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BRAKE LINING AND METHOD OF MAKING SAME.

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This invention relates to improvements in brake linings, and refers more particularly to an improved woven brake lining having wear, frictional and manufacturing characteristics superior to brake linings produced under present processes. Of the brake linings now being made with a base of woven asbestos covered with wire tape, the most common type is that treated with a saturant consisting principally of gilsonite or pitch, or a combination of the two. This type of brake lining has certain serious deficiencies, which are substantially eliminated in the present invention.

In the manufacture of gilsonite linings (in this connection gilsonite is used broadly to cover gilsonite, pitch or like substances and combinations thereof), the general method of procedure consists in dissolving the desired binder in some suitable commercial solvent such as gasoline, kerosene, benzol and like liquids. The raw woven tape is saturated with the saturating solution comprising a binder and solvent materials, and after saturation, the solvent is dried out of the woven tape by the application of heat.

This method of incorporating a solid fusible asphalt to serve as a binding agent, would be satisfactory were it not for the fact that the asphalt or pitch does not perfectly dissolve in the above mentioned solvents much below the melting point of the asphalt. As these solvents must be used cold, due to their very low flash point, the solution is highly colloidal, and in attempting to saturate a filtering material such as asbestos tape, a large portion of the colloidal binder is left on the surface. When the solvent is removed, the binder is left on the surface in a layer, the thickness of which is dependent upon the concentration of the saturant, the more concentrated solutions leaving heavily surfaced films.

Herein lies the marked disadvantage of gilsonite linings in that a considerable asphalt deposit on the surface causes severe grabbing or violent brake action and sticking to the drums if the brake is set after having been heated in use. Thus if it is attempted to introduce sufficient gilsonite into the interior to really protect and preserve the body of the lining, there is an objectionable excess of surface deposited which causes the undesirable results above mentioned.

Generally speaking, any saturation with a gilsonite solution which deposits more than twelve per cent total residual binder, may be considered unsafe from the standpoint of satisfactory brake action. When it is considered that from one-half to one-third of the saturant is concentrated at the surface, it can readily be appreciated that the interior binder on which the continued wear of the brake lining under hard service depends, may not regularly be higher than seven or eight per cent, and be accompanied by good action. This would indicate that severe service would rapidly destroy ordinarily good gilsonite lining, which has been found to be the case.

When this type of brake lining is subjected to high temperatures, as frequently occurs in conditions of strenuous service, the surface binder burns or wears away, leaving the slightly protected interior to disintegrate rapidly. Thus good gilsonite treated lining has very satisfactory frictional characteristics but comparatively poor wear resistance, other factors being equal.

The present invention relates to the development of a saturant and method of manufacture of woven asbestos brake lining which carries the frictional advantages of the above type, and eliminates many of its disadvantages, such as the unsatisfactorily saturated and treated interior body portion.

It has been found that by the use of a combination of refined water gas tar and petroleum oil in the correct proportion, which can be determined by trial, that brake linings can be produced—first—that have excellent frictional qualities under all conditions, second—that contain a high percentage of binder without undesirable surface filtration, and third—possessing the de-

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sirable characteristics of hardening in service without imparting frictional qualities, and giving long satisfactory wear under severe conditions.

By water gas tar is included the tarry residue from the manufacture of water gas, a combustible gaseous fuel consisting essentially of carbon monoxide and hydrogen produced by the reaction between steam and highly heated carbon. The refining of water gas tar consists essentially in the removal of the attendant condensed water by distillation. This refining is not essential to its use in the present process, but is an advantage due to easier handling of the saturant in production.

The term petroleum oil included as an ingredient in the saturant, is intended to include all grades and varieties of mineral oils in any stage of the refining process. It has been found that many different varieties of oil will answer the purpose. Asphaltic base oils generally give somewhat better results than paraffin base oils, but the general effect of adding an oil to the water gas tar in the use of the combination as a saturant for brake lining, is practically the same.

Thus for example, I have used California, Mid-Continent, Texas, heavy and light Mexican oils in various grades from the crude petroleum to solid asphalt with excellent results. Paraffin base oils as well as straight paraffin also have been successfully employed.

The method of making this improved brake lining consists in saturating the woven asbestos tape in a suitable combination or mixture of the above described materials, and heating the saturated tape until the more volatile portions have been driven off, leaving a binder which bears a predetermined ratio of saturant retained, to the saturant absorbed. This ratio varies with the different oils, but for any one combination, a satisfactory ratio may be determined by trial. The ratio is varied by varying the degree of heat treatment.

The following is a detailed description of a typical method which gives more satisfactory results. The saturant consists of thirty parts by weight of 14° Baumé mixed base refined Mexican crude petroleum, and seventy parts of refined water gas tar, thoroughly mixed and heated to 150° F. The woven asbestos covered wire tape is prepared by rolling between pressure rolls so that upon complete saturation in the above saturant followed by clean scraping of the surface it shows a weight increase of 45% to 50% on the original weight. The tape is saturated completely and the surface scraped clean, after which the product is cured at a temperature of substantially 450° F., for thirty-five minutes, or until the ratio of saturant retained to the saturant absorbed is between .45 and .50. The lining is then rolled to the desired size, and is ready for use.

The above brake lining shows in surface a co-efficient of friction equivalent in practically all respects to that of the above mentioned gilsonite linings; contains 18% to 20% residual saturant distributed uniformly throughout the material, which has the characteristics of hardening in use; which does not grab or stick to the drums on being heated; which does not glaze over and lose its gripping power in severe service.

The conditions of manufacture may be varied widely and still produce brake linings of high efficiency and long wear without departing from the spirit of this invention.

For example, in the above described typical method the residual saturant may vary from 12% to 22% and the condition of cure from .35 to .55 without producing defective material. This is due to the flexibility of the saturant and binder mixture for brake linings.

By the term "incombustible fibre" used in the following claims is indicated any fibre or fibrous mixture which consists essentially of asbestos, or a like incombustible fibre.

I claim as my invention:

1. Frictional elements consisting of asbestos fibre having incorporated therewith a solid residue obtained from the heat treatment of a mixture of water gas tar and petroleum oil.

2. As a new product of manufacture, friction elements comprising incombustible fibre having incorporated therewith the residue from the heat treatment of a mixture containing water gas tar and petroleum.

3. A method of making frictional material consisting in saturating woven incombustible fibrous material with a saturant consisting essentially of water gas tar and petroleum oil, and heat treating the saturated material to improve its frictional qualities.

4. A method of producing friction elements, comprising saturating an incombustible fibrous base with a saturant including water gas tar and petroleum, and heat treating the saturated base to improve its frictional qualities.

5. A method of producing frictional elements consisting in saturating woven asbestos covered wire tape with a saturant consisting essentially of water gas tar and petroleum oil, heat treating the tape to remove the volatile portions and retaining in the tape a predetermined amount of saturant.

6. A method of making frictional material consisting in saturating incombustible fibrous material with a saturant consisting essentially of water gas tar and petroleum

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oil, and heat treating the saturated material to improve its frictional qualities.

7. A method of producing frictional elements, comprising saturating an incombustible fibrous base with a saturant including water gas tar and a mineral hydrocarbon, and heat treating the saturated base to improve its frictional properties.

8. As a new product of manufacture, friction elements comprising incombustible fibre having incorporated therewith as a binder, the residue obtained from the heat treatment of a mixture containing water gas tar and a mineral hydrocarbon.

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