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METHOD OF MAKING BRIQUETS.

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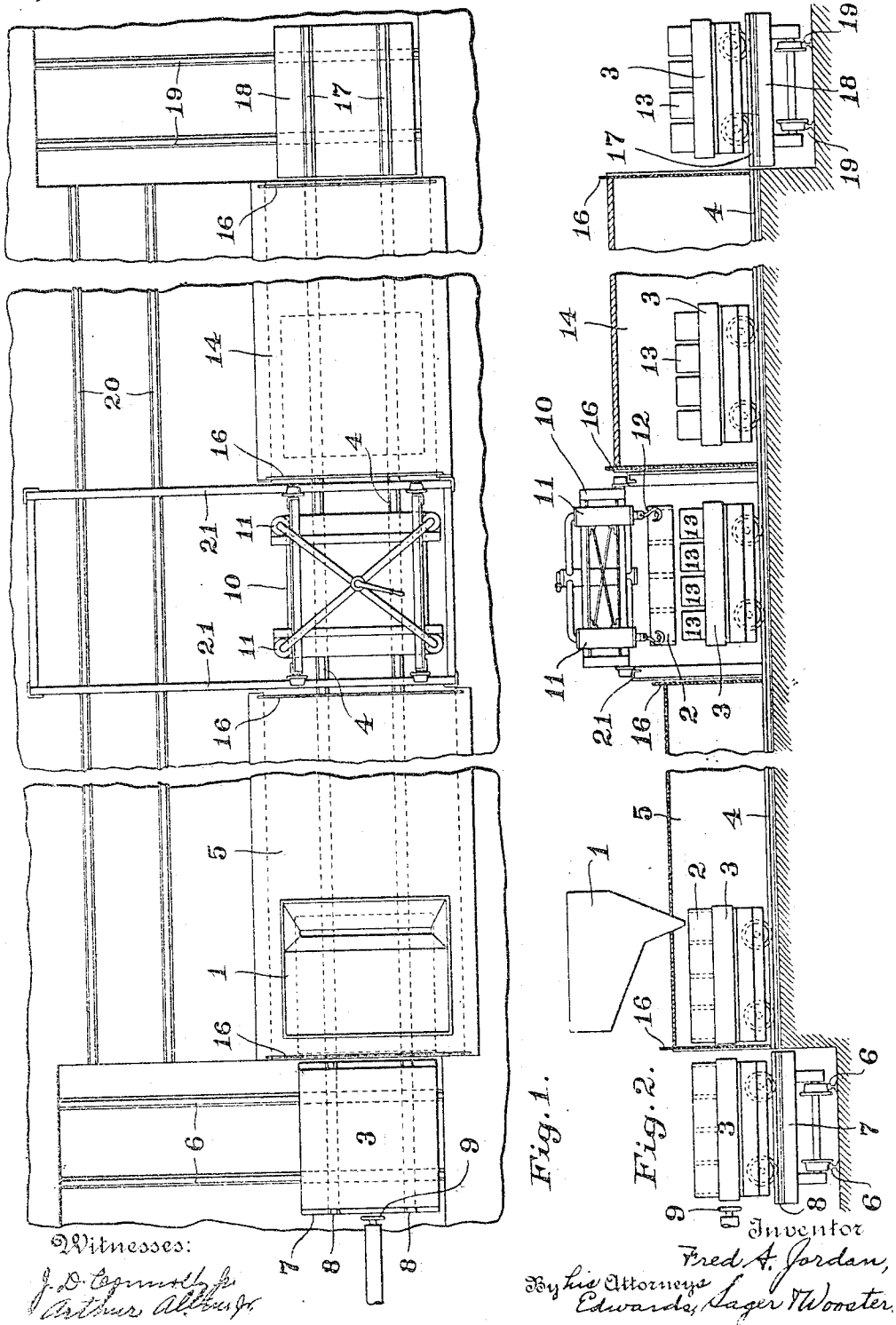


Fig. 1.

Fig. 2.

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METHOD OF MAKING BRIQUETS.

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Application filed April 30, 1914. Serial No. 835,378.

To all whom it may concern:

Be it known that I, FRED A. JORDAN, a citizen of the United States, residing at Sellwood, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Methods of Making Briquets, of which the following is a full, clear, and exact specification.

This invention relates to briqueting and has particular reference to the forming of briquets from comminuted iron or other ores, blast furnace flue dust, etc., preparatory to placing the briquets in the briqueting kiln or furnace.

This invention is intended to apply especially to the treatment of ore containing material that has been concentrated by any of the several methods of wet concentration, but it may also be used for material that is dry by first adding water thereto and then treating as wet material.

In briqueting wet concentrates or similar material the usual procedure has been to allow the concentrates to settle in large vats or tanks a sufficient length of time for the surplus water to drain and evaporate. The material would then be transported by cranes and grab buckets to brick pressing machines and then in turn the bricks would be placed manually on the kiln cars by means of which the material would be passed through the kilns. This method has proved costly because of the expensive equipment necessary for the process and also because of the large amount of manual labor that is needed. This method has also restricted the output of kilns of a given size because of several interrelated reasons. First, the bricks were limited in size because of the necessity of keeping them down to reasonable dimensions so that they could be transported manually from the brick press to the kiln car. Also the bricks when pressed from the comparatively dry material resulting from the draining process lacked tenacity and stability which also restricted the size of the individual brick and also added to the difficulty of handling them.

This invention comprises a continuous method whereby briquets are formed in a mold without pressure or binder, and placed on a kiln car in position for firing, without displacement from the position in which freed from the mold. Thereby, a large output is obtained with a minimum of labor and equipment, and the size of the briquets does not have to be determined so that they can be conveniently loaded on the kiln car by hand.

I have discovered that certain ore containing materials, such as concentrated iron ore, blast furnace dust, etc., can be briqueted by a much simpler process than has heretofore been used. I dispense with drying the concentrates preliminary to charging into the mold, and also with pressing of the material in the mold, and also with removal of the briquet from a press to the kiln car.

The invention comprises casting or molding wet finely comminuted ore concentrates, flue dust or similar material in a mold having one or more suitable compartments. The compartments are open at the top and bottom. While the mold is being filled it rests on a kiln car which has been heated by its previous passage through a kiln. The kiln car thus forms the bottom of the mold compartments. The heat radiating from the car assists in driving off the surplus moisture of the material that has been poured into the compartments of the mold. After the material has dried to a state of comparative dryness, the material begins to shrink slightly allowing the molds to be lifted gradually, leaving the bricks on the car in suitable position for burning in a kiln or tunnel furnace in the usual manner.

A feature of this invention is the utilization of the stored heat of the car to de-water and set the next charge of material, and thereby a continuous circulation of cars and molds is permitted with great economy of heat and labor. If found desirable, additional heat can be applied to de-water and set the briquets.

A preferred form of plant for carrying out the method of this invention comprises suitable supply and return tracks arranged in association with the kiln, a charging hopper, and transfer tracks, so that cars carrying empty mold-frames can be loaded with wet material, which will dry, shrink, and set as the cars move along through a closed heat retaining chamber. During this period, the material dries and shrinks away from the sides of the mold, permitting the mold frame to be lifted clear of the relatively soft briquets while still on the car. The car is then run into the kiln and the briquets fired to relative hardness, the loaded

car being discharged from the other end of the kiln and returned to the loading point after the briquets have been removed. The mold frames after being removed from the cars are transported to the car return-track, and placed on the cars, so that when the cars and molds reach the filling point the molds are in position to be again filled with wet material.

By the foregoing method and apparatus, large quantities of wet materials can be handled and briqueted with but slight labor and expense, in a continuous process.

In the accompanying drawings, Figure 1 is a plan view of one form of plant in which the method of this invention can be carried out, and Fig. 2 is an elevation.

Referring to Figs. 1 and 2, 1 represents a charging hopper which collects the wet material as it is conveyed from the concentrating department of the plant, or from the mixing machines, according to whether the plant is treating wet concentrates, or other material that has been mixed with water. The material flows from the hopper to the multiple molds 2, which are open at the bottom and are carried on a car 3, which runs on rails 4, which lead through a drying and setting chamber 5, which conserves the heat. This drying and setting chamber 5 consists of brick side walls and a suitable roof, the roof preferably containing sections which can be opened from time to time to permit inspection of the briquets passing below. It will be seen that the large amount of heat supplied by the kiln cars is conserved in this drying chamber. This heat dries the material, which at the same time shrinks away from the mold sides, permitting the mold to be lifted away from the briquets without either breaking them up or disturbing them in any way. The cars 3 are run into the inclosed drying chamber 5 from the supply transfer tracks 6, which carry transfer cars 7, and themselves have rails 8 forming a continuation of rails 4. Figs. 1 and 2 show a car 3 on the transfer car 7 and also a car 3 in the drying chamber 5, being charged from the hopper 1. The cars 3 may be pushed into the drying chamber 5 by a hydraulic plunger 9 and thereafter preferably run continuously through the kiln, though other means for moving the cars may be provided. At the end of the drying chamber 5 is a transverse mold lifting and carrying crane 10, which has four hydraulic lifting cylinders 11 provided with hooks 12 for lifting the molds 2 from the cars 3.

13 represents the briquets, which, by this time, have dried and shrunk sufficiently so that the mold frame 2 can be easily lifted. After the mold frame is lifted, the car 3 carrying briquets 13 is pushed into the kiln 14 and the briquets there burned sufficiently hard so as to stand shipment.

16 are doors for the heating chamber 5 and the kiln, which will be opened to release the cars. The car runs from the rails 4 in the kiln on to rails 17 carried by a discharge transfer car 18 similar to transfer car 7. The car 18 runs on transverse rails 19, corresponding to rails 6, and the cars 3 are returned to the transfer tracks 6 on return rails 20. The crane 10 runs on transverse tracks 21, and conveys the empty mold frames 2 transversely, as shown in Fig. 1, so that the mold can be dropped on to the returning cars. The cars then continue their return movement and repeat the cycle.

The kiln car absorbs a large amount of heat in the kiln, and a feature of this invention is to utilize this heat from the kiln car to form relatively soft briquets from the next material charged into the mold. The kiln car will ordinarily supply sufficient heat in the drying chamber 5 to de-water and set the briquets, but for certain purposes, it may be desirable to apply additional heat in chamber 5, without departure from the scope of this invention. The heat from the kiln car and the mold not only dries the material in the molds to cause it to set, but it simultaneously shrinks from the sides of the multiple mold frame. This permits the open bottom mold frame to be lifted from the briquets without the interposition of expelling devices, such as plungers or the like, which are commonly used in pressed brick manufacture.

The present invention is especially applicable to iron ore concentrates, which I have discovered have the properties above specified of contracting away from the mold sides when dry. When this material dries to a moisture content of about 10% it assumes an initial set and simultaneously shrinks from the walls of the molds, forming a relatively soft briquet. Further drying to about 7% moisture content effects further hardening and firmness of the material, and the mold frame can then be easily lifted without breakage or damage to the briquets. The length of time necessary to accomplish this drying and shrinking varies with the amount of moisture in the concentrates and the size of the grains.

It will be understood that the length of tracks required, the number and size of cars, mold frames, or the like, will be proportioned so as to make as nearly as possible a continuous process, because thereby the greatest heat economy is obtained as well as capacity of output. If desired, in addition to the heat derived from the molds and the kiln car, the drying and shrinking chamber 5 may be further heated, but this will not ordinarily be required.

From the foregoing description it will be seen that a novel method has been provided which does not require an expensive equip-

ment, or large amount of manual labor, and the briquets can be of any desired size or shape most suitable to this method, without requiring change in the mechanical appliances. By this process, much larger briquets can be made than with previous processes, which is advantageous both because fewer are required for a given weight, but an increased quantity is fired in the kiln with each car loading.

Having thus described my invention, I declare that what I claim as new and desire to secure by Letters Patent, is:—

1. The method of making briquets which consists in positioning a mold on a support, charging wet ore containing material into said mold, drying the material in the mold to effect initial set and shrinkage from the sides of the mold, removing the mold, and firing the material on the mold support.

2. The method of making briquets which consists in placing a mold on a heated car, charging wet ore containing material into the mold while on the car, forming a relatively soft briquet in the mold by the heat from the car, separating the mold and said briquet, and firing said briquet after the mold is removed and while on the car to harden and complete it.

3. The method of making iron ore briquets which consists in positioning a mold on a support, charging wet concentrated iron ore into the mold, forming a self sustaining briquet smaller than the mold by applying heat to dry and shrink the material, lifting the mold from the briquet support, moving the support with the briquet into a kiln, and firing the briquet to harden and complete it.

4. The method of making briquets which consists in positioning a mold on a movable support, charging wet ore containing material into said mold, moving the support and the filled mold into a chamber to dry and initially set the material by confined heat, removing the mold from the support and the formed briquet, and then moving the support and the formed briquet into a kiln and firing to complete the briquet.

5. The method of making ore briquets which consists in pouring wet comminuted ore containing material into multiple mold compartments, simultaneously drying and shrinking the material in the several compartments to form briquets, and then simultaneously firing the formed briquets without displacing them from the position in which they were formed.

6. The method of making briquets which consists in charging wet material into a mold and forming a briquet, separating the mold and the briquet, and firing the briquet in the same position in which it is molded.

7. The method of making briquets which consists in preheating a briquet support, positioning a briquet thereon, charging wet ore containing material into said mold on said preheated support to effect drying and initial set of the briquet by the heat from said support, and removing the mold and firing without disturbing the position of the briquet.

8. The method of making fired briquets which consists in positioning a multiple compartment mold on a support, casting wet ore containing material in the mold while on said support, drying the material to set it in a plurality of briquets, lifting the mold from the formed briquets, and transporting and firing each charge of briquets without disturbing their positions when freed from the mold.

9. The method of making fired briquets which consists in positioning a mold on a briquet firing support, casting wet ore containing material in the mold while on said support, drying the material to shrink and set it, and permit removal of the mold, lifting the mold clear of the support and the formed briquets, firing the briquets on said support, and placing the heated car and an empty mold at the mold filling point.

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

FRED A. JORDAN.

Witnesses:

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WILLIAM T. DAY.