UNITED STATES PATENT OFFICE.

EDGAR S. BUFFUM, OF NEWTON, AND WILLIAM W. CARTER, OF NEEDHAM, MASSACHUSETTS, ASSIGNORS TO THE NEWTON COMPANY, OF NEWTON, MASSACHUSETTS, A CORPORATION OF MAINE.

WATERPROOF LEATHER BOARD AND PROCESS OF PREPARING THE SAME.

965,152. Specification of Letters Patent. Patented July 26, 1910.

No Drawing. Application filed January 29, 1909. Serial No. 474,966.

To all whom it may concern:

Be it known that we, EDGAR S. BUFFUM, residing at Newton, in the county of Middlesex and State of Massachusetts, and WILLIAM W. CARTER, residing at Needham, in the county of Norfolk and State of Massachusetts, both citizens of the United States, have invented certain new and useful Improvements in Waterproof Leather-Board and Processes of Preparing the Same, of which the following is a specification.

This invention relates to the waterproofing of leatherboard, and includes the product resulting from the process hereinafter described as well as the process itself, the term "leatherboard" being herein used to denote a product made from a pulp material or mixture containing fibers of tanned leather, whether said material is composed of leather fibers only, or whether it is made up in part from such fibers and in part from fibers of other material suitable for the purpose.

It has long been desired to produce an effective and homogeneously waterproof leatherboard, but so far as we are aware no one has ever succeeded in accomplishing this result prior to our present invention, and we believe that those who have dealt with this problem have failed to recognize the wide distinction between leather fibers, on the one hand, and vegetable fibers such as form the basis of ordinary paper, on the other hand. The leather is of animal origin and nitrogeneous in character, and has been profoundly modified by the tanning process, which has entirely changed the normal relations of the animal fiber substance to water, the fibers having lost their colloidal character and with it their power of becoming greatly distended by absorption of water, whether pure water or water containing other substances in solution.

We have discovered that a thoroughly and homogeneously waterproofed leatherboard results from our process, which consists essentially in subjecting the pulp fibers to an alkaline treatment and then precipitating upon and throughout the fibers suitable waterproofing agents in an amount sufficient to produce an actual permanent waterproofing of the final product when finished. We believe that the result of the alkaline treatment is greatly to increase the receptivity of the leather fibers to the waterproofing agents, and this is probably due to the effect of the alkaline treatment in restoring to a substantial extent the original colloidal character of the leather fiber substance treated, whereby the action of the waterproofing agents is rendered vastly more effective. The alkali used in our process also has the important function of neutralizing and converting into soluble salts the acids, *i. e.*, the tannic acid, chromic acid or their equivalents, which were employed in effecting the transformation of the raw-hide into leather, thereby preventing the premature precipitation of the waterproofing compounds within the pulp mixture, as well as removing the acids from the leather fibers and leaving them receptive to the waterproofing treatment as already indicated.

It is an important feature of our process that the treatment is applied to the disintegrated fibers of the pulp materials employed and may be carried on in the beater, thereby securing a very thorough incorporation of the various chemicals employed with the fibers of the pulp.

We will now describe the process in what we have found to be a highly satisfactory and efficient form, but it will be understood, as hereinafter explained, that instead of using insoluble compounds of the fatty acids as the waterproofing agent other well known sizing agents may be employed for the purpose.

The process is carried on in a beater or hollander, in which the pulp mixture is ground in the usual manner until it attains the desired degree of fineness. To this mixture is then added an alkaline substance such as caustic soda or potash, ammonia, lime, sodium carbonate, potassium carbonate, borax or the like. One result of this alkaline treatment is that the various acids and weak acid compounds contained in the mixture, and particularly the tannic or chromic acids contained in or derived from the leather, combine with the alkaline neutralizing agent employed, and thereafter exist in the mixture as soluble salts of the alkali used. With the mixture produced as just described there is mixed a solution of soap, in which term we include any compound which is soluble in water or in the pulp mixture and is formed by the chemical

union of an alkali (sodium, potassium or ammonium) with one or more of the fatty acids, *i. e.*, the acids of the fats, oils and resins. The mixture thus produced is operated upon in the beater long enough to secure an equal distribution of the soap upon the fibers of the pulp, about an hour being usually required for this purpose, and there is then added thereto a precipitant which will react with the soap and form by the union of the fatty acids with the base of the precipitant a compound which is insoluble in water or in the liquid portion of the pulp mixture. Among the precipitants which may be used are alum, aluminum sulphate, and copperas, any of which compounds will re-act with the soap as above set forth and deposit an insoluble precipitate upon the fibers of the pulp. The pulp mixture is then operated upon in the beater for another interval, usually about an hour, and is thereafter treated in the usual manner to produce the desired sheet or other article by the employment of machines such as are commonly used for this purpose.

In practice, the choice of the precipitant will vary according to the desired color of the final product. For example, if a black leatherboard is desired, we use copperas for the precipitant, in which case, if the leather in the pulp was bark-tanned, the soluble salts resulting from the alkaline treatment above referred to will re-act with the iron of the copperas to form a black coloring compound. If the leather was chrome-tanned and a black product is desired we mix a soluble sulfid with the pulp and then employ copperas as a precipitant, with the same result. In this case the soluble sulfid can be mixed with the soap and introduced therewith into the pulp mixture. If the precipitant employed is alum, aluminum sulfate or calcium chlorid the resulting product will have a natural or reddish color.

The proportion of neutralizing agent employed must be governed largely by the acidity of the pulp, and ordinarily we employ soda ash for the neutralizing agent. According to our experience from 2 to 5 lbs. of dry soda ash for each hundred pounds of dry leather scrap or fiber will usually suffice for this purpose. The quantity of solid soap ordinarily required is about 10% by weight of the leather scrap or fiber, and the quantity of precipitant used should be such as will re-act completely with the soap or waterproofing compound and with that portion of the salts formed by the union of the neutralizing agent with the acids derived from the pulp which can be precipitated by the precipitating agent. We have found that ordinarily about one half of the last mentioned salts can be precipitated, and corresponding to the percentages of soda ash and waterproofing compound above given, the quantity of precipitant required will ordinarily be from 8 to 13% by weight of the leather scrap, if copperas is the precipitant employed, or from 6 to 10% by weight of the leather scrap if aluminum sulfate is the precipitant employed. It will be understood that the exact quantities and proportions of the neutralizing alkali, the soap and the precipitant will vary in different cases, and may be determined by chemical analysis of the pulp mixture.

The alkali necessary to effect the neutralization of the pulp mixture may be mixed with the soap employed, if desired, before the mixture so produced is introduced into the pulp, but in practice we prefer to add to the soap only so much alkali as will certainly be required, the remainder of the alkali being separately added to the mixture if analysis shows that such an addition is necessary.

The scrap leather employed in practicing our invention will contain in most cases both bark-tanned and chrome-tanned leather, so that it will usually be desirable to add a certain amount of soluble sulfid to the pulp mixture when a black leatherboard is wanted. The proportion of solid sulfid required will usually be about 5% by weight of the chrome-tanned leather scrap employed.

By the term "chrome-tanned leather" as herein used we intend to refer to all leather commercially known by that name, which is commonly used to denote any leather tanned by the use of inorganic chemical compounds of various sorts.

Instead of employing a soap compound as the source of the insoluble precipitate which is deposited upon the fibers of the pulp we may use for the same purpose any one or more of a variety of other well-known substances or compounds which will remain in solution when added to the pulp mixture and will yield an insoluble precipitate upon the addition of a suitable precipitant. For example, a colloidal substance such as albumen, casein, or gluten may be used for this purpose, as any of these substances will be precipitated in insoluble form from the substantially neutral pulp mixture by the addition of various precipitants well known to chemists, including the precipitants hereinbefore referred to. We prefer, however, to use the soap compound previously described for the reasons already stated, and also because it is relatively inexpensive.

We claim as our invention:

1. The herein described process of producing a waterproof leatherboard which consists in preparing a pulp mixture containing fibers of tanned leather, rendering the same receptive to waterproofing agents by an al-

kaline treatment, precipitating insoluble waterproofing compounds in said mixture, and subsequently forming the pulp into the desired product.

2. The herein described process of producing a waterproof leatherboard which consists in preparing a pulp mixture containing fibers of tanned leather, rendering the same receptive to waterproofing agents by an alkaline treatment, mixing therewith a soluble compound of fatty acids and alkaline bases, adding thereto a precipitant adapted to react with the fatty acids to deposit an insoluble precipitate upon the fibers of the pulp, and subsequently forming the pulp into the desired product.

3. The herein described process of producing a waterproof leatherboard which consists in preparing a pulp mixture containing fibers of tanned leather, rendering the same receptive to waterproofing agents by means of alkaline re-agents adapted to combine with the acids derived from the leather to form soluble compounds thereof, mixing therewith a soluble compound of fatty acids and alkaline bases, adding thereto a precipitant adapted to re-act with said soluble compounds to deposit an insoluble precipitate on the fibers of the pulp, and subsequently forming the pulp into the desired product.

4. The herein described process of producing a waterproof and colored leatherboard which consists in preparing a pulp mixture containing fibers of tanned leather, rendering the same receptive to waterproofing agents by an alkaline treatment, mixing therewith a soluble compound of fatty acids and alkaline bases, adding thereto a precipitant adapted to re-act with the fatty acids to deposit an insoluble precipitate upon the fibers of the pulp and to also re-act with soluble salts contained in or previously added to the mixture to form a coloring compound, and subsequently forming the pulp into the desired product.

5. A waterproof leatherboard made from pulp containing disintegrated fibers of tanned leather and having insoluble waterproofing compounds deposited by precipitation upon and thereby intimately mixed with the fibers of which it is composed, substantially as described.

In testimony whereof, we have hereunto subscribed our names this 27th day of January, 1909.

EDGAR S. BUFFUM.
WILLIAM W. CARTER.

Witnesses:
JOSEPH T. BRENNAN,
E. D. CHADWICK.