G. HAMILTON.

Process of Treating Non-Feltable Animal Hair, &c.

No. 220,532. Patented Oct. 14, 1879.

Fig 1.

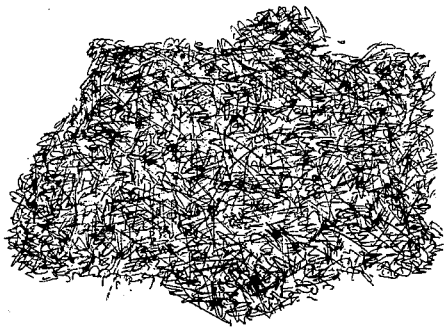
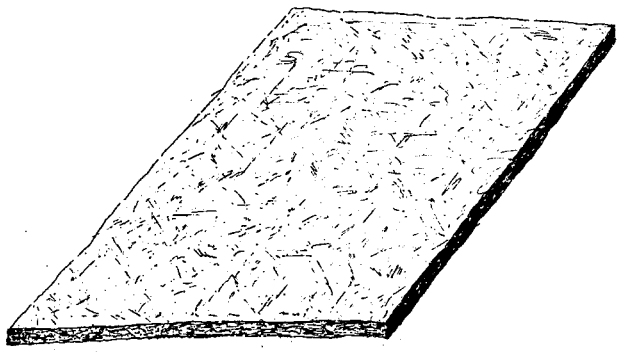


Fig 2



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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN PROCESSES OF TREATING NON-FELTABLE ANIMAL HAIR, &c.

Specification forming part of Letters Patent No. **220,532**, dated October 14, 1879; application filed January 28, 1879.

To all whom it may concern:

Be it known that I, GIDEON HAMILTON, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in the Treatment of Animal Hair, said improvements comprising a process and a product, as hereinafter described and specified.

It is the object of my invention to obtain from coarse animal hair a product which can be spun or woven, and which possesses in a greater or less degree the felting properties characteristic of wool or fur, and also possessing in a greater or less degree the curl and spring suitable for and adapted to upholstering purposes, thus furnishing a new and cheap substitute for wools and furs in various manufactures, in which they are used alone or together, or mixed with other fibers, and a new and cheap material useful for mattresses and other upholstery, thereby extending the economical use of a fiber to which improved textile, felting, and other useful properties have been imparted to many branches of the arts in which the cost of wools or furs would be restrictive or prohibitory, and this object I accomplish by subjecting to the novel process hereinafter described the raw material mentioned—to wit, coarse animal hair—which, in its normal or commercial condition, does not possess these improved properties.

I have discovered, and by a series of experiments have demonstrated, that the coarse hair which forms the coats of certain animals—to wit, the hair of cows, calves, bulls, oxen, horses, and goats—which, either in its ordinary or its commercial condition, does not possess the characteristics of the finer animal fibers which are classed as furs or wools, can, by a certain chemical treatment, have such characteristics imparted to it to such an extent as to make it amenable to the same treatment as wools or furs, and to render it available for uses similar to those which heretofore have been peculiar to wools or furs—that is to say, such animal hair by said treatment is refined and softened, is made lustrous and waved, curled, crimped, or twisted to a greater or less degree, according to the particular purpose for which it is intended to be used, and rendered capable of being felted, spun, woven, carded, and formed into bats or wadding.

As well as I can determine some of the qualities imparted by this chemical treatment are derived from a change which takes place in the fibers, and which either consists of the development on the exterior of said fibers of serrations or imbrications, like those peculiar to wools or furs, or else imparts to the treated fiber some equivalent irregularity (not incident to their natural state) which makes them susceptible of substantially the same felting, spinning, and weaving processes to which wools or furs are subjected.

In addition to this change in its surface, the fiber derives from the process a spiral, wavy, curly, or twisted form, which may be made more or less positive by a modification of the treatment, according to the purposes for which the product is to be used—for example, the greatest curl being imparted to fiber intended for mattresses and other upholstering purposes, while a less degree is more conformable with the requirements of felting, and still less with those of spinning. The treatment also rids the fiber of its coarse, harsh, stiff, horny, dull, unyielding, and straight character, and gives it fineness, flexibility, softness, and luster.

In the accompanying drawings, Figure 1 represents a loose mass of coarse animal hair prepared by my improved process, and Fig. 2 a piece of felted fabric made entirely of such fiber so treated, the fabric being made by the ordinary felting process.

Upon this discovery I have based my invention, which I now proceed to describe.

In a suitable vessel I prepare an aqueous solution of caustic soda, or of caustic potash, of a strength measuring about one-tenth of one degree of Baumé's hydrometer. I then take animal hair, of the kind hereinbefore specified, in the condition in which it is found on sale, (or if it is unduly loaded with foreign matters I previously open it out and wash it with water,) and immerse it in the bath described and boil it therein for from three to ten minutes; or in a bath of about one degree Baumé, at a temperature of, say, 160° to 170° Fahrenheit, the hair would be left from fifteen to twenty minutes.

Considerable variation may be made, if found requisite in particular cases, in the strength of the solution, the temperature of the bath, and the time during which the hair

is subjected to the treatment. With a stronger solution a lower temperature would produce the result within the same time. With a higher temperature the same strength in the bath would produce the result in less time, and with a weaker solution or a lower temperature the time must be extended. These variations cannot be defined more exactly than I have above mentioned, because they will depend upon the strength of the solution, the maintenance of the temperature at a uniform height, or in some instances upon the condition of the hair. The operator can determine whether the process is proceeding properly by taking, from time to time, a sample out of the bath and washing it in water slightly acidulated with sulphuric or other acid, and when this test shows that the fiber has acquired the proper reduction, fineness, and curl the mass should be removed at once from the bath and plunged into a bath of cold water, so as to arrest the action of the caustic solution and leave the product of the process in its proper condition, this washing being continued, with a change of water, if necessary, until the solution is thoroughly washed out. The product is then dried, and is ready for use.

Another variation in the process above described will be governed by the use for which the particular product is designed. For spinning and weaving purposes, or for forming into bats or wadding, a less curly condition of the product is desirable, while for mattresses and other upholstering uses more curl and spring is desirable. To increase the degree of curl it is only necessary to leave the hair in the same solution a little longer, but not to extend the period of immersion in conjunction with a stronger solution or a higher temperature, as this would tend to deteriorate the fiber. Where softness, luster, and pliability are desirable, with only a slight degree of curl, I use the above-described process, but with a weaker solution and at a lower temperature and for a longer time than in the instance specified—that is, a bath having a strength of, say, one-half of one degree of Baumé's hydrometer, at about 150° Fahrenheit, and for about forty-five to sixty minutes; and if an extreme degree of softness, luster, and pliability are desired, I immerse the fiber in a cold aqueous solution of caustic soda or caustic potash of a strength measuring about five degrees of Baumé's hydrometer for from twenty-four to forty-eight hours, or even longer, or in a cold aqueous solution of caustic soda or caustic potash measuring about ten degrees of Baumé's hydrometer for from four to six hours, or even longer; or, if the strength of the said cold solution be increased to fifteen degrees Baumé's hydrometer, the time will be reduced so as not to exceed from about two to four hours, in all these cases such modifications being observed as are required by the refractoriness of the fiber, and with due observance of the energy of the chemical action of the bath as affected by the temperature of the atmosphere, this action being stimulated by hot weather and retarded by cold.

The formulæ above given are indicated, for the cold treatment, in an atmosphere of from 60° to 80° Fahrenheit and a solution made with soda or potash of about sixty per centum of causticity. If desirable, the temperature of the solution may be reduced or raised and maintained at a substantially uniform degree by artificial cold or heat—as, for example, by means of ice or fires.

As in the hot treatment, so in this cold treatment, the fiber must be watched and its condition tested from time to time in acidulated water, and the fiber should be removed from the solution or caustic bath when the test indicates that it has obtained the proper condition, and should then be thoroughly washed in water.

Instead of using an aqueous solution of caustic soda or caustic potash, as above described, I use an aqueous solution of caustic lime in the following manner: I make a cold saturated solution of caustic lime, and bring this solution to a temperature of about 170° Fahrenheit, and then immerse the hair in it for a period of about three to four hours; or I bring this solution to a boiling-point, then immerse the hair in it and let it boil for a period of from ten to twenty minutes, testing it from time to time with acidulated water, as above described, and when it has reached the proper condition I wash it in water, as above described.

My invention further consists in treating the above-described product of the above-described process, whether treated in the hot or the cold caustic solution, and either before or after it has been washed in water, with a further washing in a cold weak acid solution known as a "sour," or, rather in a cold-water bath slightly acidulated with an acid, such as sulphuric, muriatic, or acetic, though I prefer sulphuric or muriatic for this purpose. This acid bath neutralizes any traces of the caustic soda, or caustic potash, or caustic lime not removed by the water-bath, increases the softness and luster of the fiber, leaving its curl and spring unimpaired, and retrieves and preserves the strength of the fiber and prevents deterioration in it in cases where the action of the first bath has been too energetic. The hair, after being removed from this acidulated bath or sour, need not be washed, but is simply allowed to dry in a warm room or by currents of warm or cold air.

I have specified caustic soda, caustic potash, or caustic lime as the best ingredients known to me for the solution forming the first bath in my process, and as imparting to the bath in the most satisfactory and efficient manner the causticity to which I mainly attribute the result of the process; but I contemplate using any chemical equivalents of caustic soda, or of caustic potash, or of caustic lime as substitutes therefor, whether such equivalents be simple or compound chemical

equivalents, and I contemplate also using solutions which, although not of themselves sufficiently caustic, yet on being brought into contact with the animal hair develop the required degree of causticity, and I enumerate among the substances now known to me as suitable for such solutions silicate of soda and silicate of potash, the essential characteristic of this feature of my invention being a solution or bath of a proper degree of causticity, substantially as indicated in the formulæ which I have given.

I do not wish to be understood as asserting that the above-described product can be obtained by subjecting to the above-described process all animal hair—as, for example, I have found that pigs' hair is so refractory as not to yield to the treatment satisfactorily under any modification of the process which I have as yet practiced. On the other hand, I have found and claim my invention as applicable to the hair of cows, calves, bulls, oxen, horses, and goats.

I contemplate extending the use of my process to other varieties of animal fiber, and specify the above as examples, respectively, of those which I have actually tried and found unavailable and of those which I have found available.

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

1. The hereinbefore-described process of treating animal hair, such as hereinbefore specified, with a solution of caustic soda, or of caustic potash, or of caustic lime, and washing out such solution, substantially as and for the purposes described.

2. The hereinbefore-described process of treating animal hair, such as hereinbefore specified, with a solution of caustic soda, or of caustic potash, or of caustic lime, washing out such solution in water, and then subjecting the washed fiber to an acidulated bath, substantially as and for the purposes described.

3. As a new product, animal hair possessing the properties requisite for felting, carding, spinning, or weaving, and for forming into bats or wadding, and for mattresses and upholstery, these properties being imparted to the said raw material by treating it with a solution of caustic soda, or of caustic potash, or of caustic lime, substantially as hereinbefore described.

GIDEON HAMILTON.

Witnesses:
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