UNITED STATES PATENT OFFICE.

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ABRASIVE WHEEL.

1,310,360. Specification of Letters Patent. Patented July 15, 1919.

No Drawing. Application filed August 27, 1918. Serial No. 251,646.

To all whom it may concern:

Be it known that I, HARRY C. MARTIN, a citizen of the Dominion of Canada, residing at Niagara Falls, in the county of Niagara and State of New York, have invented a new and useful Improvement in Abrasive Wheels, of which the following is a full, clear, and exact description.

My invention relates to abrasive wheels, and more particularly to an improvement in open or porous wheels, in which the bond employed to hold together the particles of abrasive material is a silicate.

My invention is designed to greatly increase the efficiency of such wheels by an improvement in their construction.

Abrasive wheels to which my invention relates are made up of an abrasive material, such as carborundum or carbid of silicon; an aluminous abrasive commonly known as emery, aloxite and corundum, held together with a ceramic binder.

In such wheels, the bond may be silicate of soda, which is mixed with the abrasive grains, together with certain other chemical compounds, and heated to a temperature sufficient to cause a reaction between the silicate and these other chemicals. This gives a hard porous mass in which the abrasive grains are held securely in place. Such wheels are known as silicate of soda wheels. Or the bond may be clay, together with other mineral silicates, such as feldspar, etc. In such wheels the bond and grain are mixed and heated in a kiln until the bond melts or fuses. This gives upon cooling a hard porous mass. Such a wheel is known commercially as a vitrified wheel.

Both of the types of wheel above described are porous, and in the grinding process, these pores become filled with particles of the material being ground, thus covering over the sharp cutting edges of the abrasive grains and preventing proper clearance for the cutting points. Also in the grinding process the abrasive particles become worn, lose their sharp edges, and so are too smooth for effective work. The face of such a wheel must be frequently reduced by a dressing tool to expose new cutting surfaces, which is a laborious expensive operation.

To increase the efficiency of a porous wheel, such as above described, it has been customary heretofore to fill the pores of the wheel with a material that becomes soft and fluid at the grinding temperature. It is well known in the trade that a wheel so filled is more efficient for its pores do not clog or become loaded with the material being ground during the grinding process. Such a filler, however, possesses numerous objections which I eliminate by the use of a filler of novel character.

The new substances which I have found useful for filling porous wheels are a class of organic compounds known industrially as synthetic waxes, and known chemically as chlorin derivatives of the well known chemical compound naphthalene. When the latter compound is treated with chlorin a series of wax-like compounds of various degrees of fluidity are known to result. The nature of the resulting compounds depends on the method by which the naphthalene is chlorinated. For my purpose, I prefer to use the solid and higher melting synthetic waxes especially those melting at about 90 to 100°.

To carry out my invention, I use commercial varieties of waxes which are sold under the name of "Halowax #1001" and "Halowax pitch." Either one of these substances may be used. Halowax #1001 is tetrachloronaphthalene of the formula $C_{10}H_4Cl_4$. This is a solid wax, crystalline and of a translucent, yellowish white color and almost non-inflammable. Its specific gravity is 1.589 and it melts at 196° F. Its boiling point is 615° F. It is soluble in practically all organic solvent liquids and oils when heated therewith. It is insoluble in caustic alkaline solutions and acid solutions, except those that are powerful oxidizers.

Halowax pitch, which may also be used, is a product incidental to the manufacture of Halowax. It is a pitchlike substance which is amorphous, black in color, and quite brittle like pitch. It is non-inflammable and resistant to acids and alkalis and has about the same solubility as the Halowax waxes. It is ordorless and melts at from 200° to 330° F., depending on the method used in its production. The exact chemical formula of this substance is uncertain.

In the carrying out of my invention, I have found that the ordinary impregnating machines may be used. Briefly, the process consists in heating the porous wheel and placing it in a closed apparatus with the filler. The heat is turned on in coils at the

bottom, and at the same time, the pressure inside the machine is reduced to a partial vacuum to facilitate the proper impregnation of the wheel with the fluid filler. It is essential that the filler become uniformly distributed. The process of impregnation usually occupies twenty-five minutes, which is a sufficient length of time for substantially all the voids of the wheel to become filled with synthetic wax. On removing, the wheel is balanced while hot, and on cooling, the synthetic wax solidifies within the voids. The voids may be wholly or partially filled with the synthetic wax and the term "filled," as used herein and in the claims is to be so understood.

It will be readily understood by those familiar with the art that other methods of impregnating may be used and that good results have been obtained by impregnating by immersion in an open pan immersed about thirty minutes.

Having thus described and identified this synthetic wax which I use, and having explained the process of adding it to the wheels, I shall now explain the peculiar advantages resulting from its use in porous wheels.

Porous wheels containing a filler are used mainly in the coarser grinding operations, such as snagging, rather than in precision work, and in some cases, a very high temperature is reached during the grinding process. For such grinding operations, since it is desirable for the reasons above mentioned to use a porous wheel filled with a substance that becomes soft at the temperature of grinding, due care must be given to the melting point of the filler used in the pores of the wheel. If the grinding temperature is very high, it is possible that the filler may become quite liquid long before the grinding temperature is reached. In such a case, the filler will run out of the wheel, the wheel will lose its balance, and it acts as though it was softer. In fact, the filler has not accomplished any good. This may be the case if the filler is paraffin, a low melting grease, or other low melting substances. The synthetic wax which I use is, on the contrary, a high melting substance. When certain grades are used, as high a temperature as 90 degrees C. may be obtained before the material begins to flow. Such a substance does not melt too soon or before the grinding temperature is reached. Therefore, it does not leave the wheel, and so perform its function in the wheel. Moreover, the wheel does not get out of balance and remains true to its grade or hardness.

Furthermore, my invention results in a wheel of greater efficiency apart from the advantages already described. The filler as it melts has a lubricating action on the cutting points of the wheel in their process of removing the material being ground.

I claim:

1. An abrasive wheel comprising abrasive particles united by a silicate binder to form a porous structure and having voids thereof filled with a synthetic material derived from the action of chlorin on naphthalene.

2. An abrasive wheel having its voids filled with a chlorin derivative of naphthalene which has a melting point sufficiently low to cause it to flow at grinding temperature.

In testimony whereof, I have hereunto set my hand.

HARRY C. MARTIN.