UNITED STATES PATENT OFFICE.

JOHN A. JUST, OF NEW YORK, AND FRANK A. FLETCHER AND CALLIE F. GIBBS, OF WATERTOWN, NEW YORK; SAID JUST AND GIBBS ASSIGNORS TO SAID FLETCHER.

PROCESS OF BLEACHING VEGETABLE FIBER FOR THE MANUFACTURE OF PAPER, &c.

SPECIFICATION forming part of Letters Patent No. 354,477, dated December 14, 1886.

Application filed January 14, 1886. Serial No. 188,528. (Specimens.)

To all whom it may concern:

Be it known that we, JOHN A. JUST, a resident of New York city, and FRANK A. FLETCHER and CALLIE F. GIBBS, both residents of Watertown, in the county of Jefferson and State of New York, have invented a new and Improved Process of Bleaching Vegetable Fibers and Fabrics, of which the following is a full and exact description.

This improved process is equally applicable to bleaching all vegetable fibers and fabrics, whether they be wood pulp, rags, cotton, flax, or wastes of the same to be used in the manufacture of paper or textile fabrics made from vegetable fibers; and by this process the fibers or fabrics may be quickly and economically bleached to a pure white, without the least injury to the most delicate fibers.

Heretofore bleaching has been effected by the use of chloride of lime as the bleaching agent, the fibers or fabrics being ordinarily acted upon directly by the chloride. The fibers being thus impregnated with the chlorine or chloride of-lime solution, the chlorine is then liberated by the addition of a mineral acid. The invariable result of this method of treatment is injurious to all fibers, and especially so to the more delicate fibers, which are either partly or wholly destroyed. Attempts have been made to obviate this objection by the employment of metallic oxides in the bleaching process; but good results have not been attained.

In carrying out our improved process the bleaching proper is accomplished, as heretofore in the bleaching of vegetable fibers, by oxygen or oxidation; and the invention consists in the method of presenting the oxygen to the fibers or in the materials which supply the oxygen in the most efficient manner. The object which our method accomplishes is to so treat the fibers that the chemical action of decomposing the chlorine compounds should not go on within the fibers, but around the fibers which constitute the pulp or fabric to be bleached. We protect the fibers from the corrosive action of the chlorine, and thus preserve the delicate structures of the fibers. Insoluble oxides, which have heretofore been used, are only capable of forming a mechanical mixture with water, and on being presented to fibers the water only is absorbed by the fibers, while the oxides coat their exterior. Upon the addition of chlorine to effect the bleaching, the chlorine penetrates within the fibers and impregnates the water within the same with chlorine, and therefore no prevention of the injurious action of the chlorine is attained. Since the efficiency of the bleaching process depends upon the uniform liberation of the oxygen throughout the mass of fibers, it is essential that the matter used to produce this uniformity of generation of oxygen, and hence that used to protect the fibers, should be soluble, so that the agents may be uniformly distributed and brought into intimate relation with the fibers. Solubility of the ingredients is also essential to the economical carrying out of the process, since it enables the minimum amounts to be used, while at the same time homogeneity in the strength of the solutions formed. By thus first subjecting the fibers to a protective agent they may then be bleached by the aid of chlorine without charging them with chlorine and without any danger to the delicate structures of the fibers from the destructive action of the chlorine. On the completion of the process there will be no free chlorine, thus leaving the bleached material perfectly neutral, so that no anti-chlorine nor any acid is required, the invariable effect of which is injurious to the fibers; and no anti-chlorine being required, no subsequent washing is necessary.

The protective agent which we employ in the initial step of bleaching is sulphate of zinc. In practice this achieves the most perfect results, superior to any hitherto attained. The initial treatment of the fiber with the sulphate of zinc requires only a very dilute solution of the sulphate of zinc, so that but little of it is required, and its use is hence exceedingly economical. It has been previously proposed to bleach by zinc hypochlorite; but such treatment is too expensive to be practical, requiring, as it does, no less than fifteen to twenty pounds of sulphate of zinc to each one hundred pounds of the pulp or fibers to be bleached;

and, also, by using the zinc hypochlorite no protection is given to the fiber, since the fibers are then simultaneously subjected to the corrosive action of the hypochlorous acid. The only beneficial effect of the sulphate of zinc as thus employed is in the acceleration thereby given to the bleaching process.

In giving a detailed description of the entire process it will be assumed that wood pulp is to be bleached preparatory to manufacturing paper therefrom. The amount of sulphate of zinc employed is two or three pounds to each one hundred pounds (dry weight) of the wood pulp to be bleached. The sulphate of zinc, being a soluble salt, is dissolved and put into the usual beater-engine of the paper-mill, the engine being furnished with sufficient water to carry the material to be bleached, (say about half full.) This solution impregnates the entire amount of water with the sulphate of zinc, and there is obtained a very dilute solution or bath of uniform homogeneity. The water is then warmed up to between 27° and 50° centigrade by the admission of a jet of steam, and the wood pulp is then introduced. The wood pulp on being distributed throughout the engine is uniformly permeated by the very dilute solution of sulphate of zinc, which suffices to thoroughly protect the fibers from the injurious effects of the chlorine evolved in the further stages of the process. When the pulp is uniformly distributed, the bleaching agent is then introduced, such as chloride of lime (hypochlorite of lime) or solution thereof or chlorine gas.

In bleaching materials to be used in the manufacture of paper we prefer to add carbonate of soda, which is used after the bleaching agent. The carbonate of soda, which is especially used where the paper is intended for printing-paper, forms, in the first instance, by double decomposition, with the chloride of lime, precipitated calcic carbonate, which serves as an excellent filling, since it has the property of fixing the ink in the pores of the paper, and thus rendering it immovable. The soda is to be added in quantities proportioned to the amount of filling desired; but in bleaching rags, cotton, and textile fabrics the carbonate of soda may be, and preferably is, omitted. After the introduction of the above-named ingredients, the oxygen generated acts more energetically than ordinary oxygen, and it is believed to be allotropic oxygen, (ozone,) which bleaches the fibers to a pure white in a very short time. On the completion of the process the fibers are equally as strong as they were previous to the bleaching.

In bleaching textiles they are subjected to the same process, (omitting the carbonate of soda,) and no souring is required. They are bleached with excellent results, and the fibers are left intact and fully as strong as in the unbleached goods.

The sulphate of zinc serves not only as a protecting agent, but also acts to accelerate the process of bleaching. It is also essential to the efficient and rapid conduct of the process that the water used should be warmed to at least 27° centigrade. From that degree up to about 50° excellent results are obtainable; but a higher temperature is neither necessary or desirable.

We claim as our invention—

1. In the process of bleaching vegetable fibers, first treating the fibers with a bath of sulphate of zinc in solution, and then subjecting them to the action of a bleaching agent, substantially as set forth.

2. In the process of bleaching vegetable fibers, treating the fibers with a warm bath of sulphate-of-zinc solution, and then subjecting them to the action of a bleaching agent, substantially as set forth.

3. The process of bleaching vegetable fibers, which consists in first immersing them in a warm very dilute sulphate-of-zinc solution, and then introducing chloride of lime, hypochlorite of lime, chlorine gas, or solution thereof, substantially as set forth.

4. The process of bleaching vegetable fibers for the purpose of manufacturing paper therefrom, which consists of the following steps: first, treating the fibers with a bath of sulphate-of-zinc solution; second, introducing a bleaching agent, and, third, adding carbonate of soda, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN A. JUST.
FRANK A. FLETCHER.
CALLIE F. GIBBS.

Witnesses:
J. MULLIN,
GEO. H. WALKER.