J. R. PULSIFER.

COATING MACHINE.

APPLICATION FILED MAR. 8, 1906.

956,602. **Patented May 3, 1910.**

4 SHEETS—SHEET 1.

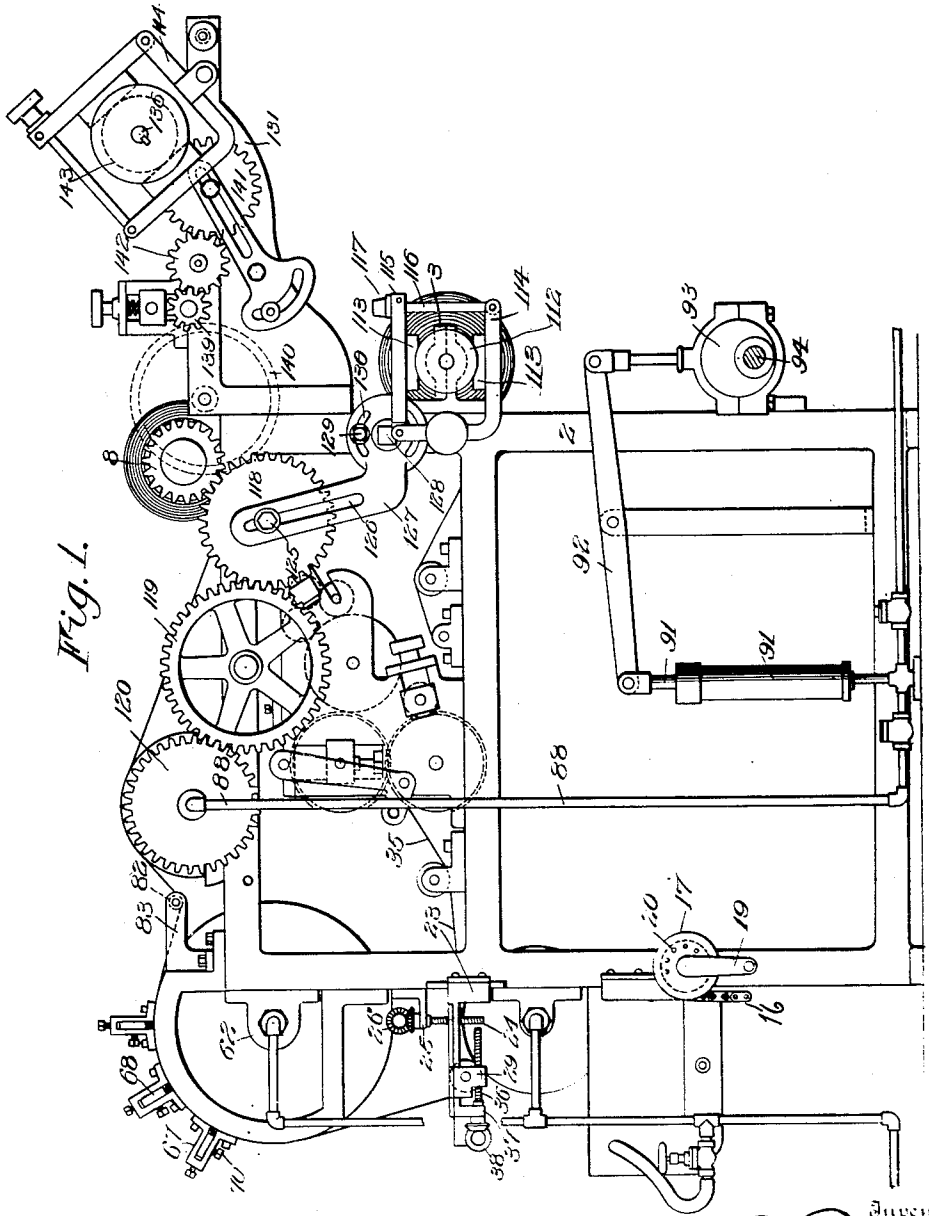

Fig. 1.

Witnesses

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4 SHEETS—SHEET 2.

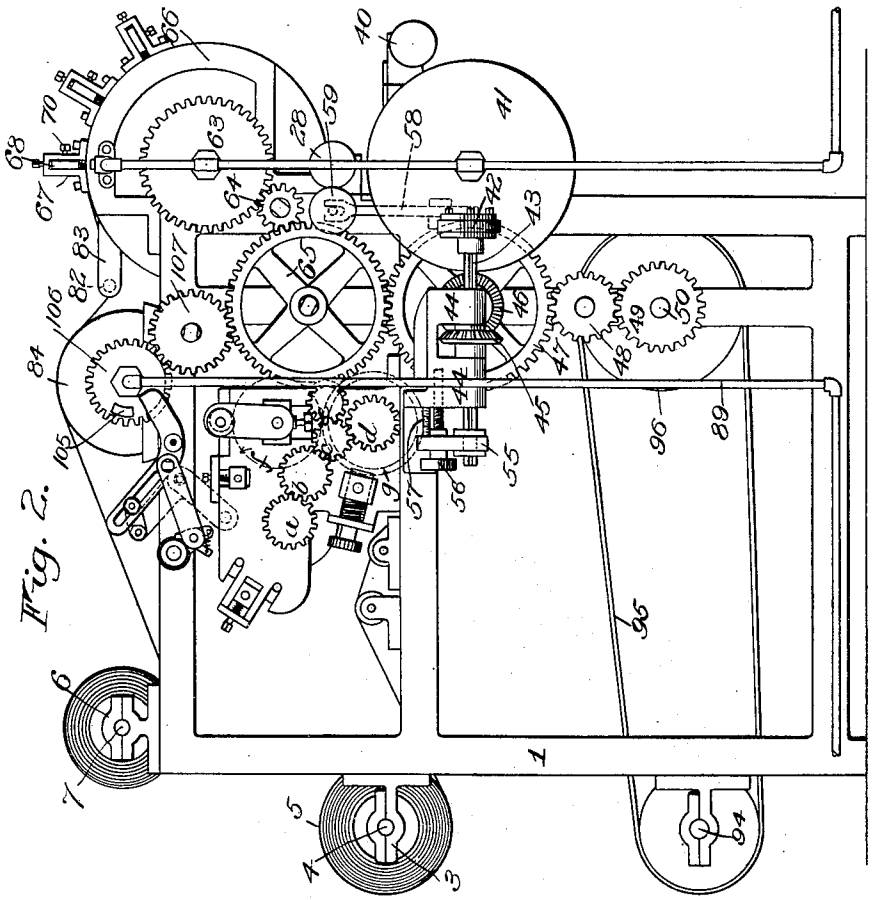

Fig. 2.

Witnesses

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4 SHEETS—SHEET 3.

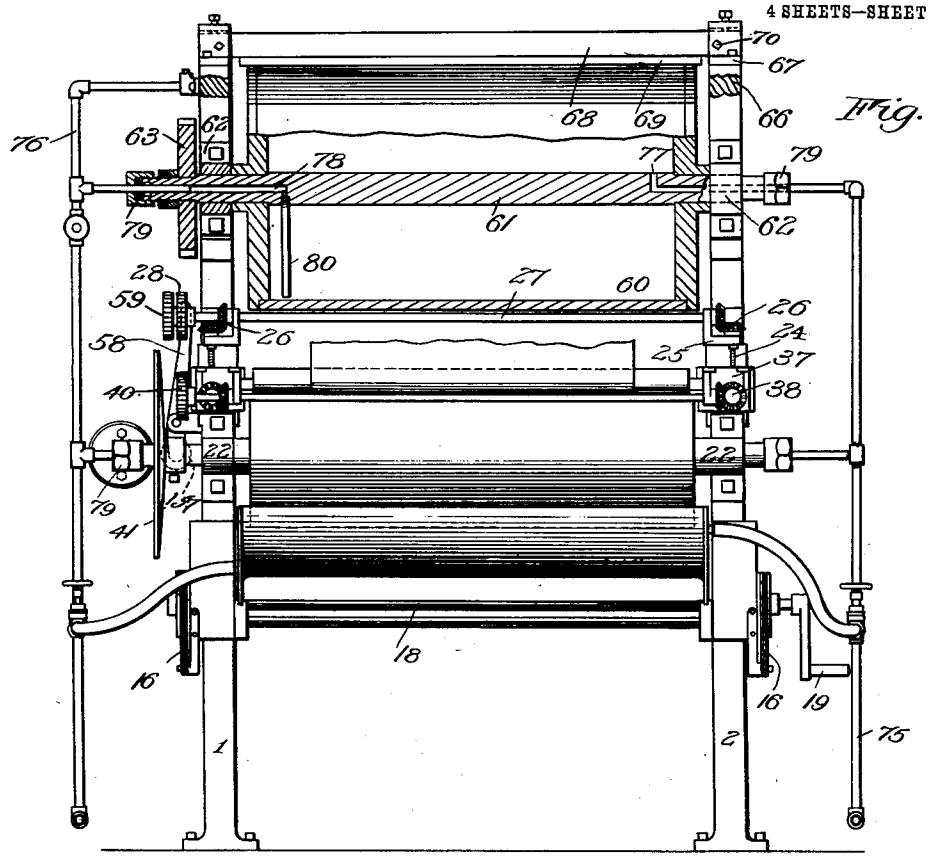

Fig. 3.

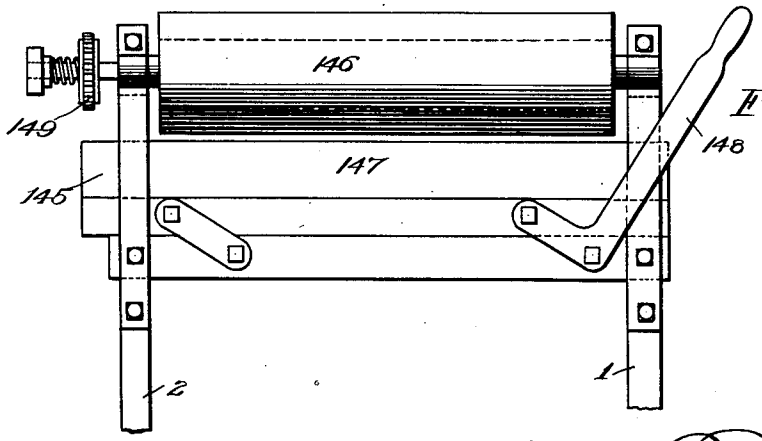

Fig. 5.

Witnesses

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4 SHEETS—SHEET 4.

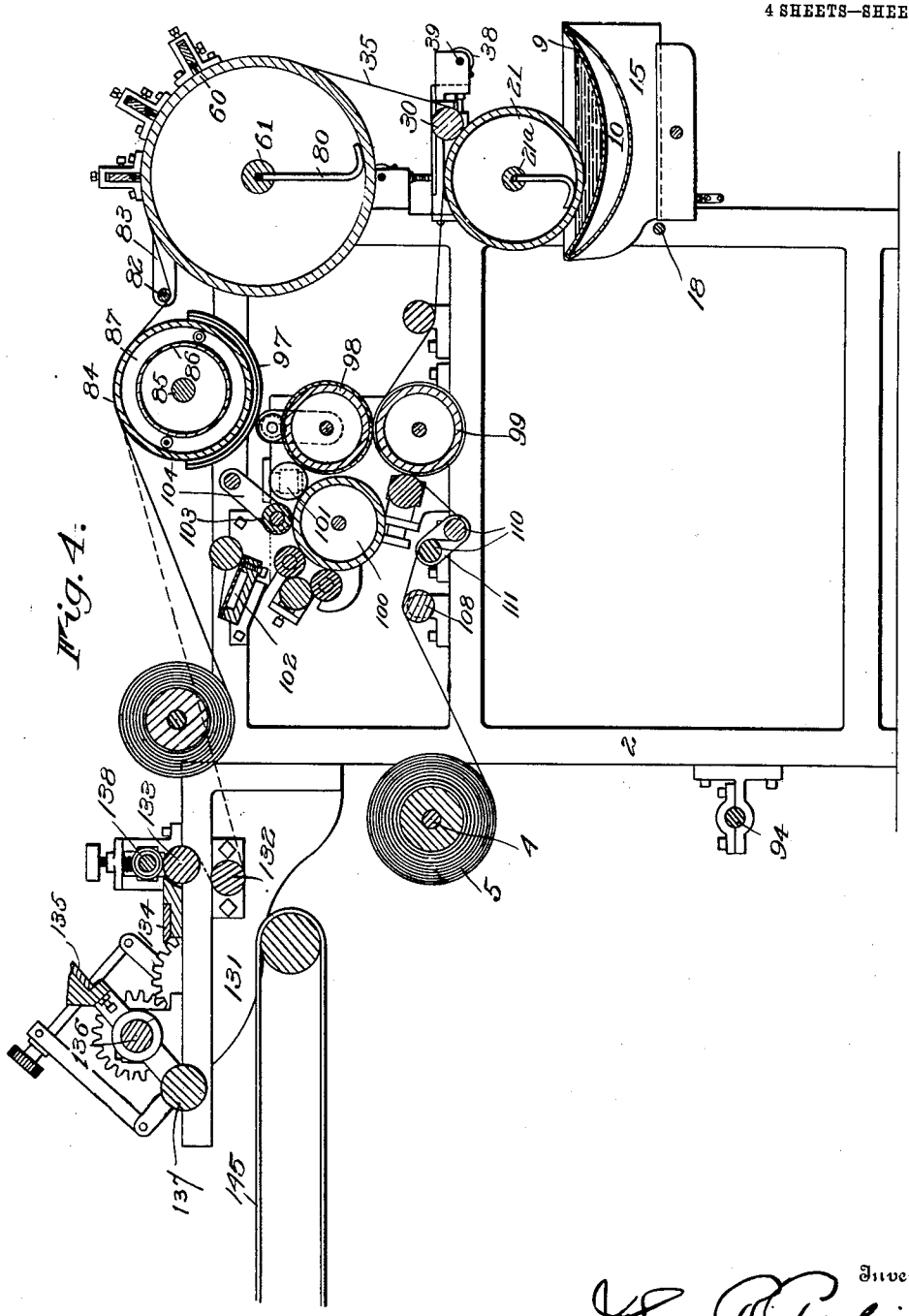

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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COATING-MACHINE.

956,602. Specification of Letters Patent. Patented May 3, 1910.

Application filed March 8, 1906. Serial No. 304,807.

To all whom it may concern:

Be it known that I, JOHN R. PULSIFER, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Coating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of the specification, and to the reference-numerals marked thereon.

My present invention has for its object to provide a machine for applying a liquid coating to a continuously moving web of paper or other material and, in addition to devices for applying a coating, it comprehends means for dispersing the coating, to make it of equal thickness throughout various portions of the paper, and other means for setting or hardening it. My invention also includes an arrangement of parts whereby the coating material may be applied to the web in greater or lesser amounts.

Another object of my invention is to apply to a machine of this character suitable printing mechanism whereby a web may be printed before the coating is applied and devices for cutting or severing it into sheets.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is an elevation of one side of a machine constructed in accordance with my invention. Fig. 2 is a similar view of the other side thereof, the cutting devices being omitted. Fig. 3 is a front elevation. Fig. 4 is a longitudinal sectional view, and Fig. 5 is a detail view of a modified form of a sheet cutting device.

Similar reference numerals in the several figures indicate similar parts.

A machine constructed in accordance with my invention comprises a main frame having front and rear side pieces 1 and 2 on which are provided supports for a roll of paper or other material, guides for directing the passage of the web, as it is drawn from the roll, and means for re-winding or drawing it continuously. The web in passing through the machine engages successively with printing devices, the coating applying devices, the means for dispersing the coating through the paper and a surface employed for chilling the coating to set or harden it. At the rear side of the frame are provided bearings 3 in which is journaled a shaft 4 supporting a roll 5 of the material to be coated. At the upper rear end of the machine is provided a pair of bearings 6 adapted to support the shaft 7 on which the web of the coated material may be rewound after it has been carried over the guides, at the front end of the machine, and passed in contact with the several devices before mentioned. The shaft 7 is provided at one end with the gear wheel 8 by means of which it is positively driven by a train of gears connected to an operating or driving shaft, as will be further described.

The devices for applying the coating to the paper, dispersing it therethrough and setting it are arranged at the forward end of the frame, as shown particularly in Fig. 4. The coating material which is in the liquid state, is contained in a tray or receptacle 9 which is preferably provided on its lower side with a steam jack 10, whereby the bath may be maintained in a heated condition. The tray is provided with end pieces 15, guided on the forward edges of the frame pieces 1 and 2, and is capable of vertical adjustment by means of short lengths of the chain 16 connected to sprocket wheels 17, attached to the ends of a shaft 18, which may be rotated by a crank arm 19, secured against rotary movement by means of a pin inserted in one of several apertures 20, in one of the sprocket wheels, which coöperates with the side of the frame, as shown in Fig. 1. The coating material is applied to the continuously moving web by a movable surface dipping into the bath, comprising in the present instance, a roller 21 rigidly secured to a shaft 21ª the projecting ends of which are journaled in bearings 22.

Arranged above the roller and at each side of the frame are forwardly projecting members or arms 23 movably connected to the frame and capable of vertical adjustment by means of screws 24 journaled in brackets 25, said screws being connected for simultaneous operation by means of bevel gears 26 and a transversely extending shaft 27 provided at one end with an operating hand wheel 28. Each arm carries a longi-

tudinally adjustable block 29 forming journals for the ends of a guide or roller 30 around which the web 35 of the material drawn from the roll 5 is passed. These bearing blocks are likewise simultaneously adjustable by means of screws 36 supported in the depending ends 37 of the arms 23, they being connected by bevel gears 38 to a shaft 39 provided with a hand wheel 40. The guide or roller 30, when in the normal position, is located with its lower edge slightly below the upper edge of the roller 21 so that the web 35 passing beneath the guide will be caused to engage the coating applying surface of the roll 21, the area of which may be varied to a greater or less extent by a relatively vertical movement of the arms 23 and a similar horizontal movement of the guide or roller 30.

The regulation of the quantity of the coating applied to the web is obtained by adjusting the speed of the coating applying surface relatively to the rate of travel of the web. At one side of the machine the end of the shaft 21ª projects beyond its bearing and is provided with a disk 41 having an outer plane surface with which engages a frictional driving member 42, mounted upon the end of a shaft 43, supported in bearings 44 between which it is connected to a pinion 45 meshing with a corresponding pinion 46, on a gear wheel 47. The latter is driven by a pinion 48 which in turn meshes with a gear wheel 49 on a driving shaft 50, operated by any suitable motor device. In order to permit the driving member 42 to be adjusted relatively to the center of the disk 41, to permit the speed of the roller 21 to be varied accordingly, the shaft 43 is splined to the pinion 45 and at its outer end is provided with an arm 55 with which engages an adjusting screw 56 by means of which the shaft may be moved longitudinally in its bearings. The upper end of the arm carries a scale bar 57 provided with indices corresponding to the volume of the coating material transferred by the surface of the roller 21 to the web when operating upon one or another of the given speeds indicated thereby. Engaging against the rear side of the disk 41 is a roller 157, (shown in dotted lines in Fig. 3) arranged in approximate alinement with the driving member 42, and supported upon an arm 58, pivoted on the frame, which is movable laterally by means of a set screw provided with an operating handle 59. The roller 157 abutting against the rear face of the disk forms a stop which serves to position the roller 21 between its bearings and also to prevent the disk 41 from springing and thus reduce its frictional engagement with the driving member 42.

The surface over which the web of paper is passed after the coating has been applied thereto is preferably located above the coating roller and coöperates with the face of the paper to which the coating has not been applied to disperse the latter through the fibers of the paper. In the present instance the surface comprises a hollow cylinder 60, secured to a shaft 61 having its ends journaled in bearings 62. The cylinder is preferably driven at the same surface speed as the web and to make this action positive the shaft 61 is provided at one end of a gear wheel 63 which is driven by an idler 64 meshing with a gear wheel 65 actuated by the gear wheel 47. On the side pieces of the frame of the machine at each end of the drum or cylinder 60 are quadrant-shaped frames 66 and supported thereon are a plurality of brackets 67 provided with slots, arranged radially of the center of the cylinder 60, adapted to receive bars 68 provided with brush faces 69, composed of strips of felt or other suitable material, adapted to assist in distributing the coating on the paper as the web passes over the dispersing surface. The brush bars 68 are removably secured in the brackets by set screws or other fastening devices 70 and one or more of them may be employed as circumstances may require. These brushes engaging the outer face of the web, on which the coating is applied, serve to distribute it evenly between the two edges of the web.

In the applications of coatings of certain materials, such as wax paraffin, it is necessary in order to keep the coating in liquid form to maintain it in a heated condition before it is applied to the paper and the coating process is perfected greatly by retaining it in this condition for a short time after its application to the paper, as the latter is more thoroughly impregnated facilitating the even distribution of the coating. For this reason the coating applying roller 21 and the dispersing cylinder 60 are both heated internally, similarly to the pan or tray 9, by steam supplied from the pipe 75 and discharged and exhausted through the pipe 76, said pipes being connected respectively to inlet passages 77 and outlet passages 78, provided in the ends of the shafts 21ª and 61, by means of stuffing boxes or glands 79, all as shown in Fig. 3. In an apparatus of this character employing steam heated rolls considerable inconvenience is experienced by the condensation occurring therein and to obviate this difficulty I provide the outlet passage 78, in each cylinder with a tubular extension 80 projecting into proximity with the inner surface of the cylinder and provided with a rearwardly extending end 81, as shown in Fig. 4. The latter is preferably curved slightly, so that when a sufficient volume of the water of condensation has accumulated in the cylinder to cover it, as the cylin-

der is revolved, the outlet orifice of the passage will be trapped, or closed momentarily, a sufficient length of time to permit the steam in the cylinder to expand and drive the water outwardly through the exhaust passage, this action occurring automatically, as will be understood. The cylinder 60 is preferably made relatively larger in diamter than the coating applying roller, to provide a comparatively large surface of contact with the web which may be increased, if desired, by passing the latter beneath a guide 82 supported at its ends in brackets 83.

The setting or hardening of the coating is accomplished after it has impregnated the paper by passing the web over a revoluble chilling cylinder 84, supported upon a shaft 85 journaled in suitable bearings on the frame. The cylinder is provided with an internal concentric drum 86 to form an annular chamber 87 which is supplied with a cooling liquid, such as ice water, from a supply pipe 88 connected to an inlet passage at one end of the shaft 85, the circulation of the liquid being obtained by connecting the outlet passage, at the other end of the shaft 85 with a return pipe 89. Arranged in the supply pipe 88 is a pump, comprising a cylinder 90 and the piston 91 reciprocated by a lever 92, operated by an eccentric 93 mounted on a shaft 94, as shown in Fig. 1, which is driven by a belt or other suitable connection 95 from a pulley 96 on the driving shaft 50. The location of the chilling cylinder beneath that portion of the web extending rearwardly toward the re-winding or drawing devices enables it to act upon the inner surface of the paper so that the coating applied to the outer surface is set or hardened in the condition in which it remains after leaving the dispersing cylinder and the brushes coöperating therewith. Extending the web forwardly, from the supply roll, operating upon it in the manner described and carrying its end rearwardly enables the machine to be made in compact form. In locating the chilling surface beneath the upper rearwardly extending portion of the web, it is desirable to protect the underlying portion thereof from injury by the drippings of the moisture condensed upon the exterior of the chilling roll 84, under certain atmospheric conditions; there is located beneath said cylinder an apron or drip pan 97 which is supported between the sides 1 and 2 of the frame.

If desired, the coating machine may be provided with suitable printing mechanism coöperating with the paper before the coating is applied thereto and in the present instance these parts comprise a printing cylinder 98, and an impression cylinder 99 cooperating therewith, over which the web is passed. Any suitable form of inking device may be employed, such as an ink roller 100, transfer roller 101, and a font 102, the ink being transferred from the font to the roller 100 by means of a carrier 103 mounted on a rock arm 104 operated intermittently by a cam 105 on a gear wheel 106 secured to the shaft 85 which also serves to rotate the chilling cylinder 84, by engagement with the pinion 107 rotated by the gear wheel 65. The impression cylinder 99 and the inking rollers 100 and 101 are rotated by a train of gear wheels *a*, *b*, *c*, *d* and *e*, the last mentioned one of which meshes with the gear wheel 65, as shown in Fig. 2. The printing cylinder 98 is driven by a gear wheel *f* engaging a similar gear wheel *g*, attached to the cylinder 99, said gear wheels being indicated in dotted lines in Fig. 2. Suitable guides 108 and 109 are arranged at opposite sides of the impression cylinder 99 and at the side of the latter, from which the web approaches, an adjustable tension device is also provided comprising bars 110 carried upon pivoted arms 111 which may be rotated into the desired position. A tension device is also applied to retard the roll 5 comprising a disk 112 provided with an annular V-shaped notch or channel in which engage correspondingly shaped edges of friction blocks 113, carried upon arms 114—115, of a yoke secured to the side piece 2 of the frame. The arm 115 is pivoted at one end and its opposite extremity is connected to the arm 114 by a bolt 116 and it may be adjusted relatively thereto by a nut 117.

The re-winding shaft 7 is provided with the gear wheel 8, as before mentioned, which is driven positively, relatively to the speed of the cylinders 60 and 84, by means of gear wheels 118 and 119, the latter meshing with a gear wheel 120 attached to one end of the shaft 85, of the cylinder 84. For convenience in assembling the parts of the machine and adapting other devices thereto the gear wheel 118 is supported upon a stud 125 adjustable in a longitudinally extending slot 126 in an arm 127, which is pivoted to the side frame 2 at the point 128 and is secured in adjusted position thereon by a lock nut 129 on a bolt projecting through a segmental aperture 130, as shown in Fig. 1.

Instead of re-winding the web on the shaft 7 the latter may be omitted and suitable sheet cutting devices arranged at the rear side of the frame and supported upon brackets 131. These devices comprise a guide 132, a roller 133, a cutting blade 134 and a revoluble shear 135, supported upon a shaft 136 and counterbalanced by a weight 137. When these devices are employed the shaft 7 is omitted and the web is extended around the guide 132, over the roller 133, as shown in dotted lines in Fig. 4, it being held in engagement with the latter by an adjustable pressure roll 138. The roller 133

is provided with a pinion 139 driven by a gear wheel 140 (shown in dotted lines in Fig. 1) meshing with the gear wheel 118. The shaft 136 carrying the shear is provided with a gear wheel meshing with the gear wheel 141, to which a rotary movement is transmitted, from the pinion 139, by an idler 142. In order to insure the true operation of the shear and prevent its racing, due to backlash between the gear wheels of the train of gears, the shaft 136 is provided with a disk 143 with which engage friction blocks on the adjustable arms of a yoke 144. When the shearing devices are employed, the sheets are delivered upon a traveling belt 145 having an end located between the brackets 131. When it is desired to cut the web into sheets, irrespective of the printed matter that may appear thereon, or to sever it into sheets of a predetermined length, if the paper is not printed, a cutting device, such as shown in Fig. 5, may be employed. This comprises brackets 145, adapted to be substituted in place of the brackets 131, provided at their upper ends with bearings supporting the axis of a drum 146 beneath which is guided a vertically movable cutting knife 147 operated into engagement with the roller by hand lever 148. The roll 146 when applied to the frame of the machine is located in the axial position of the gear wheel 140, shown in Fig. 1, and the gear wheel 149 attached to the roll is operated by the gear wheel 118 the position of which is altered from the position shown in Fig. 1, by an adjustment of the arm 127. In using this form of cutting mechanism each sheet will be of a length equal to, or greater than the diameter of the drum 146 according to the number of convolutions of the coated web wound thereon, and the operator may determine the number of sheets cut from the number of rotations of the drum.

The machine which I have shown may be employed for providing paper or other material with any suitable coating, but the arrangement of the parts which I have illustrated is particularly adapted for applying, spreading and setting a coating of wax or paraffin. The coating applying roller dipping into the bath may be rotated at a speed relative to the rate of travel of the paper and the quantity of the coating applied to the outer face of the paper may be regulated to a nicety. The dispersing surface cooperating with the inner face of the paper causes the wax or paraffin to thoroughly impregnate it when a light coating is applied thereto and when it is desired to apply a heavy coating an excess of the material will remain on the face of the paper. Further, the chilling surface also engaging the inner face of the paper coats the web and sets or hardens the coating thereon without direct engagement therewith.

I claim as my invention:

1. In a machine for paraffinizing paper, the combination with a coating material bath, a movable surface dipping therein, a surface for dispersing said material and a surface for chilling it, of means for guiding and drawing a web of paper over said surfaces successively to apply the material, impregnate the fibers of the papers therewith while in the liquid condition and then convert it into a solid state and devices for distributing the coating material as the web passes over the dispersing surface.

2. In a coating machine, the combination with means for guiding and drawing a continuous web of paper and a bath, of a movable surface transferring the bath material to one face of the web, a heated surface engaging the web and dispersing the bath material thereon and a chilled surface also engaging the web on its uncoated face to set the coating.

3. In a machine for coating paper, the combination with a bath for containing coating material, means for drawing and guiding a continuous web of paper in proximity to the bath, of a movable surface traveling in the bath and contacting with the web to transfer the coating material adhering thereto from said bath to the web, means for adjusting the area of contact of the web with said movable surface and another surface engaging the web to convert the coating from a liquid into a solid state.

4. In a coating machine, the combination with means for guiding and drawing a continuous web of paper, a bath for containing coating material and a roller dipping into the bath and applying the coating material to the web, of means for adjusting the area of contact of the web on the roller and adjustable driving devices for rotating the latter at variable speeds relatively to the movement of the web.

5. In a coating machine, the combination with means for guiding and drawing a continuous web of paper, a coating material bath and an applying roller rotating therein and contacting with one face of the paper, of a revoluble cylinder engaging the uncoated face of the web to retain the coating material in liquid condition, a cylinder also engaging the uncoated face of the web tc convert the coating material into a solid state and means for revolving the roller and cylinder, means for heating the bath, applying roller and dispersing cylinder and means for chilling the converting cylinder.

6. In a coating machine, the combination with means for guiding and drawing a continuous web of paper, a bath for containing liquid coating material and a roller therein contacting with the paper, of cylinders engaging the web for dispersing and setting the coating applied thereto, a driving mem-

ber, connection between it and the cylinders and adjustable connections between the member and the roller for varying the speed of the latter relatively to the movement of the web.

7. In a coating machine, the combination with a frame, means thereon for drawing a continuous web of paper, a tray for containing coating material and a revoluble roller dipping therein and conveying material to the web, of a guide around which the web is passed arranged at one side of the roller and means for adjusting it relatively to the roller to vary the area of contact of the web on said roller.

8. In a coating machine, the combination with a frame, means thereon for drawing a continuous web of paper, a tray for containing coating material and a revoluble roller dipping therein for applying coating material adhering thereto to the web, of a guide around which the web is passed, members on the frame supporting it, means for adjusting the members relatively to the roller and devices for adjusting the guide on the members said adjustments determining the area of contact of the web on the roller.

9. In a coating machine, the combination with a frame, means thereon for drawing a continuous web of paper, a tray for containing coating material and a revoluble roller dipping therein, of a guide around which the web is passed, bearing blocks supporting the guide and arms carrying the blocks, means for adjusting the arms on the frame relatively to the roller and devices for adjusting the blocks on the arms.

10. In a coating machine, the combination with a frame, means thereon for drawing a continuous web of paper, a tray for containing coating material and a revoluble roller dipping therein, of arms guided on the frame above the roller, a guide adjustably supported on the arms around which the web is passed and means for moving the arms relatively toward and from the roller.

11. In a coating machine, the combination with a frame, means thereon for drawing a continuous web of paper, a tray for containing coating material and a revoluble roller dipping therein, of arms guided on the frame above the roller, blocks movably supported on the arms and a guide mounted in the blocks and around which the web is passed, devices for adjusting the arms vertically and means for adjusting the guide horizontally.

12. In a coating machine, the combination with means for guiding and drawing a continuous web of paper and a bath for containing coating material, of means for applying said material to the web, a hollow chilling member having a surface coöperating with the web to set or harden the coating, a circulating pipe, a pump arranged therein and means for operating it.

13. In a coating machine for paraffinizing paper, the combination with a frame, a roller journaled thereon, a tray located beneath the roller containing liquid paraffin and means for adjusting it on the frame relatively to the roller, of a guide arranged above and in a vertical plane to one side of the turning axis of the roller around which a web of paper is passed, means for adjusting it toward and from the roller to cause a greater or less area of the web to contact with said roller, means for driving the roller and drawing a continuous web of paper over the roller and guide and means for heating the tray and roller.

14. In a coating machine, the combination with means for guiding and drawing a continuous web of paper and devices for applying a coating thereon, of a steam heated revoluble cylinder engaging the web comprising tubular journals one having an inlet port and the other an outlet port, said port being arranged in proximity to the inner surface of the cylinder.

15. In a coating machine, the combination with means for guiding and drawing a continuous web of paper and devices for applying a coating thereon, of a steam heated revoluble cylinder engaging the web comprising tubular trunnions forming inlet and outlet passages and a tubular extension on the outlet passage having a curved end lying in proximity to the inner surface of the cylinder and adapted to be closed by the water of condensation in the cylinder.

16. In a coating machine, the combination with a frame, supports at one end thereof for a roll of paper, guides at the other end of the frame around which the web of paper is passed and means for rewinding or drawing the web arranged above the roll supports, of coating devices coöperating with the web as it leaves the roll, a chilling surface engaging beneath the web and in front of the rewinding or drawing devices and an apron located beneath the chilling surface.

17. In a coating machine, the combination with a frame, a support thereon for a roll of paper, rewinding or drawing devices located above said support and guides around which the web of paper is passed forwardly from the roll and rearwardly to the rewinding or drawing devices, of means for applying a coating to the forwardly extending portion of the web, a chilling surface for setting the coating engaging beneath the rearwardly extending portion of the web and an apron arranged beneath the chilling surface.

18. In a coating machine, the combination with means for guiding and drawing a continuous web of paper, a bath and a roller

dipping therein and engaging the web, of a disk attached to the roller, a revoluble driven member engaging the face of the disk and adjustable relatively to the center thereof and an adjustable stop engaging the rear side of the disk to force it into engagement with the driving member.

19. In a coating machine, the combination with a frame, means thereon for guiding and drawing a continuous web of paper, a bath and a roller dipping therein and engaging the paper provided with trunnions journaled on the frame, of a disk attached to one of the trunnions, a revoluble driving member engaging the face of the disk, means for adjusting it relatively to the center of the disk and an arm pivoted to the frame and adjustable into engagement with the rear of the disk to hold it into engagement with the driving member.

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