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W. S. LUCEY

PROCESS OF MANUFACTURING WATERMARKED PAPER

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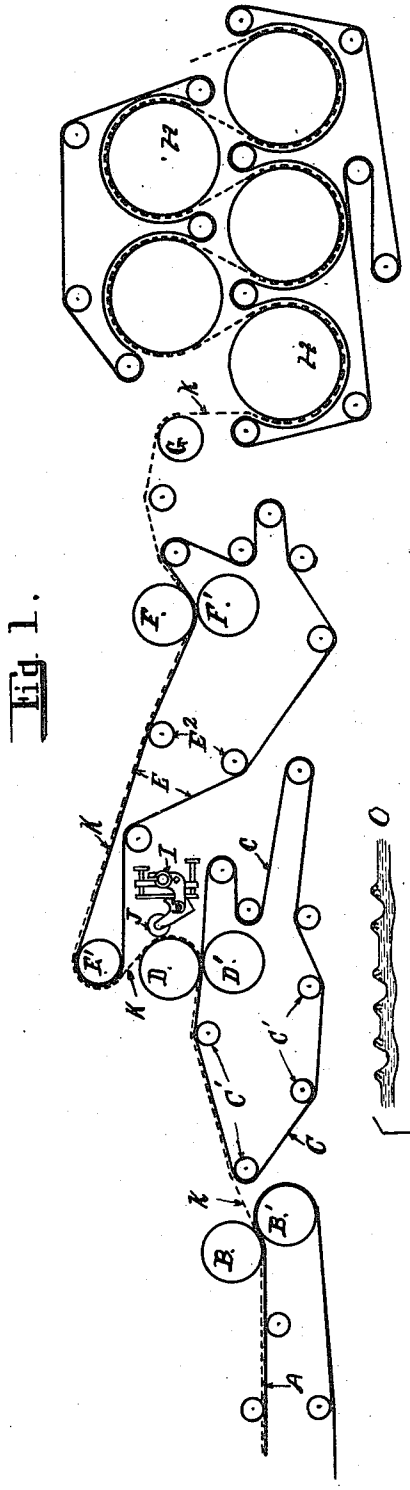


Fig. 1.

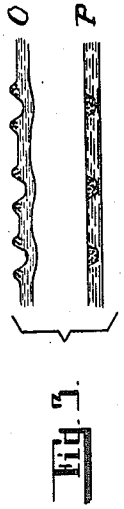


Fig. 3.

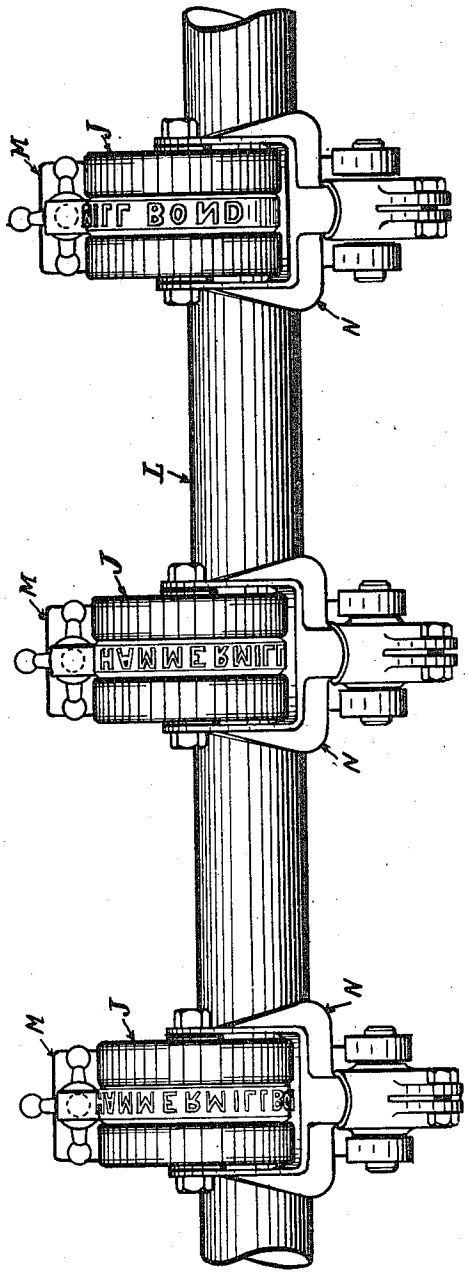


Fig. 2.

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UNITED STATES PATENT OFFICE.

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PROCESS OF MANUFACTURING WATERMARKED PAPER.

Application filed June 23, 1921. Serial No. 479,897.

To all whom it may concern:

Be it known that I, WILLIAM S. LUCEY, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Manufacturing Watermarked Paper; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to an improved method of manufacturing water-marked paper.

Heretofore there have been two well known methods of watermarking paper, namely, (1) the "dandy roll" method and (2) the Behrend method as disclosed, for example, in United States Patent No. 717,799, January 3, 1903.

In the "dandy roll" method the watermarking devices are combined with the "dandy roll" and there operate on the pulp stock while it is still in a formative state. This method has two essential disadvantages, particularly when applied to wood pulp stock, which is the stock now generally used in making paper. These disadvantages are that it is necessary in the use of this method to run the machine very slowly—a very uneconomical operation—and that the mark produced by this method is objectionably indistinct.

In the Behrend method, as it has been employed by the trade, a marking roller contacts with the web as it leaves the last press. The result is that the disadvantages of the "dandy roll" method are obviated, for the machine can be operated at full speed and the resulting mark is distinct. But the difficulty is that the resulting mark is, in a sense, too distinct. That is, it is impressed to a greater or less extent in the surface of the finished paper, a feature which has been found very undesirable in practice. A perfect watermark is one which is absolutely distinct when held up to the light but which is not impressed in the surface of the paper and is not conspicuous when the paper is not held up to the light.

It is the object of this invention to provide a method which will obviate the disadvantages of the two methods above referred to and will produce a watermark having the characteristics just described.

I have discovered that this may be accomplished in the following way: I apply the marking roll to the wet web while the latter is in such a condition of wetness that the marking roll will displace the fibers of the web along the lines of the desired mark, but of sufficient strength so that the marking roll will not tear it.

Thereafter I subject the web to sufficient pressure, as by press rolls of the machine, to cause a portion of the displaced fibers to flow back into the impressions made by the marking device and thus level off the surface. The result is that the finished paper is provided with a distinct mark, visible when it is held up to the light; but which has no surface identations.

The particular point in the travel of the web where the watermarking device should be applied to it for best results may vary in accordance with the composition of the stock. From the information herein given anyone skilled in the art will be able readily to determine at just what point it should be placed for any particular stock. For purpose of illustration, however, I shall now describe, making reference to the annexed drawing, how my improved method may be carried out with respect to certain classes of stock.

In the accompanying drawing:

Figure 1, shows a diagrammatic drawing of a paper-making machine embodying mechanism for the practice of my invention.

Figure 2, shows an enlarged side view of a portion of a watermarking mechanism, which may be used in the practice of my invention.

Figure 3, illustrates exaggerated sectional views of sheets of watermarked paper made by the old, and by my improved method.

In these drawings embodying a mechanism for the practicing of my invention A indicates the endless forming wire; B, B′ the couch-rolls; C the first conveyor felt, and C′ the supporting rolls thereof; D, D′ the first-press rolls; E the second conveyor felt; E′ one of its supporting rolls; E^2 the others of its supporting rolls; F, F′ the last set of press rolls; G the baby drier, and H the drying cylinders of a paper-mak-

ing machine of the ordinary Fourdinier type.

The water-marking mechanism is shown in its entirety at I in Fig. 1, and in practice I preferably place the same at the upper press-roll D, so that it is adapted to operate against the surface of the roll. The marking mechanism I is preferably supported upon a transverse shaft L non-rotatably secured in the frame of the paper-making machine, on which transverse shaft a gang or series of such mechanisms (consisting of the brackets M, arms N, and marking-wheels J) is secured as shown in Fig. 2, so as to make a plurality of the desired mark across the width of the web.

The supporting roller E′ of the conveyor felt E is located above the press-roll D so that the wet web K after passing between the press rolls D D′ leaves the conveyor felt C and passes up around the rear of the press-roll D and up over the roll E′ to and upon the conveyor felt E, by which it is conveyed to the last press-rolls F F′, where all imperfections caused by the watermarking mechanism, as illustrated at O in Fig. 3, are pressed and flattened out even with the face of the sheet. This is accomplished by forcing the displaced fibers back into the depressed portions of the mark, as illustrated at P in Fig. 3, thus leaving the surface of the sheet unmutilated while leaving the watermark clearly distinguishable and unimpaired; and from thence the sheet passes to the driers G and H where it is finally dried.

As above described, the watermarking apparatus is so located as to operate on the upper roll D of the first press-rolls. It is obvious, however, that with other classes of stock it might be located so as to operate on some other roll prior to the sheet's reaching the final press-rolls where the inequalities caused by watermarking it are pressed down even with the remainder of the surface of the sheet.

It is also obvious that the wet sheet, after being watermarked, may be passed between two or more sets of press-rolls, if found desirable, to completely efface and smooth down any imperfections on the face of the sheet caused by the operation of the watermarking mechanism thereon, while in the mechanism shown, as an illustration of means for practicing my invention is a mechanism for applying the watermark to the under or wire side of the wet sheet, it is obvious, however, that the watermark may, if desired, be applied to the upper or face side of the sheet without departing from the spirit and intent of my invention.

Having thus described my invention so as to enable others to practice the same, what I claim as new and desire to secure by Letters Patent is:—

1. The improvement in the art of making watermarked paper, consisting in thinning out the paper web along the lines of a desired watermark by the displacement of fibers while the web is still wet and soft, but after it has passed the couch roll, and afterwards submitting the wet web to such pressure as will move part of the displaced fibers back into the depressions formed by the watermark before drying the same.

2. The improvement in the art of making watermarked paper, consisting substantially in thinning out the wet paper web along the lines of the desired watermark, at or adjacent to the first set of press-rolls of the paper-making machine, and afterwards submitting the watermarked wet web to such pressure as will move part of the displaced fibers caused by the marking operation back into the lines of the watermark even with the surface of the sheet before drying the same.

3. The improvement in the art of making watermarked paper consisting in passing the web over a hard roll at a location in the press mechanism where the moisture has been sufficiently expressed therefrom to render it strong enough to permit application of a marking roll thereon without tearing but not sufficiently to prevent the displacement of fibers by said marking roll, applying a marking roll to said paper web against said hard roll whereby the fibers are displaced along the lines of the mark, and afterward submitting the watermarked web to the action of succeeding press-rolls whereby a portion of the displaced fibers are forced to flow back into the depressed lines of the mark.

In testimony whereof I affix my signature.

WILLIAM S. LUCEY.