# UNITED STATES PATENT OFFICE.

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## PAPER PRODUCT AND PROCESS OF MAKING SAME.

1,317,618. Specification of Letters Patent. Patented Sept. 30, 1919.

No Drawing. Application filed April 15, 1918. Serial No. 228,682.

*To all whom it may concern:*

Be it known that I, JUDSON A. DE CEW, a subject of the King of Great Britain, and resident of the city of Montreal, in the Province of Quebec and Dominion of Canada, have invented certain new and useful Improvements in Paper Products and Processes of Making Same, of which the following is a full, clear, and exact description.

This invention relates to a new paper product and a process of making same, the main object of the invention being to produce a paper in which the sizing materials are fused or molded into the paper mass in such a manner that the density of the paper is appreciably increased, thereby giving it distinctive characteristics substantially different from papers made with ordinary sizing ingredients.

According to my process, certain new sizing ingredients are incorporated into the paper stock in the beating engine, and during the calendering or drying of the paper under special conditions of temperature and pressure, these ingredients are fused into the paper mass in such a way as to greatly improve the quality of the paper. In the ordinary method of making a waterproof paper, rosin size is used, which is coagulated with sulfate of alumina forming aluminum resinate, but this sizing material does not melt or fuse either on the paper machine driers or in the calendering of the paper under heat and pressure. The result is that when a rosin size alone is used, a brittle material is formed on drying, which has no capacity for remolding itself by treating the paper with heat and pressure, and consequently it is impossible to alter the physical properties of the paper, since the dried resinate of alumina becomes crushed or pulverized by calendering and will not melt under any of the ordinary temperatures used in the drying and calendering operations.

On the other hand, if the properties of the rosin soap are altered by blending with the rosin size to be used, certain proportions of oils, fats or waxes, and precipitating this blended material in the beating engine with a salt of aluminum, a product is obtained which is sufficiently fusible in character when dry that under special conditions of temperature and pressure it can be treated in calendering, so that the sizing material will flow as a fused mass over the paper fiber, filling the interstices of the paper and making it entirely waterproof.

In carrying out my process, I use solutions of wax and rosin size, such as described in my U. S. Patent No. 1,174,697, or solutions of oil and rosin size, such as described in my U. S. patent application, Ser. No. 874,881, filed November 30, 1914, and to obtain the best results, it is preferable to use approximately 3% of the blended sizing material calculated on the weight of the paper stock. This amount is practically sufficient for coating over the fibers, so that when the paper is calendered at high temperatures, the fused sizing materials will so blend as to make a uniform coating throughout the fibers, giving a waterproof product. For special purposes, I may use more than 3% of the sizing material, in order to more completely fill the interstices of the paper and give special capacity for moisture and water resistance, but in a general way it may be stated that a satisfactory paper product cannot be made with less than 2% of the fusible sizing material, since the properties of the paper only become altered when there is enough of the sizing to form a continuous coating or film over the surface of the fibers.

I have found by making extensive experiments that in the manufacture of the ordinary water-finished wrapping paper sized with a rosin size, the paper comes to the calenders hard sized, but after the paper is moistened and then dried between steam heated calenders, which are heated to high temperatures and which crush the paper into a semi-translucency by the high pressure, then the water resistance that the paper formerly had from the rosin size is almost totally destroyed, so that the paper can be easily penetrated by water. If, however, the paper is treated in a similar manner with sizing solutions which contain sufficient wax or oil to lower the melting point of the product, so that the mixture of wax, rosin and alumina will fuse under temperatures of approximately 100° to 145° C., obtainable between the heated paper machine calenders, then the paper product becomes molded into a fibrous mass containing a continuous coating over the fibers of a water repellent material. The fusing point of the sizing material will vary slightly, but in general, the temperature of the drying rolls must be ap-

proximately that of steam under pressures ranging from five pounds to one hundred pounds, or slightly above the fusion temperature of the sizing mixture. Under these temperatures, an aluminum resinate alone will not melt or fuse and in fact the ordinary aluminum resinate cannot be fused below temperatures which will blacken and spoil the surface of the paper. It is obvious that during the drying process, none of the paper can be heated to a temperature above the boiling point of water at atmospheric pressure, which is 212° F. In order, therefore, to heat the paper to a temperature higher than this point, it must first be dried and then passed over or between steam heated rolls, in order that the now dried sizing material may be fused and allowed to run. This action is preferably done under pressure, such as exists under paper calendering rolls, so that the material may be fused and molded into the fiber.

The present application is in part a continuation of matter described in my prior applications as follows:—

Ser. No. 856,619 filed August 13, 1914.

Ser. No. 874,881 filed November 30, 1914.

Having thus described my invention, what I claim is:

1. A process of making a waterproof product, which consists in incorporating into the paper stock as a sizing agent a precipitated mixture of wax, rosin and alumina, then drying this product, and then heating to the fusion temperature of the sizing mixture.

2. A process of making a waterproof paper product, which consists in incorporating into the paper stock in the beating engine a sizing mixture having a lower melting point than ordinary precipitated resinate of alumina, then drying the product and then heating to a temperature higher than the melting point of the sizing mixture.

3. A process of making a waterproof paper product, which consists in incorporating into the paper stock in the beating engine as a sizing agent a precipitated mixture of wax with rosin and alumina, then drying the product, and then heating to a temperature between 100° and 145° C.

4. A paper product made from paper or pulp fibers, and a sizing material which has a lower melting point than that of resinate of alumina and which has become fused after the drying of the paper product.

5. A waterproof paper product having no surface coating but containing a sizing material fused on to the fibers after the drying process.

6. A paper product containing a fused sizing composition, consisting of wax with rosin and alumina incorporated into the fibers by precipitation in the beating engine.

7. A waterproof paper product made from paper or pulp fibers, and a sizing material having a melting point below that of resinate of alumina, said sizing material having become fused on to the paper fibers by heating the paper product to a temperature between 100° and 145° C.

8. A process which comprises incorporating with fluent paper stock, a sizing composition containing rosin size and wax, and an aluminum compound capable of precipitating the same, making the material into paper, drying the paper, and heating the same to a degree sufficient to melt the rosin-wax-alumina compound.

9. A process which comprises incorporating with fluent paper stock, a sizing composition containing rosin size and wax, and an aluminum compound capable of precipitating the same, making the material into paper, drying the paper, and heating the same to a degree sufficient to melt the rosin-oil-alumina compound by passing the same between heated pressure rolls maintained at a temperature above 100° C., whereby the molten material spreads itself, in fluid condition, throughout the body of the paper.

In witness whereof I have hereunto set my hand.

JUDSON A. DE CEW.