April 27, 1965 E. H. SWARTZ 3,180,722

PROCESS FOR MAKING BRIQUETTES FROM CAST IRON SHAVINGS

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Fig. 1

Fig. 2

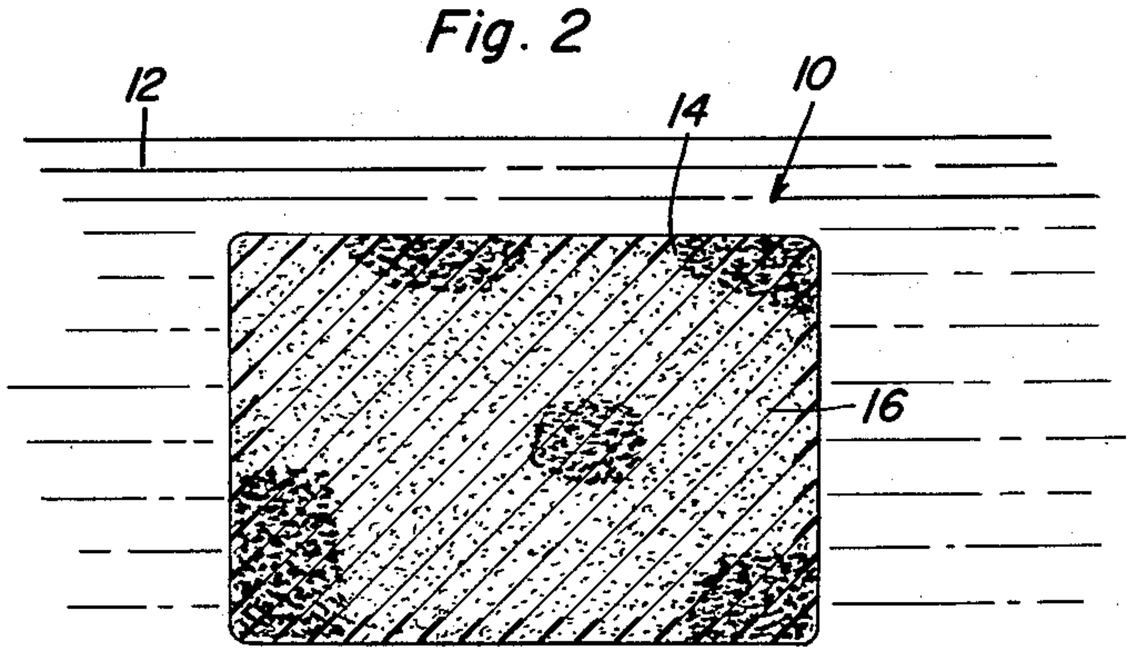
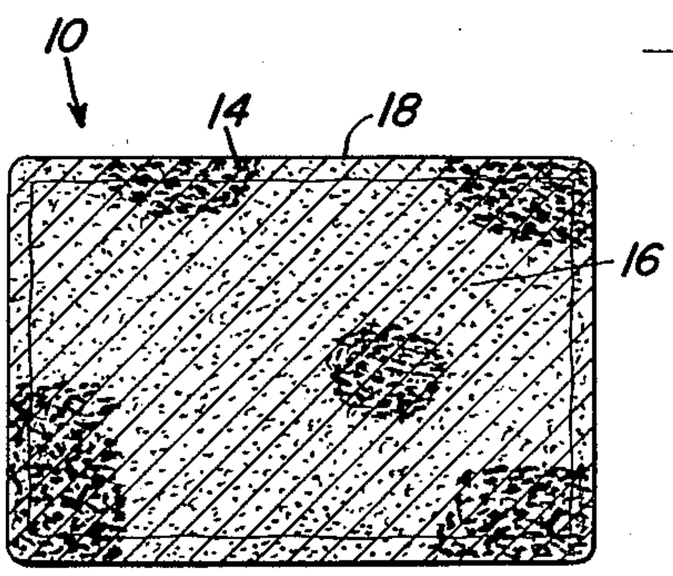


Fig. 3



Edwin H. Swartz

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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PROCESS FOR MAKING BRIQUETTES FROM CAST IRON SHAVINGS

Edwin H. Swartz, P.O. Box 1033, Sanford, N.C.

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This invention relates to a new and useful method of preparing metallurgical briquettes of essentially cast iron particles such as borings, shavings, etc.

The present invention is therefore concerned with the recovery of metallic particles having poor impact resistant properties such as cast iron for remelting in a cupola. Metallic particles when compressed into briquettes by conventional briquetting equipment for the purpose of charging a cupola or furnace with the metallic particles in briquette form, has involved a considerable problem with respect to cast iron since the briquettes in the form of cast iron or the like, are relatively frangible. Accordingly, briquetting of cast iron particles for charging of a cupola has been occasioned by a considerable loss of material due to handling prior to introduction of the briquettes into the cupola and within the cupola itself because of the air blasts therein and movements of the briquettes when the cupola is being charged. Unless precautions are taken in connection with the handling of such briquettes or unless the briquettes are subjected to some sort of protective treatment, the loss in cast iron material due to crumbling or falling apart of the briquettes could render recovery of the cast iron particles economically unfeasible.

It will be appreciated, that special care and equipment utilized in handling the cast iron briquettes and/or subjecting these briquettes to special protective treatments, could also render recovery of the cast iron particles economically unfeasible. Also, the use of other ingredients in forming these briquettes as well as the treatments to which they are subjected, could adversely affect cupola operation. Thus, numerous proposals heretofore made in connection with the formation of cast iron briquettes and/or treatment thereof to prevent loss due to crumbling, have proved to be unsuccessful and/or economically unfeasible. It is therefore a primary object of the present invention to provide a method for preparing cast iron types of briquettes so as to render them nonfrangible in such a fashion as to avoid any adverse effect on the cupola or melting of the cast iron particles and without any substantial economic disadvantage.

The method of the present invention therefore meets a long felt need in the art. The procedures of the present invention which depart from the prior art while relatively simple involve an unexpectedly beneficial and advantageous contribution in that cast iron briquettes may be formed with impact resistant properties so as to permit rough handling and charging within a cupola without any significant loss. Briquettes so formed in accordance with the present invention neverthless involve relatively little increase in cost.

It is therefore a further object of the present invention in accordance with the foregoing object, to provide a method for preparing cast iron briquettes which does not involve the use of any expensive ingredients, apparatus or equipment other than the briquetting presses heretofore utilized in connection with the compression of metallic particles into briquette form.

Preparation of cast iron briquettes in accordance with the present invention therefore involves mixing of the cast iron particles with a relatively small amount of binder material in an inactive state, which material will form a slag and flux out of the briquette body when being fired in the cupola. Accordingly, the mixture of the cast

iron particles and binder material is compressed into cohesive bodies or briquettes by the usual briquetting presses. Thereafter, the briquette is immersed in water and held submerged for a sufficient length of time as to permit limited penetration of the water necessary to render an outer layer portion of the binder material active. Therefore, when the briquette is subsequently dried, an outer protective crust is formed which has been found to exhibit impact resisting qualities operative to render the briquette nonfrangible even though the major interior portion thereof is unaffected. It will therefore be appreciated, that the mixing of the cast iron particles with a small amount of binder material such as cement and the submerging of the briquettes in water as well as drying thereof, will involve little expense and thereby meet a long felt need in the art in an economic fashion which is particularly significant in connection with recovery of waste products such as cast iron shavings, borings, etc.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a cross-sectional view of a cast iron briquette formed in accordance with the present invention and prior to treatment thereof.

FIGURE 2 is a cross-sectional view of the briquette undergoing the first stage of its treatment.

FIGURE 3 is a cross-sectional view of a briquette undergoing its final stage of treatment.

With reference to the accompanying drawings, the method of the present invention involves the production of an article **10** constituting a cohesive body or metallurgical briquette comprising essentially comminuted material such as metallic particles such as cast iron. These particles are collected as shavings or borings so that they may be remelted in a cupola. However, in order to charge the cupola with these metallic particles, they are compressed into briquette form by conventional briquetting presses which involve collection of the metallic particles in a chip box from which a ram compresses the particles through a die against an anvil at the open end of the die. Withdrawal of the ram and stripping of a briquette from the ram thereby produces the cohesive body which may take any suitable shape such as a cylinder. When dealing with cast iron as the metallic particles, there is a tendency for the briquette body **10** to fall apart or crumble inasmuch as cast iron has poor impact resistant properties. Prior to compression of the cast iron particles by the briquetting press, they are mixed with a small quantity of a slag forming binder material such as Portland cement. Two to three percent cement by volume has been used in practice to form the briquettes **10**. Thus, the briquette **10** will consist of a compressed mixture of cast iron particles and cement, the cement being in an inactive state however or substantially dry when compressed with the cast iron particles. Thus, no molding is involved in connection with the present invention, the usual type of briquetting press being utilized instead.

After the briquette is removed from the briquetting press, it undergoes its first stage of treatment by being immersed in water **12** as shown in FIGURE 2. Inasmuch as the particles that form the briquette body **10** are in a compressed state, the water will penetrate the surface thereof relatively slowly. Accordingly, the briquette body is held submerged in the water for a length of time to permit limited penetration of the water which thereby renders the cement active as a binder to a limited depth forming an outer layer portion **14**. The cement within the inner portion **16** of the briquette body however, re-

mains inactive as a binder. It will of course be appreciated, that the longer the briquette body is held submerged in the water, the thicker the outer layer 14 will become. It has been found, that an outer layer of sufficient depth is produced by holding the briquette bodies submerged for approximately two days. The water 12 has also been at ambient temperature so that no special equipment is needed in connection with the method involved. It is suspected however, that the water should be above freezing temperature as a limitation of the present method, and could be artificially heated.

As the final stage of treatment in producing the non-frangible briquette of the present invention, the briquette body 10 is removed from the water and dried. Air drying of the briquette bodies has been found to be sufficient. As the briquette body dries, a shock resistant surface 18 is formed by the outer layer portion 14 as shown in FIGURE 3, as the activated binder material within the outer portion sets or hardens. The interior portion 16 however remains unaffected. It has been found that in addition to the shock resistant quality of the briquette body resulting from the outer protective crust, an increase in compressive strength also occurs which is about three times that of a briquette compressed solely from cast iron praticles. Thus, briquettes prepared in accordance with the present invention may be handled roughly and charged into a cupola for remelting without any adverse effects. The cement ingredient merely fluxes out and involves no significant problem particularly since a relatively small amount thereof is mixed with the cast iron particles.

The utility of the method of the present invention and the article formed thereby, will be apparent from the foregoing description. It will therefore be apparent that the method is of great commercial value in that it represents a highly useful contribution in connection with the recovery of metallic particles such as cast iron and represents an unexpectedly economical solution long being sought in connection with a problem that has existed for a long time without any adequate solution.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A method of producing a non-frangible article of cast iron particles comprising the steps of: mixing said cast iron particles with a cementitious material in a dry powdered state; compressing said mixture into a cohesive body; immersing said cohesive body into a liquid which reacts with the cementitious material to form a binder therefrom; holding said cohesive body submerged in the liquid for penetration thereof to a limited depth leaving the body unaffected throughout a substantial internal portion thereof; and drying the cohesive body upon removal from the liquid to form an outer protective layer of said limited depth about said internal portion of the cohesive body.

2. A method of preparing metallurgical briquettes from cast iron particles comprising the steps of: mixing said cast iron particles with a cement in an inactive non-binding state; compressing said mixture into a cohesive body; submerging said cohesive body into water penetrating the body of a limited depth to restrictively render the cement active as a binder leaving a major internal portion unaffected; and drying the cohesive body to form an outer crust about said internal portion which renders the cohesive body non-frangible.

3. The method of claim 2, wherein the cast iron particles are mixed with approximately two to three percent cement by volume.

4. The method of claim 3, wherein said cohesive body is submerged in the water for approximately two days for penetration to said limited depth.

5. The method of claim 4, wherein the temperature of the water in which the cohesive body is submerged, is above freezing.

6. The method of claim 2, wherein said cohesive body is submerged in the water for approximately two days for penetration to said limited depth.

7. A non-frangible metallurgical briquette having an internal portion and an external protective layer, said portion and layer both consisting of substantially the same compressed mixture of cast iron particles and a cementitious material, the cementitious material within said internal portion being in an inactive non-binding state while the cementitious material within said external layer forms a binder for the cast iron particles presenting an impact resistant surface.

8. The article defined in claim 7, wherein the cementitious material occupies approximately two to three percent by volume of the mixture.

9. A method of preparing metallic particles that are compressible into frangible briquettes for melting in a cupola comprising the steps of: mixing said metallic particles with an inactive slag-forming binder material; compressing said mixture into a cohesive body; soaking said cohesive body in a liquid that penetrates the surface thereof to render an outer portion of the binder material active leaving a substantial inner portion unaffected; and drying the cohesive body to form a protective impact resistant crust of said outer portion of the binder material and metallic particles therein to render the cohesive body non-frangible.

10. The process for briquetting particulate materials, which consists of incorporating cement in a dry and inactive state with the particulate material to form a mixture therewith, compressing said mixture into a coherent mass, and immersing said mass within water in a liquid state at ambient temperature for a predetermined period of time sufficient to penetrate only an outer portion of the mass to activate the cement therein leaving the cement in a substantial inner portion of the mass unaffected.

11. An economical method for preparing a metallurgical briquette or the like from particulate material comprising the steps of: mixing said particulate material with a relatively small proportion of a binder in an inactive state; compressing the mixture of the particulate material and inactive binder into a coherent mass; submerging said coherent mass into liquid for activating said binder as the liquid penetrates the coherent mass; withdrawing said coherent mass from the liquid before the binder within a substantial inner portion of the coherent mass is activated by penetration of the liquid; and curing the binder activated within an outer portion of the coherent mass by said penetration of the liquid to form a protective crust rendering the mass non-frangible.

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DAVID L. RECK, *Primary Examiner.*

WINSTON A. DOUGLAS, *Examiner*