

UNITED STATES PATENT OFFICE.

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COMPRESSED PRODUCT FROM BONE.

SPECIFICATION forming part of Letters Patent No. 781,882, dated February 7, 1905.

Application filed November 22, 1904. Serial No. 233,892.

To all whom it may concern:

Be it known that I, JOSEPH ROSS HUNTER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Compressed Product from Bone, of which the following is a specification.

My invention consists of a new product from bone and process of producing the same.

In carrying out my invention I treat bone of any kind in any suitable manner to remove from it fatty material and then remove therefrom the mineral salts, particularly phosphate of calcium. The removal of fatty matter may be accomplished by the application of heat, and the mineral matter may then be removed by treatment with acid, preferably dilute hydrochloric acid. At any suitable period, either before or after the removal of the fatty material, lime, and mineral matter, I preferably remove the moisture, which removal may evidently be accomplished also by the application of heat. I may omit the removal of the moisture and fatty material *per se* and produce the material in the manner hereinafter described, removing the moisture or fatty matter, or either of them, if desired, as part of that operation. While I preferably remove all of these substances and my material is most desirable when so formed, I obtain an advantage from shredding and recombining the bone with or without the removal of any or all of these substances.

Where reference is made to the removal of matter from bone in the specification and claims, it is to be understood that substantial removal of such matter is intended, as it is unnecessary in most cases that the entire mineral, fatty, or fluid matter contained should be removed. Such entire removal is difficult commercially and in the case of the mineral matter risks the destruction of the fibrous residuum from which my compressed product is preferably formed.

Reference is here made to my application, Serial No. 214,618, filed June 28, 1904, for product from bone wherein is disclosed the subject-matter hereof and in which the material is claimed in this fibrous or divided con-

dition alone, no claims being there included so or intended to be included for the material in the compressed form as recombined after separation.

In carrying out my invention I preferably wash the bone thoroughly to remove flesh or other foreign matter therefrom and cut it up for convenience in handling, and to render parts of the bone more readily accessible to the treating fluid I place the bone in a vessel and subject it to a solution of acid, preferably hydrochloric (HCl) and water. The per cent. of hydrochloric acid is preferably relatively small, being about twenty per cent., but varies slightly, according to the character of the bone, whether fresh or "dead," and the temperature at which the process is to be carried out. The extent of action of hydrochloric acid upon the mineral salts relatively to the action upon the fiber of the bone which I wish to retain depends upon the temperature, and I have found that the most suitable temperature is in the vicinity of blood-heat. The fiber remaining from the hydrochloric-acid treatment, ordinarily termed "osseine," is preferably then washed thoroughly and excess of acid removed either by this means or by neutralization with an alkali, such as sal-soda. If the residuum has at this time an objectionable color, it may be bleached, as by the use of chlorid of lime, without interfering with the result which I wish to obtain. The bone-fiber is preferably kept wet until the process is completed, but may be moistened sufficiently for any of the operations herein described if it becomes too dry. The residuum, bleached, as above stated, if desired, is then beaten, preferably in a beating-engine. This breaks the fiber up somewhat; but I preferably further divide it in a refining or Jordan engine to the fineness required for the purpose to which it is to be applied. The fibers are pliable and soft and have somewhat ragged surfaces caused by the projection of small spurs, filaments, splints, or particles or other irregularities caused by the fracture. A result is obtained from these fibers similar to that from wool in that it may be felted or woven to advantage or un-

der strong pressure may be formed into masses or sheets with or without the use of an agglutinant. It is to the reunited form that the claims herein are directed. Coarser
 5 shreds or fibers may be recombined for bulky articles and those requiring comparatively less capability of flexure than is required for the finer and more delicate fabrics or products, particularly where the latter require
 10 much flexibility. Likewise more bulky articles may ordinarily be produced without the use of an agglutinant, whereas the agglutinant is more frequently necessary in the production of the finer products.
 15 My compressed material is a non-conductor of heat and of electricity and will not take fire nor support combustion. It will not absorb moisture and may readily be compressed so as to be impervious thereto.
 20 The compressed material is adapted to a large number of uses for which the characteristics above named fit it. Such suggested uses are conduits, pipes, or tubes for fluid transmission or delivery, electric conduits,
 25 either of the underground type for cable use or tubes for interior wiring, as a substitute for leather and insulation purposes, either in block form or compressed or formed about the conductor to be insulated.
 30 It will be evident that various changes may be made by those skilled in the art which may

come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact method and product.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. As a new product of manufacture compressed shredded residuum from bone.

2. As a new product of manufacture compressed shredded bone lacking mineral matter thereof.

3. As a new product of manufacture compressed shredded ossein.

4. As a new product of manufacture recombined fibers of bone from which mineral matter has been removed.

5. The process of producing a residuum from bone which consists in treating bone to remove mineral matter therefrom in finely dividing the same and in recombining the fibers thereof.

6. The process of producing residuum from bone which consists in removing the mineral matter therefrom, in finely dividing the product and recombining the particles thereof by pressure.

JOSEPH ROSS HUNTER.

Witnesses:

JOHN A. WIEDERSHEIM,
 WM. CANER WIEDERSEIM.