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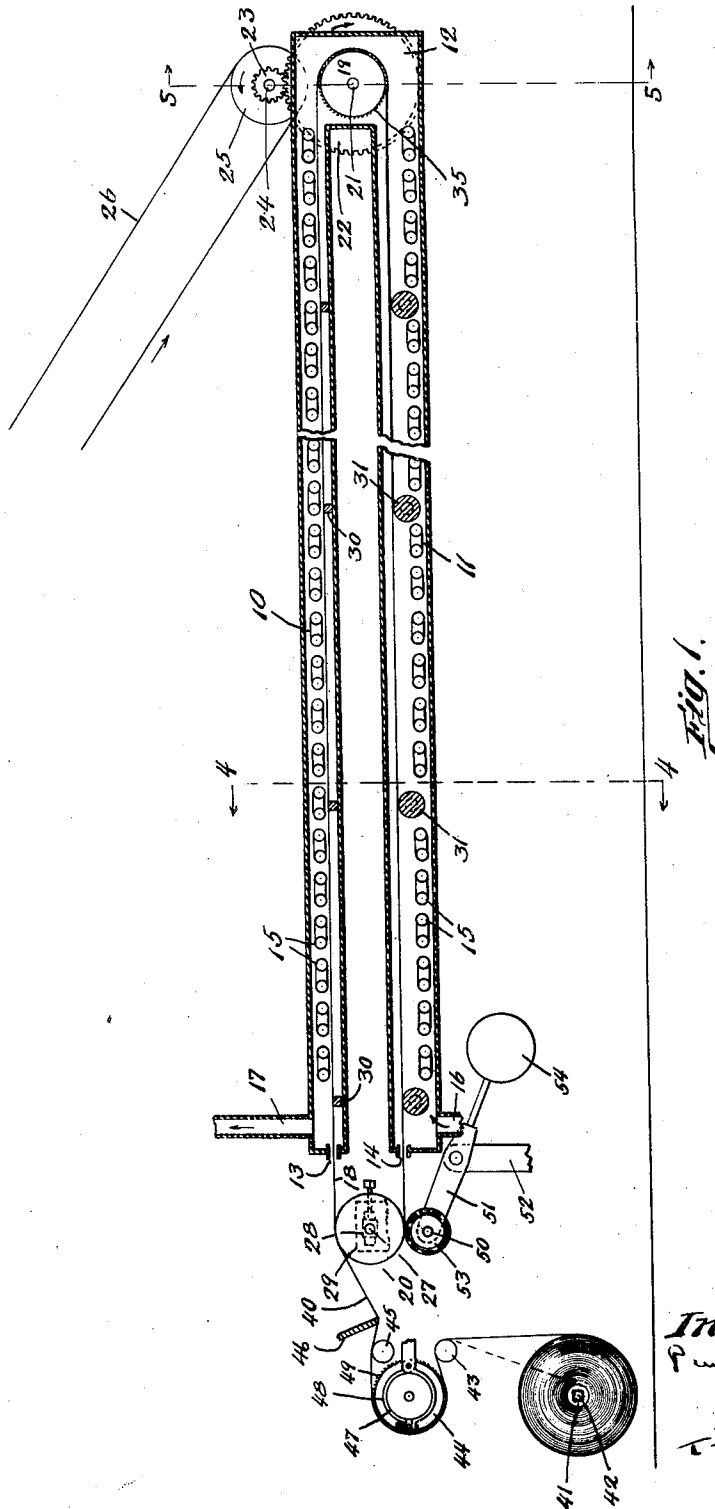
P. S. SMITH

1,551,913

APPARATUS FOR COATING AND DRYING FABRIC AND OTHER MATERIAL

Filed April 26, 1920

3 Sheets-Sheet 1



Inventor.
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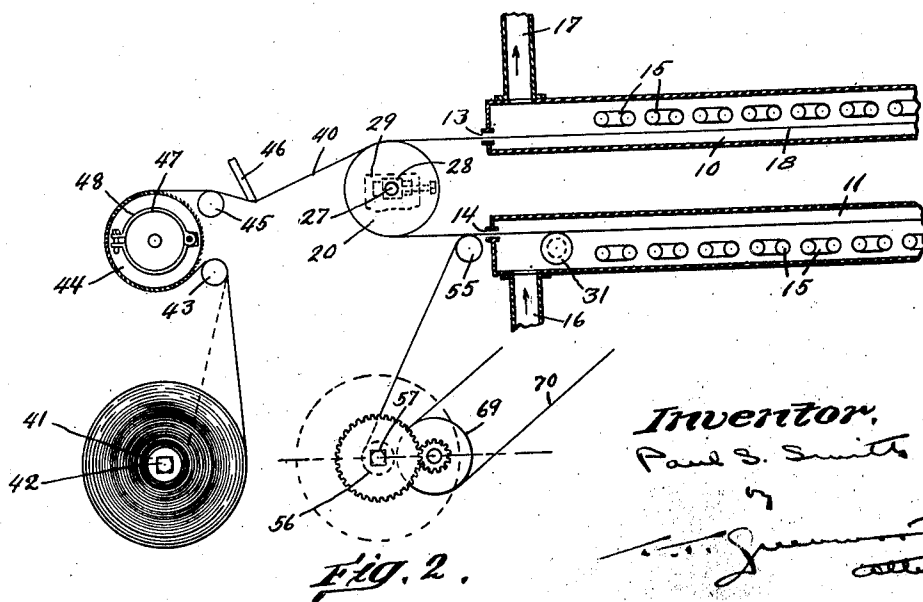
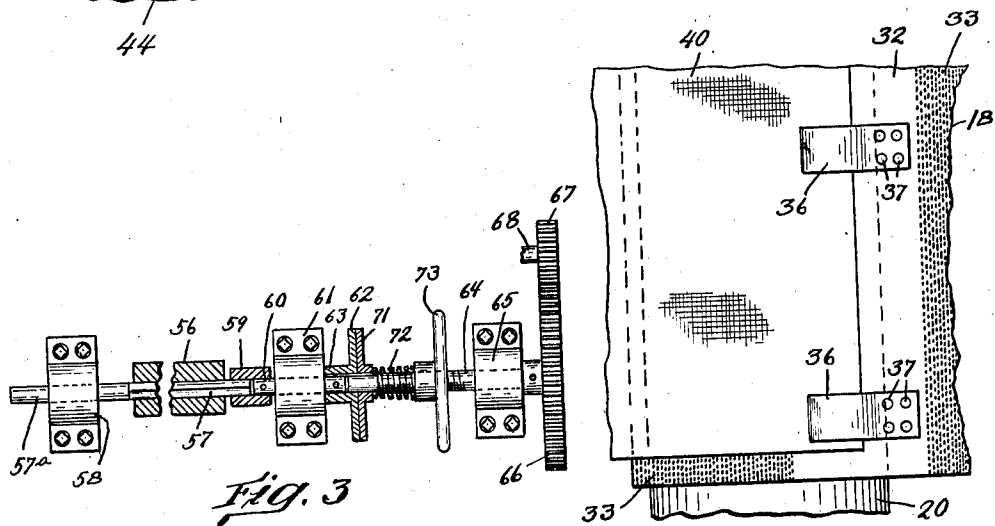
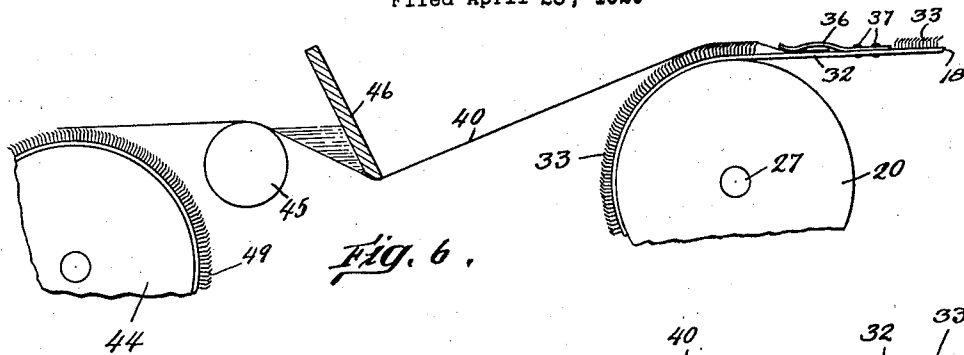
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3 Sheets-Sheet 3

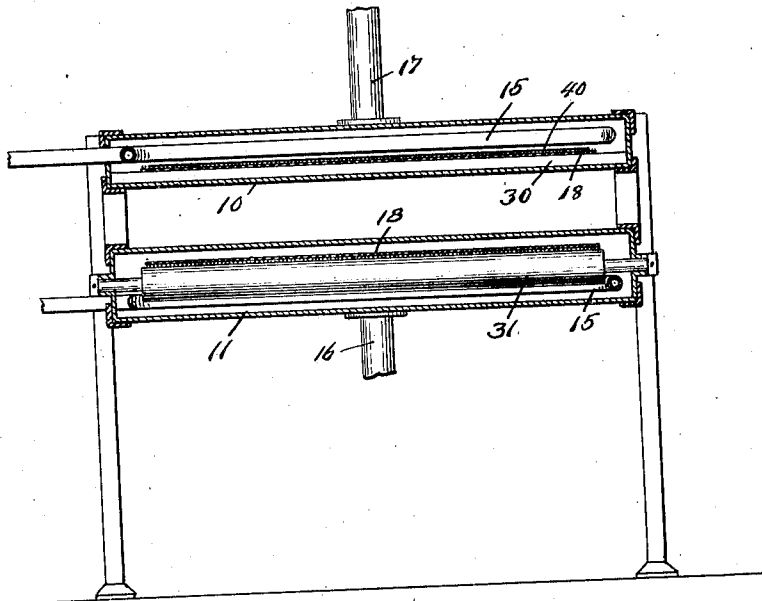


Fig. 4.

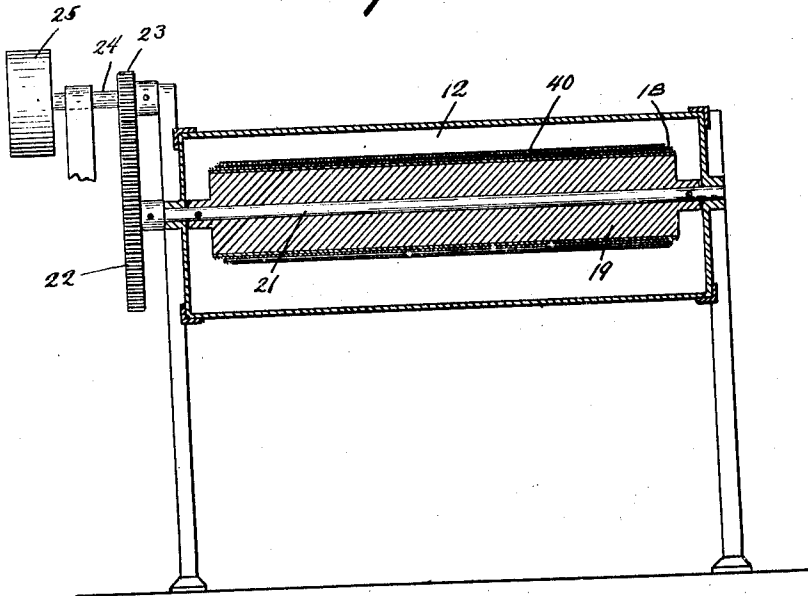


Fig. 5.

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UNITED STATES PATENT OFFICE.

PAUL S. SMITH, OF WEST BARRINGTON, RHODE ISLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO O'BANNON COMPANY, OF WEST BARRINGTON, RHODE ISLAND, A CORPORATION OF MASSACHUSETTS.

APPARATUS FOR COATING AND DRYING FABRIC AND OTHER MATERIAL.

Application filed April 26, 1920. Serial No. 376,531.

To all whom it may concern:

Be it known that I, PAUL S. SMITH, a citizen of the United States, residing at West Barrington, in the county of Bristol and State of Rhode Island, have invented an Improvement in Apparatus for Coating and Drying Fabric and Other Material, of which the following is a specification.

This invention relates to apparatus of the type set forth in my co-pending application, Serial #369,823, filed March 29, 1920, for coating and drying fabrics and other material in the web.

An object of this invention is to provide means, in combination with the drying chamber, and the coating and winding means, to receive the fabric as it passes from the coating means and support and transport it through the drying chamber and deliver it to the winding means, thereby to relieve the fabric from tension within the drying chamber and prevent the pulling-down or narrowing of the fabric.

The means by which this object is attained comprises an endless carrier-belt passed over supporting and driving rolls and through the drying chamber adapted to receive the coated material and transport it through the drying chamber to be dried.

A further object of the invention resides in the novel construction of the carrier-belt by which the fabric is securely held against slipping at all important points of contact.

A yet further object is to provide means whereby successive coatings may be applied to the web, practically without interrupting the continuity of the coating process.

Another object is generally to improve the construction and operation of coating and drying apparatus of the type set forth.

Fig. 1 is a diagrammatic side view of one embodiment of the invention with the drying chamber shown in section, and illustrating one form of take-off and winding means for the dry coated material.

Fig. 2 is a diagrammatic side view of the coating and delivery end of the apparatus, illustrating a modified form of take-off and winding means for the dry coated material.

Fig. 3 is a plan detail, partly in section, illustrating the friction driving means for the winding means of Fig. 2.

Fig. 4 is a vertical section through an in-

termediate portion of the drying chamber, along line 4—4 of Fig. 1.

Fig. 5 is a vertical section through the drying chamber and carrier-belt driving roll, along line 5—5 of Fig. 1.

Fig. 6 is a side detail of the tension roll, coating knife and receiving end of the carrier-belt, illustrating the character of the face of the tension roll and belt, and the manner of initially attaching the material to be coated to the belt.

Fig. 7 is a plan detail of the carrier-belt material-engaging means.

As here shown the drying and coating apparatus in which my invention is embodied includes the horizontal, U-shaped drying chamber having the upper drying section 10, the lower drying section 11, and the end connecting section 12. The wet coated material is introduced within the end of the upper section through the inlet slot 13 and the dry coated material is removed from the end of the lower section through the exit slot 14; and the receiving and delivering ends are at the same side of the drying chamber. Pipe coils or other suitable heating means 15 are arranged in the top of the upper section to be over the coated material, and in the bottom of the lower section to be beneath the coated material, whereby to assist in drying the coating. A pipe 16 in communication with the interior of the lower section of the drying chamber near its exit end serves to admit a current of dry air therein which is adapted to circulate along the coated material counter to its direction of traverse through the drying chamber to abstract the solvent from the coating; and the solvent-charged air finally passes from the upper section of the drying chamber through the pipe 17 in communication therewith near its inlet end.

So far as this invention is concerned, the means by which the drying air is circulated through the drying chamber and the recovery of solvent therefrom subsequently effected, is of no particular importance. Either an open or a closed air circulatory system and a solvent recovery system as illustrated in my above-named co-pending application may be employed with advantageous results.

An important component of my invention

is the endless carrier-belt 18 on which the coated material is adapted to be received as it passes from the coating device and by which it is supported and transported 5 through the upper and lower sections of the drying chamber and carried into position for delivery to the winding device. A carrier-belt driving roll 19 is disposed within the end-connecting section 12 of the drying chamber and has such a diameter as to extend beyond the level of the bottom and top walls of both sections of the drying chamber, and an idler roll 20 of similar diameter is rotatably supported without the 10 drying chamber adjacent the inlet and delivery ends thereof. The carrier-belt is passed over said rolls and through the inlet slot 13 and exit slot 14 of the drying chamber. Said driving roll has a length equal to 20 and preferably somewhat greater than the width of the carrier-belt and is fixed to the shaft 21 which is journaled in the side walls of the drying chamber and has an end thereof extended beyond a side wall. A gear 22 is fixed to said extended end and said gear meshes with a pinion 23 fixed to the driving shaft 24 which is rotatably supported in suitable bearings. As a convenient means for driving said shaft 24, a pulley 25 is 30 fixed thereto over which the driving belt 26 is passed and which is adapted to be driven by some power source not shown.

The arrangement above set forth provides speed-reducing means for driving the carrier-belt at a suitable rate. 35

The idler roll 20 is fixed to a shaft 27 journaled in bearings 28 which are slidably arranged in the supporting member 29 whereby the carrier-belt may be adjusted 40 for proper tension.

The carrier-belt is supported within the upper section of the drying chamber above the bottom walls thereof by suitable supporting means herein illustrated as the 45 spreader-bars 30 which are of suitable height and are suitably spaced-apart along the bottom wall of the section. In the lower section the rollers 31 are provided for the same purpose, the rollers, however, engaging and supporting the coated material 50 during its traverse through the lower section and, through the material, supporting the carrier-belt.

It is to be noted that a free passage of 55 drying air through the lower chamber is provided by spacing the supporting rollers from the bottom wall of the section and, furthermore, the rollers do not extend entirely across the section (see Fig. 4) by 60 which additional space is provided for passage of drying air.

While I may employ a carrier-belt composed of canvas or otherwise so constructed as to serve to support and transport the 65 coated material through the drying cham-

ber, I prefer to construct the belt so that it positively will engage the material equally throughout its width as it is received thereon. As a means for accomplishing this result, I cover the entire supporting surface 70 of the carrier-belt with the exception of a short portion of its length at 32 with a card-cloth having a plurality of wire teeth 33 arranged in close order in rows over the entire width of the belt and adapted to receive 75 and support the coated material and having their terminal or material-engaging portions angularly bent or inclined in the direction of travel of the belt. Such construction is clearly indicated in Fig. 6. By this 80 arrangement, each tooth will firmly engage the material whereby the material will be engaged and supported throughout its width but the teeth will not protrude through the material to injure the coating. 85 Furthermore, by reason of the teeth, some circulation of air on the under side of the coated material may take place which will aid in drying the coating.

The driving roll 19 also has its face 90 covered with a card-cloth covering 35 with the teeth inclined in the direction of rotation of the roll by which the carrier-belt will be positively engaged and rotated.

A series of spring clips 36 are disposed 95 along the width of the carrier-belt, on the clear portion 32 thereof, being fixed to the belt by the rivets 37 or other suitable means and serve releasably to engage and hold 100 the end of the material to be coated at the start of the coating operation whereby the material will be initially carried through the drying chamber.

The material 40 to be coated is initially 105 wound in a roll on the shell 41 which has an axial hole therethrough, through which the supporting shaft 42 is removably extended. Said shaft is adapted also to be removably supported in bearings not shown. The material is extended from its roll, over the 110 lower idler roll 43, about the tension roll 44 suitably supported in bearings not shown, the upper idler roll 45 and under the coating knife or doctor blade 46 to the carrier belt. The idler rolls serve to provide a considerable arc of contact between the material and the tension roll and the upper idler roll 115 also serves to support the material under the coating knife. The tension roll is provided with the brake drum 47 and band 48 by 120 which the tension of the material under the coating knife may be adjusted. The face of the tension roll also is provided with the card-cloth coating 49 with the teeth thereof inclined oppositely to the direction of 125 travel of the material whereby the more firmly to engage and hold the fabric and maintain a uniform tension.

The space between the tension roll and the receiving end of the carrier belt is com- 130

paratively short and as the material to be coated is in tension only over this space, being otherwise free from tension, the pulling-down or narrowing effect of the fabric is inappreciable.

As the coated material passes from the lower section of the drying chamber in dry form it is removed from the carrier-belt and wound into a roll; and in Fig. 1 there is illustrated one arrangement by which this result is accomplished. A shaft 50 is rotatably supported in the arms 51 arranged on each side of and below the carrier-belt at the delivery end of the drying chamber and pivoted to the support 52 and the shell 53 on which the roll of dried coated material is to be wound is removably received thereon. Said arms 51 extend beyond said support 52 and have the counter-balance weight 54 preferably adjustably received on said extension by which said roll is maintained in contact with the carrier belt, preferably at the point where it passes about the idler roll 20, and is driven thereby as the material is wound thereon, the drive being through the wound material. By this arrangement, the peripheral speed of winding the roll will be that of the delivery of dried coated material to the roll.

Whereas in Fig. 1 the winding roll is actuated by the carrier belt, for some purposes it will be desirable to employ other winding means and in Fig. 2 a modified form of winding means is illustrated.

In this modification, a guide roll 55 is disposed beneath and in supporting position with the carrier-belt at the exit end of the drying chamber. The dry coated material, as it emerges from the drying chamber, is removed from said belt and passed downwardly over said roll to a shell 56 on which it is to be wound arranged in the winding device.

Said shell has a square axial bore which is received over the correspondingly squared portion of the shaft 57 by which it is rotated. Said shaft is arranged to permit the removal of the roll of wound material from the winding device; and the winding device is arranged to drive the roll of material at a uniform peripheral speed as the material is being wound in the roll. To admit of this result the shaft is formed with the cylindrical end-bearing portion 57^a which is rotatably and removably supported in the supporting bearing 58; and the opposite and square end of the shaft is removably received in a square recess in the end-portion 59 of the shaft 60, which latter is rotatably supported in the bearing 61. A clutch member having the outwardly extended flange 62 formed with a clutching surface and the hub 63 is received on the end of said shaft 60 on the other side of said bearing 61. Said hub 63 extends beyond the end of said shaft

to form a bearing for the power-actuated shaft 64, supported in the bearing 65. A gear 66 is fixed to said shaft and meshes with a pinion 67 fixed to the counter-shaft 68 suitably supported in bearings, not shown. A pulley 69 is fixed to said shaft over which the driving belt 70 is extended and by which the winding mechanism is actuated.

A second clutch member 71 adapted to frictionally engage the clutch member 62 is slidably received on but connected for rotation with said shaft 64 and is pressed into frictional engagement with said other clutch-member by the spring 72 encircling said shaft and bearing against the hub of the hand-wheel 73. Said hand-wheel is screw-threaded on said shaft, and, by rotating it on the shaft, the tension of the spring 72, and consequently the frictional engagement of the clutch-members may be adjusted, whereby the winding tension may be varied.

The driving belt 70 is arranged to drive the shell 56 at a somewhat greater peripheral rate than the rate at which the material is delivered to the winding mechanism for winding, the difference being compensated for by the slipping of the clutch; and as the roll of material increases in diameter, the slipping will increase.

After the web of material has been coated and wound on the shell 56 and the winding apparatus stopped, the wound roll may be disconnected from the apparatus by removing the shaft 57 from the shell and its supporting bearings; and the roll may be taken away.

It is sometimes desirable to apply successive coatings to the material and for this purpose the wound roll of coated material, removed from the winding apparatus, may be turned end for end and placed between the supporting bearings, not shown, for the shaft 42 and said shaft inserted through the bore of the shell 56 and in its bearings. The web is then again threaded through the machine. Due to the proximity of the supporting devices for the material to be coated and the coated material, the transfer of the roll of material from one position to the other requires but a short amount of time whereby the coating process is practically continuous.

The operation of the machine is as follows:

A roll of material to be coated, wound on the shell 41, is placed on the shaft 42 and the free end of the material is carried successively about the roll 43, the card-cloth covered tension-roll 44, the roll 45, under the coating knife 46 and secured under the spring-clips 36 of the carrier belt, which will have been so moved that said clips are exposed on the upper stretch of the belt be-

tween the idler roll 20 and the inlet end of the drying chamber. Suitable tension is then applied to the material by turning the tension-roll 44 by hand in a direction opposed to the direction of movement of the material and adjusting the brake to the desired degree. A mass of coating substance is then placed on the material in front of the coating knife and the carrier belt is set in motion.

The coated material is thereby transported by the belt through the upper section of the drying chamber, about the carrier-belt driving roll 19, and through the lower section of the drying chamber over the rolls 31 and issues from the chamber through the exit slot 14. The end of the material is then detached from the spring clips and passed about the shell 53, Fig. 1, or over the roll 55 and about the shell 56, Fig. 2, preferably without stopping the machine, and the material is wound thereon. When the entire web of material has been passed through the drying chamber, the machine is stopped and the roll of coated material is transferred to the first position or removed and a roll of uncoated material placed in position for coating and the operation is repeated.

I claim:

1. In a coating and drying apparatus for material in the web, the combination of coating means for the material, receiving means for the dry coated material, a U-shaped horizontally arranged drying chamber, and means to receive the coated material from the coating means and transport it through the drying chamber and deliver the dry coated material to the receiving means.

2. In a coating and drying apparatus for material in the web, the combination of coating means for the material, a drying chamber having an upper inlet slot and a lower exit slot on the same side thereof, a winding roll adjacent the exit slot to receive the dry coated web, and an endless carrier belt extended through said slots into the drying chamber arranged to receive the wet coated web from the coating means and transport it through the entrance slot into the drying chamber and through and out of the drying chamber through the exit slot and into direct contact with said winding roll.

3. In a coating and drying apparatus for material in the web, the combination of coating means for the material, a drying chamber, winding means for the dry coated material and means to receive the coated material from the coating means and transport it through the drying chamber and deliver the dry coated material to the winding means, comprising a carrier belt extended between the coating and winding means and

through the drying chamber, said carrier belt having a plurality of web-engaging teeth extended transversely across said belt.

4. In a coating and drying apparatus for material in the web, the combination of coating means for the material, a drying chamber, winding means for the dry coated material, means to receive the coated material from the coating means and transport it through the drying chamber and deliver the dry coated material to the winding means, comprising a carrier-belt extended between the coating and winding means and through the drying chamber, said carrier-belt having a plurality of web-engaging teeth extended transversely across it, and driving means for the carrier-belt comprising a driving roll having a plurality of teeth on the periphery thereof which are arranged to engage said carrier-belt.

5. In a coating and drying apparatus for material in the web, the combination of coating means for the material, winding means for the coated material, a drying chamber having horizontal superimposed upper and lower drying sections, a horizontal endless carrier-belt extended between supporting rolls through said sections adapted to receive the wet coated material and transport it through the upper section and thence through the lower section of the drying chamber and deliver the dry coated material to the winding means.

6. Drying apparatus for material in the web including web-receiving means, a drying chamber having horizontal superimposed upper and lower drying sections, a horizontal endless carrier-belt having its upper portion extended through the upper section and its lower portion extended through the lower section of the drying chamber adapted to receive wet coated material on its upper portion and carry it through the sections of the drying chamber and deliver it to said web-receiving means, and means to support the material on the lower portion of the belt in its passage through the lower section of the drying chamber.

7. Drying apparatus for material in the web including a drying chamber having horizontal superimposed upper and lower drying sections, a horizontal endless carrier-belt having its upper portion extended through the upper section and its lower portion extended through the lower section of the drying chamber adapted to receive wet coated material on its upper portion and carry it through the sections of the drying chamber, and means to support the material and also the carrier belt in its passage through the lower section of the drying chamber.

8. In a coating and drying apparatus for material in the web, the combination of coating means for the material, winding

means for the dry coated material, a drying chamber having upper and lower superimposed horizontal drying sections with adjacent inlet and exit ends and an end connecting section, a carrier-belt supporting roll disposed without and adjacent the inlet and exit ends of the sections, a second supporting roll disposed in the end-connection section and an endless horizontal carrier belt extended over said rolls through said sections adapted to receive the wet coated material from the coating means and transport it through the drying chamber and deliver the dry coated material to the winding means.

9. In a coating and drying apparatus for material in the web, the combination of coating means for the material, winding means for the dry coated material, a drying chamber having upper and lower superimposed horizontal drying sections with adjacent inlet and exit ends and an end-connecting section, a carrier-belt supporting roll disposed without and adjacent the inlet and exit ends of the sections, a carrier belt driving roll disposed in the end-connecting section, and an endless horizontal carrier-belt extended between said rolls through said upper and lower sections of the drying chamber adapted to receive the wet coated material from the coating means and transport it through the upper section and thence to the lower section of the drying chamber and deliver it to the winding means.

10. In a coating and drying apparatus for material in the web, the combination of coating means for the material, winding means for the dry coated material, a drying chamber having upper and lower superimposed horizontal drying sections with adjacent inlet and exit ends and an end-connecting section, a carrier-belt supporting roll disposed without and adjacent the inlet and exit ends of the sections, a carrier-belt driving roll disposed in the end-connecting section, and an endless horizontal carrier-belt extended between said rolls through said upper and lower sections of the drying chamber adapted to receive the wet coated material from the coating means and transport it through the upper section and thence to the lower section of the drying chamber and deliver it to the winding means, and rollers arranged in the lower section to support the material and the belt in its passage therethrough.

11. In a drying and coating apparatus for material in the web, devices adapted to engage the web to cause it properly to pass through the apparatus characterized by having material engaging surfaces formed of a plurality of closely-spaced projecting teeth arranged to extend substantially across the width of the web.

12. In a drying and coating apparatus for

material in the web, devices adapted to engage the web to cause it properly to pass through the apparatus characterized by having material engaging surfaces formed of a plurality of closely-spaced projecting teeth inclined to the surface presented by them.

13. In a drying and coating apparatus for material in the web, the combination of supporting means for a roll of uncoated material, coating means for the material, a drying chamber, winding means for the dry coated material, an endless carrier-belt adapted to carry the coated material through the drying chamber, and supporting and driving rolls for said belt, said driving roll characterized by its belt-engaging surface formed of a plurality of closely spaced-apart projecting teeth.

14. In a drying and coating apparatus for material in the web, the combination of supporting means for a roll of uncoated material, coating means for the material, a drying chamber, winding means for the dry coated material, an endless carrier-belt adapted to carry the coated material through the drying chamber, and supporting and driving rolls for said belt, said driving roll characterized by its belt-engaging surface formed of a plurality of closely spaced-apart projecting teeth inclined to the surface of the roll.

15. In a drying and coating apparatus for material in the web, the combination of supporting means for a roll of uncoated material, coating means for the material, a drying chamber, winding means for the dry coated material, and a carrier-belt adapted to receive the wet coated material from the coating means and transport it through the drying means to the winding means characterized by having a material-supporting surface comprising a plurality of closely spaced projecting teeth.

16. In a drying and coating apparatus for material in the web, the combination of supporting means for a roll of uncoated material, coating means for the material, a drying chamber, winding means for the dry coated material, and a carrier belt adapted to receive the wet coated material from the coating means and transport it through the drying means to the winding means characterized by having a material-supporting surface comprising a plurality of closely spaced projecting teeth inclined to the surface of the belt.

17. In a drying and coating apparatus for material in the web, the combination of supporting means for a roll of uncoated material, coating means for the material, a drying chamber, winding means for the dry coated material, and a carrier-belt adapted to receive the wet coated material from the coating means and transport it through the drying means to the winding means charac-

terized by having a material-supporting surface covered with card-cloth.

18. In a coating and drying apparatus for material in the web, the combination of coating means for the material, winding means for the dry coated material, a U-shaped horizontally arranged drying chamber having adjacent inlet and exit slots, and an endless carrier belt arranged to receive the coated material and transport it through the inlet slot into the drying chamber and through and out of the drying chamber through the exit slot thereof and deliver it to the winding means.

19. In a coating and drying apparatus for material in the web, the combination of coating means for the material, a drying chamber, a carrier belt arranged to receive the wet coated material and transport it into and through the drying chamber to be dried and out of the drying chamber for delivery to a winding roll, and a winding roll for the dry coated material arranged in direct contact with the material on the carrier belt.

In testimony whereof, I have signed my name to this specification.

PAUL S. SMITH.