuel briquet made according to this process burns in the fire first of all, so that the briquets immediately fall to dust and present those properties which render the briquetting of the fuel necessary, while in connection with ore-briquets—as also fuel-briquets—the crust will very easily get damaged during the transport and when using the briquet and lead to the destruction of the latter. Regarding the briquetting of ore, a further disadvantage of the process is rendered perceptible, namely that smoke-gases always contain sulfur, which, however, pollutes the ore and gives rise to many annoyances or drawbacks.

This invention relates to a method whereby the lime used for producing the briquet can also be converted in the interior of the same into carbonate of lime or employed for making the binding agent, which leads to the result that the pulverulent material mixed with slaked lime—lime-water—is subjected during or after the pressing action to the action of compressed carbonic acid, which under such conditions penetrates into the interior of the briquets and the whole quantity of lime contained therein is converted in a short time into carbonate of lime, while charcoal or graphite is supplied to the iron refuse to be treated, together with the fluxes necessary for the remelting, in which case electrochemical actions take place in the entire quantity of material and lead to the hardening of the latter. As the briquets thus made are hardened in the interior, they are more resistable than the briquets produced with the aid of smoke-gases. The process is advantageous for briquetting ore, because the pure carbonic acid does not supply any of this polluting sulfur to the ore.

The process is carried out as follows: The pulverulent material to be made into solid pieces is mixed with a suitable quantity of pulverized slaked lime or lime-water and the mixture is pressed in presses to form pieces. The employment of lime slaked to powder is particularly adapted for the treatment of damp material as in this case the moisture is taken up by the lime and no superfluous moisture is fed to the mixture. The form-pieces are now subjected during or after the pressing action to the action of carbonic acid under a pressure of 8–25 atmospheres in such a manner that this carbonic acid is fed in thin tubes to the presses or receptacles containing the form-pieces. In this latter case, the method is carried out in such a manner that several receptacles made out of long, thick-walled Mannesmann's tubes are used, which communicate through cocks with pipe supplying carbonic acid under pressure. When one of the receptacles has been filled with the briquets, this receptacle is closed and after the corresponding cock is opened, carbonic acid is fed into the receptacle until the pressure increases to 8–12 atmospheres. At this pressure, the carbonic acid also penetrates into the interior of the briquets and converts in 1–2 minutes the slaked lime in the interior of the briquets into carbonate of

lime. While the slaked lime in one receptacle is now converted into carbonate of lime, the other receptacle can be filled thus allowing of continuous working. The pipe supplying carbonic acid to the presses or receptacles may communicate with a compressor or vessel filled with high compressed carbonic acid; in larger industries, where the lime for producing the binding agent is burnt in the factory, the carbonic acid formed when burning the lime may be compressed and used for hardening the form-pieces. The form-pieces leaving the presses or receptacles are completely solid and waterproof and can be used immediately.

The process is made simpler when iron refuse adapted for remelting is to be made into briquets. In this case, the scrap iron is mixed with the necessary fluxes, such as lime, ferromanganese, ferrosilicum and the like and with fuel, graphite or charcoal, moistened with lime-water and pressed. The lime-water form with the iron and graphite or charcoal an electric element, the form-pieces may be considered as an endless number of short-circuited galvanic couples, in which the oxygen produced by the decomposition of the lime-water is transferred to the iron-electrode, oxidizes the same and thus converts it into a cement, whereas the hydrogen passes to the charcoal-electrode, is burned here to water by the oxygen absorbed in the charcoal and thus regenerates the electrolyte. These phenomena are rendered perceptible by the heating the briquets to 80-100° Celsius and disappear within 36 hours; after cooling down, the briquets form very compact, waterproof pieces which, when melted, yield 94-96% excellent iron.

Having now particularly described and ascertained the nature of my invention, and in what manner the same is to be performed, I declare that what I claim and desire to secure by Letters Patent is:

1. The herein described method of producing solid, hard pieces from pulverulent material consisting in mixing the dry material

with lime water and pressing the same in form pieces and subjecting the pieces during the pressing action in the closed press mold to carbonic acid, compressed in a suitable manner.

2. The herein described method of producing solid piece, consisting in mixing the dry material with lime-water and pressing the same in form-pieces, and, subjecting the pieces during the pressing action in the closed press mold to carbonic acid, compressed in a suitable manner to upwards of 8 atmospheres.

3. The herein described method of producing solid pieces, consisting in mixing damp pulverized material with slaked lime, pressing the same in form-pieces and subjecting these pieces during the pressing action in the closed press mold to carbonic acid under pressure.

4. The herein described method of producing solid pieces, consisting in mixing damp pulverized material with slaked lime, pressing the same in form-pieces and subjecting these pieces during the pressing action in the closed press-mold to carbonic acid under pressure of upwards of 8 atmospheres.

5. The herein described method of producing solid pieces, consisting in mixing dry pulverulent material with lime water and pressing the same into form-pieces, placing these pieces in a closed receptacle and filling the receptacle with carbonic acid under pressure.

6. The herein described method of producing solid pieces, consisting in mixing damp pulverulent material with fine slaked lime and pressing the mixture into form-pieces, placing these pieces in a closed receptacle and filling the receptacle with carbonic acid under a pressure of from 8 to 25 atmospheres.

In testimony whereof I affix my signature in the presence of two witnesses.

LUDWIG WEISS.

Witnesses:

JULIUS REVI,
F. E. MALLETT.