

UNITED STATES PATENT OFFICE.

WILLIAM J. MENZIES, OF ST. HELENS, COUNTY OF LANCASTER, ENGLAND.

METHOD OF SIZING PULP.

SPECIFICATION forming part of Letters Patent No. 405,269, dated June 18, 1889.

Application filed October 20, 1887. Serial No. 252,904. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM J. MENZIES, of St. Helens, in the county of Lancaster and Kingdom of England, have invented a new and useful Improvement in the Methods of Sizing Pulp, of which the following is a true and exact description.

My improvement relates to that stage of the manufacture of paper at which the pulp is sized, and at which also china-clay or the other substances generally used for giving weight to the paper are usually added. The usual method of sizing the pulp is, in the first place, to saponify the rosin by boiling it with a solution of soda ash or caustic soda, thus making a liquid rosin soap. This "size" is then added to the pulp in the beating-engine either with or without china-clay, starch, &c., and afterward a solution of alum or sulphate of alumina is put in. The result of this treatment is that the alkali of the soap combines with the acid of the sulphate of alumina, and the alumina of the alum and the rosin of the soap are thus freed or precipitated and immediately combine, forming a pinate or rosinate of alumina, which become intimately mixed with the paper-pulp, and, on being heated by passing over the rolls of the paper-machine, imparts to the paper its hydrofuge qualities, or what is technically termed "sizes" it.

In the above-described treatment the acid contained in the sulphate of alumina is entirely lost, not in any way entering into the composition of the paper. Again, the acid sulphate of alumina generally employed acts destructively on the wires of the paper-making machine. It is necessary to add the sulphate of alumina in excess to thoroughly decompose the size, as, unless this is done, the pulp will not work well. The sized pulp is therefore acid, and this acidity acts injuriously on delicate colors.

The object of my invention is to accomplish the sizing of the paper by a method free from the injurious features of the above-described usual process, and at the same time less expensive and equally as good in other respects. This I accomplish by using aluminate of soda to saponify the rosin used for sizing, thus avoiding the use of the soda ash or caustic

soda heretofore used for that purpose. The soap thus prepared being added to the pulp in the beating-engine, I preferably convert the rosin or its equivalent into size by adding a solution of one of the soluble salts of magnesia, (the chloride or sulphate.) Chloride of calcium may also be used with advantage, and the use even of sulphate of alumina, as in the old process, gives, with the sizing material prepared by means of aluminate of soda, much better results than were attainable by the old method.

The advantage of using the soluble salts of magnesia or calcium, which is common to both, lies in the fact that these salts are neutral and can be added in excess without danger of injuring the wires of the machine or making the pulp acid, with the injurious effects heretofore noted. My reason for preferring to use the soluble salts of magnesia is, first, on account of its cheapness, and more particularly because the paper is increased in weight and improved in quality, owing to magnesia being precipitated along with the alumina. The surface of the paper is not so fine where the chloride of calcium is used in place of the soluble salts of magnesia.

In using my process I have obtained excellent results by the following methods: I first saponify the rosin by boiling it with aluminate of soda in the proportion of one part, by weight, of aluminate of soda containing about twenty-five per cent. of alumina combined with thirty-eight per cent. of soda and dissolved in four times its weight of water and added to two parts, by weight, of rosin. These proportions may be greatly varied, and an aluminate of soda containing more or less soda used, all that is necessary being to have sufficient alkali present to thoroughly saponify the rosin and hold it in solution. I then add this "soap" to the pulp in the beating-engine in the usual manner, and either with or without china-clay, or the usual substances used for giving weight to the paper, and introduce the solution of the soluble salt of magnesia, calcium, or alumina. In the use of the magnesia salts I have found that a solution containing one part of the salt dissolved in twenty parts of water works well; but a wide variation in this proportion is ad-

missible. This solution in the case of the salts of magnesia and calcium, which are neutral, can be added in excess of what is necessary to decompose the soap and precipitate the rosin and alumina without injury. In the case of the magnesia salts the precipitated magnesia is, as I have already explained, a valuable addition to the pinate or rosinate of alumina formed by the precipitated rosin and alumina.

For the sake of economy I prefer to use the sulphate of alumina in the form of the impure salt commonly known as "kieserit."

The chemical reactions which take place in the above-described treatment are as follows, R representing the rosin acids, (viz., pinic, abietic, and sylvic acids:) From the union of the rosin with the tribasic aluminate of soda we have a rosinate of soda combined with aluminate of soda, which is soluble, and can be represented by the following formula, viz: $4R + 3Na_2O, Al_2O_3 = 4NaR + 2NaAlO_2$. To this soluble soap the sulphate of magnesia is added in the beating-engine, the sulphuric acid of the sulphate of magnesia uniting with

the soda of the soap to form sulphate of soda, and the rosin, alumina, and magnesia being precipitated as a rosinate of alumina and magnesia, which can be represented by the following formula: $4NaR + 2NaAlO_2 + 3MgSO_4 = 3Na_2SO_4 + 2MgR_2 + MgAl_2O_4$, of which the last two are insoluble and form the size, while the first or sodium sulphate is soluble and passes away.

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

The method of sizing pulp, which consists in saponifying rosin by treating it with aluminate of soda, adding the solution thus prepared to the pulp in the beating-engine, and then decomposing it by adding a solution of magnesian sulphate or its described equivalent, all substantially as and for the purpose specified.

WILLIAM J. MENZIES.

Witnesses:

FRANK A. MULLIKIN,
JOSHUA MATLACK, Jr.