

H. Hayward, *Bank-Note Paper.*

N^o 34,634.

Patented Mar. 11, 1862.

(Magnified Cross Section.)

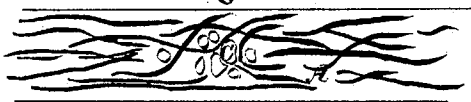


Fig. 1.

(Magnified Section on line SS.)



Fig. 2.

Fig. 3.

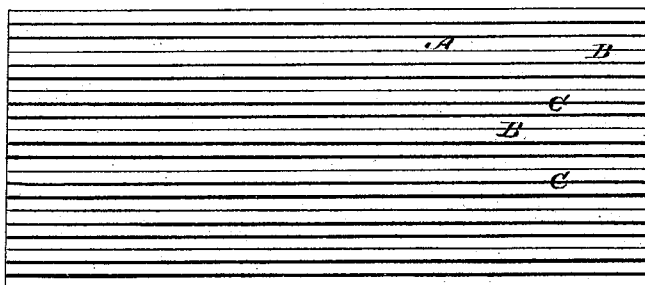
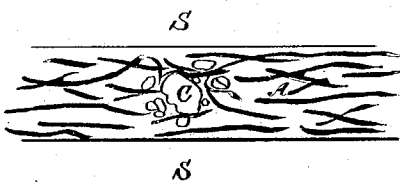


Fig. 4.



S

Fig. 5.

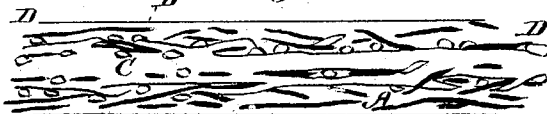
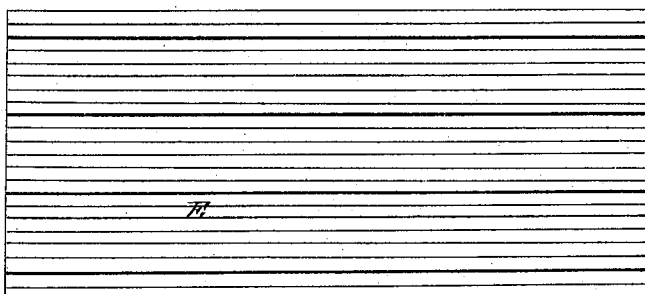


Fig. 6.



Witnesses:

G. H. Babcock.

Wm. B. Smith.

Inventor:

Henry Hayward
per Thomas L. Eldon Atty.

UNITED STATES PATENT OFFICE.

HENRY HAYWARD, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN SAFETY-PAPER.

Specification forming part of Letters Patent No. 34,634, dated March 11, 1862.

To all whom it may concern:

Be it known that I, HENRY HAYWARD, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Paper Intended for Bank Notes and Analogous Uses; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and the letters of reference marked thereon, in which—

Figure 1 is a cross-section of a portion greatly magnified. Fig. 2 is a longitudinal section on the line SS in Fig. 1. Fig. 3 is a face view of a note printed on my improved paper. Fig. 4 is a cross-section; Fig. 5, a longitudinal section, and Fig. 6 a face view showing an additional feature of my invention.

Similar letters of reference indicate like parts in all the figures.

The nature of my invention consists in the employment of continuous lines of fibrous material as means of designating the denomination or character of the note, coupon, &c., the paper being made in a single sheet and the threads introduced while in the pulpy state and worked into and among the fibers of the paper-stock, so that they cannot be detached or withdrawn without destroying the paper or surface thereof; also, in designating varieties in the value or character of such sheets by the use of different colors or kinds of such threads or fibrous lines without necessarily causing any difference in the strength of the sheets; also, in the use of bright metallic or other particles caused to adhere to such threads and be thus introduced within the substance of paper in such condition that they shall permanently change their appearance with any attempt to remove the ink from the sheet.

To produce my improved paper, I mount or otherwise connect to an ordinary Fourdrinier machine a series of spools containing floss-silk or other suitable loose thread and conduct the several threads beneath the surface of the pulp on that part of the machine in which it is in a fluid of semi-fluid condition. A bar extends across that part of the machine and suitable guides extend down therefrom into the pulp, the crotches or angles of the several guides being near but not at the bottom or lower surface of the pulp. The

oscillating action of the Fourdrinier machine causes each thread to be covered and inclosed in the paper-pulp, and as its density differs little, if at all, from that of the pulp it finally passes over the endless wire and is delivered through the machine to the drying-cylinders inclosed within the material of the sheet.

In the accompanying figures, A represents ordinary paper material; B, blue threads of floss-silk or very loosely spun thread of any kind which can present many minute branches and cavities to join with the fibers of the paper-stock. C are similar threads of a bright-red color and readily recognized as such by either reflected or transmitted light.

In consequence of the open character of the floss-silk or similar threads and the agitation of the pulps presented thereto the fibers of the thread are caused to interlock and unite very closely with those of the former, as shown in Fig. 2. This renders it impossible to remove a thread by drawing it out by its end, because its union with the material is too intimate to allow such motion to commence without first destroying the integrity of the paper. The presence of the threads obviously contributes to increase the strength of the paper, because the cohesion of the former, especially if it be silk, is greater than that of paper. I prefer to introduce such a number of threads as shall make them stand in the paper about one-fourth of an inch apart; but this may be varied as shall be found desirable in practice, so as to present such a number and arrangement of threads as shall prove most advantageous.

In order to designate the denomination of a bank-note—one dollar, two dollars, &c.—I retain the number of threads possessing the maximum advantage, as above suggested, and designate the denomination by using different colors or sizes or characters or designs of threads. Thus for a one-dollar note there are about thirteen threads of silk passing through the note. Between each blue or green line of thread is a bright red, which red line donotes the denomination. For a two-dollar note there are two red lines near to each other and divided by the blue or green lines of thread, as in a one-dollar note, the denomination of the note thus being repeated several times in each note. For high denominations arbitrary sys-

tems may be adopted, a great variety of which will readily be suggested. I prefer to print all the bills from ten to one hundred dollars in value in a position inclined relatively to the threads in one direction, all from one hundred to one thousand dollars inclined in the other direction, and all of one thousand or over with the threads extending vertically, allowing the colored threads to each indicate units, tens, &c., according to their position. The manner in which such sheets may be cut from a continuous web in which the threads traverse longitudinally will be obvious without a drawing.

I can, if desired, distinguish between the several lines by making variations other than those of color. By means of a suitable disposition of the guides I can place them in pairs or triplets or can set off a certain number in the center of each sheet by dividing them from the others on each side by spaces of greater width than those which divide the lines generally. I can use threads of a different size or differently prepared, so as to differ in transparency; or, by means of suitable mechanism acting on the threads before passing into the pulp of the paper, I can so vibrate a portion of the threads that they shall be delivered and will remain in the pulp in wavy or serpentine lines or in any other figure or design as may suggest itself, instead of straight lines.

To insure the threads against being drawn out, I can give such serpentine position to all the threads, if desired; but where this is not done a part being so disposed distinguishes them from the straight ones nearly as plainly and unquestionably as a variety of colors.

Both or all the variations may of course be used together, if preferred.

As a further security against altering notes, &c., printed on such paper, I lead one or more of the threads through a proper adhesive material, as gum-arabic, and thence through a brush or other reservoir containing bronze-powder, by which it is gilded or silvered before its immersion in the pulp. Thus presented the metallic particles remain in the paper when finished in a condition shown by D D in Figs. 4 and 5, appearing as lines of a corresponding color so long as the paper is legitimately used; but when strong chemical agents are applied to erase one denomination preparatory to substituting another the metal changes its color very radically and refuses to be again reduced to its metallic condition, thus indelibly and unmistakably defacing the note and preventing its subsequent use. The change is indicated at E in Fig. 6.

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

The within-described means of designating varieties in the value or character of printed sheets of paper in which threads of fibrous material are incorporated into and among the pulp, as herein described—to wit, the use of threads of different colors or characters, arranged substantially as specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HY. HAYWARD.

Witnesses:

WILLIAM WARNER,
MICHAEL DUDDLES.