(No Model.) 3 Sheets—Sheet 1

G. EASTMAN.

MACHINE FOR FORMING FLEXIBLE PHOTOGRAPHIC FILMS.

No. 471,469. Patented Mar. 22, 1892.

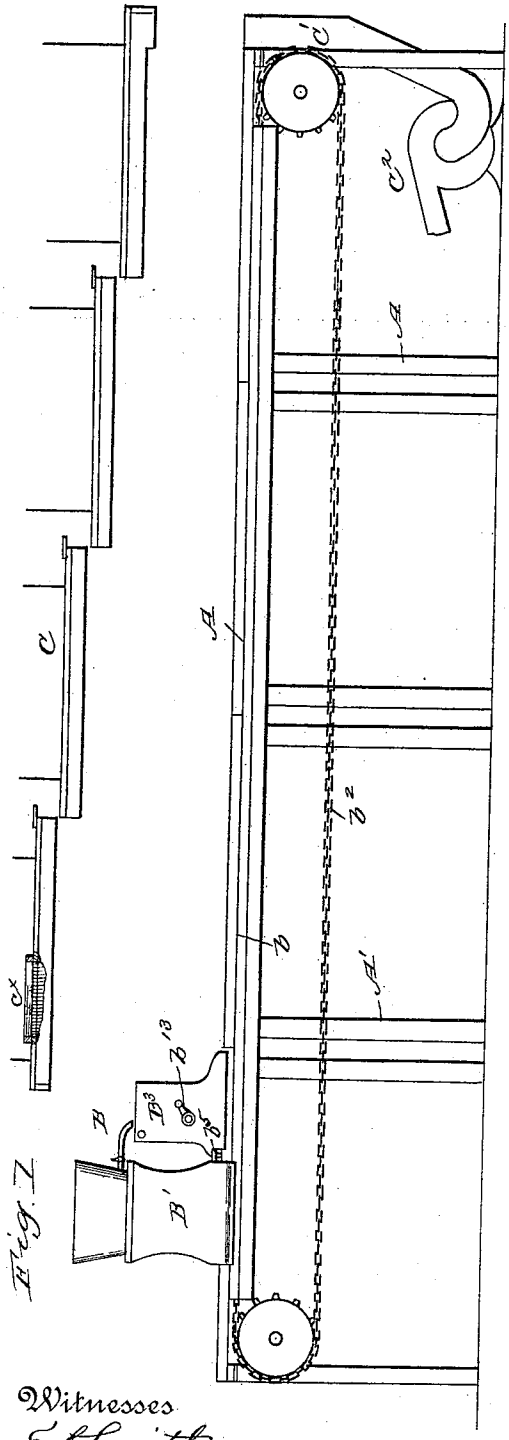

Fig. 1.

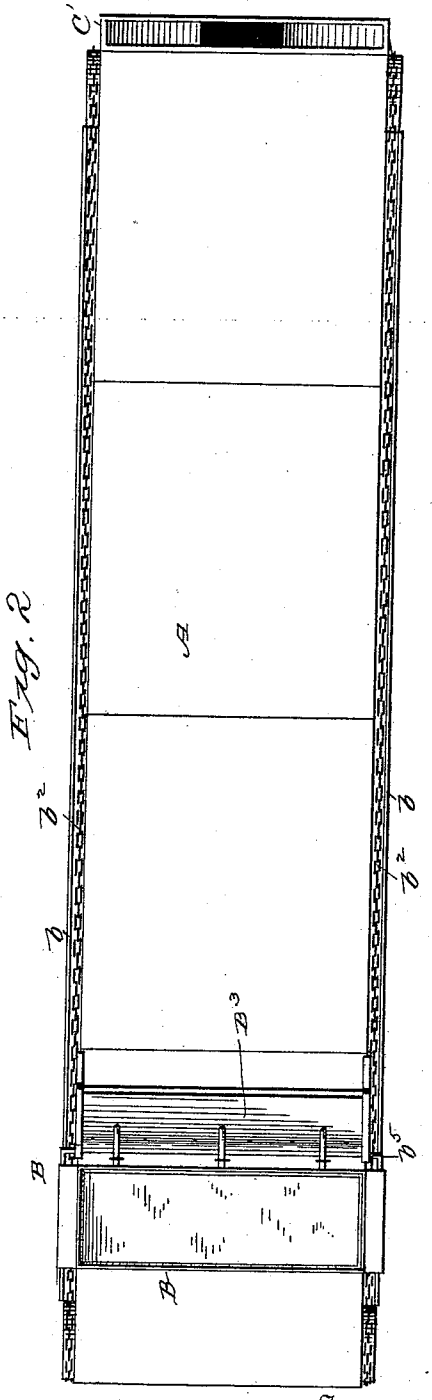

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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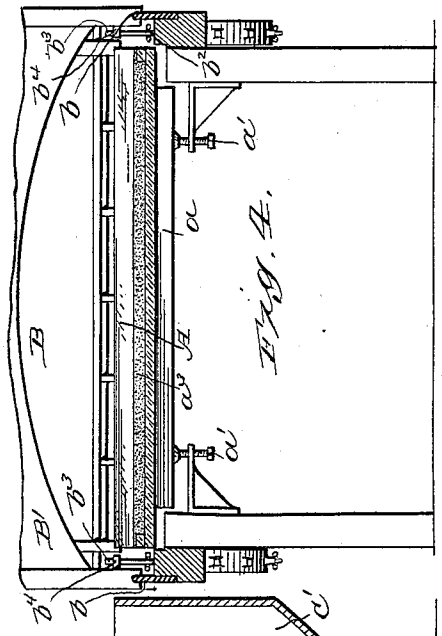

Fig. 4.

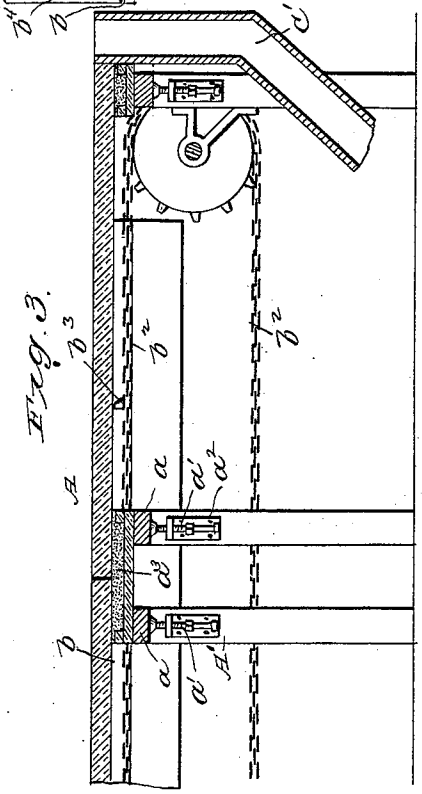

Fig. 3.

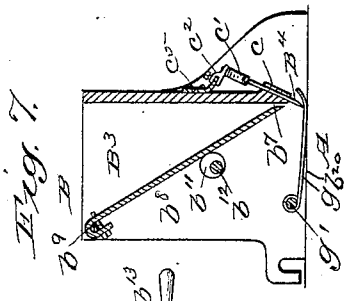

Fig. 7.

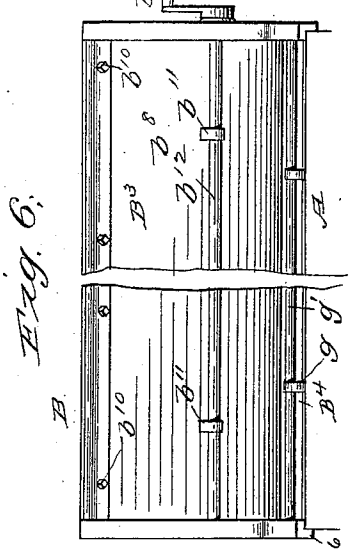

Fig. 6.

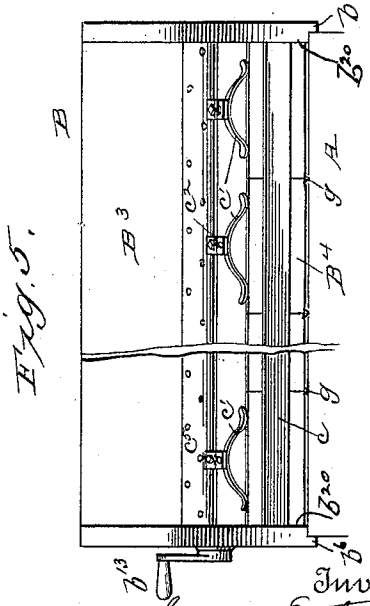

Fig. 5.

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Fig. 8.

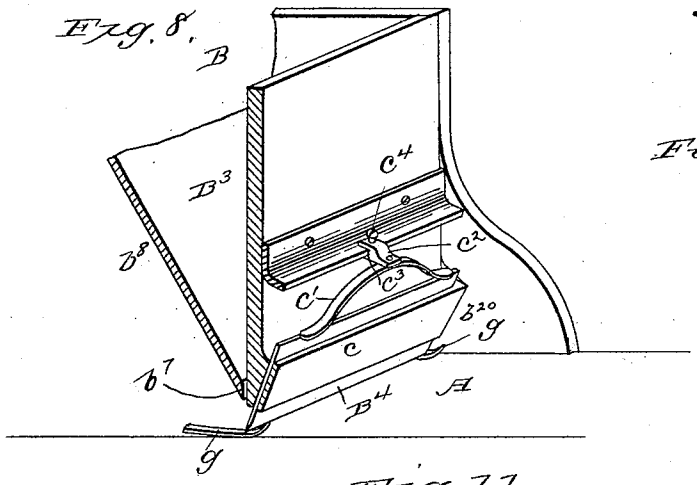


Fig. 9.

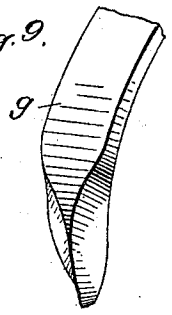


Fig. 11

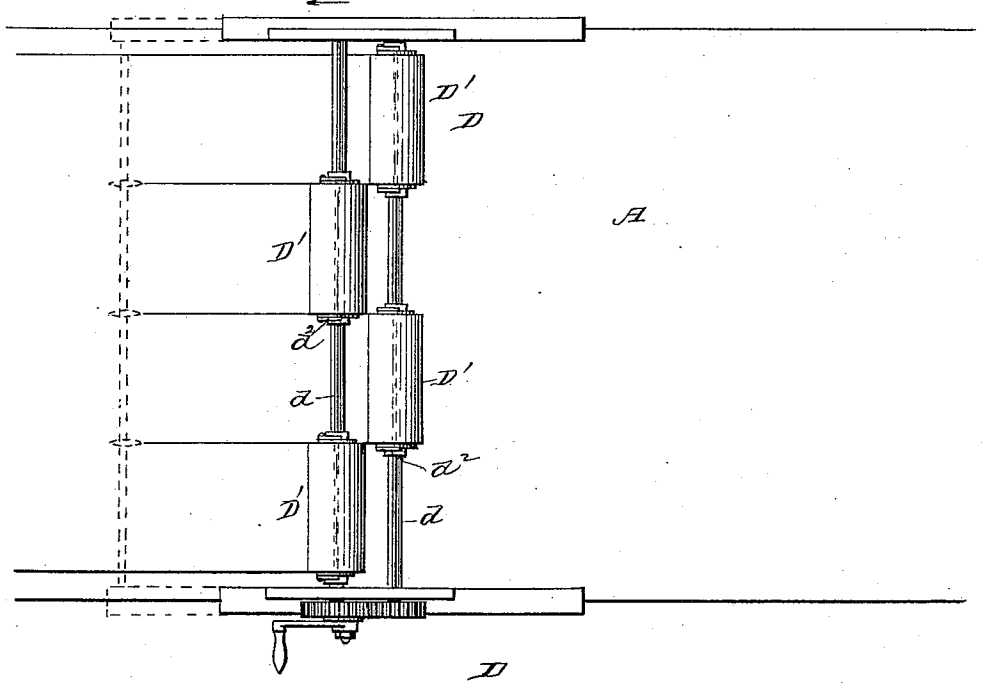
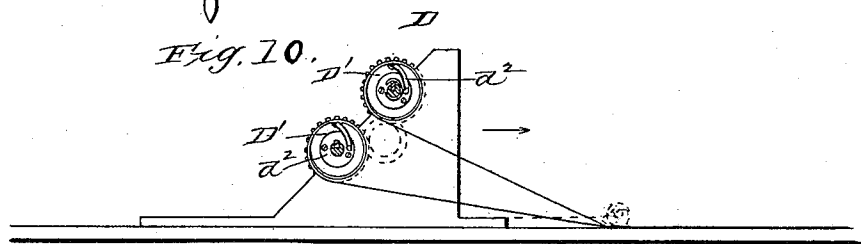


Fig. 10.



Witnesses
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Thomas Durant.

Inventor
George Eastman,
By his Attorneys
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UNITED STATES PATENT OFFICE.

GEORGE EASTMAN, OF ROCHESTER, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE EASTMAN COMPANY, OF SAME PLACE.

MACHINE FOR FORMING FLEXIBLE PHOTOGRAPHIC FILMS.

SPECIFICATION forming part of Letters Patent No. 471,469, dated March 22, 1892.

Application filed August 3, 1889. Serial No. 319,666. (No model.) Patented in England December 10, 1889, No. 19,896.

To all whom it may concern:

Be it known that I, GEORGE EASTMAN, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Machines for Forming Flexible Photographic Films, (for which I have obtained a patent in Great Britain, No. 19,896, bearing date December 10, 1889;) 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 this specification, and to the letters of reference marked thereon.

This invention relates to a new and improved machine especially adapted for the production of flexible photographic films from a fluid solution of nitro-cellulose and camphor in accordance with the method described in my prior application, Serial No. 306,284, filed April 6, 1889, but also capable of use in forming thin uniform coatings or layers of other materials; and my said invention consists in the novel construction, arrangement, and combination of parts hereinafter fully described and specifically claimed.

In the accompanying drawings, Figure 1 is a side elevation, and Fig. 2 a top plan view, of the coating mechanism. Fig. 3 is a longitudinal vertical section, and Fig. 4 a transverse vertical section, through the bed-plate and frame. Fig. 5 is a front view, Fig. 6 a rear view, and Fig. 7 a transverse sectional view, of the coating devices. Fig. 8 is a view in perspective of a portion of the coating mechanism. Fig. 9 is a view of one of the trailing-knife supports detached. Fig. 10 is an end view partly in section, and Fig. 11 a top plan view, of the stripping and winding devices.

Similar letters of reference in the several figures indicate the same parts.

The principal elements of the complete machine, aside from the frame-work, are a bed-plate A, having a rigid and substantially level surface either polished or evenly grained, a spreading mechanism B, adapted and arranged to traverse longitudinally of the bed-plate and deposit and spread a thin uniform layer of the fluid coating material, a removable casing C for inclosing the surface of the bed-plate, with exhaust apparatus for drawing off and collecting the volatile solvents, and stripping and reeling devices traversing the bed-plate for removing therefrom and winding up the dried film or films.

The bed-plate A is preferably constructed of sheets of plate-glass properly supported and leveled, the abutting ends or edges of contiguous sections being accurately fitted to form a close joint and the interstices, if any, are filled in level with the surface of the glass by the introduction of a suitable material or composition, such as cement, plaster-of-paris, wax, readily-fusible metal, &c., with a view to avoiding all crevices and depressions into which the fluid solution might enter and thus produce ridges or other irregularities on the surface and in the thickness of the film.

The bed-plate when of plate-glass can conveniently be mounted upon its supporting-frame in the following manner: The frame A′ is furnished with a series of cross-bars a, provided with means for independent vertical adjustment at opposite ends, as by mounting each cross-bar upon set-screws a', projecting vertically through brackets a^2. The cross-bars that come beneath the joints between the plates composing the bed are each furnished with a shallow trough a^3, into which is deposited a suitable plastic or semi-fluid mixture or compound capable of setting or hardening. The glass is brought into contact and pressed upon this semi-fluid or plastic body and retained thereon while the latter is setting or hardening, thus forming a bed whose surface conforms to that of the glass and affords an equal support at all points in the width of the plate. A mixture of plaster-of-paris and water has been found to answer well for the bed, as it adheres to the surface of the glass, and thus serves not only to support but also to prevent the shifting of the bed-plate.

The spreading mechanism B is arranged to traverse longitudinally of the bed-plate and includes means for depositing the fluid solution upon the surface and for spreading and regulating the thickness of the film or coating. In the present instance it comprises a carriage B′, mounted to traverse upon suitable guides b, parallel with the bed-plate and attached to the frame.

The driving mechanism shown comprises

two chains or belts b^2, one on each side of the bed-plate, mounted upon and driven in unison by pulleys at the opposite ends of the bed-plate. Each chain is provided with a lug b^3—one or more—for engaging a projecting arm or pin b^4 on the carriage, so that as the chains are set in motion by suitable driving mechanism the carriage will be drawn longitudinally of the bed-plate and its movement arrested when the lugs b^3 pass around the pulleys and are withdrawn from contact with the projections b^4.

Any of the well-known forms of driving mechanisms may be employed for starting, stopping, reversing, and adjusting the speed of the chains or belts, the latter being arranged to move in unison and engage the carriage on opposite sides of the bed-plate in order to insure an even and regular motion of the spreading devices.

Upon the carriage B′, or preferably detachably secured thereto, are the depositing and spreading devices, comprising a hopper B^3, having an adjustable discharge-orifice and a spreading-blade B^4 with means for adjusting the position of its edge relatively to the surface upon which the solution is deposited. The carriage B′ and the depositing and spreading devices are made separate for convenience, the carriage forming in effect an intermediate connection between the propelling devices—such as the chains—and the depositing and spreading devices, one which will permit the ready withdrawal and replacement of the depositing and spreading devices, and at the same time can be utilized in performing other operations, such as coating and stripping, as hereinafter explained. In the example illustrated the hopper B^3, secured to the carriage B′ by hook-and-pin connections b^5, rests at opposite ends directly upon the surface of the bed-plate, so that the blade carried by the hopper will traverse in a plane substantially parallel with the surface of the bed-plate. Guides separate from the surface of the bed-plate might be employed for supporting the blade; but owing to the fact that it is extremely difficult to arrange and maintain the guides parallel with the bed-plate, particularly when, as in the present instance, the latter is adjustable, I prefer to mount the hopper directly upon the bed-plate, the ends b^{20} of the hopper forming guides to prevent the fluid solution flowing over the edge of the bed-plate. Suitable guides—such as flanges b^6—are provided to prevent lateral motion or displacement of the hopper. The hopper is provided with an adjustable discharge-opening b^7, extending transversely of the bed-plate, through which the solution escapes, and is deposited upon the surface beneath as the carriage traverses the bed-plate.

One form of adjustable discharge is shown in the drawings, the front wall b^8 of the hopper being provided with open bearings to receive a cross-rod or pins b^9 on the end walls of the hopper, removable pins b^{10} serving to retain the front wall upon its pivots. This pivoted front wall b^8 fits snugly between the end walls, forming close joints to prevent the escape of the solution, and cams b^{11}, secured to a shaft b^{12}, serve to adjust the size of the discharge-opening by swinging the wall b^8 on its pivot to carry its lower end toward or from the rear face of the discharge-passage. A hand-lever b^{13} and a suitable gage or stop are provided for effecting or determining the adjustment.

In rear of the discharge-opening in hopper B^3 and mounted upon the latter is the spreading-blade B^4. If it were practicable to readily procure or produce a bed-plate whose surface is a true plane, a single blade B^4 with a straight edge would serve for spreading the solution in a thin even coating as the carriage is traversed over the bed-plate, the blade occupying a fixed relation to its supports and the latter traveling upon the surface of the bed-plate; but inasmuch as it is very difficult, if not impossible, to procure sheets of plate-glass of the required dimensions and having perfectly-level surfaces provision is made for adjusting the edge of the blade at different points in its length, so that it will preserve substantially the same distance from the surface of the bed-plate during the movement of the carriage—that is to say, the scraping or spreading edge is caused to conform to the profile of the bed-plate in the plane of the edge of the blade. One mode of producing such a flexible automatically-adjusting blade is shown in the drawings, and consists in forming the blade in sections and supporting them in the same plane in a guide formed between the rear wall of the hopper and a strip c, applied thereto. A separate yielding pressure device is applied to each blade-section, the same consisting in this instance of a bow-spring c', with its ends engaging the blade-section. Each spring c' is secured at or near the center to a holder c^2, having a socket c^3 and set-screw c^4 or equivalent means for detachably securing it to a bracket c^5 in rear of the hopper. The bow form of spring is preferred, as by its use both ends of the blade-section are acted upon equally, and any section can be removed or replaced by simply detaching its spring from the supporting-bracket. The blade B^4, being composed of sections which are independently movable toward and from the surface of the bed-plate, becomes in effect and is the equivalent of a flexible blade with a capacity for adjustment at various points in its length, whereby the edge of the blade can be made to conform to variations or changes in the plane of the surface of the bed-plate and held at all times substantially parallel with the surface upon which the fluid material is deposited. To effect the automatic adjustment of the edge, so as to conform to the profile of the bed-plate on a line parallel with the blade and to preserve this relation at all points in the length of the bed-plate, the blade is supported or sustained at intervals in its

length by a series of gages or supports engaging or running upon the surface of the bed-plate, and serving to sustain that portion or section of the blade contiguous to the point of contact at the proper elevation above or distance from the surface of the bed-plate, so that every change in the profile of the bed-plate will effect a corresponding elevation or depression of that portion of the blade contiguous thereto, and thus the edge of the blade will be made to conform to the surface of the bed-plate on which the solution is deposited, and a layer of substantially uniform thickness will be deposited and spread upon said surface.

The thickness of the layer will of course depend upon the width of the space or interval between the surface of the bed-plate and the edge of the blade, and this will be determined by the height or thickness of the supports or gages between the surface in contact with the bed-plate and the points of attachment or connection to the flexible blade.

One form and mode of applying the gages or supports to a flexible blade is illustrated in the drawings, wherein the sectional blade and the bed-plate and preferably beneath the contiguous ends of adjacent sections are arranged a series of gages g, which operate to maintain the edge of the blade at all times at substantially the same distance from the surface to be coated. In the preferred construction the gages g are made in the form of wires, rods, or plates, pivotally connected to the hopper or to a rod g' thereon. The gages or trailing strips g are located beneath or in line with the several joints of the sectional blade, each blade supporting the proximate ends of adjacent blade-sections, and when so constructed and located their lower faces are flattened and so bent or shaped as to make close contact with the surface of the bed-plate at a point or points substantially in line with the edge of the blade. The under surfaces of the gages are inclined upward and narrowed or beveled beyond and in rear of the blade and the point of contact with the bed-plate.

The removable casing (designated C in the drawings) may be of any preferred form, construction, and material, as its principal function is the exclusion of dust, &c., from the surface of the film while drying, and incidentally the prevention of the escape of volatile solvents. In the example given it is made in the form of a light cover suspended from above, and having its side rails so arranged as to rest upon the surface of the bed-plate along the edges thereof, with an inlet-opening at one end, as at c^4, and an outlet at the opposite end, said outlet being formed by extending the casing beyond the bed-plate and covering a space communicating with a trunk or conduit C', leading to an exhaust apparatus—such, for example, as a fan C^2.

The stripping and reeling devices D are mounted upon a carriage. It may be the carriage B' or one substituted therefor, and arranged to traverse longitudinally of the bed-plate.

As the sheet formed upon the bed-plate is usually several times the width of the commercial article, it is more convenient to divide it into strips by the use of cutting-edges while lying flat upon the bed-plate, to which it adheres, and in order to remove the strips without disturbing the films and to effect a clear separation on the lines of the cuts a series of rolls or reels D' are mounted upon the carriage, arranged in different planes and provided with suitable winding devices or mechanism for actuating them. The ends of the strips are applied to the rolls D', and the latter are rotated as the carriage advances, whereby the film is stripped from the surface of the bed-plate and wound evenly upon the rollers. The adjacent rollers or reels are located in different planes in order that the strips mounted thereon may be drawn from the bed-plate at different angles, whereby one strip is separated or stripped from the surface in advance of the adjacent strips, the separation of contiguous strips on the line of the cuts being thus performed on the surface of the bed-plate and tearing of the material prevented.

By the use of traveling rollers or reels for winding the strip and effecting the separation of the latter an equal tension is put on each strip and distortion or rupture of the film prevented.

The reels or rolls D' are mounted upon or connected to two driving-shafts d, geared together to rotate in unison, so that all the rolls are given the same motion, and to provide for slight variations in tension the several rolls may be connected to their shafts or driving mechanism through suitable yielding tension devices, such as springs d^2.

The operation of the machine as a whole is as follows: The bed-plate is first leveled, the gages interposed between the sectional blade and the surface of the bed-plate are adjusted or regulated, so as to support the edge of the blade at the proper distance from the surface to produce a layer or coating of the desired depth, and the discharge-opening in the hopper is adjusted proportionally to the rate of motion to be given the carriage and the degree of fluidity of the solution or other material to be spread. The machine having thus been adjusted, the coating material, consisting of nitro-cellulose and camphor dissolved in a volatile fluid solvent—such as methyl alcohol—is poured into the hopper or delivered therein through a regulated discharge and the driving mechanism set in motion. The fluid escaping from the hopper is deposited in a measured stream upon the surface in advance of the spreading-blade, and is prevented from running over the edges of the bed-plate and traveling along the edges thereof at opposite ends of the discharge-orifice in the bottom of the hopper by the guides or ends b^{20} of the hopper, the latter resting

upon the surface of the bed-plate. As the carriage advances the solution is spread or distributed upon the surface in the form of a thin layer of substantially uniform depth by the action of the blade B^4.

It might be presumed that the slight irregularities existing in the surface of the ordinary plate-glass would not produce any appreciable or material variation in the dimensions of the coating; but such is not the case, as will be readily understood when it is considered for what purposes the films are designed, and that as ordinarily made they are but from three to five one-thousandths of an inch in thickness, although the coating as at first applied is somewhat thicker, allowance being made for the volatile solvents contained in the solution and which are afterward removed.

It is to counteract the defective action resulting from the irregularities in the plane of the surface that the blade is made flexible and the gages arranged at different points in the length of the blade and interposed between the latter and the surface, so that the edge of the blade will be automatically shifted and be held at all times substantially parallel with the surface of the bed-plate, but removed therefrom, thus forming a passage of uniform dimensions, through which the solution is drawn or escapes as the hopper advances over the bed-plate.

The solution employed when spread out in a thin sheet sets rapidly, a thin skin being formed on the surface, which prevents the material from flowing readily, and as the gages when interposed, as shown, directly between the edge of the blade and the surface of the bed-plate occupy more or less of the surface of the bed-plate in the opening beneath the blade their rear under surfaces are inclined and beveled, so that the still fluid material may run together and form a continuous sheet before setting, or, if it is desired to cover but a portion of the surface of the bed-plate or produce two or more separate sheets or strips, the gages corresponding in position to the edge or line of separation may be flattened and prolonged somewhat in rear of the blade.

When the solution has all been spread or the carriage is arrested, as by the withdrawal of the lugs on the chains, the casing C is drawn over or placed in position to cover the bed-plate and the exhaust apparatus is set in motion.

The covering of the layer of solution is for a twofold purpose, to exclude dust, &c., from the surface of the material and to prevent the volatile solvents from escaping into the atmosphere, as they are highly injurious, besides which they are valuable products and can be recovered.

The exhaust draws the air through all openings, joints, or crevices in the casing, thus preventing the escape of the fumes. It also facilitates the escape or vaporization of the solvents, which latter can afterward be recovered by well-known methods.

In drying the film or layer of nitro-cellulose and camphor is diminished in thickness by the removal of its solvents, and when dry will be found to adhere closely to the surface of the bed-plate, so much so that considerable force is required to detach it therefrom.

The next proceeding, if sensitized photographic films are to be produced, is to apply a thin even coating of sensitized emulsion, cover and dry the same, when the film is ready to be removed. The spreading of the emulsion is performed by the aid of any of the well-known forms of coating devices adapted for the purpose and mounted upon a carriage reciprocating longitudinally of the bed-plate and its adherent film.

The removal of the completed film from the surface of the bed-plate is accomplished by attaching one end to a reel or roller traversing the bed-plate.

If the film as produced by the machine is wider than required for use and it is desired to divide it into two or more strips, this can best be accomplished while the material lies flat upon and adhering to the surface upon which it was formed, as by running a cutting edge or knives along the surface, for which purpose the knives may be attached to the carriage, as indicated in Fig. 10 by dotted lines, and the latter caused to traverse the bed-plate. The ends of the several films are then detached from the surface of the bed-plate and each connected to one of the reels on the movable carriage.

The reels being located in different planes draw the strips from the surface at different angles, and the tension being regulated one series of strip will be drawn from the surface in advance of the other. Each strip is thus placed under equal tension its full width, and as the roll is simultaneously advanced and rotated the film is stripped from the surface without danger of being distorted, torn, or otherwise defaced.

It is essential that the movement communicated to the traveling coating apparatus should be steady and uniform throughout the whole distance traversed, as otherwise waves and inequalities in the thickness of the film will be produced. By employing duplicate hauling devices or belts moving in unison and attaching them to the carriage at widely-separated points the carriage is sustained against lateral vibratory motions and is moved equally at opposite ends, whereas if a single belt is employed and attached to the carriage at one point the latter becomes a center about which the carriage may be vibrated or oscillated during its progessive movement, as when the friction at opposite ends varies or some slight obstruction is encountered. The two chains or belts connected to the carriage at remote points serve to check this oscillatory movement, which is destructive to uniformity in

the thickness of the film, as neither end of the carriage can be retarded and the opposite end advanced so long as the two chains or belts move in unison and the connection with the carriage is preserved.

Having thus described my invention, what I claim as new is—

1. In a machine such as described, the combination of a bed-plate having a substantially flat surface and a traveling coating apparatus mounted and reciprocating upon guides parallel with the surface of the bed-plate, substantially as described.

2. In a machine such as described, the combination, with a coating apparatus provided with a depositing and spreading apparatus mounted upon guides, of a sectional bed-plate composed of sheets of glass with the interstices between the abutting edges filled with plaster-of-paris or equivalent material level with the surface of the sheets to form a a bed-plate having a continuous surface, substantially as described.

3. In a machine such as described, the combination, to form a bed-plate for the reception of the film, of the frame, the vertically-adjustable cross-bars provided with receptacles for the reception of the plastic beds, sheets of glass resting upon said beds, and a filling of plastic material between the edges of adjacent sheets to form a continuation of the surface thereof, substantially as described.

4. In a machine such as described, the combination, with the bed-plate, of a traveling coating apparatus provided with a hopper for the fluid, having a discharge-orifice, and a spreading-blade supported in rear of said discharge-orifice and extending transversely across and parallel with the surface of the bed-plate, substantially as described.

5. In a machine such as described, the comnation of the bed-plate and a traveling coating apparatus, the latter comprising a hopper or receptacle for the fluid with a discharge-orifice, a spreader, and plates engaging the bed-plate opposite the ends of the discharge-orifice and serving to prevent the fluid from flowing laterally toward the edges of the bed-plate as the coating apparatus is advanced, substantially as described.

6. In a machine such as described, the combination, with the bed-plate, of the traveling coating apparatus furnished with a hopper supported on guides engaging the surface of the bed-plate, said hopper having a discharge-orifice and a spreader in rear thereof, substantially as described.

7. In a machine such as described, the combination, with the bed-plate and traveling carriage supported upon guides parallel with the bed-plate, of a coating apparatus provided with a depositing and spreading device mounted and guided upon the surface of the bed-plate and connected to the carriage, substantially as described.

8. In a machine such as described, the combination, with the bed-plate, the carriage supported upon guides and traversing longitudinally of the bed-plate, and mechanism for actuating said carriage, of a coating apparatus connected to said carriage, mounted directly upon the surface of the bed-plate and provided with a hopper for the reception and discharge of the fluid upon the bed-plate, and a spreader-blade, substantially as described.

9. In a machine such as described, the combination, with the stationary bed-plate and movable carriage, of the hopper detachably secured to said carriage and provided with guides engaging the face of the bed-plate, said hopper being provided with a regulated discharge and a spreading-blade, substantially as described.

10. In a machine such as described, the combination, with the surface upon which the film is formed and a hopper for containing and discharging the solution upon said surface, of a flexible spreading-blade and a series of gages interposed between said blade and the surface designed to receive the solution for automatically adjusting the edge of said blade, substantially as described.

11. In a machine such as described, wherein the fluid is deposited and spread upon a retaining-surface, and in combination with the devices for depositing such fluid and the surface upon which it is deposited, an automatically-adjusting spreading-blade, the same consisting of a series of independent sections supported upon gages, the latter resting upon the surface upon which the solution is to be deposited, substantially as described.

12. In combination with the sectional spreader-blade and independent pressure devices applied to the sections thereof, the gages interposed between the ends of the adjacent blade-sections, and the surface upon which the film is formed or spread by the blade, substantially as described.

13. In a machine such as described, and in combination with the bed-plate and a hopper movable longitudinally of and parallel with the surface of the bed-plate and provided with a discharge-orifice for the fluid, a sectional spreader-blade supported in rear of the hopper, each blade-section being provided with an independent pressure device, and gages engaging the surface of the bed-plate, substantially as described.

14. In a machine such as described, and in combination with the sectional spreader-blade supported in rear of the hopper, a pressure-spring applied to each blade-section to force it toward the bed-plate, and two gages interposed between each blade-section and the bed-plate to adjust and sustain said blade-sections with their edges removed from and substantially parallel with the surface of the bed-plate, sub tantially as described.

15. In a machine such as described, the combination, with the bed-plate and sectional blade co-operating therewith to form a film or layer of the fluid, of a series of gages or supports for the blade-sections, resting in contact

with the surface of the bed-plate and provided with converging or beveled sides, substantially as described.

16. In a machine such as described, and in combination with the sectional spreader-blade, a series of trailing strips pivotally supported at one end and extending beneath the blade-sections and resting in contact with the surface of the bed-plate or supporting-surface for the film, substantially as described.

17. In a machine such as described, the combination, with the sectional spreader-blade and supports engaging the bed-plate to hold said blade-sections removed from the latter, of the bow-springs engaging said blade-sections to press them toward the bed-plate, substantially as described.

18. In a machine such as described, and in combination with a blade-section, a bow-spring attached to a bracket at or near its center with its ends engaging the blade-section, substantially as described.

19. In a machine such as described, the combination, with a horizontal bed-plate upon which the film is deposited and dried, of a traveling coating apparatus attached to a carriage mounted on guides extending longitudinally of the bed-plates, and two chains or belts extending longitudinally of the bed-plate on opposite sides thereof, said belts or chains being driven to move in unison and connected to the traveling carriage at points remote from each other, whereby a steady and uniform progressive movement of the carriage is secured and lateral twisting prevented, substantially as described.

20. In a machine such as described, the combination of the bed-plate, the traveling carriage, the hopper attached to the carriage and provided with a regulated discharge-orifice, and the sectional spreader-blade mounted in rear of the hopper and provided with pressure devices and gages for sustaining the edge of the blade substantially parallel with the surface of the bed-plate, as set forth.

21. In a machine such as described, the combination, with the bed-plate upon the surface of which the film is formed, of a removable casing for covering the film while drying, and an exhaust apparatus in communication with the interior of said casing, substantially as described.

22. In a machine such as described, the combination, with the frame, bed-plate, and the trunk or conduit communicating with an exhaust apparatus or device, of the removable casing provided with an inlet orifice at one end of the bed-plate and an outlet at the other end opening into the exhaust-conduit, substantially as described.

23. In a machine such as described, and in combination with the bed or plate upon which the film is formed and to which it adheres, a carriage traversing said bed and provided with one or more cutters for dividing the film into strips while attached to the bed, substantially as described.

24. In a machine such as described, the combination, with the supporting-surface to which the film adheres, of a traversing winding-reel, substantially as described.

25. In a machine such as described, the combination of a supporting-surface on which the film is formed, a carriage mounted on guides and traversing longitudinally of said supporting-surface, and two or more winding-reels mounted upon said carriage in different planes, substantially as described.

26. In a machine such as described, the combination of the bed-plate, the traversing carriage, and two shafts mounted upon said carriage and geared together, each of said shafts being provided with a winding roll or reel, substantially as described.

27. In a machine such as described, the combination, with the bed-plate or surface upon which the film is formed and separated into strips while adhering thereto, of a traveling carriage, winding rolls or reels, and driving mechanism therefor mounted upon said carriage, and yielding tension devices—such as springs—intermediate the reels and their driving mechanism, substantially as described.

GEORGE EASTMAN.

Witnesses:
FRANK M. CROUCH,
FRED F. CHURCH.