F. M. COSSITT & L. D. CASTOR.

PROCESS FOR COATING AND DRYING PHOTOGRAPHIC PAPERS, PHOTOGRAPHIC FILM SUPPORT, AND SIMILAR MANUFACTURES.

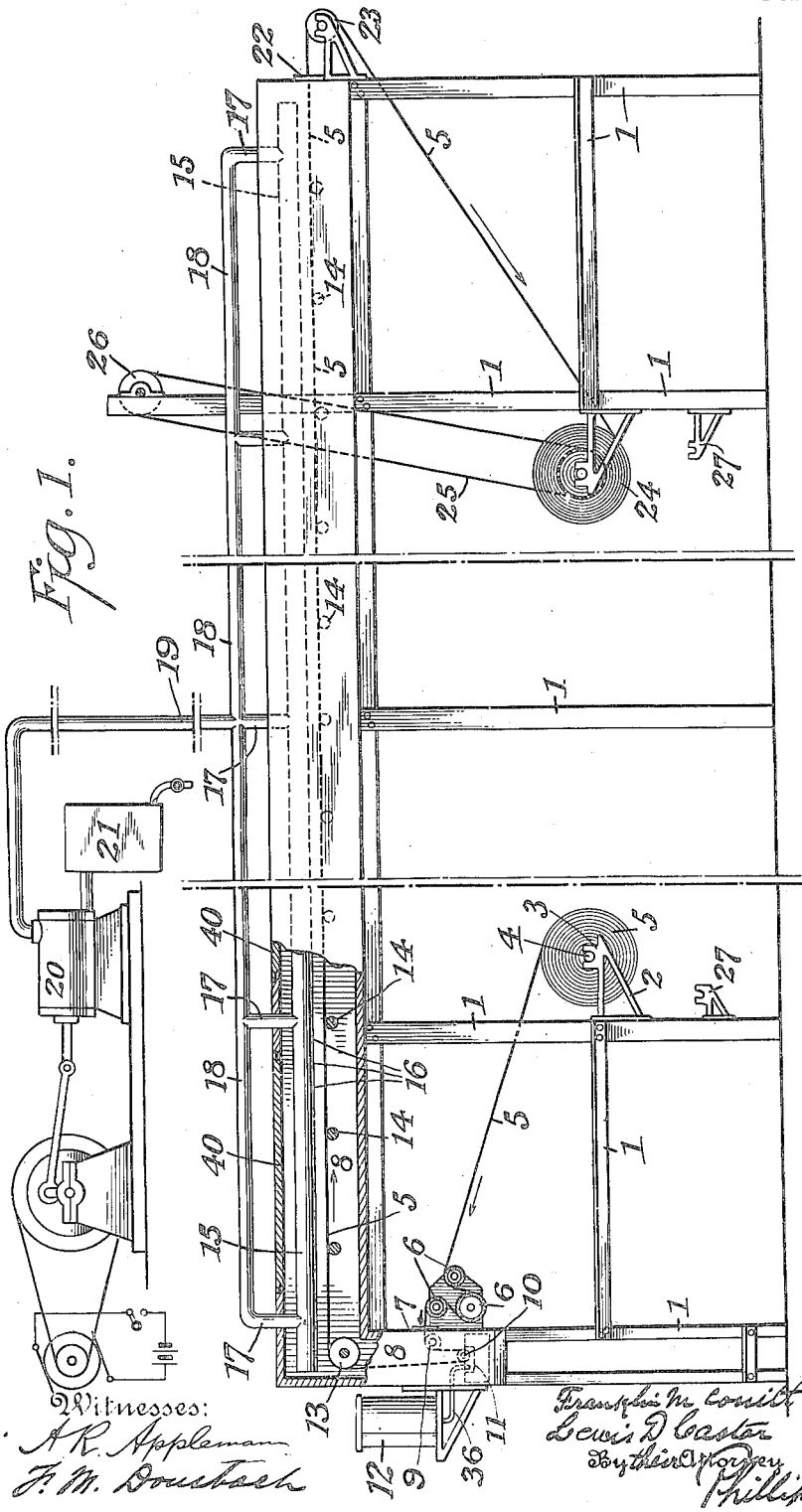
APPLICATION FILED MAY 14, 1914.

1,180,255.

Patented Apr. 18, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
A. R. Appleman
F. M. Dousbach

Franklin M. Cossitt
Lewis D. Castor
Inventors
By their Attorneys
Phillips Abbott.

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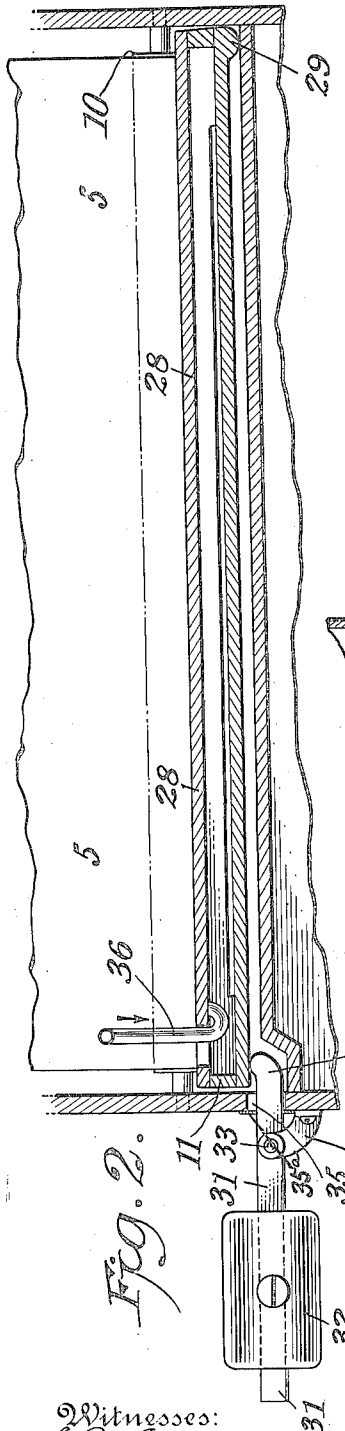

Fig. 2.

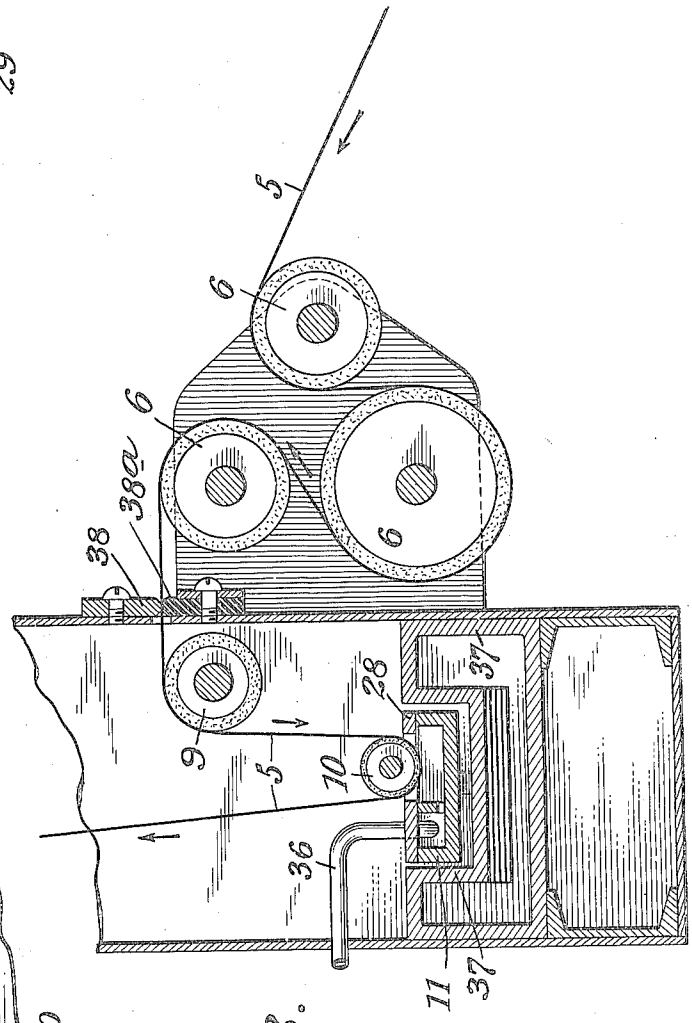

Fig. 3.

Witnesses:
A. R. Appleman.
F. M. Dousbach

Franklin M. Cossitt
Lewis D. Castor
Inventors
By their Attorneys
Phillips Abbott

UNITED STATES PATENT OFFICE.

FRANKLIN M. COSSITT AND LEWIS D. CASTOR, OF BINGHAMTON, NEW YORK, ASSIGNORS TO ANSCO COMPANY, OF BINGHAMTON, NEW YORK.

PROCESS FOR COATING AND DRYING PHOTOGRAPHIC PAPERS, PHOTOGRAPHIC-FILM SUPPORT, AND SIMILAR MANUFACTURES.

1,180,255. Specification of Letters Patent. Patented Apr. 18, 1916.

Application filed May 14, 1914. Serial No. 838,446.

To all whom it may concern:

Be it known that we, FRANKLIN M. COSSITT and LEWIS D. CASTOR, both citizens of the United States, and both residents of the city of Binghamton, county of Broome, and State of New York, have invented a new and Improved Process for Coating and Drying Photographic Papers, Photographic-Film Support, and Similar Manufactures, of which the following is a specification.

Generally stated the invention consists in continuously feeding a finished web, sheet or film of material through a vacuum chamber and in its transit applying to one side thereof the desired coating which will usually be a sensitized photographic solution or emulsion, and after the application of the same to continue the transit of the sheet, web or film while suitably supported through the vacuum chamber for a sufficient time to effect the drying or hardening of the coating, so that at the end of the operation, the coated product will be in condition to be coiled up, used, or stored.

We call particular attention to the fact that our process is essentially different from the vacuum processes heretofore practised for various purposes in the arts because in all such known to us the methods employed, the conditions of the material being treated and the results or product obtained, have been entirely different from and unsuited to the production of the products we secure by the practice of our process; that is to say, in the old methods, in most instances, the material being treated carried more or less moisture and the object of employing a vacuum has been to aid in drying out or removing this moisture; also in some instances a vacuum chamber has been employed in the impregnation or saturation of fabrics with a preservative or waterproofing substance, for example, roofing material, belting, cording, canvas, and the like. In these instances the function of the vacuum has been not only to remove moisture, as above suggested, but also to exhaust the air from the crevices or interstices in the material being treated, so that the impregnating material may more thoroughly penetrate and saturate.

In the manufacture of the photographic products we contemplate, on the contrary, there are many conditions present which have not occurred in any prior manufacture or process, that is to say, the supporting webs, sheets or film hereinafter called the stock, which we use in our manufactures, are dry, hard, dense and practically non-absorbent materials, the nitrocellulose film support being absolutely so, and the sensitive coatings which we apply to this basic stock is very expensive, so that we apply the same as a mere surface coating or application, which does not penetrate or saturate the supporting stock at all. Indeed, any saturation or impregnation thereof with our expensive coating material would be commercially impossible; also our applied material must be free from bubbles, which would injure the photographic products we make, and the coating must be quickly set when applied to the stock so that it will not move thereon and the operation must be a continuous one, so that undue flowage resulting in an uneven or marked surface will not result, and it must be dried as quickly as possible in order to avoid degradation of the product because of dust, and also in order that factory space may be saved and consequent cost of the plant reduced, and lastly, the solvents employed are some of them valuable and their recovery through condensation is greatly expedited and reduced in cost because of the reduction in the volume of the air requiring refrigeration.

It will be seen that by the practice of our process we solve all the problems and accomplish all the advantageous results referred to.

Referring to the drawings, Figure 1 illustrates an elevation, partly broken away, of an apparatus shown in U. S. Patent No. 1,171,321 dated February 8, 1916, issued on an application filed by us whereby our process may be practised; Fig. 2 illustrates a longitudinal vertical sectional view of the coating apparatus; Fig. 3 illustrates a transverse vertical sectional view of that which is shown in Fig. 2.

1 represents a frame which may be made of any suitable material.

2 is one of a pair of brackets provided with a journal 3 upon which is rotatably supported upon a shaft 4 a coil or roll 5 of the web, sheet or film to be coated and which passes in the direction of the arrows over a series of guide and tension rollers 6, 6, 6, which may be of any preferred material and

construction and through one of the walls 7 of a vacuum chamber 8 within which chamber the stock passes over a guide roller 9, thence under a coating roller 10 applies the coating to one side only of the stock, the roller 10 which is located in a coating trough 11, the detail of one form of which will be described later and which is supplied with the sensitive or other coating from a reservoir 12 which may be outside of the vacuum chamber, as illustrated, or inside of it, if preferred. After passing under the coating roller the stock 5 extends upwardly still within the vacuum chamber over a guide roller 13 and thence through an extension (preferably although not necessarily horizontal) of the vacuum chamber 8. In its transit it is preferably supported in any suitable manner. We prefer a series of rollers 14, 14, because if they are employed, then more free circulation of air currents about the coated stock will be secured than if a continuous table be employed, but a series of bars or slat work or for that matter a supporting surface of any kind may be employed, provided it makes contact only with the uncoated side of the stock. We impose no limitation in this respect. For certain manufactures no support whatever will be necessary.

In the vacuum chamber is an exhaust tube 15 provided with openings 16, shown in this instance as made in its under surface. They may be located in any preferred part. This exhaust tube is in open connection with a series of pipes 17 which connect with a longitudinal pipe 18 which in turn connects with a pipe 19 leading to a vacuum pump 20 run by a suitable electric motor or other power as indicated and from the pump an exhaust pipe extends to a condenser indicated at 21.

After the stock 5 has passed through the vacuum chamber which is made of such length as necessary to sufficiently dry the coating upon the stock, it may pass through the opposite wall of the vacuum chamber, as at 22, over a guide roller 23 and is wound up as at 24 upon a shaft which is driven by belting 25 connected with any suitable source of power, indicated at 26, in a well known manner.

We show duplicate brackets 27, 27, upon the frame 1, because it will sometimes be convenient to run more than one strip or band of stock through the machine at the same time and for this purpose the guide rollers, coating roller, vacuum chamber and its appurtenances may all be made of such width as will accommodate one or more strips of stock of any preferred width.

The details of one form of coating apparatus are illustrated in Figs. 2 and 3. The coating trough 28 is supported at one end upon a fulcrum 29 or other suitable support. At its other end it rests upon the inner end 30 of a lever 31 provided with an adjustable counterbalance 32. The lever is pivoted as at 33 upon a bracket 34. The opening 35 through which the lever passes is made sufficiently airtight in any suitable manner as by a sliding sealing device 35a. A pipe 36 connected with the reservoir 12 supplies the coating material which flows in the direction of the arrow in Fig. 2. Its lower end is turned upwardly as shown and seals against the under side of the top which partially covers the coating trough when the trough is full, as shown best in Fig. 2, the coating trough 28 rests within an interior fixed trough or waterbath 37 which may be heated in any preferred manner so as to maintain the coating material at such temperature as desired. The relation between the coating roller 10 and the surface of the fluent coating material in the tank is such that the lower arc of the roller will merely touch or slightly dip into the surface of the coating material and will thus apply it to the under side only of the stock which passes around the lower side of the coating roller, and it will be particularly noted that the operation of the parts is such that the coating material is maintained practically at a predetermined level in the tank.

In order that the in-sucking of air owing to the vacuum within the vacuum chamber may be prevented or reduced to a negligible degree and yet the stock not be injured in its passage through the walls of the vacuum chamber, we prefer to provide the openings through which the stock enters and passes from the vacuum chamber with suitable sufficiently airtight devices shown at 38 and 38a in Fig. 3. The upper one 38 may be made of any preferred material. Its rounded edge which engages with the stock may if desired be covered with some suitable non-abrasive material, as for instance, a closely woven felt or plush, not shown. The lower one 38a may be similarly constructed, but we prefer to make it of relatively soft rubber as indicated. The surface which comes in contact with the stock may also be covered with protective material. These parts being separated, the end of the stock may be passed between them into the vacuum chamber and then being readjusted and fastened as by set screws and washer shown, the stock may be so closely held between the opposed edges of the parts referred to as to reduce leakage of air to a negligible amount and yet not injure or scratch the surface of the stock.

Many useful details of construction are not illustrated or described for they form no essential part of the invention. We state, however, that in order to facilitate the threading of the leading end of the stock through the machine, we prefer to have re-

movable sections 40 (see Fig. 1) in the upper wall of the vacuum chamber so that ready access to its interior may be secured. The edges of these removable sections may beneficially be provided with some suitable sealing material, as, for instance, rubber gaskets, so as to secure the requisite air-tightness.

The operation is as follows: The cover sections 40 are removed from the vacuum chamber, the stock 5 is threaded through the machine as described and the leading end of it is made fast to the winding up device. The covers 40 are then replaced, the coating material, sensitized or otherwise, as the case may be, is then allowed to flow from the reservoir 12 into the coating trough. As the trough gradually fills, its weight is increased so that it will depress the counterpoise 32 which is adjusted upon the lever 31 as conditions may require. When the coating trough is sufficiently full, it will have swung downwardly so far that the upturned end of the fixed pipe 36 will come in contact with the cover of the trough as above stated and thus act as a valve to cut off the further incoming of the coating material. It will be noted, as above suggested, that the relation of the coating roller to the surface of the coating material will be such as to apply the material to the lower side only of the stock as it passes beneath the roller 10. The vacuum pump is now started and owing to the relatively small space inclosed within the vacuum chamber the rarefaction of the air is quickly accomplished. The degree of vacuum requisite for successful operation will depend upon the character of the coating material, *i. e.*, the volatility of the solvents employed, its viscosity, the speed at which the machine is run, the length of the vacuum chamber, and to some extent also upon the character of the stock being treated. Therefore no fixed degree of vacuum can be stated, but for ordinary purposes from ten to fifteen inches will be sufficient.

When the desired vacuum has been established, which may be indicated by any suitable gage, not shown, the apparatus is started and the winding up device which is positively driven, will draw the stock through the apparatus at predetermined speed. During its transit it will have become coated, the coating set and sufficiently dried or hardened to permit the finished product to be coiled up as shown in a roll 24.

Especial attention is called to the fact that inasmuch as the coating trough in which the coating material is placed is itself within the vacuum chamber, there will be no bubbles in it, for owing to the reduction of atmospheric pressure due to the vacuum, they will instantly come to the surface, break and disappear and if by any possibility a bubble should here and there be taken up upon the surface of the traveling stock, it will instantly break, and owing to the then fluent condition of the coating material, the spot where the bubble was will immediately close or be flowed over, thus producing a smooth surface.

Owing to the presence of the vacuum *i. e.*, the relief of atmospheric pressure, the volatility of the solvents will be very greatly increased, so that the coating upon the stock will almost immediately set and quickly thereafter dry or harden, so that by the time it reaches the end of the vacuum chamber, it will be in condition to be coiled up for use or storage.

We call especial attention to the fact that the exhaust from the vacuum chamber will obviously be of very greatly reduced volume as compared with the volume of air that is necessarily present where a blower or other means is employed to generate drying air currents as heretofore customary in the manufacture of the products we contemplate, so that the expense of condensation under our system is materially lessened because instead of there being a large volume of air but slightly impregnated with the vapors of the valuable solvents, there is a small volume only and it is heavily surcharged therewith and thus the expense of refrigeration is very greatly reduced.

We have illustrated the reservoir and the supply and take up roller as located outside of the vacuum chamber because in ordinary apparatus this will be the most feasible construction but obviously these features, or some of them, may be inclosed within the vacuum chamber. The fact that the stock is dry and hard and that it does not encounter the coating material until it is within the vacuum chamber enables us to pass it through the airtight, or sufficiently airtight devices described from the exterior to the interior of the chamber without scratching or otherwise injuring the surface of the stock. Of course if the coating material be sensitive to light and the reservoir be upon the outside of the vacuum chamber, it will be necessary to provide suitable means now well known and not shown to prevent the contents of the reservoir from becoming light struck.

We claim:

1. The described process of manufacturing sensitized photographic products consisting in applying to one side only of a supporting sheet or strip a coating of fluent photographically sensitive material in a partial vacuum, maintaining the coated side free from contact, and setting or drying said coating while still subjected to the vacuum.

2. The described process of manufacturing sensitized photographic products consisting in passing a supporting sheet or strip continuously into a vacuum chamber, continuously applying a coating of fluent

photographically sensitive material to one side only of the support within said chamber, maintaining the coated side free from contact, continuously setting or drying said coating within said chamber while still subjected to the vacuum and continuously removing the coated support from said chamber.

3. The described process of manufacturing sensitized photographic products consisting in applying to one side only of a moving sheet or strip a coating of fluent photographically sensitive material, maintaining the coated side free from contact and setting or drying the coating all in a vacuum chamber and while subjected to the vacuum, removing the exhaust from the chamber and condensing the same for the recovery of the solvents.

4. The described process of manufacturing photographically sensitive products consisting in supplying to a suitable coating apparatus a body of fluent, photographically sensitive material, rarefying the air surrounding the coating apparatus as by a partial vacuum and applying said material upon the sheet or strip to be coated.

5. The described process in the manufacture of photographically sensitive products consisting in automatically and continuously during the coating operation supplying to a suitable coating apparatus a body of fluent, photographically sensitive material, rarefying the air surrounding the coating apparatus as by a partial vacuum and applying said material upon the sheet or strip to be coated.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRANKLIN M. COSSITT.
LEWIS D. CASTOR.

Witnesses:
L. D. FIELD,
E. O. SCHULTZ.