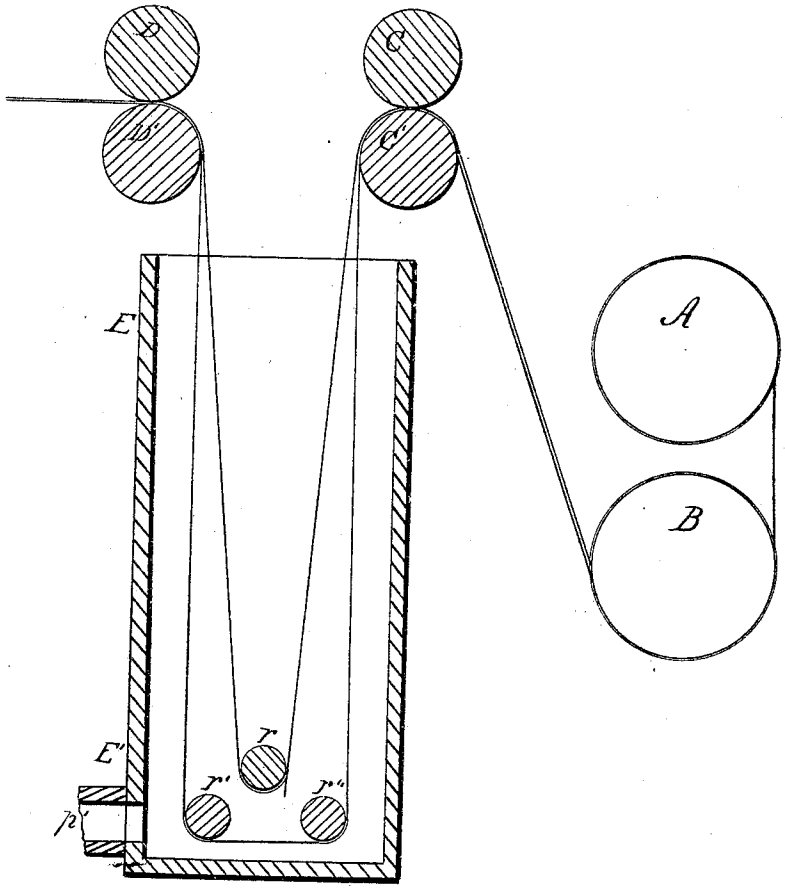
J. Scoffern.
Coating Paper.

No. 86,103. Patented Jan. 19, 1869.



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UNITED STATES PATENT OFFICE.

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IMPROVED PROCESS OF TREATING PAPER AND WOVEN FABRICS TO PRODUCE WATER-PROOF SHEETS AND SLABS.

Specification forming part of Letters Patent No. **86,103**, dated January 19, 1869.

To all to whom it may concern:

Be it known that I, JOHN SCOFFERN, of 21 New North street, Finsbury, in the county of Middlesex, England, M. B., a subject of the Queen of Great Britain, have invented or discovered new and useful Improvements in Treating Paper and Woven Fabrics to Produce therefrom Water-Proof Sheets and Slabs; and I, the said JOHN SCOFFERN, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof—that is to say:

It is well known that ligneous matter, and more especially ligneous matter in the condition of paper and vegetable woven tissue, can be dissolved by immersion in copperized ammonia. It is well known, also, that if paper or vegetable woven tissue be immersed in copperized ammonia for a time insufficient to effect complete solution, whereby a pasty or glutinous condition of surface is obtained, and if two surfaces thus treated be brought together under pressure, they will adhere.

My process consists in so applying this principle that complete adhesion shall ensue, whereby the resulting aggregation of ligneous sheets shall be rendered applicable to numerous purposes.

To this end I proceed as follows: Assuming two sheets of paper of woven fabric, or of paper and woven fabric, to be cemented together, which is the simplest case that can be presented to the operator, I employ an apparatus such as is represented in the annexed drawing.

To promote simplicity I do not indicate the frame-work of the machinery I use, as its nature will be obvious. It consists, in its simplest form, of, first, rollers A B, from which the paper or woven tissue is unwound; second, feeding-rollers C C′, whereby the same is conveyed evenly, edge to edge, into the bath E E′; third, draw-rollers D D′, whereby the same are brought into contact under roller-pressure and made adherent.

Having passed through the draw-rollers, the original two sheets, now cemented into one, may be artificially dried by any of the ordinary means known to paper-manufacturers and paper-stainers.

As concerns the materials necessary to be used in the construction of the above apparatus, the supply-rollers A A need no explanation, being such (when paper is used) as ordinarily come from the paper-manufacturer. The feed-rollers C C′, I prefer to be made of wood. The draw-rollers D D′, I prefer to be made of cast-iron, as being even better than steel, owing to the natural roughness of cast-iron, thus enabling it to gripe the bathed fabric, which, for some time after leaving the bath, is of the nature of a lubricant, more oily to the touch than even oil itself.

In order to have a full comprehension of my process, it is necessary to be aware that copperized ammonia develops an adhesive power altogether peculiar: First, not being in itself of the nature of gum, glue, or paste, it causes various matters with which it comes in contact to assume a gummy or pasty feel, whereby they become adhesive, and can be made to adhere; second, that, unlike the case of glue, paste, or gum, the adhesive quality is not coexistent with mere wetness of surface, but rapidly passes away, so that in causing surfaces under my treatment to adhere, they must be brought into contact under pressure within the duration of a certain time after the two or more sheets under treatment have left the bath; third, it is necessary to bear in mind that copperized ammonia, if allowed to come into contact with vegetable matter for sufficient time, dissolves it wholly.

To render my process more clear, I will first assume my machinery put in motion, while the bath E E′ remains uncharged, whereby the two sheets of paper will be drawn through dry. At the bottom of the bath three steel or iron rollers are sectionally represented. They are indicated in the drawing at $r\ r'\ r''$. The arrangement is such that one sheet of paper taking a turn round the topmost cylinder of the triangular group, while the other winds around the two lower rollers, it follows that the two sheets never come into contact while passing through the bath. The two sheets having passed beyond the draw-rollers D D′, they are dried and wound upon a roller. The

subsequent drying and final winding-up arrangements have not, however, any novelty.

Now, I prefer (though it be not absolutely indispensable) to commence my operation, as already described, with an uncharged bath, seeing that, as hereinbefore explained, a too long immersion will cause solution of the paper wholly, not mere surface solution, which is alone desired.

As soon as the machinery has delivered the two dry sheets beyond the rollers D D′, and winding-up connection has been established, I charge my bath in the manner to be now described.

At the lowest side portion of the bath, a connection-pipe, *p′*, is established between it and a reservoir of copperized ammonia. Turning on a tap, I cause the copperized ammonia to enter and rise upward to an extent shown by a glass gage-pipe fitted to the bath, but not shown in the drawing. When the level has been attained that had previously been deemed necessary, that level must be preserved; otherwise the result will not be uniform.

It follows, from the nature of my operation, that the time of bath-immersion will vary according to circumstances, such as strength and condition of the copperized liquor, thickness or quality of the paper, depth of fluid in the bath, and, lastly, quickness or slowness of the machinery. As a general rule, I find that half a minute of immersion is sufficient; and whether the time of immersion be more or less, it may be regulated either by the depth of liquid in the bath, or by the greater or less velocity of roller action, or both combined; or, lastly, by using copperized ammonia partially saturated, or "killed," by either ligneous or other matter already dissolved in it.

The manufacture of copperized ammonia I do not now claim; nevertheless, for the sake of precision, I state that the standard copperized ammonia preferred by me I make by immersing any quantity of copper, so long as it be in excess, in liquor of ammonia of .880 specific gravity, and permitting atmospheric air to enter from time to time.

Under favorable circumstances, a month's immersion suffices to perfect my product; but to satisfy myself of its perfection, I use the following test: I take a quarter of a yard, or about, of thin white Persian silk, to which (being thrust into a wide-mouthed pint bottle) I add half a pint of copperized ammonia and shake it. If the silk dissolve wholly in not more than a minute, I conclude the copperization of my ammonia to be sufficient. This is the best test of efficiency I know of. According to my experience, the test of specific gravity is not in this case to be relied on.

An essential matter has now to be taken heed of, and is this: My paper, in passing through the bath of copperized ammonia, takes cupreous matter out of the same, just as certain dye-stuffs are taken out of dye-vats; hence it may happen that the copperized ammonia deteriorates faster than the paper can take it up. To obviate this I establish two connections (not represented in the drawing) with the stock-tank, and a piston arrangement thereto, whereby a circulation of liquid is effected; or, what is more simple, when occasion favors, I have two tanks on different levels—one (the higher) to feed my bath, and the other to receive—thereby avoiding the need of piston or pumping circulatory arrangement.

Having described the manner of bringing two sheets of paper together, and incorporating them by my process, in the manner hereinbefore described, I must now state that three or more sheets may be similarly treated by an obvious rearrangement and numeral increase of the bath-rollers *r*, the object being to prevent contact of the several sheets until they come to the draw-rollers D D′.

For some purposes, I modify the operation already described by passing single sheets through the bath and rollers, then subjecting them to reduplication, either each on itself, (as in manufacturing a tube,) or each upon a dry fabric, whereby I obtain a variety as to surface.

It must be particularly observed that neither sheets of paper nor of woven tissue can be practically cemented by copperized ammonia until the excess of solution withdrawn from the bath be cleared off, either by the pressure of rollers, (which I consider best,) or by a metal or glass straight-edge on a metal or glass plane, or two straight-edges.

It remains, finally, to state that the bath may be made of cast-iron, which is what I prefer. In no case must any part of the mechanism having to deal with copperized ammonia be made of brass in any of its varieties, or zinc. Copper, also, is interdicted, except when used with the specific intent of being dissolved.

Having thus fully described the nature of my said invention, and the manner of performing the same,

I would have it understood that I do not herein claim copperized ammonia as a cement, but the use of the same in connection with roller or straight-edge pressure acting upon fabrics partially dissolved by immersion in a bath of copperized ammonia.

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