

W. E. RAMAGE & H. D. SHAW.
 PAPER AND PROCESS OF GROOVING SAME.
 APPLICATION FILED DEC. 6, 1906.

958,174.

Patented May 17, 1910.

Fig. 1.

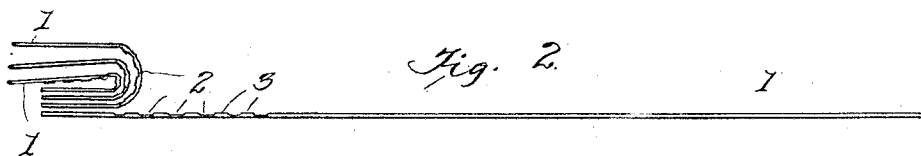
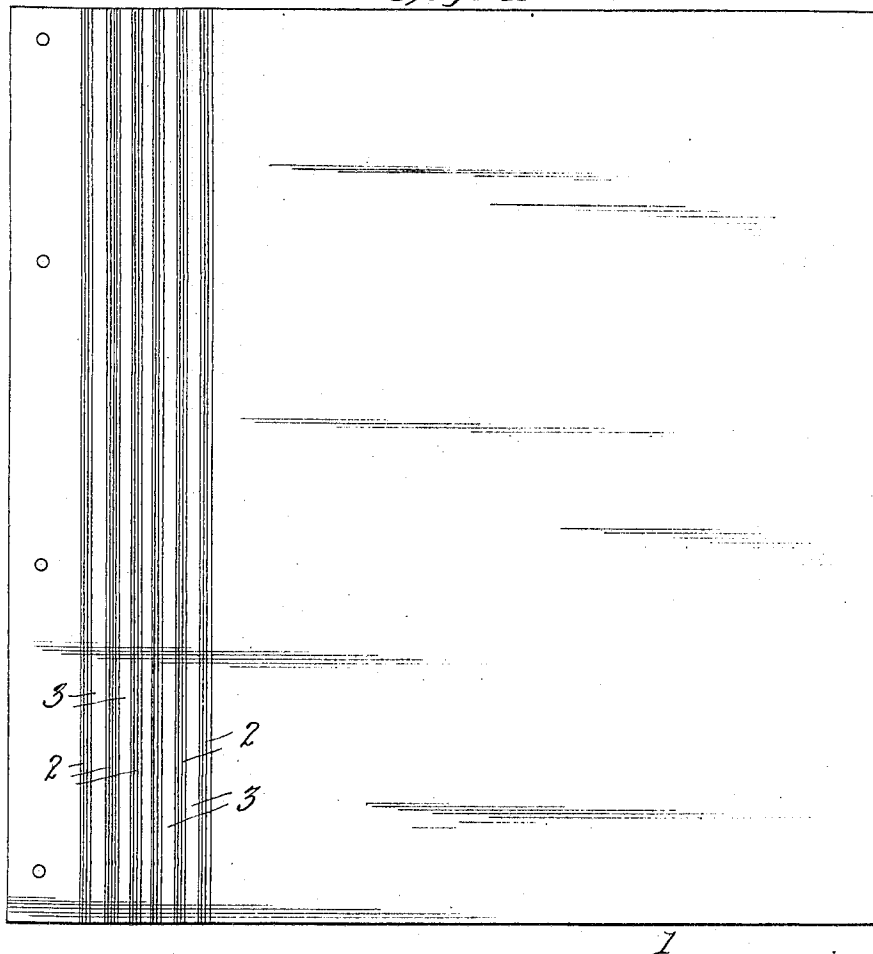


Fig. 2.

Fig. 3. *Wm. E. Ramage* Inventor
Henry D. Shaw and

Witnesses
C. K. Davis,
W. E. Moore

Wm. E. Moore
 Attorney

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UNITED STATES PATENT OFFICE.

WILLIAM E. RAMAGE AND HENRY D. SHAW, OF ADAMS, MASSACHUSETTS, ASSIGNORS
TO BERKSHIRE HILLS PAPER CO., OF ADAMS, MASSACHUSETTS.

PAPER AND PROCESS OF GROOVING SAME.

958,174.

Specification of Letters Patent. Patented May 17, 1910.

Application filed December 6, 1906. Serial No. 346,562.

To all whom it may concern:

Be it known that we, WILLIAM E. RAMAGE and HENRY D. SHAW, citizens of the United States, residing at Adams, in the county of Berkshire and State of Massachusetts; have invented certain new and useful Improvements in Paper and Process of Grooving Same, of which the following is a specification.

Our invention relates to improvements in paper and process of grooving same, and has for its object to form a flexible hinge portion along one edge of the paper, so that the paper when bound in book form will have its greatest flexibility along the binding edge where the angle of bend is greatest.

Another object of the invention, is to groove the paper to form a flexible portion therein, and to perform this operation while the paper is being manufactured and before it has been "animal sized" and calendered so that the grooved portion of the paper will not present a rough and unfinished surface and will not be liable to tear on the lines of the grooves, because when the paper is finished, the grooved section therein will be just as hard, smooth, and practically as strong as the balance of the sheet.

A further object of our invention is to produce such a paper in a simple and inexpensive manner, and to provide effective means for accomplishing the purposes set forth.

With these and other objects in view, our invention consists essentially in the process of forming grooves or flexible portions in the web or sheet of paper while the same is being made and before it has been sized and calendered so that such flexible portions will possess the same durability as the rest of the sheet, and the invention further consists in certain other novel features both in the article and the process substantially as herein disclosed.

Figure 1, is a plan view of a sheet of paper formed with a flexible portion near one edge thereof in accordance with our invention: Fig. 2, is an edge view of several of the sheets grooved in accordance with our invention with the grooves therein on a magnified scale, several of the sheets being flexed or bent backward. Fig. 3, is an enlarged sectional view of the grooved section of the sheet.

As before intimated, the grooving opera-

tion is performed during the manufacture of the paper after the same is dry and preferably in web form. In a co-pending application filed by us of even date herewith Serial No. 346,561, we have shown the manner in which the paper is grooved, as follows: The web of paper as it nears the "drier" end of the paper-making machine commonly known as the "Fourdrinier" type and after it has passed around the last drier roll, is passed over an adjustable platen over which, cutter wheels are rotated at a high rate of speed in a direction opposite to the travel of the web. The cutter wheels and platen are both adjustable to cut any number or depth of grooves in the paper, and the paper after it passes under the cutters, goes to the sizing boxes and then it is calendered in the proper manner and cut into the proper sized sheets. Thus it will be seen that the dry and unfinished paper is grooved, afterward animal sized, then calendered and finished.

In the accompanying drawings: the numeral 1, designates a sheet of finished paper treated as described, and 2, the series of parallel grooves formed in the paper adjacent one edge thereof. These grooves are comparatively narrow and are arranged according to the degree of flexibility desired, in series of from one to six or more grooves to the sheet. The grooves are separated by the ridges 3, and the walls of the grooves are set at an angle or incline 4, so as not to weaken the grooved portions too much. As the paper is not sized or finished until after it has been grooved, the paper has a continuous glossed surface as indicated at 5, the grooves receiving the sizing and finishing as well as the plane surface of the paper. Before the paper reaches the last drier on the paper machine, it is grooved, and from that time on the finishing process commences, which is as follows: After the groove is formed in the paper, the loose fibers are cleaned therefrom by means of a burnishing brush rotating at a high rate of speed so that the surface of the groove is given a clean and smooth surface. The paper is now practically dry and in this condition it is passed through the receptacle containing the animal sizing thereby absorbing a great deal of the sizing so that the grooves are filled with the sizing, and the paper is then slitted and cut into sheets of

any desired size. The paper is then removed, hung on poles and air dried in a loft built for that purpose, the grooves having been filled with animal sizing are given a smooth and even surface with the remainder of the sheet of paper, so that the strength of the grooved portion is thus greatly increased by this filling of sizing, which when air dried, hardens and becomes stronger but does not interfere with the flexibility of the hinge or grooved sheet. After the paper is dried, it is run between rolls of pressed cotton and hard steel known as calenders, which give the sheet a high, smooth finish, such that after treatment, the grooved portion of the sheet is practically of the same thickness as the remainder of the sheet, yet flexible at the hinge. By this means the paper has an unbroken finished surface, including the grooved portion, and the paper while practically as strong over its entire surface, is rendered more flexible along a certain portion thereof.

Having thus described and illustrated our invention, it will be apparent that we have accomplished all the objects herein set forth, and it will be understood that the paper treated in the manner set forth possesses great durability, flexibility and strength, as it is first rendered flexible, then sized, and afterward calendered and finished.

We claim:

1. The process of grooving paper consisting in cutting grooves in the web of the paper while on the driers of a Fourdrinier machine and before it has reached the last drier roll, cleaning the grooved portions of loose fibers, passing the then practically dry web through animal sizing, removing the paper and air drying, then passing the paper through calendering rolls to give it a smooth surface.
2. The process of treating paper consisting in cutting grooves in the paper while in a dry condition, cleaning the grooved portions of all fibrous material, passing the paper through animal sizing thereby filling the grooves with sizing and impregnating the paper, removing the paper and thoroughly air drying, then calendering the entire surface of the paper.
3. As a new article of manufacture, paper having grooves first ground or cut in the pulp while in a hardened state, to form a thinned portion, the sides of said grooves

being inclined; the paper being then sized to produce a uniform surface and afterward calendered.

4. The method of making hinged ledger leaves, consisting in grinding or cutting a paper sheet to form a relatively thin hinge section, and in then sizing and calendering the sheet.

5. The herein-described method of making hinged ledger leaves, which consists in forming a paper sheet from pulp, in producing a relatively thin section therein to form the hinge, then sizing the thinned sheet, and finally calendering.

6. The method of making hinged ledger leaves, which consists in forming a paper sheet from pulp, in grinding a section of the sheet to form a thin hinge section, then sizing the sheet, and finally calendering.

7. The method of making hinged ledger leaves, consisting in forming a paper sheet from pulp, in then grinding or cutting a section of the sheet to form a hinge portion, and finally calendering the sheet.

8. The method of making hinged ledger leaves, which consists first in producing a pulp web, then finishing the web into sheet form, in grinding a section of the sheet to form a thinned hinge portion, in slitting or cutting the sheet at approximately the time of grinding, then sizing the paper, including the thinned portion formed therein, and finally calendering.

9. As a new article of manufacture, a paper sheet first ground or cut to form a relatively thin hinge section therein and afterward sized and calendered.

10. As a new article of manufacture a hinged ledger leaf of paper first ground or cut to produce a relatively thinned section therein to form the hinge and the thinned sheet being afterward sized and calendered.

11. As a new article of manufacture a hinge ledger leaf, the paper pulp being first ground or cut while in a hardened state and before it is sized, to form a thin hinge section therein, the thinned sheet being afterward sized and calendered.

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

WILLIAM E. RAMAGE.
HENRY D. SHAW.

Witnesses:

ARTHUR C. WOODWARD,
FRANKLIN H. B. MUNSON.