J. E. DOYLE.

METHOD OF CONDITIONING PAPER PREPARATORY TO PRINTING THEREON.

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1,196,437.

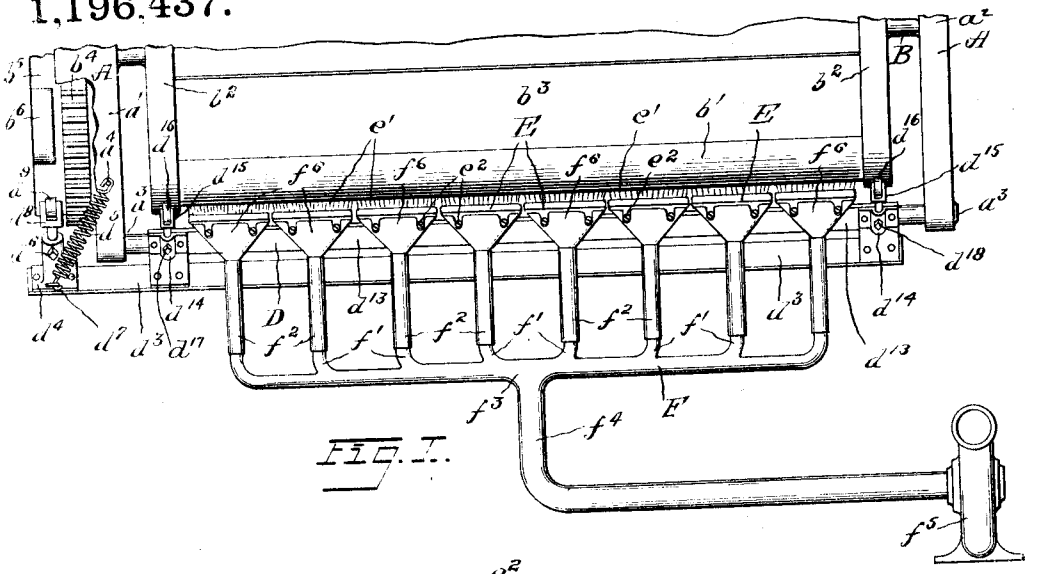


FIG. I.

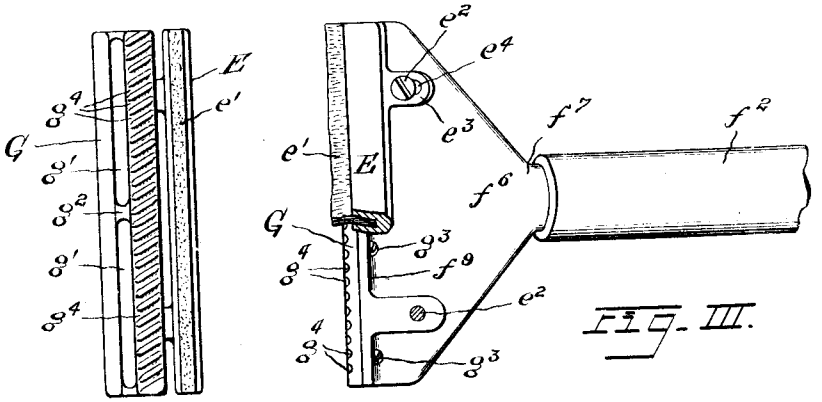


FIG. III.

FIG. IV.

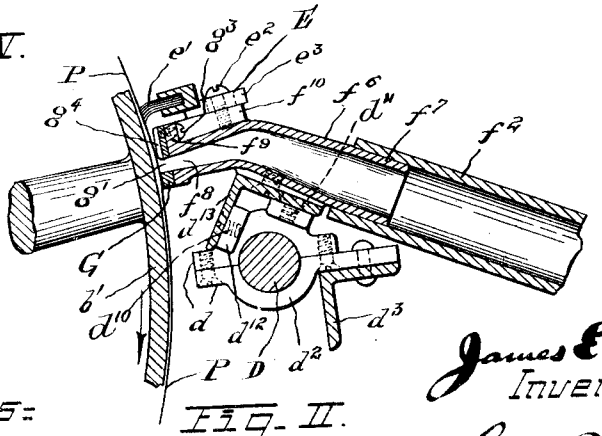


FIG. II.

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METHOD OF CONDITIONING PAPER PREPARATORY TO PRINTING THEREON.

1,196,437. Specification of Letters Patent. Patented Aug. 29, 1916.

Original application filed July 26, 1913, Serial No. 781,306. Divided and this application filed December 22, 1913. Serial No. 808,160.

To all whom it may concern:

Be it known that I, JAMES E. DOYLE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and useful Improvement in Methods of Conditioning Paper Preparatory to Printing Thereon, of which the following is a specification, the principle of the invention being herein explained, and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The invention to be herein explained is closely indicated by the title.

The object is the accomplishment of the desired result without disturbing the continuity of procedure of the ordinary printing operation.

Every printer is familiar with the occasional disalinement of adjacent lines of type on either single, successive or alternate sheets. It is also known that this is due to a comparatively slight though irregular stretching of those particular sheets during their conveyance. All paper sheets are capable of being and therefore frequently are unintentionally stretched to a varying extent. In certain instances this extent may exceed an eighth of an inch. Furthermore any stretching thus effected is necessarily not uniform. When this happens in even less appreciable measure, the uniformity in alinement of the type to be subsequently impressed thereon is seriously interfered with. My invention overcomes this deleterious propensity of paper which till now ever occasioned concern because of the likelihood of defective sheets. During the operation of a press supplied with my invention, the sheets are stretched smoothed, or ironed out by their incalculable retardation while passing suction nozzles, the paper being drawn toward these as shown in Figure I, and such stretching is moreover as uniformly distributed as possible throughout the extent of that dimension which is substantially transverse to the course of travel. My exemplifying construction involves the employment of a lineal suction of sufficient force to accomplish this, without itself becoming the cause of any disarrangement of some portion of the sheet with respect to another portion thereof.

When printing different colors by successive impressions upon the same sheet, my invention permits the added advantage of insuring a perfect register. As the paper passes the nozzles the warp and stretch is taken out of it at that point instead of on the "form" of the first color. This does away with the variation from true register between the first and second colors that is caused by the slight stretch of the sheet when the first color is printed as heretofore under ordinary conditions. On second revolution of the press all the dirt left from the under side of the sheet is collected before it has a chance to reach the form. Ordinarily, a great deal of dirt is carried back into the fountain by the rollers after they pass over the type forms, rendering the ink unfit for use. My invention prevents this and saves a large percentage of ink waste.

Doubtless, paper sheets have been stretched before in association with other arts. Moreover, several patents including the applicant's numbered 1,043,812 besides his pending application filed July 26, 1913, Serial No. 781,306, (of which this is a division) have disclosed the application of a suction force in proximity to a paper sheet. It is not contended therefore that either the result or the suction agency are in themselves novel, rather that the precise method here presented for utilizing the latter to effect the former does constitute in the particular art of printing patentable invention.

The essence of the present conception attaches itself to the successful control of a suction of sufficient force to stretch paper sheets subjected thereto without causing the moving sheet to be drawn out of line with the prescribed direction of its type line. Such disarrangement could cause the wrinkling or even partial creasing of certain areas.

I have contrived not only to exert a suction of substantially constant force across the moving sheet, but initially, that is in proximity to such sheet, at an oblique angle, in fact along a diagonal line, with respect thereto through a series of passages alined in a direction transverse to the passing direction of movement of the sheet. Each passing sheet of paper is purposely stretched in advance of receiving an impression from the type and all irregularities in the work thereby avoided.

Directing attention to the drawings:—Fig. I is a plan of the front part of a printing press showing the manner in which my inventive method may be applied in conjunction therewith. Fig. II is a vertical section of a detail involved in the practice of my method in operative proximity to a portion of the sheet conveyer likewise shown in section. Fig. III is a plan of the detail represented in Fig. II showing certain parts broken away. Fig. IV is a front elevation of one portion of the detail seen in Figs. II and III.

I have deemed it advisable to employ throughout the description the identical system of letters designating the respective parts as appear in my co-pending principal application earlier identified. It may be worthy of note also that the four figures shown in this application correspond with Figs. I, VII, V and VI respectively, of the such pending application. As exemplified by the several views selected for the drawing, my method may be associated with a printing press of the cylindrical sheet conveyer type in which sheets of paper are carried around upon the surface of a cylinder prior to being given the impression of the type.

The supporting frame as a whole is designated by the reference character A, and is provided with a gear guard a', a part of which is broken away in Fig. I to disclose such gear which comprises a part of the driving mechanism. The frame A is furthermore provided at opposite ends with primary bearings a^2 for the reception of the cylinder shaft; and with secondary bearings a^3 for the reception of a member forming one part of this improvement. The driving end of the frame is formed with a lug a^4.

A driving shaft B is mou ted in the bearings a^2 and supports a cylindrical sheet conveyer b', having annular metal rims b^2 at each end and a peripheral gap b^3 to permit of the movement therethrough at predetermined intervals of the sheet gripping mechanism. The shaft is provided at one end with a gear b^4 to be connected with power mechanism not shown, though intended to rotate the cylinder in the direction indicated by the arrows. The gear b^4 is formed with an annular extension b^5 and this extension is in turn fashioned with the cam b^6 the function of which corresponds precisely with that assigned the cam of my structural application.

Mounted for oscillatory movement in the secondary bearings a^3 is a rod D. This rod is embraced inwardly adjacent each of its journals by upper and lower caps d' and d^2 respectively, and these caps are secured with respect to each other by means of bolts or screws indicated in Fig. I. Affixed in a depending position to the caps d^2 through the medium of rivets is an angle d^3 extending not only the entire length of the cylinder but beyond the same at that end adjacent to which the gear b^4 is located. Such projecting extremity of the angle d^3 in turn supports a member d^4 likewise attached thereto by rivets appearing in Fig. I. This member is of complementary angle shape formation below, and projects upwardly in a direction tangential to the surface of the cylinder. A tension spring d^5 connects this member, whose function is in the nature of a trunnion, with the lug a^4 for the purpose of controlling the movement of the former, as will be presently explained. This latter I have marked separately as d^6, and it has an upwardly projecting ear d^7 to which one end of the spring is actually fastened. Mounted for adjustment in the trunnion d^6 is a forked member d^8, in the end of which a roller d^9 is mounted. This roller is operatively disposed in the same vertical plane as the cam b^6 and is adapted to be engaged thereby. As will now be apparent, the intermittent engagement of the cam b^6 with the roller d^9 serves to lift the latter, to tilt the members d^4 and d^3 away from the cylinder and hence oscillate the rod D. The adjustment of the member d^8 is accomplished by axial and transverse set screws d^{10} and d^{11} respectively. Extending across so as to rest upon and be secured in any suitable manner to an angular shaped formation d^{12} on the upper surface of the caps d' is another angle d^{13}. This angle d^{13} supports intermediately of its ends and in fact within the two vertical planes of the annular rims b^2, constructions similar to that just described. Each of the latter comprise trunnion members d^{14} in which forked rods d^{15} are loosely mounted. These last mentioned rods each supports a roller d^{16} adapted to engage the annular rims b^2. The fixing of the rods d^{15} in various positions with respect to the trunnions d^{14} is also suggested as capable of accomplishment by axially and transversely extending set-screws d^{17} and d^{18} respectively. The purpose of the rollers d^{16} is to limit the extent of oscillation toward the cylinder of the rod D and necessarily whatever structure may be carried thereby, according to the precise demands of successful operation.

A manifold F extends substantially parallel with the shaft B and has a plurality of, and in this instance eight, branch inlets f' projecting in the direction of the cylinder. Inclosing the ends of these inlets are a corresponding number of hose lengths f^2. The other or rear side of the manifold F is provided with a single medial outlet f^3 with which a duct f^4 connects and an electrically operated suction fan f^5 is connected with the other open extremity of this duct f^4. Connected with opposite ends of these hose-lengths are a corresponding number of noz-

zles f^6. These nozzles are of flared formation having a circular constricted portion f^7 with which the hose lengths directly connect. The flared inlet ends of the nozzles f^6 are of flattened laterally elongated formation to present an elongated opening f^8. Surmounted over this inlet opening f^8 in each case is a flange f^9 having a plurality of transverse screw-thread openings. The upper surface of each of the nozzles f^6 is also fashioned near opposite ends with a boss f^{10} and each of these bosses is provided with a screw-threaded opening for the usual purpose soon to be manifested. All of the nozzles f^6 are rigidly secured to the angle d^{13} by means of screws passing upwardly through the latter as represented in dotted lines in Fig. II.

An elongated bracket E, adapted to carry the elongated brush or bristle cluster e^1, corresponding in length with the length of the cylinder b^1, is adjustably secured to the bosses f^{10} through the joint agency of screws e^2 and a pair of rearwardly extending ears e^3 provided with elongated slots e^4 which register with the screw-threaded openings in the bosses. The forward edge of the bracket E is fashioned with a correspondingly elongated recess in which the brush e^1 is seated. It is this brush which is intended to contact the paper sheets which are being carried around on the surface of the cylinder, and in so doing take up the slack in and smooth out the sheet. It is manifest, therefore, that the brushes incidentally assist in the fulfilment of this invention by presenting the sheets to the suction agency so that the latter may be more efficaciously exerted thereupon. In other words the sheet will have been already ironed out as it were, and every transverse line thereof made to approach in a similar manner the alined nozzles.

The differentiating essence of this improvement resides in the operation of means interposed between the passing sheets and the inlet openings of the nozzles proper. These means consist in this particular exemplification of caps G. These caps are each provided with an elongated opening g^1 precisely registering with the inlet openings f^8. A strengthening partition g^2 is incidentally shown in Fig. IV. These caps G are screwed to the flanges f^9 as a close mechanical fit by a plurality of screws g^3 passing through the screw-threaded openings which have already been mentioned as put therein. Those portions of the cap G which are disposed above their respective openings have their exposed or forward faces provided with a plurality of closely alined parallel and diagonally extending grooves g^4. These are clearly represented from three different view-points in Figs. II, III and IV. Each set extends obliquely downward from the front upper edge of the caps to communicate with the opening g^1 and indirectly therefore with the nozzle. While they are in the present instance shown to be parallel, they need not necessarily be so, nor must they necessarily have to be straight, nor all alike as to any one or every dimension.

In operation, the character and relative adjustment of the cam b^6 is such that the roller d^9 will be lifted just prior to the instant when the front edge of the moving sheet P is to be taken hold of by gripping mechanism adapted to reach through the gap b^3 in the manner well known to the art. Directly the roller d^9 has passed over the cam b^6, the entire nozzle supporting structure is oscillated back toward the periphery of the cylinder by the action of the tension spring d^5 until the rollers d^{10} again engage the rims b^2, and simultaneously the brushes e^1 again contact the sheet immediately beyond such gripping mechanism. Thereafter the loosened sediment is continuously drawn into the grooves g^4 to pass through the nozzles, manifold and suction duct f^4. Meanwhile any particular portion of the sheet has been subjected to suction exerted in an oblique direction or in a direction other than substantially perpendicular thereto, with the desired result that no displacement of the sheet occurs.

Paper sheets are actually stretched by the operation of continuously drawing out warps in the sheet. In order to make this effective however, the suction agency must be one of considerable force, and must furthermore be exerted other than in a direction perpendicular to any particular portion of the moving sheet. A slight wave-like or billowy movement on the part of the sheet is caused in a direction at an angle to that dimension of the sheet which is parallel to its direction of travel, as shown in Fig. II. My invention makes it feasible to utilize a suction force of sufficient degree by compelling a series of parallel diagonal lines of force to traverse the passing sheet in a diagonal direction. The alined lines of force exerted by the alined nozzles accordingly exert a uniform lineal suction diagonally across the passing sheet.

My invention being thus described with sufficient thoroughness, what I desire to secure by Letters Patent and therefore claim specifically, is:

1. The method of conditioning paper preparatory to printing thereon, which consists in revolving a sheet, and causing a suction force to be exerted in the plane of successive diagonally extending portions of the passing sheet whereby to both clean and stretch the same.

2. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet and causing a suc-

tion force to be exerted thereagainst along a line extending diagonally within the plane of the passing portion of the sheet.

3. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet in a given direction and opposing a lineal suction thereacross, such suction force being exerted in a direction oblique with respect to the line of opposition and within the plane of the sheet whereby to iron out and stretch the same.

4. The method of conditioning paper preparatory to printing thereon, which consists in drawing a sheet in a given direction and causing an elongated suction effect to be opposed thereacross in a direction oblique relative to the direction of travel and in the plane of the paper.

5. The method of conditioning a paper sheet preparatory to printing thereon, which consists in conveying a sheet across a surface, and causing a lineal obliquely extending suction force to be applied to the sheet counter to said surface.

6. The method of conditioning paper preparatory to printing thereon, which consists in drawing a sheet in a given direction and causing a suction force to be applied to the sheet and along a line oblique with reference to the direction of movement and lying in the plane of the sheet.

7. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet in a given direction, brushing such sheet from one side across to the other, and thereafter exercising a retarding effect thereacross such that a smooth continuity of travel is maintained while effectively stretching said sheet.

8. The method of conditioning paper preparatory to printing thereon which consists in conveying a sheet along with moving surface and causing a retarding air current to be exerted solely in opposition to one side, and along a line oblique relative to the direction of travel, and in the plane of such sheet.

9. The method of conditioning paper preparatory to printing thereon, which consists in rapidly conveying a sheet in a given direction on a moving surface and momentarily causing a portion of said sheet along a line oblique with reference to its direction of movement to leave and return to such surface whereby to stretch the same.

10. The method of conditioning paper preparatory to printing thereon, which consists in rapidly conveying a sheet in a given direction on a moving surface and continuously opposing a suction effect so as to occasion a wave-like action on the part of said sheet relatively to the movement of said surface along a line oblique with reference to its direction and substantially in the plane of movement.

11. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet in a given direction, brushing such sheet, and causing a suction effect to be opposed thereto in a line of the passing sheet, in a direction oblique relative to the direction of travel of such sheet and in sufficient proximity to stretch said sheet.

12. The method of conditioning paper preparatory to printing thereon, which consists in drawing a sheet in a given direction, and exerting a suction effect within the plane of one side of such sheet and along a fixed line which is oblique with reference to the travel of such sheet.

13. The method of conditioning paper preparatory to printing thereon, which consists in drawing a sheet in a given direction, and exerting diagonal suction effects on a series of lines in the plane of said sheet, of fixed relation to each other and with respect to the direction of movement of said sheet.

14. The method of conditioning paper preparatory to printing thereon which consists in drawing a sheet in a given direction and exerting a suction effect progressively along a diagonal line in the plane of a passing portion of said sheet whereby to stretch said sheet without disalining the same.

15. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet, and causing a suction force of sufficient intensity to be exerted along a given diagonal line at only one side of said sheet and in the plane of a passing portion thereof whereby to smooth out such portion.

16. The method of conditioning paper preparatory to printing thereon, which consists in conveying a sheet in a given direction and causing a series of diagonal air currents to be exerted progressively thereacross whereby to accomplish an ironing-out effect, and simultaneously to clean and stretch such sheet.

17. The method of conditioning paper preparattory to printing thereon, which consists in conveying a sheet in a given direction and causing an air current to be exerted diagonally within the plane of the exposed surface of the sheet whereby progressively to stretch without disalining the same.

Signed by me, this 20th day of December, 1913.

JAMES E. DOYLE.

Attested by —
MARY COLEMAN,
K. F. SCHLEGEL.