

UNITED STATES PATENT OFFICE.

JAMES M. WILLCOX, OF GLEN MILLS, PENNSYLVANIA.

SAFETY-PAPER.

Specification forming part of Letters Patent No. 56,650, dated July 24, 1866.

To all whom it may concern:

Be it known that I, JAMES M. WILLCOX, of Glen Mills, in the county of Delaware and State of Pennsylvania, have invented a new and useful Improvement in Preventing Counterfeiting Bank-Notes, Bonds, &c.; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to fully understand and make use of the same.

This invention consists in intermingling with certain portions of the body of the paper intended for bank-notes, bonds, or other documents of value fibers of any suitable material or materials different from the ordinary fibers of the paper, the other portion or portions of the paper being left free from such additional fibers or their equivalent in such a manner that a paper is produced which cannot possibly be imitated, and which, when used for bank-notes, bonds, or other documents of value, will effectually prevent alteration or counterfeiting.

My invention consists in the preparation of a peculiar paper to prevent the counterfeiting of bank-notes, bonds, drafts, and other evidences of value. This I propose principally; but I propose also to impart a higher character to paper values by making them more reliable, so as to raise them in public estimation. My paper is designed for these purposes, and by protecting my invention by a patent I purpose to confine the production of the peculiar paper to special sources, thus guarding the article and keeping it away from the reach of counterfeiters.

Many plans have been offered and carried out for the production of a peculiar paper, but not one of them is now in extensive use—such as water-marking, introducing coloring-matter either into the pulp or into the paper during its transition from pulp, placing letters and figures couched between two or more layers of formed paper, threads also and filaments couched between layers in the same way; but all of these substances are only foreign bodies, distinguishing the paper only by their foreign character, and lending value to it only by the supposed difficulty of introducing them into an association with the paper.

Of all the above methods water-marking alone offers a peculiarity of the paper substance, and has been consequently more used

than all the others together. This is due to the general knowledge of the fact that water-marking at one time could only be effected in the transition stage, and could not be subsequently imitated. At present it is no longer inimitable and is going into disuse.

Some years ago a new process of marking paper appeared in France in the introduction of pigments of various colors into the transition pulp in such a way as to produce lines and figures in the sheet. From the fact that the coloring-matter introduced in this way among the fibers became a *quasi* component part of the paper a new effect was universally conceded. Although there was no perfect homogeneity, either in material or method, a near approach to it brought forth a new effect, and an invention was made.

Now, if I set aside the old method of mixing colored fibers promiscuously through the pulp, I stand alone in introducing into the paper a material perfectly homogeneous with it in a perfectly homogeneous method, and forming a single, solid, homogeneous sheet—that is, I mark certain component fibers of the sheet and interlock them through and among themselves and the other fibers in the same way as all the rest of the paper is put together. This produces a new effect to the eye, and the knowledge of the method produces a new effect to the mind, a feeling of greater security, which is all I design to accomplish. There is no foreign body in my paper, and it is easily recognized by this perfectly apparent peculiarity.

Paper is made of fibers intermingled and interlaced together in such a way that they are not individually visible to an ordinary observer. I make a portion of them—a determined portion of them—visible to all, making the paper recognizable, not by the association of anything else with it, but by itself. The marked fibers, perfectly homogeneous with the others, are mingled with them while all are in a fluid state, and all are woven together, both upon the surface and at all depths, into the body of the paper. The effect is the same as though certain ordinary fibers of a sheet of paper could be selected and colored or marked along their whole lengths on the surface and into and through the sheet without changing others, and this is not only the same effect produced, but it is the same fact accomplished. Other plans have been rejected as unsuit-

able for various reasons. All plans based upon the principle of couching foreign bodies, large or small, between layers of paper have been finally rejected, and properly rejected, for they can all be imitated by placing the same bodies between sheets of paper already made and dried and then cementing them together, and this can be done in secrecy; moreover, they do not show when the paper becomes soiled, worn, and opaque.

Another reason is that foreign bodies separate the fibers of the sheet, preventing their interlocking in certain places, and thus so weaken the paper by occupying the place of paper that they cause it to be easily cracked or worn through or torn. The sheet, moreover, when foreign bodies are couched between its layers, is thicker at those places and not well adapted to fine printing, and any hard calendaring resorted to to diminish those thicknesses weakens the real paper covering and unfits it for service.

I insist upon the perfect homogeneity of my paper as producing a unique effect, and this character of it is easily recognized by the marked fibers showing plainly on the surface and dimly in the interior by a surface examination, but all of them distinctly by looking through the sheet. This, added to the knowledge that the paper could not be imitated or produced outside of a paper-mill, would lend a very strong sense of security. The temptation to try to produce it in a hidden way for unlawful purposes would not be entertained, nor the temptation to try to imitate it by exterior coloring, so as to produce the same effect.

The task of imitating the exterior portions would seem a hopeless one, and the imitation of all, both interior and exterior, would be betrayed by a glance through the transparency of the paper.

There are in my paper marked fibers at every and any degree of depth from surface to center, which is not the case with any other. I claim, then, a new effect in this, and I claim another new effect, not in any degree less important, but really of the very first importance, in the fact that my paper can be produced or imitated nowhere but in a paper-mill, in no part of a paper-mill but upon the paper-machine, and on no paper-machine except a Fourdrinier. This is not the case with any other special paper; and if the difficulty of manufacturing without notoriety and of manufacturing at all be a safeguard, then do I offer that safeguard above all others.

Nearly all other special papers can be so closely imitated in secrecy by cementing bodies between sheets of thin paper that in order to counterfeit, it is not necessary to bring a paper-mill into collusion, much less a first-class mill. With my paper it is different. The counterfeiter must have a Fourdrinier machine, and the reason is evident.

In a cylinder-machine the cylinder covered with wire-cloth revolving in a vat of fluid pulp sucks the nearest fibers against the surface by

an interior vacuum, and the paper is already formed before it rises out of the water. As the side of the cylinder climbs, the attached fibers, full of water, take a vertical direction, and any marked fibers among the pulp would take the same general direction—a circumstance which would always betray a cylinder-made paper, even if the marked fibers could be grouped; but the impossibility of locating and interweaving a line of marked fibers upon a cylinder under the surface of a fluid pulp and against a perpendicular wall of wire-cloth effectually confines the manufacture of my paper to machines that form their sheet upon a horizontal vibrating wire, which is not the case with any other peculiar paper for the prevention of counterfeiting. Now, when we reflect that such machines, known by the name of their inventor, Fourdrinier, are compared with the number of cylinder-machines, comparatively few, so few as to be easily watched, and that they are only in mills of the higher class, and when we know, moreover, that the mere preparation of a marked fiber must attract observation in any mill, and that the subsequent introduction of it into the paper would require special machinery not now in use, we may feel assured that the manufacture of paper in the way that I propose would involve a notoriety that would effectually confine it to paper for lawful purposes and highly useful to the government and the community.

The peculiar features of my paper, then, concern:

First, its substance; and they are, first, its perfect homogeneity, to the exclusion of all foreign bodies whatever. This is novel in paper locally marked.

Second, the oneness or solidity of the sheet, necessitating a weaving and proper incorporation of the marked fibers, and preventing the splitting of the paper to remove or alter the peculiar marks, both which advantages are unattainable in a paper couched with layers having a marked substance between them:

Third, the new and greater varieties and combinations of special marks which can be made in paper by this process, and by no other, and which cannot be substituted by others if taken away, which advantages are likewise not attainable by paper that is not of one thickness, and whose distinguishing-marks are foreign bodies, and not a part or portion of itself. The parts of my paper, the marked fibers, may be taken away or their color discharged; but they cannot be recolored.

Fourth, the absence of different thicknesses in paper produced by the introduction of foreign bodies, and which unfit it for fine printing, and which render it liable to break, rub, wear away, tear easily, and even lose its peculiarity by the foreign substance working loose and changing or coming out. So far as regards the substance of the paper.

The other patentable features regard the new effects which I produce. The first of these is due to the appearance of the marked paper,

the fibers showing both on the surface and at various depths, which is a peculiarity of my paper, and which distinguishes it from all others. The second is due to the general understanding that my peculiar marking must be done at the transition stage of the pulp, and in a mill, and cannot be effected at any other stage, which is not the case with any other paper hitherto made except those marked by introduced pigments. This is evidenced by the appearance of the interwoven fibers through and through the body, and the effect of security is heightened by the knowledge that marked fibers introduced in that way cannot be imitated or changed. The effect produced by the introduction of marked fibers at that particular stage is a new one. The peculiarity is great and inimitable. The third is due to the knowledge that my paper cannot be produced upon any other machine than the Fourdrinier or in any other than a first-class mill. This is peculiar to my paper. No other need be combined to a Fourdrinier machine. As it cannot be imitated and cannot be produced without great notoriety, it affords a thorough evidence of genuineness not reached by any other paper yet prepared.

It is well known that by far the greater number of counterfeit notes are printed or photographed upon paper which is not genuine bank-note paper, but a paper made in imitation of it by some obscure cylinder-machine, and by persons who do not know how to make the genuine article. Bank-note paper is made, indeed, by only three or four mills in the whole country. If it is then so difficult for counterfeiters to procure common bank-note paper, how much counterfeiting would be done if it had to be done upon paper like mine, with the argus eyes of the whole country vigilant for public protection?

As a manufacturer of bank-note paper from my youth, I have made a long study of this matter, aided by a long experience. I know the different designs that have been tried or suggested, and I know that not one of them is in use at the present time, all having proved unsuitable in practice. I know the various reasons why they have been rejected or gone into disuse, and by the aid of that knowledge I have invented a new paper which is free from the objections which have ruled out all others.

I have designed to make a paper so distinctly marked that all can distinguish it; so peculiarly marked that all can readily learn the peculiarity; to experts perfectly inimitable; to the microscope absolutely so; to the public sufficiently so to scare off the great body of utterers of spurious money.

I have invented a peculiar paper, which, if protected by a patent, counterfeiters could not obtain, and it is the only paper yet invented which cannot be well imitated without great notoriety. I can vary the figuring in it somewhat analogously to the varying of bank-

note printing, making it, when desirable, different on one side from what it is on the other, in different degrees, even to leaving one side entirely white when the peculiar marking does not extend entirely through the sheet, producing a different article and a new effect not hitherto produced by any other.

We know the value of a paper circulation to the government, and that its value depends entirely upon its inimitability. It is, perhaps, impossible to render it absolutely secure, yet how important is it to approach the point as nearly as possible, for paper values are counted in this country by thousands of millions. How important is it for the experts of the government and of public institutions to have an infallible test in redeeming notes, and especially in redeeming coupons. Paper made according to my plan could have the distinguishing-mark run through a whole line of coupons, and their genuineness, when detached, could be tested by matching the cut fibers with those in the bond.

After the perfection and intricacy of bank-note engraving, the best principle which suggests itself is the production of a peculiarity of the substance of the note or bond, so as to combine all possible difficulties to stand in the counterfeiter's way. When he has succeeded in making one spurious plate he can counterfeit millions if he can procure the paper. His utterances will be limited by his supply of proper paper, and if proper paper is of a peculiar kind, not producible in an obscure way, nor to be imitated by other devices, one which is easily recognized as such, and whose production is limited by a patent protection to one legitimate source, the counterfeiter's occupation would become so risky and unremunerative and his tracks so discoverable that the public might hope for entire freedom from his evil work.

A paper of this kind I have produced having these properties in an eminent degree, without any of the objectionable features which have kept all other peculiar papers out of use; and this I have effected without going outside the paper itself to find an associate to protect it.

I would add, in fine, one peculiarity of my paper—that is, the facility which I offer of marking with perfect distinctness thick parchment-papers and other thick and opaque papers which would not show marking in the middle by another method. I can mark with distinctness upon a Fourdrinier wire-cloth paper of the greatest thickness that can be made upon it by sowing and weaving the peculiar fibers through and through the sheet.

In carrying out my invention I prepare the pulp of the paper in the ordinary manner, and then I distribute among this pulp during the stage of its transformation into paper, or while the same passes over the wire-cloth or wire, colored fibers or shreds of any suitable material different from the ordinary fibers of the

paper in color, texture, or otherwise. By these means the additional fibers are embodied into the paper or interwoven with the ordinary fibers thereof, and they cannot be embodied in a similar manner in the paper except during its process of transformation, so that an imitation of the sheets is almost impossible; and by producing sheets with one or more lines or stripes running transversely or one or more lines or stripes running lengthwise different denominations of bank-notes or bonds can be indicated, and the alteration of one denomination to another is effectually prevented.

I do not claim as my invention mixing different-colored fibers indiscriminately in paper-pulp or paper; neither do I claim the insertion of shreds in paper; but

What I claim as new, and desire to secure by Letters Patent, is—

Paper having intermingled or united with the fibers of the sheet during the stage of transformation from pulp to paper, or at any other time when such a thing can be done, of detached fibers or shreds different from the ordinary fibers in such a way as to group or locate the introduced matter in any part or parts of the sheet while the remainder is left free, or comparatively free, from it, thereby forming one or more streaks or drops or clouds, or giving a general direction to said introduced fibers, or thereby producing any other distinctive mark or marks in the sheet or note.

JAMES M. WILLCOX.

Witnesses:

W. HAUFF,

WM. DEAN OVERELL.