UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN THE MANUFACTURE OF PAPER.

Specification forming part of Letters Patent No. **184,466**, dated November 21, 1876; application filed January 18, 1876.

To all whom it may concern:

Be it known that I, AMBROSE G. FELL, of the city, county, and State of New York, have invented a new and useful Improvement in the Manufacture of Paper; and that the following is a full, clear, and exact description of the same, reference being had to the accompanying specimens.

This invention is in the nature of an improvement in the manufacture of paper; and the invention consists in splitting or dividing, chemically and mechanically, the thickness of ordinary paper into two or more parts, so that from one sheet of paper of any given thickness and size two or more sheets of paper may be produced, each sheet being of the same size as the original sheet, but thinner.

By this process a thin paper, adapted to all the purposes for which tissue-paper is now used, and many other purposes, is produced from stock of an inferior kind, such as wood or mixed pulp. Heretofore it has not been possible to obtain from such or other inferior paper-stock fine and thin sheets of paper, even by the closest working by the ordinary paper-making machinery. For instance, the lightest paper which is now made from wood or mixed pulp stock, is the light, poorer kinds of printing-paper, weighing from seventeen to twenty-one pounds per ream, (the sheets measuring twenty inches by thirty inches.) This paper, when subjected to my process of splitting, yields sheets of just half their original weight and thickness, and twice as many in number, (if the sheet is split in two parts,) and at the same time imparting a smoother, closer, and more silky texture, superior, in fact, to the best linen-stock tissue-paper, since it is entirely free from the innumerable pinholes which characterize the ordinary tissue-paper.

My process of treating and producing the divided paper above mentioned is as follows: I first treat the sheet of paper that I desire to divide up with any chemical reagent capable of dissolving the cellular substance thereof, and producing a more or less perfect vegetable parchment on the surface of the paper only, the action of these reagents being confined to the surface of the paper by the presence of sizing or other substance previously introduced to impede its penetration. The sizing that is ordinarily found in paper, as generally constructed, answers the purpose very well without the addition of other sizing. The reagents used for dissolving the cellulose of the paper, and for producing the parchment-like surface before named, may be a solution of either ammoniacal oxide of copper, sulphuric acid, nitro-sulphuric acid, chloride of zinc, or any other agent that will toughen the surface without entering the interior of the paper, so as to allow of its being split into sheets without tearing or injuring them, it being immaterial whether these agents act by reason of converting the surface of the paper into parchment or otherwise, so long as the sheet that is under treatment can be divided in the manner I have stated; but I prefer some one of the above agents for this purpose, for it not only enables the paper to split in a uniform manner, but adds beneficial qualities thereto. The paper, having been wetted with any of the above agents—for instance, sulphuric acid—is next thoroughly washed with water until no trace of the acid remains. This being done, it is divided, say, into two sheets by laying it flat and smooth on a table, and splitting the corner of one of its ends with a sharp knife or other similar instrument. The texture of the paper being in this way broken, the upper surface is carefully lifted until a thin film is raised across the full width of the sheet. A rod or roller is next inserted beneath the film, and as it is forced upward, the paper will be split to the full length of the roll. This splitting may be accomplished at almost any degree of speed desired, and it is best accomplished by having the roller fixed in suitable bearings, and passing the paper against it; and this may be done without the least danger of fracturing the paper or tearing the fiber, providing the paper is kept smooth as it progresses. After the paper is separated, it is dried in any convenient way. The paper may be split into two or more layers, as required, or as the thickness of the paper will admit.

It is essential that only the thinnest possible layer of the paper's surface be acted upon

by the chemical used, otherwise the paper would not split; and even if it would split, the result would be two layers of vegetable parchment, which are transparent, stiff, and possess other qualities which would not answer the purposes of this invention, the object being to produce a fine quality of opaque, supple paper, answering all the requirements and possessing the qualities of the finer papers, but being produced from inferior stock, as hereinbefore mentioned, and by the method stated.

The depth to which the chemical agent shall penetrate the paper is under the full control of the operator by observing certain rules governing the strength of chemical solution used, its temperature, and time of treatment therewith, &c.

The thinner paper obtained by my process, even from the poorer qualities of stock, is as light in weight as the finest linen-stock tissue-paper, but is much closer and uniform in texture, being, as before stated, entirely destitute of the innumerable pin-holes which are visible in the best of ordinary tissue-paper, and possesses other qualities, such as being stronger, &c., which fits it for uses for which the ordinary article cannot be used. For instance, its close texture enables it, when colored, to be used for all the purposes for which the surface-finished fancy papers are now used—viz., covering paper boxes, &c.

The split surface affords a rough absorbing surface for the adhesion of paste or other attaching agent that may be used to fasten it to any desired surface. The want of such rough or absorbing surface has hitherto unfitted vegetable parchment for many uses.

The flannel-like surface of my split paper enables it to cling very close and tenaciously to any textile fabric to which it may be attached, thus furnishing a cheap material for book-cloth, window-shades, &c. Its merits might be continued at length; but I have stated sufficient to give a clear idea of the nature of my invention. I will mention, however, one other use to which my paper may be advantageously applied, and that is for the purpose of copying-paper under the ordinary letter-press.

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

1. The process hereinbefore described of splitting or dividing papers through their thickness into two or more thin sheets, by the application of chemical agents to the surface of the paper, and by means of a roller splitting or dividing the paper into thin sheets, substantially as described.

2. The process hereinbefore described of splitting or dividing papers through their thickness into two or more thin sheets, by condensing or hardening the entire surface of the paper, and at the same time preserving its interior soft and yielding, substantially as described.

3. As a new article of manufacture, split paper having a glazed surface on one side and an unglazed surface on the other, and of a smooth, close, and silky texture, free from pin-holes and the like, substantially as specified.

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Witnesses:
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