UNITED STATES PATENT OFFICE.

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THERMOTIC INSULATING MATERIAL AND PROCESS FOR MAKING THE SAME.

1,281,097. Specification of Letters Patent. Patented Oct. 8, 1918.

No Drawing. Application filed January 10, 1916. Serial No. 71,382.

To all whom it may concern:

Be it known that I, JUSTIN KAY TOLES, a citizen of the United States, residing at San Francisco, in the State of California, have invented new and useful Improvements in Thermotic Insulating Material and Processes for Making the Same, of which the following is a specification.

This invention relates to a new and original composition of matter adapted for use as thermotic insulating material and for many other purposes; and further relates to the process for making the same.

The main object of the invention is to furnish a novel and improved material or felt which is exceptionally well adapted for thermotic insulation and for use in the manufacture of wall boards, fiber board, both hard and soft, and is practical and economical to produce commercially, and which is lighter, cheaper, stronger, more durable and also more highly efficient than materials heretofore used for thermotic insulating purposes and for other purposes as herein set forth.

Other objects and the advantages of the invention will be apparent to those skilled in the art from a careful consideration of the following description of the insulating felt and the process for making the same.

My insulating felt is composed of a binder and a filler. The binder consists of the fibers of rice straw, which is produced in large quantities and is cheap, and I use these fibers because they are peculiarly adapted by reason of their superior felting qualities to produce a tenacious felt. The filler consists of chopped or ground tule, water grasses, or the straws of previously prepared rye, wheat, barley and the like.

The use of tule in the composition is preferable because the tule plant is composed of finely divided and hermetically sealed air cells, and it makes, when broken up, ground, or pulverized and combined with rice straw fiber or other suitable binding fiber, a highly efficient insulating material. The tule has no natural binding qualities, and when an adhesive binder of sufficient density to hold it together is used, the insulating efficiency of the tule is nullified because the dense adhesive binder acts as a conductor to transmit thermotic changes therethrough, thus permitting the heat or cold to avoid the path through the air cells of the tule and establishing a direct thermodynamic communication from one side of the material to the other by way of the path furnished by the adhesive binder.

The naturally formed air cells of the tule are not destroyed when the tule is ground or finely divided, and the rice straw fiber is used only in sufficient quantity to afford a binder or interlocking means to hold the ground tule or other filler products together in a compact form. The material so formed has greater insulating efficiency than the usual commercial insulating material, as has been proved by careful laboratory and engineering tests.

The process of making insulating material or felt embodying the present invention, consists in first digesting rice straw, preferably in a nominally weak solution of alkali, until the rice straw is disintegrated to its fiber constituents (a one per cent. or less alkali solution is preferred); then washing the same in water to rid it of excess alkali, and then introducing ground or chopped tule in the proportion of from one-third to two-thirds of tule, according to the density desired, and thoroughly agitating the mass in the wash water, so as to thoroughly mix the two ingredients; then passing the mass through moderate squeeze rollers, or otherwise ridding the mass of water; then placing the mass into a bath of any suitable water-proofing compound (a suitable water-proofing compound is the subject of a separate United States Patent application filed December 20, 1917 and bearing Serial No. 67,741 and for this reason is not herein disclosed); then thoroughly agitating the mass in the water-proofing bath; then passing the mass through moderate squeeze rollers or otherwise ridding the mass of excess water-proofing solution; after which the mass may be put through another water bath and floated over a draining screen. It may thereafter be formed into sheets or cakes of given size and thickness and finally placed in a drying room to dry.

The above process can be utilized to make thermotic insulating material from rice straw, or other suitable vegetable fibers, such as, for instance, the stems or stalks of peas or beans when used as binders. The pea and bean stalks are very tough and strong and

their fibrous constituents make very good binders for the ground tule or cereal straws and like products which are refractory; the former being of a pithy nature, unless boiled. However since boiling or digesting the tule renders it unfit for use as a filler, it is used in the uncooked, ground state.

By the above process, rice straw is reduced to fine, soft fibers having a very high felting efficiency. Said fibers, when floated or otherwise brought together, so intermesh and interlock as to produce a strong, resilient, and flexible felt. It is not necessary to employ sizing or other substances to hold the fibers together; and, moreover, said fibers act effectively to bind the ground tule into place, the resultant mass making, when dried, an insulating material especially desirable for refrigerator car floors, cold storage plants, battleships, pipe covers and the like. As heretofore stated, the material may also be used in the manufacture of house insulating wall boards, fiber board, hard and soft, and many other analogous articles.

I claim as new and desire to secure by Letters Patent:

1. An insulating felt, comprising a binder composed of fibers derived by cooking rice straw in a weak alkaline solution, and a filler of uncooked vegetable tissues.

2. An insulating felt composed of the long fibers of rice straw, and a filler of tule tissue.

3. The herein-described process of making insulating felt, which consists in first reducing the fibers of rice straw to a partially purified condition in a weak solution of alkali, then washing the fibers and thoroughly mixing the same with uncooked vegetable tissue by agitating the ingredients in water, and finally drying the felt.

4. The herein-described process of making insulating felt, which consists in first reducing the fibers of rice straw to a partially purified condition in a weak solution of alkali, then washing the fibers to rid them of excess alkali, then mixing the same with uncooked vegetable tissue by thoroughly agitating the ingredients in water, then floating the material over a drain screen and forming the same into sheets of predetermined size and thickness, and finally drying the felt.

5. The herein-described process of making insulating felt, which consists in first steeping rice straw in a weak alkaline solution to soften the gums and free the fibers, then washing the fibers and mixing the same with macerated vegetable tissue by agitating the ingredients in water, and finally drying the felt.

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