

# UNITED STATES PATENT OFFICE.

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## PAPER AND PROCESS OF MAKING SAME.

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*To all whom it may concern:*

Be it known that we, EDWIN H. FOWLER and DICKERSON N. HOOVER, citizens of the United States, and residents of Washington, 5 in the District of Columbia, have invented certain new and useful Improvements in Paper and Processes of Making the Same, of which the following is a full, clear, and exact description, such as will enable those skilled 10 in the art to which they appertain to make and practice the same.

It is our object primarily to produce a tough pliable paper that is non-expansible and non-shrinkable and which will readily 15 receive impressions when subjected to the process of printing without being previously wetted.

Most papers in ordinary use preparatory to being printed upon have to be dampened to 20 receive the impression properly. Such a paper when so dampened owing to its structure expands or stretches more in one direction than in the other. While in this condition it receives the impression. Consequently 25 when the paper dries and shrinks to its original proportions the impression becomes distorted. Also after the completion of the printing process when subjected to atmospheric changes the paper expands or con- 30 tracts, as the case may be, which also causes a distortion of the impression. This is very objectionable in the printing of charts, maps, and other work in which it is desired to have the impression remain unchanged and to con- 35 form to the original imprint. In maps and charts, for an instance, the impression on the dried paper becomes so changed and distorted as to render scale measurements inaccurate and unreliable. Under our invention 40 this objectionable feature is avoided, as the paper does not have to be wetted preparatory to printing and does not expand or contract.

To obtain the results we have in view, we treat the paper with a solution of glycerin 45 and alcohol. This is done either by introducing the preparation into the paper during any stage in the process of the manufacture of the same or by impregnating the finished paper in its dry state with the solution. In 50 practice we have found that good results are obtained by a solution of about sixteen pounds

of chemically-pure glycerin, two gallons of grain-alcohol, ninety-five per cent. pure, and one gallon of distilled water applied to one hundred pounds of finished paper. The so- 55 lution can be applied in various ways—for an example, by passing the paper between rolls coated with the preparation. The proportions of the ingredients may be varied according to the treatment and the quality and 60 kind of paper used and the result desired. Also different kinds of alcohol may be used.

Attempts have been made to accomplish the above purpose by treating paper with glycerin dissolved in water, but without 65 much success. In most paper there is more or less resin and wax adhering to and in combination with the individual fibers composing the fabric. The resin and wax repel water, 70 and as there is a close affinity between water and glycerin the latter is prevented from becoming immediately associated with the individual fibers, owing to the repulsion of the water by the wax and resin. The solution of 75 glycerin and water only enters and remains in the larger interstices between the fibers. Alcohol is not repelled by the resin and wax, but, on the contrary, dissolves them readily and penetrates the fibers and carries the 80 glycerin with it, so that the latter becomes immediately associated with the individual fibers. After the alcohol has served its purpose as a conveyer for introducing the glycerin into the fibers much of it evaporates, but some may still be held by the glycerin. The lat- 85 ter also holds much of the water of the solution, and if any should be lost by evaporation it absorbs additional moisture from the atmosphere should the paper become exposed to agencies to cause the water to evaporate. 90 As the glycerin is immediately associated with the individual fibers of the paper and as it always holds considerable water and perhaps some of the alcohol of the original solution, the condition of the fabric will remain 95 practically constant. Its condition will always be such as to readily receive impressions in printing processes without a preparatory moistening. Consequently the impression it first receives will not have its dimensions 100 changed by subsequent shrinkage or expansion. Also as the glycerin always holds a



certain amount of water the paper will not be liable to change when subjected to atmospheric changes. Furthermore, paper so treated retains its original strength and pliability, as its fibers do not become hard or brittle. Should the glycerin become exhausted through any cause, it can be readily renewed by again subjecting the paper to the same process. Where an impression is made on paper not so treated and becomes distorted through shrinkage, it can be restored to its original dimensions by subjecting the paper to our process. The injection of the glycerin and water into the paper will cause it to expand, and it will be held in the expanded condition, which will be practically the same it was in when the impression was made.

The process has been found particularly adapted to treating old papers and parchments to restore them to their original form. By treating such with the solution their fibers are softened and made pliable and expanded, so that the impressions are returned to their original dimensions. Paper treated according to the process is well adapted to printing where there are several successive superimposed impressions made at considerable intervals of time. If the paper should be dampened in the ordinary way during the intervals between the impressions, the paper might

contract, so that a proper registration of the succeeding imprints could not be obtained. If the paper should be treated according to the present process, there would be an accurate registration of the imprints, as there would be no changes in the condition of the paper during the intervals between the making of the impressions. Other advantages of the article and process might be stated.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The process of treating paper, consisting in impregnating the paper while in an unfinished or a finished state with a solution of glycerin and alcohol.

2. The process of treating paper, consisting in impregnating the paper with a solution of glycerin, alcohol, and water.

3. As a new and useful article of manufacture, paper having its fibers immediately associated with glycerin.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

EDWIN H. FOWLER.  
D. N. HOOVER.

Witnesses:

DAVID M. HILDRETH,  
W. F. PEABODY.