UNITED STATES PATENT OFFICE.

STEPHEN M. ALLEN, OF WOBURN, MASSACHUSETTS.

IMPROVEMENT IN REDUCING LONG-STAPLE FIBERS.

Specification forming part of Letters Patent No. **37,846,** dated March 10, 1863.

To all whom it may concern:

Be it known that I, STEPHEN M. ALLEN, of Woburn, county of Middlesex, and State of Massachusetts, have invented a new and improved method of making a short staple or fiber like cotton and wool from long staple or fiber—such as that derived from flax, hemp, jute, china-grass, or other like vegetable fiber—to be used in the manufacture of threads, yarns, cloths, paper, and felts; and I hereby declare that the following is an accurate specification of the same, wherein I have set forth the nature and principles of my said improvements by which my invention may be distinguished from all others of a similar nature, as well as from a method previously discovered by me for producing a partially similar result, and for which I obtained United States Letters Patent on the 20th day of November, 1860.

My present invention consists in a new method of treating the fiber of flax, hemp, jute, china-grass, cane, and other woody fiber, whereby the same may be bleached and colored or dyed more readily than this could be done heretofore, and also to be spun and woven on the ordinary short-staple machinery with like facility as cotton and wool, as well as to be used in felting and in the manufacture of paper, producing, when so treated, a much softer and more beautiful yarn, thread, cloth, or felt, and a more perfect paper than can be produced from the ordinary long-line fiber.

The ordinary long-line fiber of flax, hemp, jute, and such other substance as is now generally used in linen burlaps, baggings, carpets, &c., is composed of fibrils so cemented and joined together by albuminous or resinous substances as to form apparently continuous fibers or filaments. The main object of my invention is to control this resinous substance so as to enable me to extract it easily from the fibrils, leaving the latter in a soft silk-like state, provided with stranded ends. These fibrils, if short, can be readily spun on the ordinary cotton and wool machines. To attain this my object I was led to a close examination of not only the chemical properties of the cementing compound, but also of the physical constitution of the ultimate fibril itself, and I found that the old method of treating the flax and hemp and other like fibrous substances was entirely incompatible with the nature of the resinous substances which remained in the fiber after it was taken from the woody stalk, and hardened rather than softened the same, involving great cost of money and time in bleaching, while it was nearly impossible to make it take and hold color, excepting by the use of mordants destructive of the fiber. I also ascertained that cutting the long-staple fibers in that state rendered them unfit for spinning, owing to the blunt ends of the fibrils. Experiments and investigations convinced me that the ultimate fibrils are of from one to two and three inches in length, overlying each other in the natural stalk, and are closely connected by a peculiar resinous substance, but joined together near the end of each fibril, one end of the one opening on the outer surface of each stalk, and the other terminating inwardly toward the pith. These fibrils are tubular, and during the growth of the stalk, and before the juices become crystallized, they are open as lungs to convey the air and moisture from without to the interior. Their resinous substances can be easily extracted by submitting the filaments alternately to the action of air and vapor, both followed by steeping in warm water in a retort or otherwise and by washing before boiling in alkalies. I also discovered that when this cementing compound was properly extracted the fibers would separate at their connecting-points, both longitudinally and transversely, under the action of weighted drawing-rollers, or by any other mode of separating them by a tensile strain between two given points; also, that when thus torn the ends opened like a stranded rope, easily entwining in spinning or felting. These operations were fully described in and secured to me by Letters Patent of the United States of March 20, 1860.

In the practical application of my invention to manufacturing purposes—*i. e.*, when operating in large masses—I have found that the effect produced is not so uniform as may be desired, the glutinous matter in the interior and on the outside of the fibrils being variously acted upon, producing injurious effects on the ultimate fiber itself. Thus when the external cement is duly disintegrated—*i. e.*, in condition to be readily washed off—it is in a state of decay with fermentation, which, if suffered to remain upon or in connection with

the fiber, would affect the inner wax or gluten, thereby eventually destroying the fiber itself. Hence the necessity for a treatment suited to both the outer and inner surface of the fibril. I have accomplished this by proceeding as follows: I take the fibers of flax, hemp, jute, china-grass, cane, woody matters, and other like substances, either rotted or unrotted, in the straw or stalk on which it grows, or after the same has been detached, or either before or after the same has been treated according to the air and vapor process as patented to me on the 20th day of March, 1860, and steep the same first in lukewarm water, and then in an alkaline solution. I then wash the fiber and rinse it by manipulating it by hand or machinery, as the case may be. In this way I am enabled to take away all the resinous or glutenous matter. The washing or steeping should be effected successively at different temperatures, beginning at a low temperature and increasing gradually until the boiling-point is reached; but before arriving at the boiling-point the fibers should be thoroughly washed and rinsed, after which it may be boiled for fifteen minutes, more or less. I then bleach it or color it in open vats or under pressure, and when thus prepared and dried the fiber is drawn down by smooth or fluted rollers or by any other process, whereby the same is drawn until the fibril is fully extended or stretched and torn in a manner most suitable to be spun into yarn. The fibrils thus produced may be spun alone or together with cotton, wool, or other substances on ordinary short-staple machinery, or it may be felted, or still further reduced for the manufacture of paper-pulp.

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

1. The process of treating long-stapled fiber for the purpose of converting the same into a short-stapled fiber by the application to the fibers to be reduced of successive washings in warm water, increasing in temperature, as herein described, in combination with the use of alkaline solution, substantially in the manner and for the purposes hereinbefore set forth.

2. In combination with the treatment of long-stapled fiber by successive washings in warm water and subsequent boiling, the method of reducing the same mechanically, in the manner and for the purpose herein described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

STEPHEN M. ALLEN.

Witnesses:

ATKINS A. CLARK, Jr.,

WM. D. SEAVER.