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COATED PAPER

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Our invention relates to certain new types of paper, as articles of manufacture, and to the method of producing the paper.

The principal objects of the invention are, firstly, to produce paper which is both flameproof and water and moisture resistant or which is only flameproof or only water and moisture resistant; secondly, to increase in desired varying degrees the strength of the paper beyond what may be termed its normal strength as determined by the character of the pulp used; thirdly, to effect a material saving in the quantity of pulp needed for a given grade of paper and, fourthly, to produce these several results by simple procedures which may, and preferably do, form part of the paper manufacturing process.

We accomplish these objects in the manner hereinafter more fully described.

The invention is especially, although not exclusively, applicable to the treatment of paper used for wrapping paper, paper bags, paper boxes, corrugated paper board and packaging paper of all kinds. Our method may be performed at any stage of paper manufacture succeeding the pulping step but we have found, in practice, that the most desirable results are obtained by treating the paper after it has been made into sheets or blanks.

To produce paper which is flameproof as well as water and moisture resistant we impregnate all or substantially all of the paper fibres with a flameproofing compound, protect the latter and hold it in the fibres by a substantially or normally insoluble protective film, and then render the whole waterproof and moisture resistant by impregnation with a waterproofing substance or substances, preferably latex.

The flameproofing compound which we prefer to use contains ammonium sulphate as an ingredient and the best results have been obtained with a compound containing ammonium sulphate and other ingredients in the following proportions:—

Borax		ounces	1
Sodium phosphate		do	4
Ammonium phosphate		do	4
Ammonium sulphate		do	20
Glycerine		pint	1/2

these ingredients being dissolved in one gallon of distilled water at a temperature of from 160° to 180° F. It may be noted in this connection that the borax and either or both of the phosphates may be omitted entirely or their quantities varied, in which event the quantity of water

used in the solution will be adjusted to produce the desired concentration of flame proofing compound.

A desirable protective coating is formed from

Gelatin (preferably Cox's)		ounces	4
Glycerine		pint	1/2
Distilled water		gallons	2

the gelatine being soaked about six hours in one quart of cold water, the glycerine being added with vigorous stirring, the remainder of the water then added at about 120° F. and the solution heated in a water bath to from 100° to 120° F. until the gelatine is wholly dissolved.

The flameproofing and protective solutions are then stirred together in the proportion, by volume, of two parts of the former to one part of the latter and the whole is kept at a temperature of not below 100° F. and preferably not above 120° F. This mixed solution is then sprayed on or otherwise applied to rubber pressure rolls between which the paper to be treated is passed. In its passage between the rolls the paper is impregnated with the solution, any excess of the latter being expressed and returned to the source. From the impregnation rolls the wet sheet passes over or through drier rolls where the paper is dried. The fibres of the paper are thus impregnated with the flameproofing salts and the latter are protected by a gelatine film which is insoluble, for all practical purposes. At this stage, the paper is flameproof without necessarily being water or moisture resistant. An additional precaution to permanently retain the salts in the fibre consists in treating the flameproofed paper with a weak (not over 2%) solution of formaldehyde, this treatment having the effect of hardening the protective film and closing all avenues for the escape of the salts. It will be understood that the formaldehyde treatment is optional.

To now render the flameproof paper water and moisture proof, we treat it with a waterproofing substance and we have found that latex is most desirable for this purpose. The latex we prefer to use is that known on the market as U. S. Rubber, Naugatuck Chemical Plant, TL-958 Control L-4785-39.83%. The latex is used in solution with varying degrees of concentration dependent upon the degree of water resistance that the final product is to have. We have used concentrations ranging from 1 part of latex to 40 parts of water to 1 part of latex to 10 parts of water. To apply the latex solution to the flame proofed paper, the latter is passed between pres-

sure rolls charged with the solution; then the bulk of the moisture is evaporated and while the product is still slightly damp it is passed through hot vulcanizing rolls which vulcanize the crude rubber which has been applied to the paper.

The final product resulting from the several treatment stages above described is a paper sheet, permanently flameproofed as well as water and moisture proof, and of a strength greatly superior to that which it would have without our special treatment. The paper may be said to have been doubly strengthened, viz:—once by the gelatine network applied in the flameproofing step and, again, by the latex or vulcanized rubber network applied in the water and moisture proofing step.

It will be understood that the glycerine used in our method serves as a plasticizer and prevents brittleness of the several coatings or impregnations.

By suitable variations of procedure we may produce a number of alternative forms of paper having qualities designed for given purposes, and some of these forms will now be described.

A

If it be desired to produce a strong, tough, flexible waterproof paper which is not flame resistant, we omit all but the glycerine and water from the flameproofing compound, using the protective compound, as described, and then treat the paper in the manner described above, with the modified mixed solution or compound.

B

A waterproof and flexible paper, less strong and tough than that described under "A", may be produced by treating the sheet or blank, in the manner described above, with a suitably concentrated latex solution followed by vulcanization. We believe that we are the first to render paper waterproof, flexible and fairly tough, by treatment with latex and succeeding vulcanization.

C

Should we desire to produce a flameproof and water resistant paper not quite as strong as that described under "A" we omit the use of the glycerinated gelatine, using only the flameproofing compound, drying the product, then impregnating it with latex, drying again and finally vulcanizing the impregnated crude rubber.

It will be apparent from the few foregoing examples, that by comparatively slight modification of procedural steps and of the ingredients employed, many varieties of paper with greatly su-

perior qualities to present grades may be produced for almost any intended use.

What we claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, a flameproof and water and moisture resistant paper, having its fibres impregnated with a flameproofing compound containing as an essential constituent ammonium sulphate, a network of glycerinated gelatine protecting said compound and retaining the same in the fibres and a waterproofing rubber coating on said paper.

2. As a new article of manufacture, a flameproof and water and moisture resistant paper, having its fibres impregnated with a solution of sodium phosphate, ammonium phosphate and ammonium sulphate, a network of glycerinated gelatine protecting the ingredients of said solution and retaining the same in the fibres and a waterproofing rubber coating on said paper.

3. As a new article of manufacture, a flameproof and water and moisture resistant paper, having its fibres impregnated with a flameproofing compound comprising borax, sodium phosphate, ammonium phosphate, ammonium sulphate, glycerine, a network of gelatine and glycerine protecting said compound and retaining the same in the fibres and a waterproofing coating of vulcanized latex on said paper.

4. The herein described method of fireproofing and waterproofing paper, which comprises impregnating said paper under pressure with a compound containing ammonium sulphate as an essential constituent, and gelatine and glycerine; and thereafter coating said paper and impregnating the fibres thereof with vulcanized latex.

5. The herein described method of fireproofing paper, which comprises impregnating said paper under pressure with a compound containing borax, sodium phosphate, ammonium phosphate, ammonium sulphate, gelatine and glycerine and thereafter treating said paper with formaldehyde.

6. The herein described method of fireproofing paper and rendering the same water and moisture resistant, which method consists in impregnating the fibres of said paper under pressure with a solution in water of borax, sodium phosphate, ammonium phosphate, ammonium sulphate, gelatine and glycerine, drying the paper so treated, impregnating the treated paper under pressure with a solution of latex, partially drying the paper and thereafter vulcanizing the latex in the paper.

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