UNITED STATES PATENT OFFICE.

HERBERT FROOD, OF CHAPEL-EN-LE-FRITH, ENGLAND.

FRICTION-SURFACE.

1,307,857. Specification of Letters Patent. Patented June 24, 1919.

No Drawing. Application filed May 15, 1914. Serial No. 838,871.

To all whom it may concern:

Be it known that I, HERBERT FROOD, a subject of the King of Great Britain and Ireland, and a resident of Chapel-en-le-Frith, in the county of Derby, England, have invented certain new and useful Improvements in Friction-Surfaces, of which the following is a specification.

This invention relates to improvements in that type of brake block, friction clutch lining, or the like, (hereinafter for general convenience referred to as and included in a reference to a brake block) composed of vegetable or other fibers impregnated and filled with a gummy, waxy, bituminous or like cementitious and binding substance. Such a brake block as originally constructed is inflammable or capable of giving off sparks during working as a result of the presence in the block of fibers of an inflammable nature, or as a result of the inflammable nature of the cementitious and binding material used, or owing to the inflammability of both the fibers and the binding substance.

In carrying this invention into effect a brake block of the composition indicated is rendered non-inflammable by treatment of or intimate mixture with its inflammable part or inflammable parts with or of a suitable solution or material which has the property of preventing combustion of the substance with which it is combined or mixed.

A convenient way of carrying this invention into effect in connection with a brake block composed of cotton or other naturally inflammable fibrous material is to treat such block with a suitable solution which will render the fibrous material non-inflammable before such block is treated with the cementitious and binding material. Treatment with the binding substance then follows. Preferably the treatment to render the block non-inflammable should also be one which will harden it. To obtain this result the treatment of the brake block may be first by a solution of a sulfate of a metal. After this treatment the block may be immersed in a weak solution of caustic soda. This converts the metal sulfate into hydrate upon and in the fiber. By drying and aerial exposure the hydrate is converted into oxid. This conversion is assisted by the application of heat. The metal sulfate used may, for example, be that of aluminium, or copper, or iron, or magnesium, or tin, or zinc. The following is an example of this treatment:

A brake block consisting of a thick woven cotton material of the nature of machine driving belting is immersed in a solution of sulfate of copper prepared with 9 parts of water to one of sulfate. After thorough impregnation in this solution at a temperature of 80° F. the block is removed and dried. It is then treated with a weak solution of caustic soda. After thorough impregnation the block is removed from the alkaline solution and dried.

It is then impregnated and filled with a solution of hard gums (such as gum arabic or resin) and asphaltum in drying oils (such as petroleum spirit or acetone) and turpentine. After such impregnation and filling it may be dried and stoved at any desired temperature.

The treatment of the non-inflammable blocks with the binding, filling and cementitious gums or the like may follow directly upon the fireproofing treatment without any intervening treatment with an alkaline solution.

The treatment with cementitious filling and binding substance may be other than that indicated in the above example. Other gums and bituminous substances or other equivalent substances such as hard waxes may be employed in either the molten or dissolved condition, and such substances may be finished off in any desired manner without the necessity for stoving.

The fibrous blocks treated need not be woven in one solid piece. They may be knitted, felted, or otherwise produced. The fabric composing a block need not be of only a single thickness. Various plies or layers may be united by stitches, pegs, or the like to give the required thickness of block, before the block is treated as hereinbefore described.

Instead of such a block being treated only after its formation with the fireproofing solution, the yarns or fibers of which it is composed may be treated with the fireproofing solution (and if desired with the hardening solution) before they are woven or otherwise incorporated into or combined to form the block. The treatment with the cementitious and binding material may follow after the block has been formed.

If desired, however, treatment with both

the fireproofing solution (and if desired with the hardening solution) and with the cementitious substance may be given to the fibers, yarns, or the like before they are incorporated into the block. If the block is to be felted or similarly formed by pressure, the fibers are combined while they are still in a pasty condition from the cementitious substance.

If they have to be woven they will first be dried, and after the block is woven the cementitious substance will be softened and rendered adhesive by heat or by the application of a suitable solution and the block will then be pressed into a solid whole.

Up to now the fibers, yarns, or the like have been referred to as being of an inflammable nature. But they may be of a non-inflammable nature such as asbestos. Such fibers would be treated with the fireproofing solution as already described for inflammable fibers, not, of course, to render them non-inflammable, but to prevent combustion of the inflammable cementitious substance with which they will subsequently be impregnated.

Instead of the treatment with the fireproofing solution followed by a separate treatment with cementitions substance, the operations of fireproofing and cementing and binding may be performed in a single operation, by the use of a single bath or solution. Such a bath or solution may be prepared by first dissolving about 10 per cent. by weight of metal sulfate in drying oil and then utilizing such oil in the preparation of the required bath or solution of cementitious and filling substance. Treatment of the block or of its component yarns or fibers in this bath results in impregnation of the yarns with the fireproofing material and with the cementitious substance in one treatment. The block or the yarns can then be dried to drive off the solvents.

A brake block produced as hereinbefore described may have suitable pressure applied to it in a die which will only permit it to be reduced in thickness between its wearing and back faces without any lateral or longitudinal elongation. The amount of pressure so exerted should be sufficient to so reduce the block in thickness that further pressure exerted upon it during its normal working conditions cannot further reduce the thickness and any further reduction in thickness will take place as a result only of wear and attrition. The die may be curved to the curvature of the block when in use. It is not claimed herein that such die pressing of a block is new *per se* as the application of such pressure to blocks which have not been rendered uninflammable according to this invention has been already described in the specification to my prior U. S. Patent No. 1,096,705 dated May 12, 1914.

What I claim is:—

1. The process of producing fire-proof friction surfaces which comprises treating fibrous material with a metallic sulfate and then with a solution of a cementitious material in a drying oil.

2. The process of producing fire-proof friction surfaces which comprises treating fibrous material with copper sulfate and then with a solution of a cementitious material in a drying oil.

3. The process of producing friction surfaces which comprises treating fibrous material with a metallic sulfate, then treating the fibrous material with caustic soda to convert the sulfate to a hydrate, drying the fibrous material to convert the hydrate into an oxid, and then treating it with a cementitious material.

4. The process of producing friction surfaces which comprises treating fibrous material with a metallic sulfate, then treating the fibrous material with caustic soda to convert the sulfate to a hydrate, drying the fibrous material to convert the hydrate into an oxid, and then treating it with a solution of a cementitious material in a drying oil.

5. The process of producing friction surfaces which comprises treating fibrous material with copper sulfate, then treating the fibrous material with caustic soda to convert the sulfate to a hydrate, drying the fibrous material to convert the hydrate into an oxid, and then treating it with a cementitious material.

6. The process of producing friction surfaces which comprises treating fibrous material with copper sulfate, then treating the fibrous material with caustic soda to convert the sulfate to a hydrate, drying the fibrous material to convert the hydrate into an oxid, and then treating it with a solution of a cementitious material in a drying oil.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HERBERT FROOD.

As witnesses:
WILLIAM GEO. HEYS,
HENRY S. BAKER.