# UNITED STATES PATENT OFFICE.

JOSEPH JORDAN, OF BRIDGEPORT, PENNSYLVANIA.

## MANUFACTURE OF PAPER-PULP AND PAPER.

SPECIFICATION forming part of Letters Patent No. 264,168, dated September 12, 1882.

Application filed July 12, 1882. (No specimens.)

*To all whom it may concern:*

Be it known that I, JOSEPH JORDAN, of Bridgeport, Montgomery county, Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Paper-Pulp and Paper, of which the following is a full, clear, and exact description.

My invention relates most particularly to the manufacture of paper-pulp and paper from varieties of the palm and palmetto, but may also be applied to various other vegetable fibrous plants, woods, and grasses.

I will describe my process as applied to the manufacture of paper-pulp from the dwarf-palm and the "cabbage," "blue," "hummock," and "saw" palms, vulgarly so called. The treatment of all being about the same, I will limit myself to that of the dwarf palm or shrub, which grows to a height varying from eighteen inches to about three or four feet, and the leaves of which are very large and fibrous. The stalk of this plant is cut off close to the ground. The stalk, including the leaves, is then cut up into suitable lengths to accommodate the hydraulic or other press which is to be used to crush them to expel the liquor, which liquor flows when mechanical pressure is applied to the stalk and leaves. The next step in the process is to place the material so cut into a hydraulic or other press; and I prefer to place the lengths of material on end, so that the compression is from the ends. The object of this compression is to extract as much of the liquor or sap of the plant as it is possible to do by these means. The liquor thus extracted is then boiled at a temperature sufficient to prevent fermentation. The fibrous stock thus freed from its superfluous liquor is then placed in a close digester or boiler and saturated with a solution of alkali rendered very slightly caustic, simply sufficiently so to separate the fibers when boiled under pressure without materially affecting the remaining intercellulose matter left in the fibers after the extracting or crushing process. The boiler is then closed and the mass is then boiled under pressure. The digester is then, after its contents have been reduced to a pulp, discharged into an open tank or vessel, where the mass of pulp is washed with successive applications of water, first hot and then gradually cooler. The pulp will then be found in a condition ready to be made into paper, still containing all or nearly all its intercellulose matter. This mass is then subjected to a grinding or beating action in the Jordan engine or any other ordinary pulp-engine, which results in the fibers being finely divided and separated, the intercellulose matter still remaining with them. After this result has been reached the bleaching agent—namely, a combination of chlorine and oxalic acid—is then inserted into the engine and the inner contained mass is then subjected to agitation until the bleaching agent is thoroughly mixed with it, after which the mass is deposited in vats, where it is allowed to remain until it has been bleached to the desired color. The mass is then subjected to the further action of a beating or pulping engine, and while it is being finally subjected to this beating action a continuous stream of water is passed into and out of the engine so operating upon it, which cleanses and removes the remaining portion of the bleaching agent from it. All of the remaining parts of the bleaching agent being removed, the pure long-fibered pulp, with its intercellulose matter, remains. The pulp now being very long fibered, is again subjected to a beating process to reduce its fibers to a length commensurate to the quality of the paper to be produced or which it is desired to produce.

The object of removing the liquor or sap by the mechanical pressure described in the first step of this process was to save it from destruction or from being lost or carried away in those subsequent steps of the process already described, and also to free the fiber and intercellulose matter from it at an early stage of the process, so as to permit a freer and more efficient action of the alkaline solutions upon the fibers in separating them from each other, and also to admit of the use of a much weaker alkaline solution than would be necessary for it to overcome the added resistance of this removed liquor were it allowed to remain in the fiber, thus materially lessening the injury to the fiber which would be caused by a stronger solution of caustic alkali, also saving soda, lime, and labor in working the pulp.

To return to the pulp itself, after the fibers have, as above described, been reduced to a suitable length and divested of all impurities, the liquor or sap first removed, as above described, by mechanical pressure is returned to them while they are in the beater last mentioned. It is returned at this point because no subsequent step in the process will operate to remove or destroy it, nor will it retard the subsequent steps. This liquor or sap, when joined to the pulp, restores some of the properties which it originally possessed before it was separated from the wood. It is the natural liquor or sap, is white and clear, possesses the quality of rendering the fibers or particles with which it is amalgamated cohering. It possesses sizing properties, as it contains sago, silica, and "asuga." It answers the purpose of sizing. The pulp when joined with this liquor, when manufactured into paper, produces an article having a peculiar ivory-like or talcky surface, which it would have been impossible to attain had this valuable liquor or sap been allowed to be destroyed or lost by being subjected to the caustic alkali and subsequent washings. The pulp thus combined with the liquor and its attendant intercellulose is then ready for immediate conversion into paper by any of the methods well known to the art.

I have thus described what I consider the most economical plan of manufacturing palm into paper by first extracting an ingredient or component part of the palm in the first stage, and which is valuable in the latter stages for producing a fine paper entirely different from that produced from any other material, while I thus at the same time leave the fiber and the remaining intercellulose free and more easily and economically acted upon in subsequent steps of the process. It may be desirable to remove from other woods—such as pine, maple, &c.—out of which paper is to be manufactured the liquor or sap which is in them as a preliminary step to their subsequent treatment in a digester, either for the purpose of rendering the remaining fiber more easy and economical in manipulation or for the purpose of reuniting the liquor with the stock before the latter is finally made into paper.

What I claim as new is—

1. In the process of reducing vegetable fibrous material to paper-pulp, the extraction of the liquor or sap from the original stock by mechanical pressure, the reduction of the remnant mass to pulp by any of the well-known processes, and the reunion of the liquor or sap first extracted with the resultant perfected pulp before the latter is converted into paper, substantially as described.

2. In the process of manufacturing paper-pulp or paper from the various species of palm, preliminarily extracting the liquor or sap from the original stock by mechanical pressure, reducing the remaining mass to a perfected pulp by any of the well-known processes, then adding thereto the liquor or sap so first removed preparatory to the conversion of the pulp into paper, substantially as described.

3. As a new article of manufacture, the paper made of palm, sized with its own natural sap or liquor, possessing the peculiar ivory-like surface and distinguishing properties substantially as described.

JOSEPH JORDAN.

Witnesses:
H. B. COBB,
WM. H. CARSON.