Jan. 18, 1938. P. J. MASSEY ET AL 2,105,488

APPARATUS FOR APPLYING MOBILE FILMS

Filed Sept. 11, 1935 4 Sheets-Sheet 1

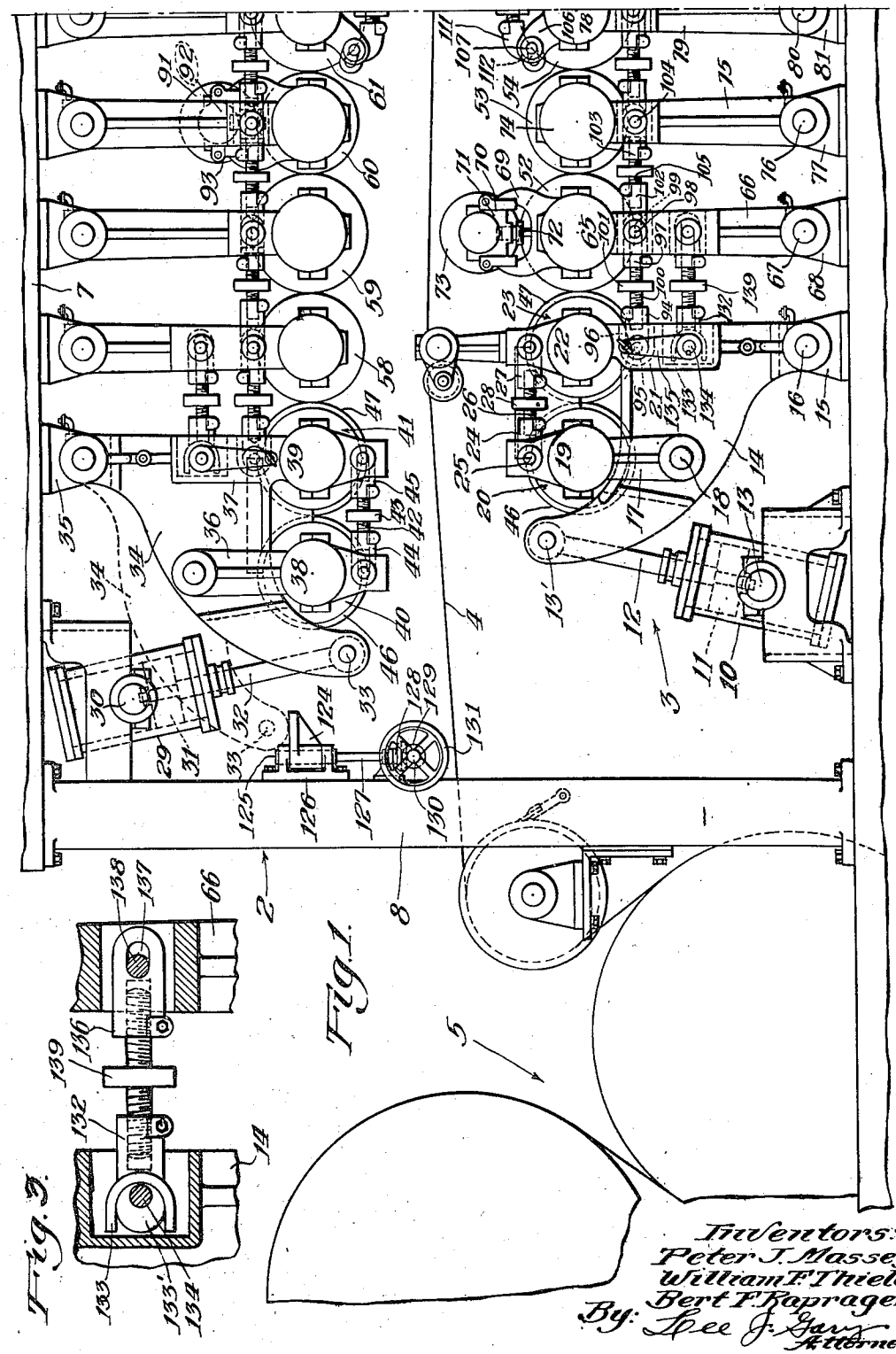

Fig. 1.

Fig. 3.

Inventors:
Peter J. Massey,
William F. Thiele,
Bert F. Koprager.
By: Lee J. Gary
Attorney

Jan. 18, 1938. P. J. MASSEY ET AL 2,105,488

APPARATUS FOR APPLYING MOBILE FILMS

Filed Sept. 11, 1935 4 Sheets-Sheet 2

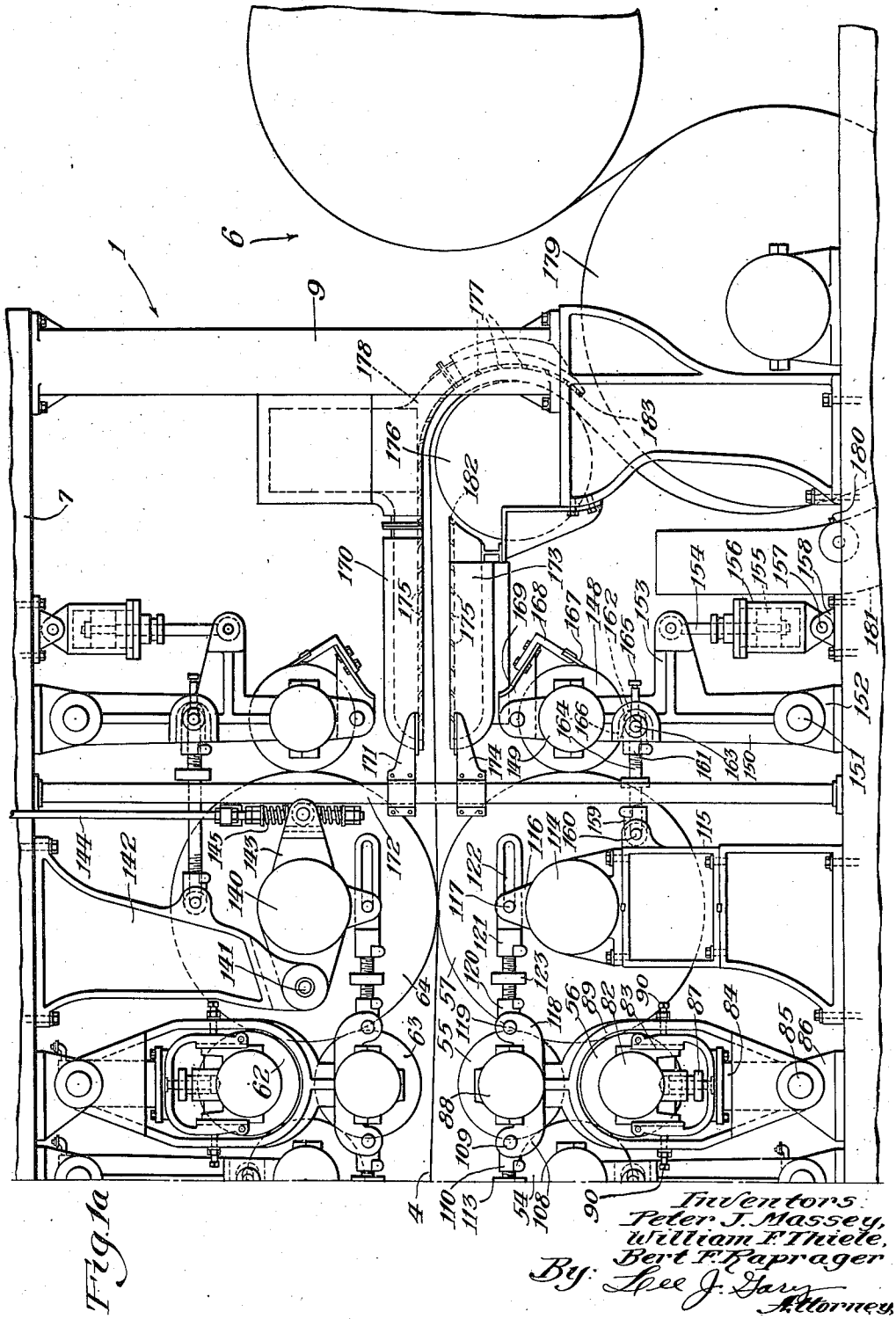

Fig. 1a

Inventors
Peter J. Massey,
William F. Thiele,
Bert F. Paprager
By: Lee J. Gary
Attorney

Jan. 18, 1938. P. J. MASSEY ET AL 2,105,488

APPARATUS FOR APPLYING MOBILE FILMS

Filed Sept. 11, 1935 4 Sheets-Sheet 3

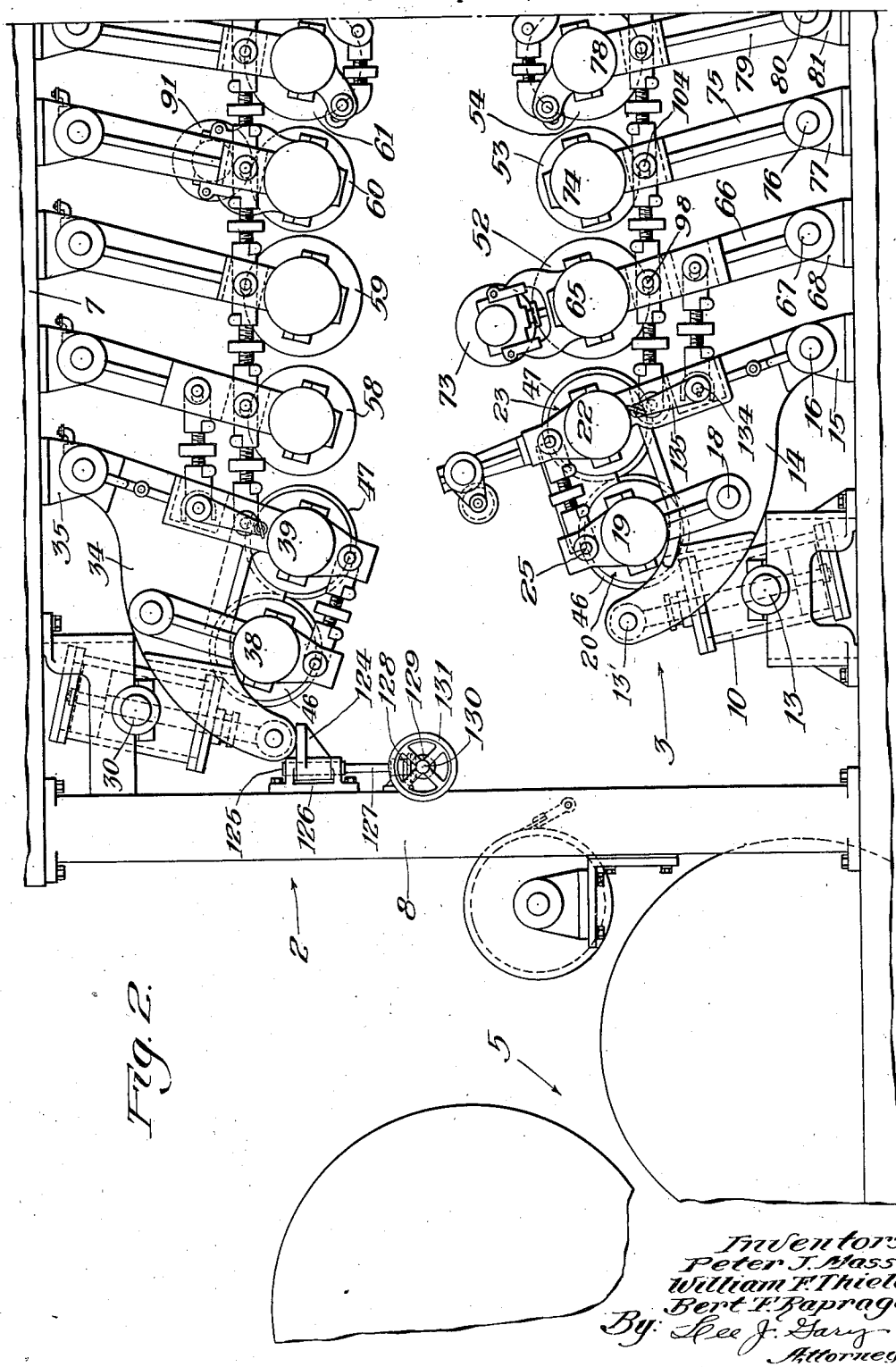

Fig. 2.

Inventors:
Peter J. Massey
William F. Thiele.
Bert F. Baprager.
By: Lee J. Gary
Attorney:

Jan. 18, 1938. P. J. MASSEY ET AL 2,105,488

APPARATUS FOR APPLYING MOBILE FILMS

Filed Sept. 11, 1935 4 Sheets-Sheet 4

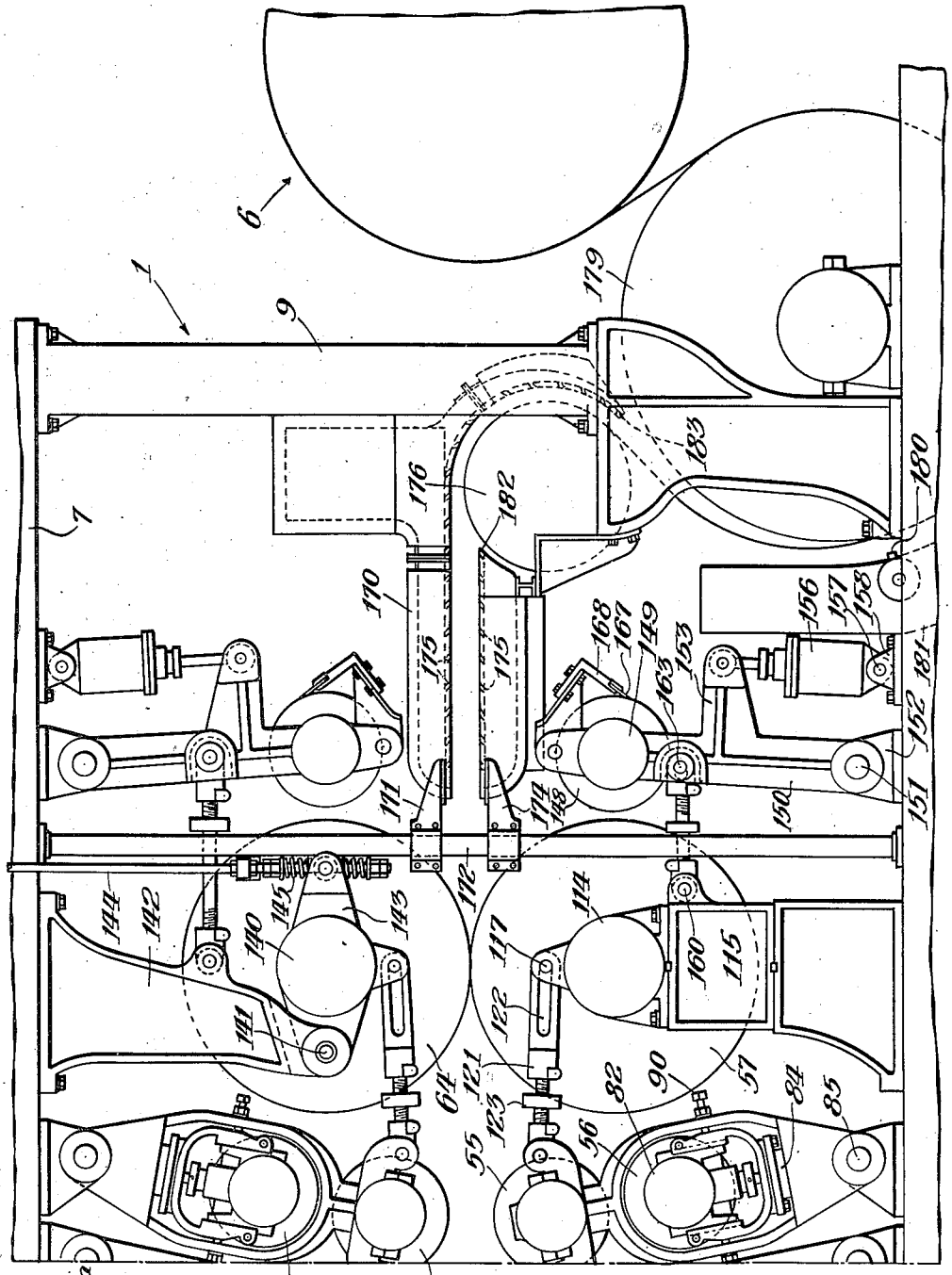

Fig. 2a

Inventor:
Peter J. Massey,
William F. Thiele,
Bert F. Kaprager
By: Lee J. Gaus
Attorney

Patented Jan. 18, 1938 2,105,488

UNITED STATES PATENT OFFICE

2,105,488

APPARATUS FOR APPLYING MOBILE FILMS

Peter J. Massey, River Forest, Ill., and William F. Thiele and Bert F. Raprager, Wisconsin Rapids, Wis., assignors, by mesne assignments, of nine-tenths to Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., a corporation of Wisconsin and one-tenth to Peter J. Massey, Chicago, Ill.

Application September 11, 1935, Serial No. 40,151

10 Claims. (Cl. 91—50)

This invention relates to improvements in a liquid or semi-liquid film working and smoothing device, and refers specifically to a system of distributing rolls so arranged as to permit accurate control of the thickness and distribution of such a film, the arrangement being characterized in that the rolls may be adjusted, cleaned, repaired etc., with the expenditure of a minimum of time and labor.

In many processes wherein films of liquid or semi-liquid material are applied by means of rolls to flat surfaces, such as the surfaces of moving flexible webs, the liquid or semi-liquid film prior to application to said surface must be worked, and smoothed so that the film when applied to the surface is uniformly distributed, smooth, of proper viscosity and devoid of lumps or streaks. To accomplish this pre-working and smoothing of the film the same is passed over the surfaces of a plurality of contacting rolls, known to the art as distributing rolls whereby the film is passed from roll surface to roll surface, eventually being transferred to the applying or coating roll and thence to the surface to be coated.

Our invention relates to improvements in this type of apparatus, and is characterized in that, the liquid of semi-liquid film may be closely controlled as to thickness and distribution in passage over the roll surface; adjustments may be conveniently made; the contacting rolls may be temporarily separated to effect cleaning thereof, to replace broken parts, or remove a broken web without affecting the initial adjustment of the device.

Other objects and advantages of our invention will be apparent from the accompanying drawings and following detailed description.

In the drawings, Fig. 1 is a diagrammatic side elevational view of a portion of our device.

Fig. 1*a* is a similar view of a continuation of the device shown in Fig. 1.

Fig. 2 is a view similar to Fig. 1 illustrating the distributing rolls in separated relationship.

Fig. 2*a* is a continuation of Fig. 2 corresponding to Fig. 1*a*.

Fig. 3 is a detailed sectional view of the means for separating the gate rolls from the distributing rolls.

Our invention is particularly adapted for distributing, smoothing and working a film or films of coating material to carry out the invention described in the United States Patents to Peter J. Massey, Patents Nos. 1,921,368 and 1,921,369. However, it is to be understood that our present invention may find other uses, for instance, as an ink distributing mechanism for printing presses or for distributing any type of coating material or "dope" for fabrics or the like. For purposes of description our invention will be described as being used to distribute coating material for the coating of paper in accordance with the Massey patents above mentioned.

Referring in detail to the drawings 1 indicates a coating machine with which our invention may be used. The machine comprises essentially two sets of substantially similar instrumentalities designated generally at 2 and 3, being the mechanisms for respectively coating the upper and lower faces of a paper web 4 which passes continuously from the preliminary dryers 5. The web 4 after being coated is passed to the final dryers 6 wherein the web is dried to the desired degree. The upper mechanism 2 is suspended from a frame 7 which is supported by columns 8 and 9. The lower mechanism 3 may be mounted immediately beneath the mechanism 2.

Referring particularly to Figs. 1 and 1A, 10 indicates a cylinder in which a piston 11 is positioned, said piston being connected to piston rod 12 which passes through the head of the cylinder 10. Cylinder 10 may be mounted upon trunnions or bearings 13 whereby said cylinder may be rocked upon movement of piston rod 12. The end of piston rod 12 is connected to rod 13' which is journalled at its ends in opposite frame members 14. The frame members 14 are supported at their bottoms in oppositely positioned lugs or brackets 15, the supporting connection comprising a pivot 16 whereby the frame members may be rocked. Means (not shown) is provided whereby air or fluid under pressure may be introduced into cylinder 10 either above or below piston 11, or, if desired, a vacuum may be established above or below piston 11 within cylinder 10. In either case, a piston 11 can be moved upwardly or downwardly in cylinder 10 which, of course, causes cylinder 10 to rock about bearings 13 and frames 14 to rock about pivots 16. The purpose of so operating this mechanism will be hereinafter fully described.

A pair of standards 17 may be pivotally mounted upon frame members 14, said standards being swingable or rockable about pivots 18. The upper ends of each of the standards 17 carry bearings 19 which support roll 20 between them. A pair of standards 21 may be rigidly mounted upon frame member 14, said standards carrying bearings 22 which support roll 23. A bushing 24 is pivotally secured, as at 25, to an upper extension of standards 17 upon each side of the ma-

chine, said bushing being adapted to receive one end of screw 26, said screw being threaded in said bushing. A bushing 27 is pivotally secured to an upper extension of each standard 21, the opposite end of screw 26 being threaded in said bushing. A capstan 28 is mounted upon the central portion of screw 26. The arrangement is such that, upon rotation of capstan 28 and therefore screw 26, rolls 20 and 23 may be adjusted with respect to each other, the opposite ends of screw 26 having pitches of opposite direction or the opposite ends may be pitched in the same direction but of different degree.

Referring particularly to the upper mechanism 2, the apparatus hereinbefore described is substantially duplicated. However, said apparatus is in inverted position and is carried by the frame 7. A cylinder 29 is carried upon bearings 30, a piston 31 being slidably movable within said cylinder and secured to a piston rod 32 which in turn is connected to rod 33 which is carried between opposite frame members 34. Frame members 34 are pivotally secured to lugs 35 upon each side of the machine which, in turn, are carried by frame 7.

Standards 36 and 37 are mounted in spaced relationship upon each frame member 34, each of said standards carrying bearings 38 and 39 respectively between which rolls 40 and 41 are mounted. The outer ends of standards 36 and 37, in this case, the lower ends, are adjustably tied together by means of screw 42 which carries capstan 43, the ends of said screw being threadedly engaged in bushings 44 and 45, pivotally mounted upon standards 36 and 37 respectively. Similar to the corresponding apparatus in the lower mechanism 3, the contiguity of rolls 40 and 41 may be controlled.

Rolls 20 and 23 and rolls 40 and 41, hereinafter referred to as fountain or gate rolls, are adapted to carry in their respective nips a quantity of liquid or semi-liquid coating, ink or the like, which is delivered therefrom through appropriate agencies to the coating rolls, all of which will be hereinafter described.

Rolls 20, 23, 40 and 41 are covered with rubber, the rubber covering 46 on rolls 20 and 40 being of relatively high density and the rubber covering 47 on rolls 23 and 41 being a medium hard rubber. The rolls per se are constructed of metal, preferably of a non-corrosive type, and the rubber coverings 46 and 47 extend short of each end of the roll, as shown and described in our co-pending application for Letters Patent, Serial No. 40,150, filed September 11, 1935.

All of the rolls 20, 23, 40 and 41 are preferably of the same overall diameter and are preferably separately driven. In operation, rolls 23 and 41 are driven counter-clockwise and rolls 20 and 40 are driven clockwise. Rolls 23 and 41 are adapted to carry a film, of desired thickness, of coating material, ink or the like, which is adapted to be transferred to rolls osculating therewith, hereinafter described. Obviously, in utilizing a machine such as herein described it is desirable to apply different types of coating materials, inks or the like, and different weight or quantities of coating or ink to the web. In our machine such control is obtained primarily by the gate rolls 20, 23, 40 and 41. To exercise such control in addition to the proper manipulation of capstans 28 and 43 which controls the contiguity of each pair of rolls, said rolls are adapted to be driven at different peripheral speeds, that is, rolls 20 and 40 will be driven at a different speed than rolls 23 and 41. It is preferred that the drive of rolls 23 and 41 be such as to drive said rolls from a speed equal to the speed of the rolls to which the film of coating material, ink or the like, is transferred to a speed approximately one-fourth as much. Rolls 20 and 40 are driven over a maximum range of speed preferably from one revolution per minute to full speed corresponding to the maximum speed of rolls 23 and 41.

In practice, a "Ward Leonard" drive is utilized to drive rolls 20 and 40, said drive (not shown) comprising a direct current motor energized by a direct current generator both being separately excited and the generator being driven by any suitable prime mover. The speed of the motor may be controlled from approximately half speed to full speed by means of variation of the motor field current, that is, by reducing the field current for higher speeds and increasing the field current for lower speeds. The speed of the motor for speeds less than half speed is controlled by varying the impressed voltage upon the motor armature which is accomplished by varying the generator field current. To vary the speed of rolls 23 and 41 a mechanical speed changer of the "reeves" or "link belt" type is used, the speed changer being driven by any suitable means (not shown). It is obvious that the greater the differential in peripheral speed between rolls 21 and 23 and 40 and 41, the less will be the thickness of coating or other film applied to rolls 23 and 41 and, hence, less material will be transferred to the system.

In the lower mechanism the film of coating material, ink or the like, is transferred from roll 23 to distributing roll 52 which revolves in a clockwise direction. The film is transferred therefrom to distributing roll 53 which revolves in a counterclockwise direction, thence to roll 54 which revolves clockwise. From roll 54 the film is transferred to form rolls 55 and 56 both of which revolve in a counterclockwise direction. Form rolls 55 and 56 transfer the film to coating or film applying roll 57 which revolves in a clockwise direction and by which the film is applied to one surface of the web 4.

In the upper mechanism 2, the film of material carried upon the surface of roll 41 is transferred to the surface of roll 58, which revolves in a clockwise direction. From roll 58 the film is transferred to roll 59 which rotates in a counterclockwise direction. Roll 59 passes the film to roll 60 which revolves in a clockwise direction. Roll 60 transfers the film to the surface of roll 61 which rotates in a counter-clockwise direction. From roll 61 the film is passed to rolls 62 and 63, both of which revolve in a clockwise direction. The form rolls 62 and 63 pass the film from their surfaces to the surface of the upper coating or film applying roll 64 whereby said film is applied to the upper surface of the web 4 simultaneously with the application of a similar film to the lower surface thereof by roll 57.

Rolls 57 and 64 revolve at the same peripheral speed which is equal to the linear speed of web 4. In the lower mechanism 3 rolls 52, 53, 54, 55 and 56 all revolve at the same peripheral speed as roll 57 and in the upper mechanism 2 rolls 58, 59, 60, 61 and 62 and 63 revolve at the same peripheral speed as coating or film applying roll 64. It will be noted that all of the rolls comprising the lower mechanism 3 with the exception of the form rolls 55 and 56 have their axes disposed in the same horizontal plane. Similarly all of the rolls comprising the upper mechanism 2 with

the exception of the form rolls 62 and 63 have their axes disposed in a common horizontal plane. In transferring the films from the rolls 57 and 64, the thickness of said film must be controlled to a fine degree of accuracy. The film in passing from roll to roll throughout the upper and lower mechanisms is worked and smoothed by such passage and said rolls consequently must be carefully adjusted with respect to their contiguity. It is well known that members of relatively great weight such as the rolls herein used, being supported only at their ends, deflect due to their weight. By disposing substantially all of the rolls in a common horizontal plane, the deflection of all of said rolls is in the same direction and a film of uniform thickness may be carried throughout the entire surface of each of the rolls. This is a very important feature of our invention in view of the fact that the films of coating material, for instance, applied to the web are applied as finished films necessitating no further working or smoothing after application to the web. Consequently said film must be prepared with the highest degree of accuracy and care, particularly with respect to its thickness. In addition, it will be noted that the rolls comprising the upper and lower mechanisms, that is, rolls 58, 59, 60, 61, 62 and 63 and rolls 52, 53, 54, 55 and 56 are all of different diameters.

It can readily be seen that inasmuch as the peripheral speeds of all of said rolls are equal, the fact that the diameters are different prevent the surfaces of adjacent rolls from repeatedly contacting along the same line. In other words, a portion of the surface of roll 52, which at one revolution contacts a predetermined portion of the surface of roll 53, will not again contact said predetermined portion for a long period of time. In this manner the surfaces of the rolls are maintained in uniform condition and ridges will not be formed upon the coating film carried upon the surfaces of the rolls. In order that the direction of rotation of the coating rolls be correlated with respect to the direction of rotation of the gate rolls in both the upper and lower mechanisms, an additional roll is provided in the upper mechanism 2, namely roll 58, which serves merely as an agency for changing the direction of rotation.

Roll 52 is carried by bearings 65 which, in turn, are carried by standards 66 positioned upon each side of the machine. Standards 66 are pivotally mounted as at 67 to lugs 68. Each of the standards 66 are provided with upward extensions 69 which carry guides 70. A bearing block 71 is slidably positioned in said guides and may be adjusted upwardly or downwardly by means of capstan screw 72. A roll 73 may be journalled in bearings 71 and is adapted to be disposed in osculating position with respect to roll 52. Roll 73 is an idler roll and is driven only by means of its contact with roll 52. Roll 73 in so contacting roll 52 assists in working and smoothing the film of coating material carried by roll 52.

Roll 53 is carried at each of its ends in bearings 74 which, in turn, are carried at the upper ends of standards 75 positioned at each side of the machine, said standards being pivotally mounted as at 76 upon lugs 77. In the case of both rolls 52 and 53, conventional means (not shown) is provided for oscillating said rolls longitudinally simultaneously with their rotation, which action further assists in working and smoothing the coating material carried upon their peripheral surfaces.

Roll 54 is carried by bearings 78 which, in turn, are mounted upon standards 79 positioned at each side of the machine, said standards being pivotally supported as at 80 upon lugs 81.

Roll 56 is carried by bearings 82 which are slidably positioned in guides 83, said guides being carried by standards 84 upon each side of the machine.

Standards 84 are pivotally mounted as at 85 upon lugs 86. Bearings 82 may be moved upwardly or downwardly thereby moving roll 56 upwardly or downwardly by means of the adjusting capstan screw 87. Roll 55 is carried by bearings 88 which, in turn, are carried by standards 89 also pivotally mounted upon lugs 86 as at 85. Standards 89 comprise a frame which embraces a portion of standards 84 and the center line of bearings 88 can be changed with respect to the center line of bearings 82 by means of set screws 90 threadedly positioned upon opposite sides of each of the standards 89 and adapted to bear upon the guide portions of standards 84.

Rolls 58, 59, 60, 61, 62 and 63 are mounted in substantially the same manner as rolls 52, 53, 54, 55 and 56. To facilitate and simplify the description only those portions of the upper mechanism associated with said rolls which differ from the lower rolls will be described. In view of the fact that rolls 58 to 63 inclusive are positioned above the passing web 4, said rolls are disposed upon suspended supports, all of said supports being pivotally connected to the frame 7. Roll 60 has associated therewith an idler roll 91 which is journalled in bearings 92 movable in guides 93. The function of the roll 91 is similar to that of roll 73, said roll being adapted to bear upon the surface of roll 60 and is driven only through its contact with roll 60. Similar to rolls 52 and 53, rolls 59 and 60 may be oscillated longitudinally by conventional means (not shown). The mounting of rolls 62 and 63 is similar to that of rolls 55 and 56 with the exception that the standards which carry rolls 62 and 63 are suspended.

Coating rolls 57 and 64 are preferably driven by means of conventional cone pulleys and belt (not shown) from the indriving shaft of dryers 5 or 6. Rolls 52, 53, 54, 55 and 56 and rolls 58, 59, 60, 61, 62 and 63 may be driven from rolls 57 and 64 through a suitable train of gears and indriving shafts (not shown). In place of said gear train, if desired, the indriving shafts of rolls 57 and 64 may drive alternating or direct current generators. Either alternating or direct current motors may then drive the rolls, above mentioned, through suitable reducing gears, each roll being driven by a separate motor. If an alternating current generator is driven by the indriving shaft of rolls 57 and 64 the usual induction motors of relatively high speed and relatively small diameter may be used and the correct peripheral speed is obtained by means of the gear ratio between the motor and the rolls. As the speed of the rolls 57 and 64 is changed from time to time the induction motors will follow as the slip of the induction motor changes very little with the change in frequency of the generator. On account of the simplicity of operation of the induction motors they are preferred to direct current motors, however, a direct current generator and direct current motors may

be used by separately exciting all of the direct current motors and generator. The voltage of the generator will then vary with the speed of rolls 57 and 64 and consequently the speed of the direct current motors will vary as the impressed voltage varies and thereby the speed of the rolls will follow the speed of the coating rolls.

As has been hereinbefore described the efficacy of our machine resides in the ability to apply a film of predetermined thickness and quality to the surface of a passing web. To obtain such film the material is passed over the surfaces of a plurality of distributing rolls which passage works the coating material upon the surfaces of the rolls and reduces the film to the proper thickness and smoothness. Obviously, therefore, it is essential that close control be maintained of the proximity or contiguity of the various osculating rolls. To obtain this minute control is one of the primary features of our invention.

A bushing 94 is pivotally secured to the frame member 14 as at 95, said bushing being positioned in a recess 96 in said frame. Another bushing 97 is pivotally connected to a pin 98 carried by standard 66, said bushing being provided with a slot 99 in which pin 98 is adapted to be positioned. A screw 100 is threadedly positioned at each of its ends in bushings 94 and 97 respectively, said screw being operable by means of a capstan 101. The arrangement is such that by manipulation of capstan 101, standard 66 and frame member 14 may be positioned a desired distance from each other and, consequently, the surfaces of rolls 23 and 52 may be positioned a predetermined distance from each other. Screw 100 functions as a spacer and when operating to control the distance between rolls 23 and 52, said screw acts as a compression member, roll 23 being urged toward roll 52 by means of compressed air in the lower portion of cylinder 10. The threads at opposite ends of screw 100 may be pitched in opposite directions or said threads may be pitched in the same direction but of a different degree. In this manner the proximity or contiguity of roll 23 with respect to roll 52 may be very closely controlled. In practice this proximity may be controlled to a fraction of one-thousandth of an inch.

In a similar manner the proximity of rolls 52 and 53 are controlled, a bushing 102 being pivotally secured to pin 98 and a bushing 103 being pivotally secured to pin 104 carried by standard 75, bushing 103 being provided with a slot similar to slot 99. Bushings 102 and and 103 may be operatively connected by means of capstan screw 105 which functions similar to screw 100 to control the spacing or degree of contiguity of rolls 52 and 53.

The spacing of roll 53 with respect to roll 54 is controlled by means of an arrangement similar to those described with respect to rolls 23 and 52, and rolls 52 and 53. In view of the fact that the mechanism is identical with that hereinbefore described, it is believed that the same will be apparent to those skilled in the art without further description.

An arm 106 is carried by bearing 78, said arm in turn carrying pin 107. Bearing 88 is provided with an arm 108 which carries pin 109. A bushing 110 may be pivotally secured to pin 109 and a bushing 111 may be pivoted to pin 107, said bushing being provided with a slot 112. A capstan screw 113 operatively connects bushings 110 and 111 in a manner similar to the capstan screws hereinbefore described. By this arrangement it can readily be seen that standard 89 which carries roll 55 may be spaced a desired distance from standard 79 which carries roll 54 and inasmuch as standards 89 and standards 84 may be adjusted relative to each other, the manipulation of capstan screw 113 also controls the relative positions of standards 79 and 84. In this manner the degree of contiguity or proximity of roll 54 and rolls 55 and 56 may be controlled.

Coating roll, or film applying roll 57 is mounted upon bearings 114 which, in turn, are supported by standards 115. Bearing 114 carries an upwardly extending lug 116 which, in turn, carries pin 117. Bearing 88 has an outwardly extending arm 118 which carries pin 119. A bushing 120 is pivotally secured to pin 119 and a bushing 121 is pivotally connected to pin 117, said last mentioned bushing being provided with an elongated slot 122 in which pin 117 is adapted to be disposed. A capstan screw 123 operatively connects bushings 120 and 121 and controls the degree of contiguity of rolls 55 and 56 with respect to the coating roll 57.

The arrangement for controlling the contiguity or proximity of the rolls constituting the upper mechanism 2 is identical with that described in conjunction with the lower mechanism, and to facilitate and clarify the description and prevent duplication said control mechanism will not be described in detail.

As has been hereinbefore described, the various capstan screws between the adjacent rolls function as spacers or compression members when the device is in operation. All of said rolls are brought to the predetermined position determined by the adjustment of said capstan screws by means of the application of air or other fluid under superatmospheric pressure within the lower portion of cylinder 10. It can readily be seen that when piston 11 acts to move frame member 14 in a clockwise direction, pins 98, 104, 107 and 117 will be positioned at the extreme left end of the slots in which said pins are respectively positioned. It frequently happens, in paper mills or in printing presses, that the web 4 breaks. If this breakage occurs while said web is passing over the various distributing rolls comprising the lower mechanism, said web would tend to wind upon one or more of the rolls. Obviously if this situation occurs the winding web would tend to force the rolls away from each other. However, in view of the fact that all of the rolls are ultimately urged towards each other by means of fluid under pressure within cylinder 10, a broken web or any foreign substance interposed between adjacent rolls would not cause any breakage of the machine since piston 11 would merely be urged against a cushion of air within cylinder 10.

In addition, in view of the fact that close adjustment of the proximity of the rolls is of vital importance it is desirable that the breakage of a web or the interpositioning of a foreign substance between adjacent rolls would not throw said rolls out of adjustment. Further, it may be desired to separate each of the rolls from one another without changing the ultimate adjustment of the rolls. Each of these situations can be taken care of in our machine without the necessity of laboriously re-adjusting the capstan screws.

If it is desired to separate the rolls, it is merely necessary to introduce fluid under pressure above piston 11 within cylinder 10 and relieve the pressure below said piston. When this is done rolls 55 and 56 are rocked about pivot 85 in a counter-clockwise direction and are separated

from roll 57 a distance substantially equal to the length of the slot 122. Similarly roll 54 rocks about pivot 80 and is separated from rolls 55 and 56 a distance equal to the length of slot 112. In like manner each of the rolls 53 and 52 rock in a counter-clockwise direction about pivots 76 and 67 respectively a distance equal to the length of the slots in bushings 97 and 103. The frame member 14 also rocks in a counter-clockwise direction a distance substantially equal to summation of the distances comprising the various slots. However, rolls 20 and 23 do not separate from each other in view of the fact that both of said rolls move with frame member 14 as a unit. The position of the machine when the rolls are separated as described above is clearly shown in Figs. 2 and 2a. It can readily be seen that after said rolls have been separated in the manner hereinabove described, fluid under pressure may be applied to the lower side of piston 11 and the pressure may be relieved from the upper side of said piston. The resulting action of the piston moves all of the standards in a clockwise direction about their various pivotal supports until the pins carried by the standards again contact the left ends of the various bushing slots. It can readily be seen that in this manner the machine can be substantially instantly brought to operating condition without the necessity of re-adjusting or re-manipulating the capstan screws.

The same operation can be carried out with respect to the upper mechanism 2. However, in the case of the upper mechanism the standards rotate about their suspending pivots. If the rolls are to be maintained in separate relationship for a considerable period of time, it is not necessary to maintain pressure on the upper side of piston 11, within cylinder 10 since the standards will remain in their canted position under the influence of gravity. However, in view of the fact that the upper standards would tend to return to vertical position, thereby bringing the rolls into contiguous position, means is provided for positively holding the frame member 34 in rocked position thereby holding all of the standards in canted position. This means comprises a platform 124 which is swingably positioned upon pin 125 carried by bracket 126 mounted upon column 8. Pin 125 comprises an extension of rod 127 which carries at a lower end a bevel gear 128 which meshes with bevel gear 129 carried upon shaft 130. A hand wheel 131 is rigidly connected to shaft 130 and functions to rotate said shaft together with shaft 137. When air under pressure is introduced into cylinder 29 at the lower side of piston 31, and frame member 34 is rocked in a clockwise direction, platform 124 is swung to a position parallel to column 8. After frame member 34 has been brought to the position shown in dotted lines in Fig. 1 or to the position shown in Fig. 2, platform 124 is rotated by means of hand wheel 131 to its extended position whereby the end of frame member 34 can be supported thereon. In this manner the upper rolls may be maintained in spaced relationship without the necessity of maintaining a continuous supply of fluid under pressure for cylinder 29.

To wash or clean rolls 52, 53, 54, 55, 56 and 57, and rolls 58, 59, 60, 61, 62, 63 and 64, means is provided whereby frame members 14 and 34 may be rocked to separate rolls 23 and 52 and rolls 41 and 58 without separating the remaining rolls. This means comprises a bushing 132 having a forked end 133 which is adapted to embrace an eccentric 133' carried by pin 134. An arm 135 is keyed to pin 134 and is adapted to rotate eccentric 133'. A bushing 136 may be pivotally connected to an intermediate portion of standard 66, said bushing being provided with a slot 137 which embraces pin 138 secured to said standard. A capstan screw 139 operatively connects bushings 132 and 136, said screw being similar to and functioning in a similar manner to the remaining capstan screws.

The arrangement is such, that when arm 135 is rotated through an angle of 180° from the position shown in Fig. 1, the capstan screw 139 together with bushings 132 and 136 are effectively lengthened thereby rocking frame member 14 in a counter-clockwise direction against the fluid pressure within cylinder 10 beneath piston 11. This action, of course, separates rolls 23 and 52 without affecting the relative positions of the remaining rolls. Similar apparatus is provided in connection with the upper mechanism 2, said apparatus functioning in an identical manner.

Rolls 64 unlike roll 57 which is mounted upon the fixed bearing 114, is mounted upon a floating bearing 140 which is pivotally secured at 141 to standard 142 which, in turn, is supported by frame 7. Bearing 140 has an outwardly extending arm 143 which is pivotally and slidably associated with rod 144 the connection between arm 143 and rod 144 being buffed or cushioned by coil springs 145. Rod 144 is connected at its upper end to a suitable motor driven capstan screw (not shown). By this arrangement the contacting pressure of roll 64 may be controlled by raising or lowering rod 144.

A cleaning roll 148 is disposed in contacting relationship with coating roll 57. A similar cleaning roll is associated with coating roll 64 and the mechanism to be hereinafter described relative to said cleaning roll is duplicated in the mechanism 2. Roll 148 is mounted upon bearings 149 which in turn are supported by standards 150, pivotally mounted at 151 to lugs 152. Each of the standards 150 may be provided with an outwardly extending arm 153 which is pivotally connected at its end to piston rod 154. A piston 155 is mounted upon the end of piston rod 154 which is adapted to be slidably positioned within fluid cylinder 156. Cylinder 156 is pivotally mounted at 157 to supporting lug 158. The arrangement is such that when fluid under pressure is introduced into cylinder 156 beneath piston 155, standard 150 is urged in a counter-clockwise direction thereby bringing roll 148 into contiguous relationship with roll 157.

A bushing 159 is pivotally connected at 160 to standard 115. A bushing 161 is pivotally connected to standard 150, said bushing being provided with a slot 162 which is adapted to embrace pin 163 secured to standard 150. A capstan screw 164 is connected at its ends to bushings 159 and 161 and is adapted to control the spacing between rolls 148 and 57. A set screw 165 is threaded into the standard 150, the end thereof projecting into recesses 166 in which bushing 161 is positioned. By the provision of said set screw the movement of standard 150 away from standard 115 and, consequently, the movement of roll 148 away from roll 57 may be controlled.

Such movement, that is clockwise movement of standard 150 may be obtained by introducing fluid under pressure into cylinder 156 above piston 155 and relieving the pressure below said piston.

Roll 148 and its companion roll in the upper section are adapted to serve as cleaning rolls for

the coating rolls 57 and 64 respectively. In view of the fact that the films of coating material applied to the surfaces of the web 4 are in their finished condition immediately after application, it is obvious that any accumulations or deposits upon either of the coating rolls would tend to disrupt or disfigure said film. Consequently, the cleaning rolls hereinabove described are provided. The roll 148 and its companion roll in the upper mechanism have relatively hard porous surfaces and may be constructed of stone, "Stonite" or other artificial stone. Accumulations or deposits removed from rolls 57 and 64 by the cleaning rolls are scraped therefrom by means of the blades 167 which, in turn, are mounted upon brackets 168 supported by arms 169. Web 4 after passing between coating rolls 57 and 64 have deposited upon their surfaces a film of coating material. In order that said material can be deposited in its final smooth form it must contain a substantial quantity of moisture. Consequently, when web 4 leaves the coating rolls its surfaces contain a coating material which is relatively moist. A conduit 170 supported at one end by means of bracket 171 secured to the supporting rod 172 is positioned above the path of travel of the web 4. In like manner a conduit 173 is supported by means of bracket 174 to the supporting rod 172, said latter conduit being positioned beneath the path of travel of the web. Both conduits 170 and 173 are provided with discharge openings of nozzles 175 and said conduits are connected to a suitable source of warm or hot air under pressure which is discharged into contact with the upper and lower coated surfaces of the web 4. After passing between conduits 170 and 173 the web is trained around guide roll 176. In passing over said guide roll warm or hot air under pressure is discharged through nozzles 177 provided in the wall of an arcuate conduit 178 which comprises a vertical extension of conduit 170. After passing over guide roll 176 the web 4 is trained over drier roll 179 which comprises one roll of the drier bank 6. In passing over roll 179 warm or hot air under pressure is discharged through nozzles 180 provided in an arcuate conduit 181 which conforms with a portion of the periphery of roll 179.

The end of conduit 173, namely, that end which is adjacent roll 176 is provided with a series of nozzles 182 which discharge streams of air between the lower face of the web 4 and the surface of roll 176. In this manner a film of air is provided between the lower face of the web and the surface of the roll and, consequently, the coating upon said web is detrimentally affected by the contact with the surface of roll 176. In like manner discharge nozzles 183 in conduit 178 discharge warm or hot air between web 4 and the surface of the drier roll 179, the purpose being similar to that hereinbefore described.

We claim as our invention:

1. In a device of the class described, a plurality of pivotally mounted standards, a roll carried by each of said standards, means connecting adjacent standards, adjustable to control the degree of contiguity of the rolls carried by said adjacent standards, single means for urging said adjacent standards together to maintain said rolls at the adjusted degree of contiguity, said urging means being operable to rock said standards about their pivotal mounts away from each other to separate said rolls.

2. In a device of the class described, a series of pivotally mounted standards, a distributing roll carried by each of said standards, adjustable means connecting adjacent standards for limiting the minimum and maximum distances between adjacent standards, and pneumatic means for moving said standards to their proximate or remote positions.

3. In a device of the class described, a series of pivotally mounted standards, a distributing roll carried by each of said standards, adjustable means connecting adjacent standards for limiting the minimum and maximum distances between adjacent standards, and single means for moving all of said standards to their proximate or remote positions.

4. In a device of the class described, a series of pivotally mounted standards, a distributing roll carried by each of said standards, micrometric adjustable means interposed between adjacent standards for limiting the proximity of said adjacent standards, and the degree of proximity of said rolls, and means providing for temporary separation of said standards and rolls carried thereby without disturbing the adjustment of said micrometric means.

5. In a device of the class described, a plurality of pivotally mounted standards, a roll carried by each of said standards, means connecting adjacent standards, adjustable to control the degree of contiguity of the rolls carried by said adjacent standards, means for urging said standards together to maintain said rolls at the adjusted degree of contiguity, said urging means being operable to rock said standards about their pivotal mounts away from each other to separate said rolls, said urging means comprising a piston rod operatively connected to one of said standards, a piston carried by said piston rod, a cylinder in which said piston operates, and means for introducing fluid under pressure into said cylinder.

6. In a device of the class described, a pivotally mounted frame, a pair of gate rolls carried by said frame, said gate rolls being osculating and carrying a quantity of mobile material in their nip, a plurality of pivotally mounted standards, a distributing roll carried by each standard, one of said distributing rolls being adapted to contact one of said gate rolls, adjustable means connecting said frame and the adjacent standard whereby the degree of contiguity of said gate roll and distributing roll is controlled, similar adjustable means connecting adjacent standards together whereby the degree of contiguity of adjacent distributing rolls is controlled, and means for maintaining said rolls in adjusted contiguous relationship, said last mentioned means being operable to rock said frame and standards to separate adjacent rolls.

7. In a device of the class described, a plurality of pivotally mounted standards disposed in seriatim, micrometric means connected between adjacent standards for controlling the degree of proximity of said adjacent standards, contacting distributing rolls carried by said standards for distributing and passing a mobile material from roll surface to roll surface, means for simultaneously urging said standards together to a distance predetermined by said micrometric means, said urging means being operable to temporarily separate said standards.

8. In a device of the class described, a series of pivotally mounted standards, a distributing roll carried by each of said standards, means comprising a lost motion link connecting adjacent standards together, said link permitting a limited degree of independent movement of said

standards relative to each other, and means for moving said standards to both limits of movement of their connecting links.

9. In a device of the class described, a series of standards, adjacent standards of said series being movable toward and away from each other, a distributing roll carried by each of said standards, adjusting means interposed between adjacent standards for limiting the proximity of said adjacent standards and the degree of proximity of said rolls, and means providing for temporary separation of said standards and rolls carried thereby without disturbing the adjustment of said adjusting means.

10. In a device of the class described, a plurality of standards disposed in seriatim, adjacent standards being movable toward and away from each other, adjusting means connected between adjacent standards for controlling the degree of proximity of said adjacent standards, distributing rolls carried by said standards with their respective surfaces normally in film transferring relationship for passing a mobile material from roll surface to roll surface, means for simultaneously urging said standards together to a distance predetermined by said adjusting means, said urging means being operable to temporarily separate said standards.

PETER J. MASSEY.
WILLIAM F. THIELE.
BERT F. RAPRAGER.