UNITED STATES PATENT OFFICE.

XAVIER KARCHESKI, OF BELLEVILLE, NEW JERSEY, ASSIGNOR TO SOLOMON D. McMILLAN, TRUSTEE, OF NEW YORK, N. Y.

IMPROVEMENT IN HARD-SIZING PAPER.

Specification forming part of Letters Patent No. **149,317**, dated April 7, 1874; application filed July 28, 1873.

CASE B.

To all whom it may concern:

Be it known that I, XAVIER KARCHESKI, of Belleville, New Jersey, have invented certain Improvements in Sizing Paper and other materials, of which the following is a specification:

My invention, in its application to the manufacture of paper, consists in submitting paper in the web, before it is dried, first to a bath of vegetable size, and then to a bath of animal size, both of peculiar composition, and in removing the superfluous sizes by scraping and in drying the product upon the heated cylinders of the paper-machine, so that the complete operation of manufacturing paper which is sized is conducted with only one drying process, irrespective of whether the paper is more or less hard-sized or enameled; and, further, so that earthy matter contained in my vegetable size is distributed upon a web composed solely of paper-pulp, filling its pores and cavities, and thus producing an even surface upon which my animal size is subsequently deposited in a thin pellicle. I thus avoid making the paper brittle, which is one objectionable result of mixing earthy matter with the pulp, and I prevent the paper from absorbing animal size to such an extent as to become translucent. My sizes contain some novel ingredients, and their composition is varied according to the various results sought to be accomplished, as herein severally set forth.

My process involves the introduction between the drying-cylinders and the last pair of press-rolls in a Fourdrinier or "cylinder" machine, of two vats or tanks for containing vegetable and animal sizes respectively, each provided with suitable devices for scraping off the superfluous size from the material operated upon. The first vat contains my vegetable size, consisting of bleached rosin dissolved by heat in the least possible quantity of alkalies and water, with the addition to the solution of a quantity of colorless earth and soap. The web of paper from the press-rolls passes through the size and absorbs the rosin and soap, while the colorless earth fills its pores.

When the paper is manufactured from new stock, and is free from impurities and foreign matters, colorless earth in the first vat may be omitted, if increase in the weight of paper should be objectionable.

The excess of size is removed from the paper by scrapers, and the web then passes into the second vat, which contains my animal size, consisting of a solution of glue, alum, tallow, or other soap, colorless earth, and a trace of chloride of sodium.

In combining these ingredients the proportions are not arbitrary. The operator will soon learn to vary them according to the quality of surface required, as to hardness, luster, and enamel, and also according to the purity of the ingredients themselves, and the conditions attending their use.

Care must be taken in all cases that a sufficient quantity of alum is present to kill the alkalies used in the process. The superfluous animal size is removed by scrapers, as before, and the web then passes on to the drying-cylinders.

It will be seen that in my improved mode of manufacturing paper the web is in a wet state when introduced into the first or vegetable-size bath, so that the water it contains combines with the vegetable size. The fiber of the web absorbs the rosin and soap solutions, while the earthy matter fills the pores and cavities in the web, and the scraping operation produces an even surface. The web being then introduced into the animal-size bath, and being incapable of absorbing any more liquid, simply receives upon its surface a thin pellicle of animal size, and the repetition of the scraping operation not only removes the superfluous size, but still further tends to equalize and smooth the surface of the web. The web, which then passes onto the drying-cylinders, is prevented from adhesion thereto by the presence of the chloride of sodium contained in the size, and loss of size by evaporation during the drying process is prevented by the presence of the fatty acids in the size.

Printing-paper manufactured by my process, while it is not increased in cost, is greatly improved in quality in respect to superior smooth-

ness, evenness of texture, and capability of bearing writing or receiving even impressions from printer's types. "Hard-sized paper," so called, *i. e.*, writing-paper, is not only improved in quality by my process of manufacture, but is greatly reduced in cost.

Heretofore there has been no successful process of hard-sizing paper in the web before drying it, and consequently a second drying operation has been necessary. By my process I save the time and labor expended in the second drying operation.

In manufacturing writing-paper it is to be observed that my vegetable size of rosin, alkalies, soap, and colorless earth, which fills the pores of the web, as I have described, prevents the translucency which is a characteristic of paper finished with purely animal size.

To produce the hard surface required in writing-paper the following will be found to be an effectual composition of animal size, to be applied after the administration of the vegetable size: Dissolve one and a half pound of white soap in two gallons of water, and two pounds of strong white glue in two gallons of water, mix the two solutions, and add sufficient alum to kill the alkalies present, as aforesaid, then add colorless earth and a handful of chloride of sodium. This size is to be used warm, say, at a temperature of about 120° Fahrenheit.

Paper sized with this succession of vegetable and animal sizes will be perfectly opaque and firm, and will have a hard, even surface.

In manufacturing printing-paper the animal size is made weaker—that is, with a weaker solution of glue, printing-paper not requiring so hard a surface.

I claim as my invention—

1. The described mode of hard-sizing paper in process of manufacture, by administering vegetable and animal sizes successively to the web before it is dried upon the heated cylinders, substantially as and for the purposes set forth.

2. The described process of sizing paper or other material, by the application of vegetable and animal sizes successively, substantially as and for the purposes set forth.

3. The described process of treating paper or other material with vegetable and animal sizes successively, such sizes being combined with earthy or mineral matters, and the superfluous size being removed by scraping, for the purpose of giving the fabric operated upon a smooth, even, and hard surface or enamel, substantially as set forth.

4. The described process of treating paper or other material with vegetable and animal sizes successively, the animal size containing a fatty acid and chloride of sodium, for the purpose of preventing the evaporation of the size by heat, and also preventing the adhesion of the sized fabric to the drying-cylinders, substantially as set forth.

In witness whereof I have hereunto signed my name this 24th day of July, 1873.

XAVIER KARCHESKI.

Witnesses:
EDW. E. QUIMBY,
GEO. W. MIATT.