UNITED STATES PATENT OFFICE.

THOMPSON HANNA AND THOMPSON S. HANNA, OF PITTSBURG, PA.

IMPROVEMENT IN THE MANUFACTURE OF PARCHMENT-PAPER.

Specification forming part of Letters Patent No. **198,382**, dated December 18, 1877; application filed October 20, 1877.

To all whom it may concern:

Be it known that we, THOMPSON HANNA and THOMPSON S. HANNA, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful improvements in methods and processes of treating paper, paper-pulp, and vegetable fiber generally; and we do hereby declare the following to be a full, clear, and exact description of our invention, such as will enable others skilled inthe art to carry it into effect.

Our invention relates to the treatment of vegetable fiber of all kinds and kindred substances, whereby we produce sheet or laminated vegetable parchment, or a molded body of the same, having all the valuable properties of the sheet now commercially known as "parchment-paper."

This parchment-paper is at present capable of being made only in single sheets, or in one continuous sheet, for the following reasons:

The treatment is generally a bath of diluted sulphuric acid, either alone or with chloride of sodium. After being immersed the proper length of time the sheet is withdrawn, and, unless it be instantly passed into a cleansing or neutralizing bath, the action of the acid will carbonize it and render it useless; but as this transition period is the very one at which the sheets possess an intrinsic cohesive power, and must at this period be massed together in order to produce a laminated structure, it follows that by the above treatments laminating is impossible, because the time and exposure required to obtain the necessary thickness, be it only that of two sheets, are sufficient to allow the sheets to fall a prey to the destructive tendency of the acid.

Another reason exists in the fact that, even if it were possible to effect the lamination without previous destruction, there would still be some acid in the interior or intermediate sheets, which would effect the destruction before the cleansing-bath could have time to permeate them and neutralize the acid. Hence the lamination of parchment-paper, or the molding of fiber-pulp, after sulphuric-acid treatment as at present employed, is utterly impracticable, and thus a valuable substance lost to industrial application and the arts.

Our object is to introduce into the sulphuric-acid bath such a medium as will retard or delay or so influence its action upon the material as to give time to laminate the sheets or treat the pulp in quantities for molding at the very time when its cohesive power is in vigorous existence, so that we are thereby enabled to utilize all the valuable properties of the so-called "parchment-paper" for a very wide range of purposes, to which it has hitherto been inaccessible.

Having this object, as well as others, in view, we proceed substantially as follows: Into a bath of diluted sulphuric acid (ordinary commercial acid will do) we place a small quantity of metallic zinc, the proportions being about thirty-two parts, by weight, of acid solution and one part of zinc. This we allow to stand until the acid has combined with as much zinc as it will take. The purpose of this combination will appear hereinafter. After it has cooled we add a quantity of dextrine, in about the proportion of four parts, by weight, of solution to one part of dextrine. This produces a peculiar effect upon the workings of the bath. It is probable that, on account of its being very hygroscopic, the acid takes some of the elements of water out of the dextrine, and while the superfluous strength of the acid is thus expending itself in one direction, the remainder is exerting itself in parchmentizing the fiber, and cannot concentrate itself to carbonize. But whatever be the action, chemical or mechanical, this much is certain, that when a sheet of paper or mass of fiber-pulp is immersed in this bath and withdrawn the acid does not immediately destroy the paper or pulp, while its cohesiveness is maintained for a considerable time. This gives the time necessary to place two or more sheets together to form a board, or to mass or mold the treated pulp. After this is done we pass the treated material through a bath of common salt and water. Here, it is believed, a double decomposition takes place, due to the presence of sulphate of zinc and free sulphuric acid retained by the material from the treating-bath. The sulphuric acid attacks the chloride of sodium, forming sulphate of soda, and setting free hydrochloric acid, which unites with the zinc held in the material, forming chloride of zinc. The two salts—sulphate of soda and chloride of

zinc—thus formed—are soluble in water. The material is then washed in clean water, which abstracts all soluble matters from the paper or pulp, and leaves it in the condition desired. It may then be operated upon by any of the well-known means or machinery employed in the manipulation of substances of a kindred nature.

We have given zinc and dextrine in the process merely as a good example of our method; but we wish it distinctly understood that we do not limit the scope of our invention to them, or either of them.

It consists, essentially, in treating fiber by sulphuric acid in presence of such medium as will retard the intense effect of the acid.

Iron might be substituted for zinc, and a suitable reacting solution substituted for that of chloride of sodium, effecting like results.

We have found that, instead of dextrine, other organic matters may be used, such as crude petroleum, blood, albumen, or even paper or paper-pulp; also, the cuttings and scraps obtained in manufacturing the parchment material, thus utilizing all the factory waste. In all of these substances the elements of water are combined. Other media may be found to operate with similar results.

By this process all forms of vegetable fiber or tissue may be treated, such as sized or unsized paper, paper-pulp, whether from rags, wood, or other material, cotton-wool, lint, and cotton-shoddy; also, fabrics made from any of them. These, when treated and laminated to a sufficient degree, make an admirable substitute for leather or rubber belting.

To make extra thicknesses of board, we laminate to a convenient degree first, and then unite two or more such masses by brushing or spreading the treating-liquid over the adjacent faces, thus causing them to cohere, and then washing, as before.

We render the product water-proof by adding a small quantity of nitrate of potash to the treating-bath; but this is not an essential of our invention.

As in other kindred processes, we can, by means well known to those skilled in the art, render the product of any desired quality—hard, soft, pliable, or plastic—and thus render it suitable for the manufacture of a great variety of articles, such as washers, belting, hose, trunks, roofing-cloth, statuettes, ornaments, furniture, utensils for household use, &c.

We are well aware that fiber has been treated by a mixture of oil of vitriol, water, and glycerine; but glycerine simply acts as a diluent, and does not effect the retardation of the action of the acid, which is the object we accomplish. Glycerine does not and cannot retard the effect of the acid, and hence the action is different. We do not, therefore, claim glycerine as forming any part of our invention, and specifically disclaim it as an ingredient.

We are also aware that starch has been used to effect the so-called "water-marks," as applied to parchment-paper, and to effect such marks in colors; but we disclaim any such treatment in spots, or partial actions, as our invention essentially aims at treating whole sheets and large masses to form a homogeneous product.

Having fully described our invention, we claim and desire to secure by Letters Patent—

1. The herein-described process of treating vegetable fiber, consisting in subjecting it to a bath of dilute sulphuric acid, whose corroding effects are retarded by means substantially as described, and then washing out the surplus acid.

2. The herein-described process of treating vegetable fiber, consisting in subjecting it to a bath composed of dilute sulphuric acid and dextrine or its designated equivalent, and then washing out the surplus acid.

3. The herein-described process of treating vegetable fiber, consisting in subjecting it, first, to a bath composed of dilute sulphuric acid, an organic substance, and a metal; secondly, to a bath composed of water and a salt between whose base and the sulphuric acid, or between whose acid and the metal employed, there exists a superior chemical affinity; and, thirdly, to a bath of water, substantially as set forth.

4. The herein-described method of retarding the action of sulphuric acid upon vegetable fiber and other material by mixing with it dextrine or its designated equivalent, as set forth.

5. In the above process, the method of neutralizing the acid by adding to it zinc or other metal, and afterward causing a reaction with a solution of a salt, whereby double decomposition is set up and two soluble salts formed, as described.

6. Specifically, as an improvement in the art of making parchment-paper, the treatment of the paper by dilute sulphuric acid and dextrine or its designated equivalent, as set forth.

In testimony whereof we have hereto set our hands this 17th day of October, 1877.

THOMPSON HANNA.
THOMPSON S. HANNA.

Witnesses:
ROBERT CALHOUN,
T. J. MCTIGHE.