

UNITED STATES PATENT OFFICE.

GEORGE M. RICE, 2D, AND ALFRED L. RICE, OF WORCESTER, MASSACHUSETTS.

SEPARATING SILK FROM MIXED FIBERS.

SPECIFICATION forming part of Letters Patent No. 555,054, dated February 18, 1896.

Application filed October 3, 1894. Serial No. 524,794. (Specimens.)

To all whom it may concern:

Be it known that we, GEORGE M. RICE, 2d, and ALFRED L. RICE, citizens of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in the Art of Separating Mixed Fibrous Material Containing Silk, of which the following is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

Our present invention relates to the treatment of rags, mill-waste, cloth-cuttings and similar material containing wool, worsted, or hair, and having mixed therewith silk threads or silk fibers, or silk fibers and vegetable fibers—such as cotton, linen or ramie, &c.—by a process comprising the application to the fibers of sulphuric acid, or sulphurous acid, and a steaming operation, or the application of hot watery vapor in a manner that gives saturating effect upon the fibers, and a temperature therefor at about the boiling-point of the solution employed, the acid and steaming treatment together affording a combined action that will effect the destruction of the silk, as hereinafter explained, the object of our invention being to separate the mixed fibers for the recovery of the wool, worsted, or hair entirely free from silk fibers, as well as from vegetable fibers; also, to afford a method of eliminating silk from mixed wool-stock that can be carried on as a wet process—that is, with the rags or wool-stock wet or moist during the course of treatment.

In carrying out our invention in practice the mixed wool-stock, waste, rags, cloth-cuttings or other fibrous material is primarily saturated or moistened with diluted sulphuric acid of a strength ranging, say, from 4° to 12° Baumé, more or less, for ordinary conditions of stock. This moistening can best be done by soaking the rags or mixed stock in a vat containing the sulphuric-acid solution, or by sprinkling the stock spread upon a suitable bed with a shower of the acid liquid, or in other convenient manner. After the stock has become sufficiently saturated with the sulphuric acid any surplus acid solution may

be drained off or removed from the mass by the usual method of revolving the same in a hydro-extractor. The acidulated rags or stock is then placed within a container or receptacle, there properly inclosed and subjected to the action of steam at low tension. The steam is applied to the stock in a manner that will produce a saturating effect and maintain a substantially uniform temperature at about the boiling-point of the solutions employed, the steam being introduced as steam, but at so low a tension that it condenses and becomes a saturating agent immediately it mingles with the fibers—this in contradistinction to the use of steam as a drying agent. This saturating steam or vaporous heat being held at approximately uniform temperature at a degree between the boiling-point of water and the boiling-point of the acid solution used, or at about that degree, more or less, and so continued for a moderate time—some thirty minutes, more or less—partially gelatinizes the substance of the silk, softening it and allowing the acid to act upon it, while at the same time the acid is constantly diluted and rendered less and less corrosive on the fiber as the working proceeds, the excess of wet being allowed to drain out of the stock as it accumulates, but the stock is maintained fully saturated with the condensing steam and heat, and comes out dripping, or nearly so, upon its removal from the container. The result of this steam saturation and dilution, in connection with the action of the sulphuric acid, is to cause the destruction or disintegration of the silk fibers, so that it will, in the subsequent operation, come out in the form of dust. The material, after its removal from the container, is rinsed in clear water or placed in a suitable wash-box and scoured with suitable alkaline agents and water, then dried, and subsequently passed through a dusting operation in well-known manner. Successful results in the destruction or disintegration of the silk fiber can be thus attained without injury to the wool fibers in any material degree.

In some instances the mixed stock can be dried with or without artificial heating after it has been moistened with the sulphuric acid

and before the application of the steam or hot vapor; but the steaming operation, or hot vapor, must be applied to the stock while the acid remains in the fiber and before any neutralizing operation or washing of the stock is done. Such drying of the stock is not essential to successful practice, and as a general rule is not so economical in cost of working as to proceed without such intermediate drying.

Wool-stock treated with sulphuric acid in the manner herein described retains moisture until it is finally washed and the acid neutralized. Thus it is left in pliable condition, and not made harsh by the treatment. Instead of concentrating the acid in the fiber by a drying action or evaporation of the water therefrom, our treatment constantly weakens the acid in its effect upon the wool fiber by the introduction of the steam or hot vapor intermingled with the fibers.

We prefer in practice to employ the sulphuric acid of commerce diluted.

It is well known that treatment of mixed stock or rags with sulphuric acid and then drying the stock destroys vegetable fibers, and such method has been heretofore practiced in the separation of fibers; but as such common use of sulphuric acid independently, as heretofore practiced, is incapable of destroying the silk it does not constitute our invention, and we do not wish to be understood as claiming the use of sulphuric acid unaccompanied by the steaming or vaporizing operation. It will of course be understood that any vegetable fiber contained in the mixed rags, wool-stock, or fibrous material will be incidentally destroyed and eliminated by our process above described.

What we claim as of our invention, and desire to secure by Letters Patent, is—

1. In the art of separating mixed fibrous material containing silk, for the recovery of wool, worsted, or hair, free from silk fiber; the described improvement which consists in treating mixed stock or material, wet with dilute sulphuric acid, by subjecting it to continued saturating vapor and heat within a close container by application thereto of steam at low temperature, as and for the purpose set forth.

2. In the art of separating mixed fibers containing silk, for the recovery of wool, worsted, or hair, free from silk, the process which consists in primarily impregnating the fibers with sulphuric acid, at from 4° to 12° Baumé, and then further diluting the acid in the stock and simultaneously gelatinizing the silk substance by vaporous heat and saturating action with low-tension steam.

3. In the art of separating mixed fibrous material for recovery of wool or similar fibers, the process consisting in first saturating the mixed fibrous material with an acid solution, then inclosing the wet stock within a receptacle, or container, and therein subjecting the mixed fibers to the action of saturating vapor and heat at a temperature between the boiling-point of water and the boiling-point of the acid solution used.

Witnesss our hands this 27th day of September, A. D. 1894.

GEORGE M. RICE, 2D.
ALFRED L. RICE.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.