

UNITED STATES PATENT OFFICE.

EBENEZER CLEMO, OF TORONTO, CANADA.

IMPROVEMENT IN MANUFACTURE OF PAPER-PULP.

Specification forming part of Letters Patent No. 29,059, dated July 10, 1860.

To all whom it may concern:

Be it known that I, EBENEZER CLEMO, of the city of Toronto, in the united counties of York and Peel, and Province of Canada, have invented a new and Improved Process of Manufacturing Pulp for Paper from Straw or Grasses; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention consists in the employment, in the manner hereinafter described, of nitric or nitrous acid, or the aqua fortis of commerce, in the conversion of straw and grasses into pulp for the manufacture of paper. By the use of either of these agents I bring the stock to a condition to be reduced to pulp by the action of the beating-engine ordinarily employed in the manufacture of paper-pulp.

My invention further consists in the use, in connection with the described treatment of the stock with nitric or nitrous acid or aqua fortis, of a subsequent treatment with a solution of a hydrate or carbonate of an alkali for the purpose of reducing the stock to a fine fibrous pulp without subjecting it to the beating or other mechanical operation. The nitric or nitrous acid or aqua fortis may be used either in its concentrated state or diluted with water; but I prefer, on account of the greater economy and convenience, to use it diluted, and in such case I generally employ a mixture of about sixteen (16) parts, by measure, of water to one (1) of acid, as I find these proportions to give the most satisfactory result, although almost any proportions may be employed by a due regulation of the temperature employed in the process of digestion, a weaker liquor requiring a higher temperature and a stronger liquor being effective at a lower temperature. The process performed with the diluted acid is conducted as follows: I cut the straw or grasses into fine pieces (if straw, to about an inch in length) and place them in a vessel or vessels of earthenware, stoneware, or any material capable of resisting the action of nitric or nitrous acid, and of any convenient form. I then add a sufficient quantity of the diluted acid to cover the straw or grasses completely, and submit the vessel or vessels, with their contents, to a gentle heat for about four (4) hours. For the strength of acid above specified the heat should be about 200° Fahrenheit. At the

expiration of the time above specified I remove the straw or grasses from the vessel or vessels and express the liquor from it and wash out the acid remaining in it, when it is sufficiently softened to be readily converted into pulp by the ordinary beating-engines, or by the treatment with an alkaline hydrate or carbonate, as hereinafter explained. The acid liquor expressed from the stocks is preserved, to be employed again, with the addition of a further quantity of acid, and its use may be repeated till it becomes too much loaded with vegetable matters for further use.

The treatment with alkaline hydrate or carbonate to reduce the stock which has been softened by the use of nitric or nitrous acid to the state of pulp suitable for making all ordinary kinds of paper simply consists in boiling it, after its removal from the acid liquor, in a weak solution of the hydrate or carbonate of either of the alkalies for about two hours. The proportion of alkali may be about from one hundred (100) to one hundred and fifty (150) pounds to the ton of pulp, and the quantity of water merely what is sufficient to make the pulp of ordinary consistency. The pulp thus obtained, after being washed, will be ready for bleaching, and whether it is obtained in this way, or by beating it in an engine after its being digested in the acid, may be bleached by the modes commonly adopted for bleaching paper-pulp.

The vessel in which the straw or grasses is digested in the diluted acid may be closed at the top and furnished with a condensing-pipe passing through water to a stoneware condenser. In this condensing-pipe, by the admission of atmospheric air and steam, I propose to convert the nitric oxide or deutoxide of nitrogen resulting from the decomposition of the acid again into nitric acid, which is condensed in the pipe and collected in the condenser, to be employed again, as before. In the use of the acid in its concentrated state I employ no artificial heat to aid the process. The straw or grasses having been cut up, as before described, is steeped in the acid in a suitable vessel for about four hours, and afterward removed and subjected to a heavy pressure to recover the principal part of the undecomposed portion of the acid, which may be used over and over again on fresh stock till too much decomposed,

weakened, or charged with vegetable matter for further service. The stock, having been thus subjected to the action of the acid, requires to be washed in a small quantity of water and again submitted to pressure to express the acid liquor, which may be concentrated by evaporation, to be used again, as before, or for any other use. The acid liquor, having been expressed after washing the softened stock, is ready for further treatment either by the beating-engines or by the alkaline hydrates or carbonates, as already described with regard to the stock which has been treated with dilute acid.

The following are some of the substances on which I have instituted a series of experiments,

and to which I find the process herein described is equally applicable: wheat, oat, rye, barley, pea, broom-corn, thistles, rushes, and all straws and grasses.

I do not claim, broadly, the employment of nitric acid in the manufacture of paper-stock; but

I claim—

The mode or process of treating straw or other fibrous substances in the manufacture of paper-stock, substantially as herein described.

EBENEZER CLEMO.

Witnesses:

B. GIROURCE,

M. M. LIVINGSTON.