

UNITED STATES PATENT OFFICE.

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APPARATUS FOR COATING AND DRYING PAPER.

SPECIFICATION forming part of Letters Patent No. 545,674, dated September 3, 1895.

Application filed September 3, 1894. Serial No. 522,453. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. BURNS, of Ayer, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in an Apparatus for Coating and Drying Paper, of which the following is a specification.

This invention relates to a process in the manufacture of paper by which one side or both sides of the web are coated with a composition of clay and other ingredients, which, by reason of coloring-matter therein, gives to the surface of the paper any desired color or tint, and when calendered imparts to the surface of the paper a very high finish, which enables it to take impressions from finely-engraved plates, &c., paper thus prepared being generally used for illustrated books, magazines, &c. The coating composition is applied to and evenly distributed in a plastic or semi-fluid condition upon the surface or surfaces of the paper, usually while the web of paper is in motion, by suitable applying and distributing devices. The coating composition has usually been applied to one side of the paper at a time while the paper is being carried or moved upon a rubber apron or cylinder or other suitable device, and the coating is dried while the paper is suspended upon sticks or other devices that come in contact with the dry side of the paper only. It is very desirable, for the sake of economy, to apply the coating to and distribute it upon both sides of the paper (where both sides are required to be coated) at one time, and many efforts have been made to do this practically. In these efforts a serious difficulty has been heretofore experienced in supporting the paper while being coated and in handling and moving the web while the coating upon both sides is in a wet or sticky condition, for if before the coating is sufficiently dried the surface of the paper comes in contact with any rigid or solid object the coating is marred and permanently marked. It is therefore necessary to move the web of paper through the coating device under such a tension as will permit the brushes to uniformly apply and distribute the coating, and to provide a means by which any given portion of the web shall be caused to occupy such a length of time after leaving the coating device until it

comes in contact with any rigid or solid object that the coating will have been so dried or hardened as not to be marred or marked by such contact.

My invention has for its object to provide a proper tension for the paper while the coating material is being applied and distributed, and to provide for the maximum length of web which may intervene between the coating and the drawing appliance of a feeding device without coming in contact with any solid object or support, and at the same time to expedite and secure a uniform drying or hardening of said coating.

To these ends the invention consists in the combination, with means for supporting and progressively moving a web of paper, said means including positive supports in contact with the web, of an intermediate pressure-maintaining apparatus located at one side of a direct line between said supports and comprising an air-forcing device and an air-guiding device arranged to apply a deflecting air-pressure to the web, whereby the freshly-coated portion of the web is deviated from a direct course and formed into a bight or loop supported and kept under tension wholly by air-pressure.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a diagrammatic elevation showing an apparatus embodying my invention. Fig. 2 represents a section on line 2 2 of Fig. 1 and a plan view of the parts below said line. Fig. 3 represents a sectional view showing a modification, and Fig. 4 represents a side elevation of the said modification.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a web of paper, the supply portion of which may be in the form of a roll *a'*, from which the web is or may be drawn by a suitable drawing device or mechanism. Said drawing device may comprise one or more positively-rotated rolls *b*, with which the web is in contact and by which it is moved progressively in the direction indicated by the arrows in Fig. 1. The web-coating device or mechanism may be of any suitable character. For the sake of illustration, I have here shown as the web-coating device two rotary brushes *c c*, each receiving the

coating composition from a reservoir *c'*, the two brushes being arranged at opposite sides of the web so as to coat both sides simultaneously, and distributing-brushes *d d'* arranged in pairs below the brushes *c c*, said distributing-brushes serving to distribute the coating applied by the brushes *c c*. I do not wish to understand, however, as limiting myself to these particular coating and drawing devices, and may use any other suitable devices or mechanism for moving the web and for applying the coating thereto.

In carrying out my invention I apply air-pressure to the portion of the web intervening between the coating device and the drawing device, said pressure being exerted at a point at one side of the direct line between the two devices and being of sufficient force or power to support the web in the form of a bight or loop, the apex of which is shown at *a'*. The air-pressure is sufficient to entirely support the web at the point *a'*, so that there is no contact between the freshly-coated web and any solid object between the coating and feeding devices, the pressure at the same time exerting tension on the web and causing it to pass in a tense flat condition between the coating-brushes. It will be seen that the air-pressure takes the place of a supporting roll or pulley or a series of such pulleys between the coating and feeding devices, and thus enables a sufficient length of the web to intervene between said devices to insure the proper setting or drying of the coating without subjecting the coating to contact with any solid object, besides exerting the desired tension on the paper and facilitating the drying of the coating.

I prefer to provide as the means for exerting air-pressure on the web in the manner described an air-delivering nozzle *e*, formed to deliver a blast of air across the entire width of the web, as shown in Fig. 2, said nozzle being connected by a flue *e'* with the casing *e²* of a fan-blower. The blast of air delivered by the nozzle *e* in this case constitutes practically an atmospheric or pneumatic pulley over which the paper passes and by which its course is diverted from a straight line between the coating and feeding devices.

e³ represents a nozzle arranged to deliver a blast of air against the under side of the web at a point between the bend *a'* of the web and the feeding device, the object being to equally dry both sides of the web, the supporting-blast of air above described acting, also, to dry the side of the web against which it is directed.

I do not limit myself to supporting, deflecting, and maintaining the tension of the web by the direct pressure of air exerted on one side of it in the manner described. In Figs. 3 and 4 I show a modification in which the bend *a'* of the web is caused and maintained by an air-exhausting apparatus connected with the bell-shaped mouth *f* by an exhaust-pipe *f'*. In this case, as will be readily seen, the result will be to hold the bight of the paper by air-pressure created by the air-exhausting apparatus. If desired, the portion of the web intervening between the coating and feeding devices may be deflected or bent at more than one point by air-pressure, in the manner described.

Air-pressure applied to a flexible strip or web between two points where the same is laterally supported may be utilized as a means for deflecting and applying tension to the strip for other purposes. Hence I do not limit myself to its use for paper coating and drying. The blast of air by which the web is supported may be tempered or heated in such a way as to secure the best drying conditions.

I claim—

1. The combination with means for supporting and progressively moving a web of paper, said means including positive supports in contact with the web, of an intermediate pressure-maintaining apparatus located at one side of a direct line between said supports and comprising an air-forcing device and an air-guiding device arranged to apply a deflecting air pressure to the web.

2. The combination with means for supporting and progressively moving a web of paper, said means including positive supports in contact with the web of an air-directing nozzle located out of line with said supports and arranged to direct a blast of air against a portion of the web between said supports, and an air-forcing device communicating with said nozzle, the arrangement of the nozzle being such that the blast delivered thereby holds the web in the form of a bight or loop between said supports without contact with a solid object.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of September, A. D. 1894.

GEORGE J. BURNS.

Witnesses:

WARREN H. ATWOOD,
C. F. WORCESTER.