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P. J. STYFFE

METHOD OF MAKING ABRASIVE WHEELS

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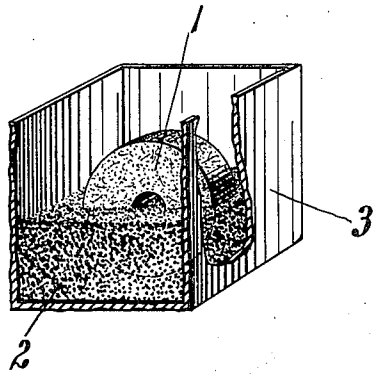


Fig. 1

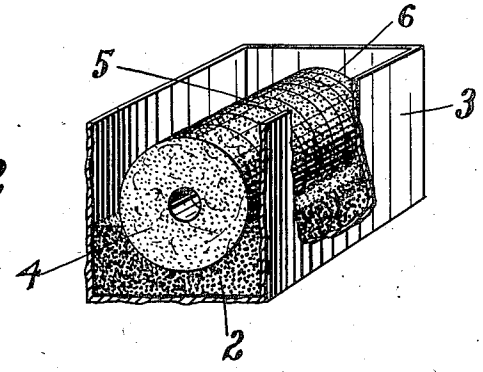


Fig. 2

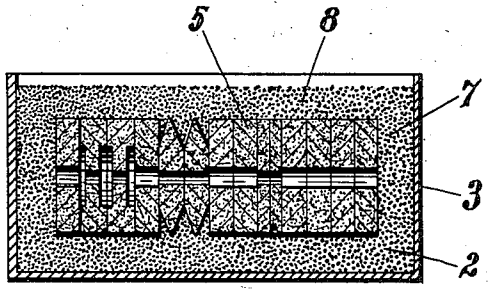


Fig. 3

WITNESSES

John H. McGinnis

Harold P. Savage.

INVENTOR

P. Joel Styffe

BY

Clayton R. Jenkins

ATTORNEY

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UNITED STATES PATENT OFFICE.

PETER JOEL STYFFE, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO NORTON COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

METHOD OF MAKING ABRASIVE WHEELS.

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To all whom it may concern:

Be it known that I, PETER JOEL STYFFE, a citizen of the United States of America, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Methods of Making Abrasive Wheels, of which the following is a full, clear, and exact specification.

This invention relates to a method of making abrasive wheels, which require a heating process in the course of their manufacture, usually termed "firing", and more particularly to a method of setting them in containers such as saggers preparatory to placing them into the kiln in which this firing operation is carried out.

In the manufacture of grinding wheels and similar abrasive products, the raw materials consist of an abrasive in granular form and suitable heat setting bonding materials. The abrasive grain and bonding materials in the required proportions are mixed with a sufficient amount of water to give the desired consistency. The mixture thus prepared is moulded into the form of a wheel, allowed to dry and shaped to provide for the dimensions required. At this stage of the process the wheel, which is only loosely held together by the dried bonding material and is in a crumbly, semi-plastic or friable condition, is commonly referred to as a green wheel.

In order to harden the green wheel so as to render it suitable for abrasive purposes, it is necessary that it be heated to relatively high temperatures, which may be carried out in various types of kilns. During this operation the bonding material must be carried to approximately the melting point, the exact temperature depending upon the materials used, in order to develop its cohesive and adhesive strength between the grains. As a consequence, the wheel is greatly softened, and apart from shrinking, it is very apt to deform, which would render it practically useless for grinding purposes.

For this reason, it has always been considered necessary to place the green wheel upon its broadest surface in a sagger in which it is to be held while in the kiln, in order to avoid any stresses and strains being set up within the wheel by others or by an unequal distribution of its own weight. It has also been found that even when laid upon its flat side, a wheel may be seriously deformed unless the bed of sand which is commonly used to support it is perfectly level. And moreover, for the same reason, only a few wheels have been placed upon each other while in the green condition or during the firing operation. As a result of these considerations much space in each sagger and a considerable amount of room in each kiln as a whole has not been utilized, and extra care and work have been required in order to successfully bring the wheels through this operation in a satisfactory condition.

It is accordingly an object of my invention to eliminate the special care which is necessary in setting a wheel upon its broad surface and to devise an economical and simple method of setting wheels whereby a greater part of the kiln space will be utilized by the product and a correspondingly increased amount of product may be fired in any given kiln.

With this and other objects in view, as will be apparent in the following disclosure, I have devised a method of making and setting abrasive wheels in accordance with the following specification, reference being had to the attached drawings in which:

Figure 1 is a perspective view of a single wheel set in a sagger according to the method hereinafter described;

Fig. 2 is a perspective view of a group of wheels arranged in a sagger; and

Fig. 3 is a longitudinal cross section of a sagger loaded with various types of wheels such as may be grouped in actual practice.

In accordance with my invention, I make a wheel of granular abrasive combined with a bond such as vitrifiable clay, by moulding a mixture of these materials and water in proper proportions into the form of wheel desired, by any suitable method, allowing it to dry and trimming it to the specific dimensions to be provided. In order to fire the green wheel thus produced, I propose to support it in the kiln upon a suitable refractory and hold it in an upright position upon its peripheral face during this operation. For such refractory support I may utilize a granular material like quartz sand, for example, which will conform to the shape of the wheel, holding it in position and keeping the wheel in shape during firing. If only one third of the diameter of the wheel is thus supported, it is usually sufficient, but when

it is desired, the granular setting material may entirely surround and cover the wheel. Groups of wheels may also be set in this fashion, in which each wheel is placed against the side of another, in close contact, so as to hold it firmly in place and the group as a whole is kept together by the mutual lateral support thus obtained and by setting sand, refractory blocks or the ends of the container itself. As thus arranged the green wheels are ready to be placed into the kiln and fired according to the methods usually adopted, which are well known in the art.

According to one method of carrying out my invention, which is illustrated in Fig. 1, I set the green abrasive wheel 1 in a substantially upright position upon a portion of its peripheral face on a bed of granular refractory 2 in a container 3. In case it is the only wheel to be burned it may be held in place and supported laterally by surrounding it with the granular refractory as shown.

Where there are many wheels to be set, which is the more important application of my invention, I place the first wheel 4 (Fig. 2) in a substantially upright position upon the bed of granular refractory material 2. The second wheel is placed beside it and, if they are of the same size, it is preferable that they be concentrically arranged. The third is placed beside the second and so on with as many wheels as there may be space for, each being in contact with the adjacent wheels upon its sides as in the row 5. In case they are of different diameters it is more convenient to place them so that they will be supported in tangential alignment upon the setting material. The groups thus arranged are held in place by the granular refractory at each end 7 or by the ends of the container used 6. If it is desired, a larger amount of the granular setting material than that required for the wheels to rest on it may be added. In the firing of some wheels it is desirable that they shall be protected from the kiln gases or that the whole of the peripheral face shall be supported while in the kiln. This may be done as shown in Fig. 3 by completely surrounding the group of wheels with the granular material 2, 7 and 8.

If any space is left in the sagger or other container after arranging the wheels as described, more wheels may be set into the sagger about the first row likewise upon their peripheral faces until the sagger is full. More setting material is then filled in about them until they are nearly covered, as already described. The sagger thus loaded is ready to be placed into the kiln for firing.

This method of setting results in getting many more wheels into a given sagger than is possible when they are laid flat. Accordingly a much larger quantity of product (approximately 5 or 6 times) may be loaded into the same kiln and "burned" or "fired" with the same amount of fuel. It has, moreover, been found that the abrasive products set and burned in this fashion are not warped so much as formerly, that they have a more uniform coloration and a better structure. These qualities are obtained on account of the more uniform distribution of heat and of the hot gases in the kiln brought about by the better disposition and arrangement of the articles themselves.

It will be obvious that the term "wheel" as used in the specification and claims is intended to cover equivalent articles in the abrasive and refractory industry, since it is immaterial, so far as my method is concerned, whether the article thus made is used as a grinding wheel, a refractory brick, a non-slip tile or for other purposes.

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

1. The method of making an abrasive wheel, comprising the steps of supporting the wheel consisting of granular abrasive and heat setting bonding material upon a substantial portion of its peripheral face by a refractory, retaining the wheel in such position and firing it while in this position to bond the abrasive grains.

2. The method of making an abrasive wheel, comprising the steps of supporting the green abrasive wheel upon a substantial portion of its peripheral face by a granular refractory material, retaining the wheel in place and subjecting it to the firing operation while in this position, to bond the abrasive grains.

3. The method of making an abrasive wheel, comprising the steps of supporting the green abrasive wheel upon a substantial portion of its peripheral face by a refractory, retaining it in place by lateral support to prevent material deformation of the wheel during firing and firing it while in this position to bond the abrasive grains.

4. The method of making a number of abrasive wheels, comprising the steps of supporting the green wheels upon a portion of the peripheral face of each by a refractory, retaining each side of an individual wheel by contact with another wheel, holding the groups thus arranged in place and firing them while in this position.

5. The method of making ceramic articles comprising the steps of forming green shapes of refractory grains united by a vitrifiable ceramic bond, placing the green articles in lateral contact, supporting them upon their peripheral faces on a bed of granular refractory material, holding the ends of the group by said material and

thereafter firing the articles to vitrify the bond.

6. The method of making abrasive wheels composed of abrasive grain and bonding material, comprising the steps of placing the green wheels concentrically, with their sides in contact with each other, supporting them on the under portion of the peripheral face of each by granular refractory material, surrounding and covering the group thus arranged with granular refractory material and firing the wheels in this position.

Signed at Worcester, Massachusetts, this 18th day of October 1920.

P. JOEL STYFFE.