UNITED STATES PATENT OFFICE.

FRANCIS HICKMAN, OF BOUND BROOK, NEW JERSEY, ASSIGNOR TO THE FRENCH-HICKMAN FLAX FIBRE COMPANY, LIMITED, OF LONDON, ENGLAND.

FIBROUS STOCK AND PROCESS OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 629,077, dated July 18, 1899.

Application filed May 11, 1899. Serial No. 716,333. (No specimens.)

To all whom it may concern:

Be it known that I, FRANCIS HICKMAN, of Bound Brook, county of Somerset, State of New Jersey, have invented a new and useful Fibrous Stock and Process of Making the Same, of which the following is a specification.

My invention relates to the art of paper manufacture; and it consists in a new and improved fibrous stock therefor and the process of producing the same. This stock is derived from the flax-plant or from the straw, waste, tow, and the like of flax, and comprises, substantially, all the bast fibers and other cellulosic tissue of the material treated practically unweakened and free of cementitious materials—gums, fats, waxes, and lignin.

It is well known that flax-straw as a raw material from which paper stock or pulp may be produced differs, essentially, from wood and the straw of other fibrous plants—such as, for example, jute and hemp. These differences may be defined generally as follows: The fats and waxes of the flax-plant are far more difficult to break down and saponify with a caustic-alkali solution than are those of wood, and the percentage of fats and waxes in flax is much higher than in other fibrous plants. Hence it is necessary to provide a solution for flax which will efficiently break down and eliminate this unusual quantity of fats and waxes and which can overcome their peculiarly refractory character without destroying or weakening the fiber. I believe that by no process hitherto known or discovered for reducing flax-straw to secure its bast fibers alone, not even including that of retting, can the fats and waxes be completely eliminated without at the same time greatly weakening and partially destroying the fibers themselves. In a long course of experiments I have found that by combining a proper percentage of sulfur with an aqueous solution of caustic soda the former will unite with or saponify the more refractory fats and waxes of flax and retard the oxidizing effect of the caustic, whereby the process of saponification is so far modified and hastened under proper conditions of time, temperature, and pressure that the fibrous material is protected from injury by oxidation and the incrusting matter—such as lignin, fats, waxes, and gums—is broken down before the fibrous and cellulosic tissue can be attacked and weakened by the caustic.

The percentage of fats and waxes in the flax-plant varies under different conditions of soil and degree of plant maturity. Hence the percentage of sulfur necessary in a caustic liquor varies accordingly. While, however, the proper proportions of ingredients are thus variable within the range of, say, one-half of one per cent. to five per cent., by weight, of sulfur with ninety-nine and one-half per cent. to ninety-five per cent., by weight, of caustic soda, the proportions which I have generally found most satisfactory are about two per cent. of sulfur to ninety-eight per cent. of caustic soda. It may be said, however, that an excess of sulfur has no deleterious effect upon the product. I prepare this liquor by boiling the sulfur in the caustic-soda solution, in which it is readily dissolved. In carrying out the process the material is cooked with the liquor in a suitable digester under a pressure of preferably seventy to ninety-five pounds, with a corresponding temperature, for about four and one-half hours. The conditions of temperature, pressure, and time may, however, be interchangeably varied without affecting the desired result. I have also for the purpose of cheapening the liquor sometimes used sodium sulfate as a partial substitute for the caustic soda.

While the flax-plant can be utilized in its pristine condition—*i. e.*, as it is gathered from the fields—it is advantageous to "break" it beforehand by machinery, as in the well-known processes for making upholsterers' tow.

My process can also be employed with complete efficiency for the elimination of the same undesirable material frequently found in manufactured flax products, such as linen yarn or linen fabrics of the lower qualities, thereby greatly enhancing their value and utility.

My improved process as above described differs from retting in that the latter only partially degums the fiber, removes but a small percentage of its contained fats and waxes,

and destroys all cellulosic tissue other than the bast fiber. It also differs from the bisulfite-of-lime process in being a saponification process, which the latter obviously is not. It also differs from all other saponification processes by reason of the presence in the reducing liquor of sulfur in such form as to be available for union with the fatty constituents distinguishing this stock, whereby the saponification is so far promoted as to make its completion possible before the bast fibers and other cellulosic tissue are injured—a result not sequent upon the treatment of this stock with any other liquor.

Having thus described my invention, what I claim is—

1. A paper-stock consisting of the bast fibers and other cellulosic tissue of the flax-plant or straw, freed from fats, waxes, and other incrusting material.

2. The herein-described process of treating flax-straw to reduce it to a paper-stock, consisting in dissolving free sulfur in a hot solution of caustic soda in substantially the proportions specified, and then cooking the straw in the liquor thus prepared.

Signed at New York city this 5th day of May, 1899.

FRANCIS HICKMAN.

Witnesses:

AUGUSTUS LEE, Jr.,

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