

UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING MOLDED ARTICLES FROM FIBROUS MATERIAL.

SPECIFICATION forming part of Letters Patent No. 717,050, dated December 30, 1902.

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To all whom it may concern:

Be it known that I, JOHN W. STREHLI, a citizen of the United States, residing at the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Processes of Producing Molded Articles from Fibrous Material, of which the following is a specification.

My invention consists in a new method of treating fibrous material—such as wood-pulp, sawdust, wood-shavings, excelsior, leaves, straw, grass, waste, cotton, paper, cornstalks, bagasse, hemp, manila rope fiber, jute, and other vegetable substances—and producing solid articles therefrom.

The main object of my invention is to produce a hard, tough, fibrous composition which shall answer all the purposes for which vulcanized fiber, gelatinized fiber, leatheroid, or like substances may be used and many of the purposes for which wood, iron, and other hard substances are used. Vulcanized fiber has not heretofore been successfully molded in form or dies, but must be made in sheet form, and can only be bent one way. The article to be made therefrom must be cut, stamped, or pressed out of the finished sheet. This makes it very expensive and inconvenient in handling and renders its use impossible for many purposes for which it might otherwise be used. Another objection to vulcanized fiber is that it has a grain, inasmuch as it is made by rolling one sheet upon the other, and thus it cracks one way very readily. Many attempts have been made to produce a substitute and to mold vulcanized fiber, but without success.

By my new method and process it is possible to mold fibrous materials into any shape and form which shall be as hard, tough, and dense as vulcanized fiber and have no grain, but will be a homogeneous mass.

My process is cheap, simple, and efficient. The material is first finely divided, unless cotton, hemp, manila rope fiber, tow, or similar fiber is used, in which event the fiber is left long and stringy. However, I can divide the fiber as desired.

My first step is to change the nature and character of the fiber by making it more dense, consequently less porous, thus increas-

ing its tenacity, strength, and durability. To bring about this change in the fibrous material, I employ chlorid of zinc, or I may use other chlorids—such as chlorids of tin, calcium, magnesium, aluminium, or the like—of the required strength. Oil of vitriol or the like or any other kind of chemical which will bring about the required result may be used.

In making vulcanized fiber chlorid of zinc or the like is used. The process ordinarily used is what is known as the "Schmidt process." I may use any process or system of using the chlorids of zinc or the like in organically changing the fibrous material.

I may use the chlorid of zinc or other chemicals, which may be used in any desired quantity and of any specific gravity, according to the effect desired to be imparted to the fibrous material.

In the manufacture of vulcanized fiber the whole process is a "wet process," and this is one great reason that vulcanized fiber cannot be molded, as in drying it shrinks from fifty (50) to sixty (60) per cent., and no two manufactured articles would be similar in shape, size, and contour.

My process, except the part in which the character of the fibrous material is changed, is a dry process. The fibrous material is placed into the molds dry, and the pressed article comes out of the molds dry, the molds being heated. The article keeps its form and does not warp, swell, or shrink.

I may use the chlorid of zinc with or without heat and treat the fibrous material in any kind of vessel, under agitation or not, just as desired.

After the fibrous material has been thoroughly treated by being saturated with the chlorid of zinc and all the fibers have been acted upon by it it is allowed to dry. If desired, I may subject the fibrous material after the chlorid of zinc has done its work to a bath of water, but this is not absolutely essential in all cases.

In cases where the product needs flexibility and softness I subject the fibrous material after the chlorid of zinc has done its work and before or after it has been dried to a bath of water and glycerin, sugar-water, or

any agent which will have the desired result. The proportions of the ingredients composing this bath, as well as the time the fibrous material can be left in it, will be according to the
 5 size of the mass being treated and the degree of flexibility it is desired to impart.

The next step in my process consists in taking a fusible binding agent—such as resin, gum, shellac, or the like—or any binding
 10 agent and pulverizing it and then thoroughly mixing it by any suitable means with the pulp or cellulose which has been treated with the chlorid of zinc or other agent used to effect the desired organic change.

I also, if desired, mix pulverized slaked lime with the pulverized resin and then mix the resin and lime with the pulp or cellulose, and, if desired, I may use oil, fatty substances, or tal-
 15 low with the lime by mixing it with pulverized lime after it has been slaked or impregnating the slaked lime with the oil. Any binding agent or waterproofing or fireproofing material may be used and connected with the pulp or cel-
 20 lulose after treatment and combined in a dry state, the lime being used to raise the fusing-point of the resin or binding agent and to add hardness to the material. After the dry treated pulp or fibrous material has been combined with the powdered resin, or resin
 30 and lime, or resin, lime, and oil or grease in a suitable tumbling-barrel or in any convenient way it is filled into heated molds and subjected to the action of a hydraulic or other powerful press and pressed into any
 35 desired shape, form, thickness, contour, or to any degree of hardness. The material can be colored by adding pigments to the materials when in the tumbling-machine.

I may, especially when large thick articles
 40 are being pressed, warm the dry material to a degree a little below the fusing-point of the binding agent before it is placed in the warm molds, thus insuring more certainly and rapidly and more evenly bound together through-
 45 out. This material is tough, hard, without grain, resists the action of hot and cold water, and is not disintegrated by oil or acids. It will not crack or blister in the molds and is ready for use as soon as removed from the
 50 molds. It can be used for many purposes—to wit, kegs, barrels, pails, moldings, car-wheels, hollow ware, and electrical purposes. A pulley or friction wheel of unequalled merit can also be made from this material. It will
 55 not shrink nor expand and is not affected by the elements.

It will be seen that the main features of my invention consist in densifying the fiber and then binding this fiber together in heated
 60 molds under great pressure.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. The herein-described process of treating fiber or like material, which consists in first
 65 subjecting said fiber to a bath of chlorid of zinc, or other organically transforming agent, drying the same, mixing the resultant cellulose with a binding agent in a dry state and subjecting the same to the action of heat and
 70 pressure in molds.

2. The herein-described process of treating fiber, or like material, which consists in first
 75 subjecting said fiber to a bath of chlorid of zinc, and glycerin or sugar-water, drying the same, mixing the resultant cellulose with a binding agent in a dry state and subjecting the same to heat and pressure in molds.

3. The herein-described process of treating fiber, or like material, which consists in first
 80 subjecting the said fiber to the action of a chemical bath to effect an organic change, then drying the same and then connecting the resultant product with a dry connecting binding agent under the application of heat and
 85 pressure.

4. The herein-described process of treating fiber, or like material, which consists in first
 90 subjecting the said fiber to the action of a chemical bath to effect an organic change, then drying the same and then connecting the resultant product with a dry connecting binding agent and pulverized lime, under the ap-
 95 plication of great pressure in heated molds.

5. The herein-described process of treating fiber, or like material, which consists in first
 100 subjecting the said fiber to the action of a chemical bath to effect an organic change, treating with glycerin or sugar-water, drying the product, then subjecting the resultant product with a dry connecting binding agent
 105 and pulverized lime, under the application of great pressure in heated molds.

6. The herein-described process of treating fiber, or like material, which consists in sub-
 110 jecting said material to a chemical bath or densifying process, then to a softening-bath and drying the same, then mixing the same with a dry binding agent and then subjecting the resultant product to the action of great
 115 pressure in heated molds.

7. The hard and tough product or composition herein described consisting of fibrous material organically changed and dried as set forth, combined with a fused binding agent under the application of heat and pressure,
 120 substantially as set forth.

JOHN W. STREHLI.

Witnesses:

CHARLES J. TURBER,
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