No. 676,314. Patented June 11, 1901.

C. E. HEARSON.

APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

(No Model.) (Application filed Aug. 9, 1900.) 6 Sheets—Sheet 1.

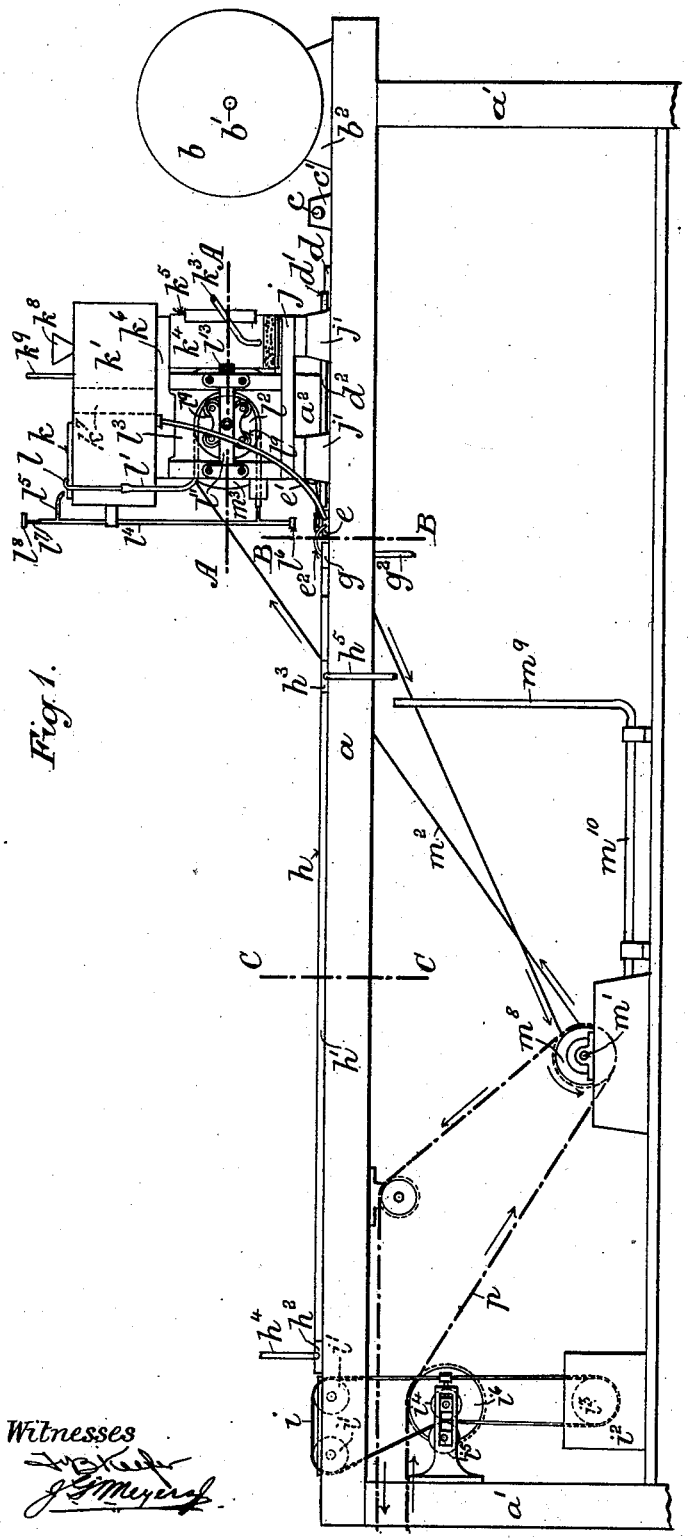

Fig. 1.

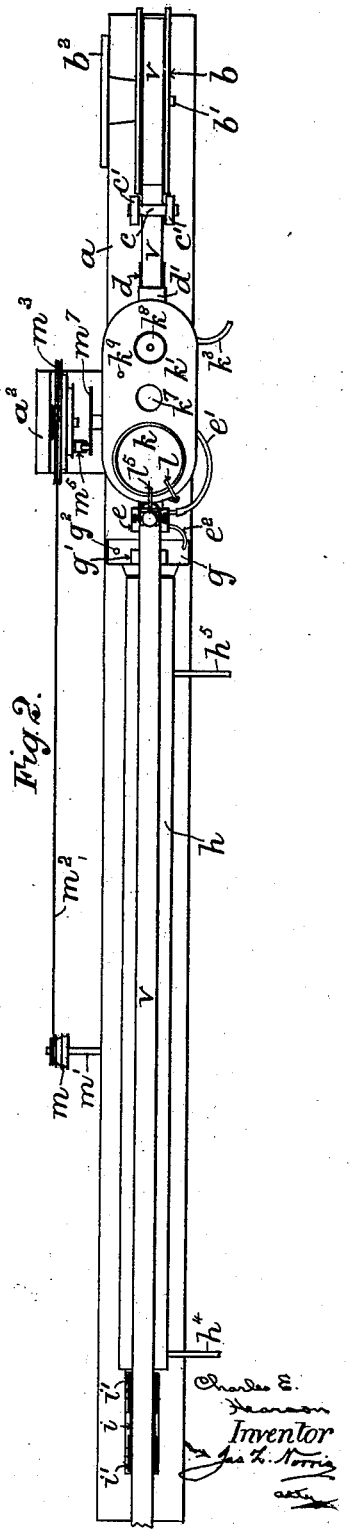

Fig. 2.

Witnesses

Inventor

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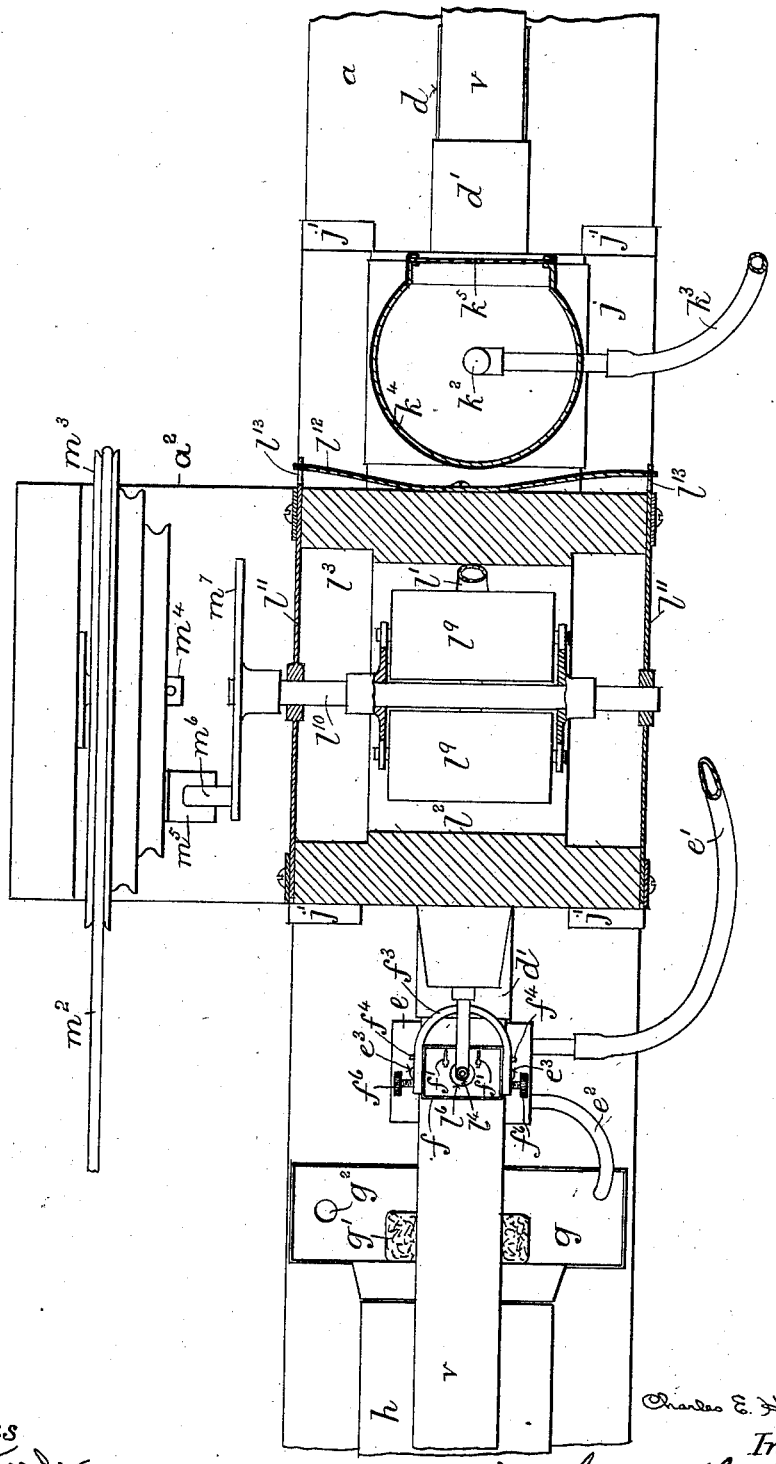
(No Model.) (Application filed Aug. 9, 1900.)

6 Sheets—Sheet 2.

Fig. 3.



Witnesses
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Charles E. Hearson
Inventor
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No. 676,314. Patented June 11, 1901.

C. E. HEARSON.

APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

(Application filed Aug. 9, 1900.)

(No Model.) 6 Sheets—Sheet 3.

Fig. 6.

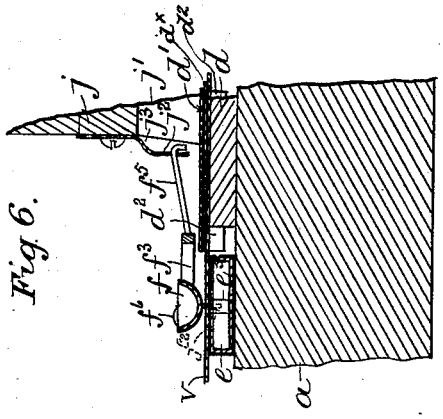


Fig. 5.

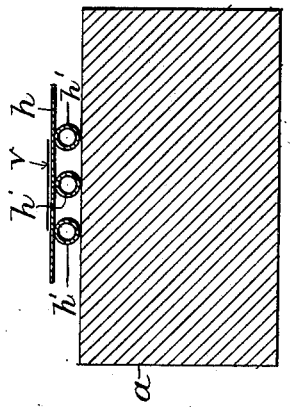
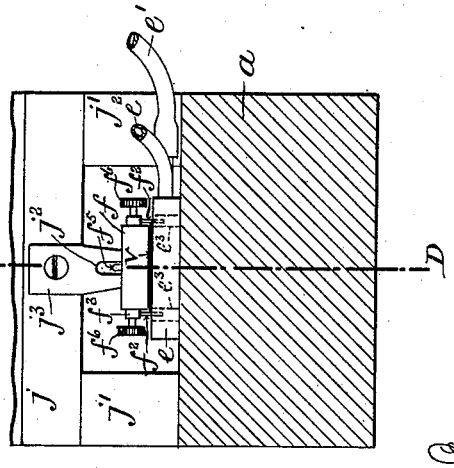


Fig. 4.



Witnesses

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J. E. Meyers

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APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

(No Model.) (Application filed Aug. 9, 1900.) 6 Sheets—Sheet 4.

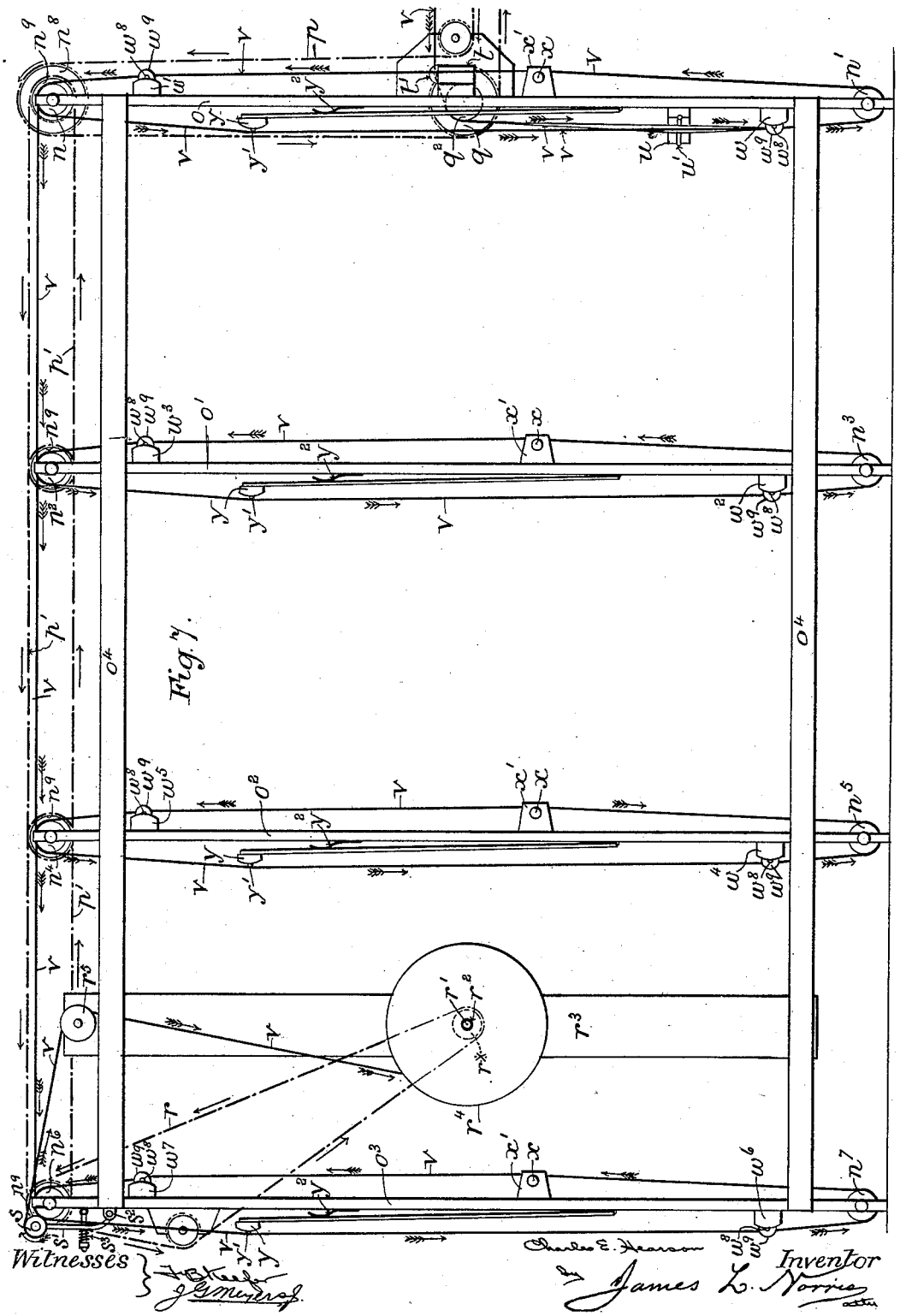

Fig. 1.

Witnesses
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No. 676,314. Patented June 11, 1901.

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APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

(No Model.) (Application filed Aug. 9, 1900.)

6 Sheets—Sheet 5.

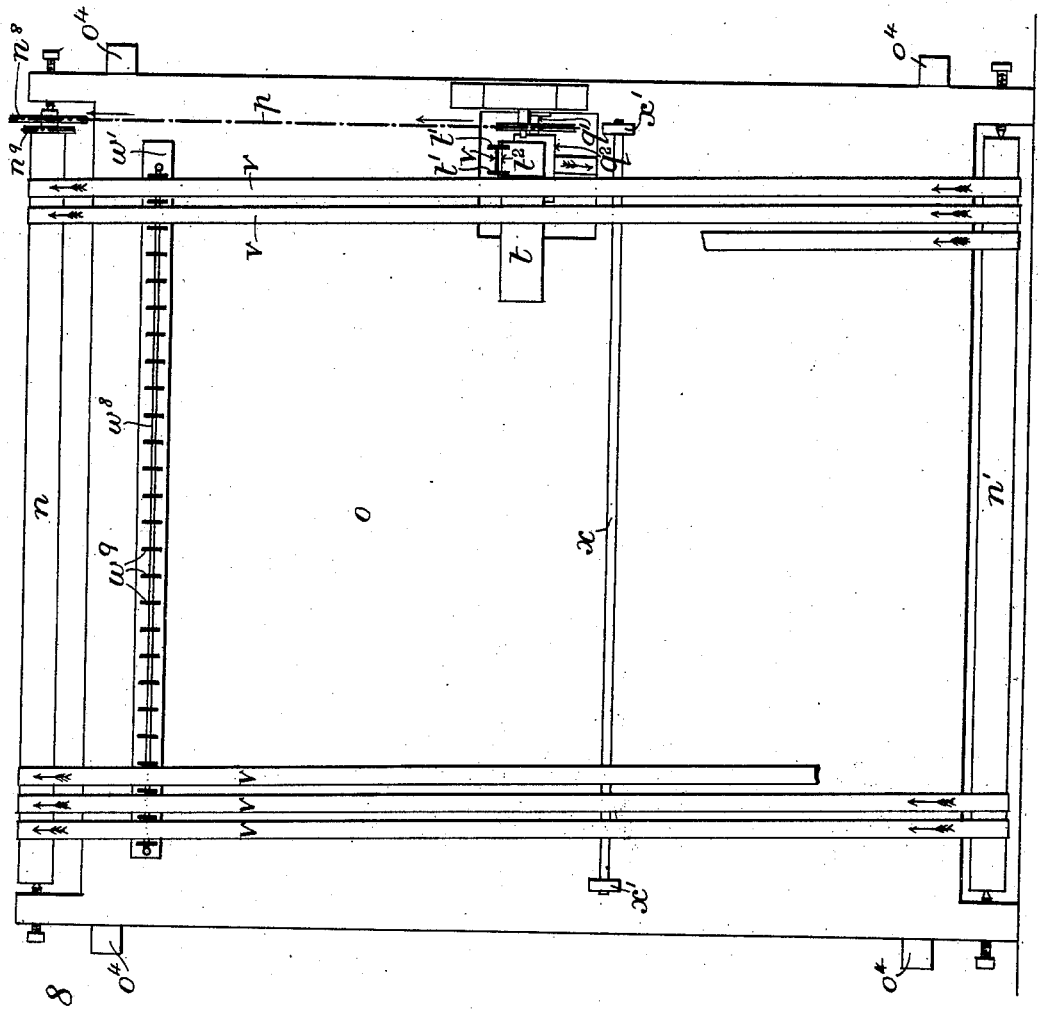

Fig. 8

Witnesses:
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No. 676,314. Patented June 11, 1901.

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APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

(No Model.) (Application filed Aug. 9, 1900.) 6 Sheets—Sheet 6.

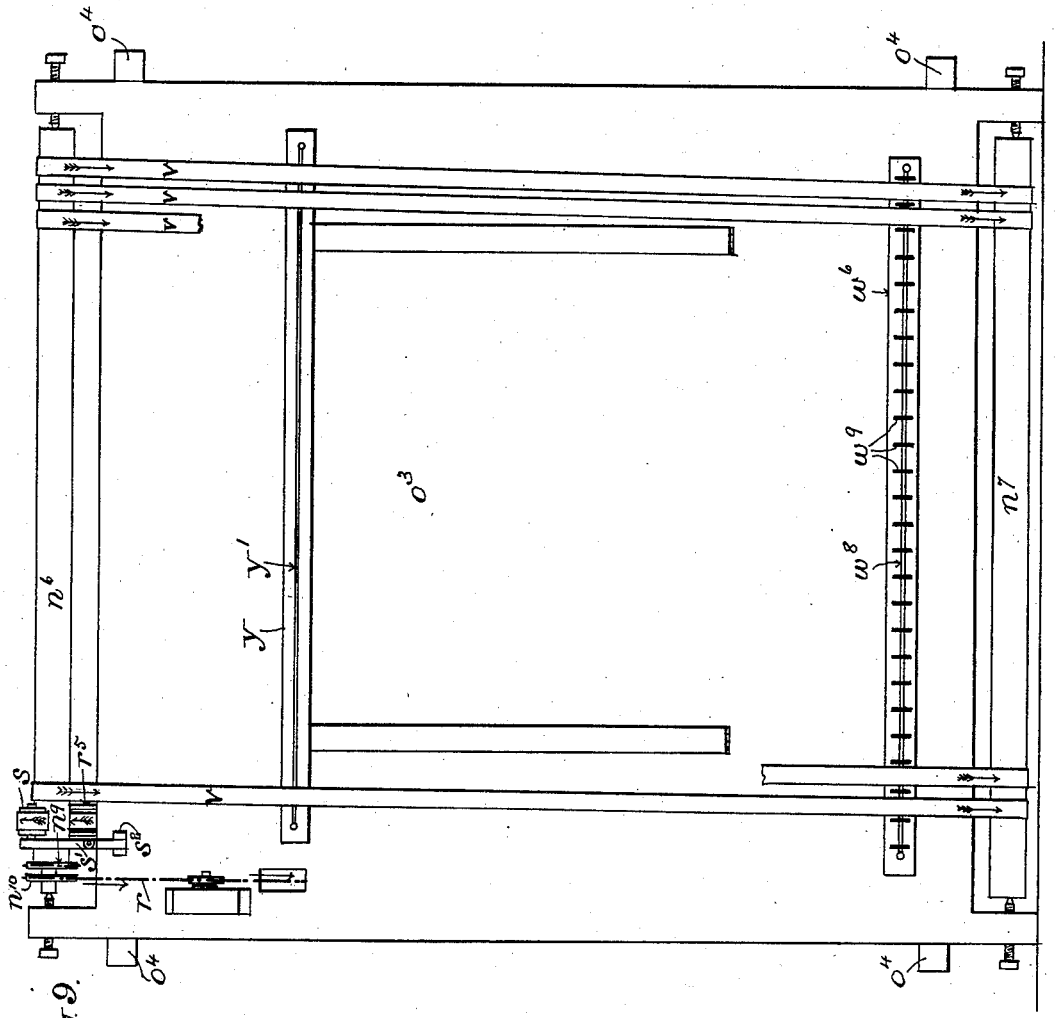

Fig. 9.

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES EDWARD HEARSON, OF LONDON, ENGLAND.

APPARATUS FOR COATING PHOTOGRAPHIC FILMS WITH SENSITIVE EMULSIONS.

SPECIFICATION forming part of Letters Patent No. 676,314, dated June 11, 1901.

Application filed August 9, 1900. Serial No. 26,400. (No model.)

To all whom it may concern:

Be it known that I, CHARLES EDWARD HEARSON, a subject of the Queen of Great Britain, residing at London, England, have invented new and useful Improvements in Apparatus for Use in and in Connection with the Coating of Photographic Films with Sensitive Emulsions, of which the following is a specification.

Apparatus constructed according to my invention for coating photographic films with sensitive emulsions consists of a reservoir for containing a supply of the emulsion and means for keeping the emulsion in a fluid state and conducting it from the said reservoir to a delivery vessel, from which it flows onto the films, which are caused to pass under the said vessel, the means for conducting the emulsion from the reservoir to the said vessel being actuated or governed or controlled in its action by connection with the means for causing passage of the films under the emulsion-delivery vessel. Buckling or curling of the films after application of the emulsion thereto is prevented by moistening them on the reverse side and causing them to travel over a flat slab or sheet of metal or other suitable material, preferably having a refrigerator arranged in combination with it, with which slab or sheet the moistened side of the film is in contact. The films after being coated pass to a conveyer consisting of a system or series of parallel rollers, to and over and between which each strip or length of coated film is so guided or conducted that the several layers thereof on the said rollers and the portions between or extending from one to another of the said rollers are side by side and separate from each other, the coated face of the film being outermost. The number and length and arrangement of the said rollers and the speed at which they are driven are such that by the time the films pass from the said conveyer the coating of emulsion on them is sufficiently dry to admit of their being at once removed and packed for storage or transit.

I will further describe my invention with reference to the accompanying drawings.

Figure 1 is a side view, and Fig. 2 a plan, of the part of the apparatus where the films are coated. Fig. 3 is a horizontal section of a portion of Fig. 1, taken on the line A A in that figure. Figs. 4 and 5 are vertical sections taken, respectively, on the lines B B and C C, Fig. 1; and Fig. 6 is a vertical section taken on the line D D, Fig. 4, the said Figs. 3, 4, 5, and 6 being drawn to a larger scale than the said Figs. 1 and 2. Fig. 7 is a side elevation, and Figs. 8 and 9 are end elevations, of the conveyer to which the films pass after being coated with emulsion, the said Figs. 7, 8, and 9 being drawn to the same scale as Figs. 1 and 2.

In the following description the parts of the said drawings are referred to by the letters marked thereon. The same letters of reference indicate the same parts in all the figures of the said drawings, in all of which, except Fig. 1, the film is shown and marked *v*.

The part of the apparatus at which the coating of the films takes place is supported by a table *a*, mounted on uprights *a' a'*, along which table are arranged the parts hereinafter described: A drum or spool *b* for the reception of a length of uncoated film, which drum or spool turns on a pin *b'*, carried by a fixed upright b^2; a rod of glass *c* for the film to pass under, secured in fixed uprights *c' c'*; a fixed block *d*, over which is placed a metal plate *d'*, lined with velvet $d^\times$ (see Fig. 6) and having downwardly-turned edges d^2 d^2 for keeping it in place, between which block and plate the film passes just before being coated with emulsion, the object of the velvet lining of the said plate being to remove dust from the upper face of the film which is to receive the coating; a heater consisting of a box *e*, connected by a pipe *e'* with a supply of heated water, above which box is a cup *f*, constituting the emulsion-delivery vessel, and over the surface of which box, between it and the said cup *f*; (see Figs. 3, 4, and 6,) the film passes while receiving the coating of emulsion from the said cup, the object of the said heater being to prevent chilling of the emulsion; a tray *g*, containing a pad of absorbent material *g'* and supplied with water from the box *e* by a pipe e^2 and provided with a water-outlet pipe g^2, opening a little below the level of the upper face of the pad *g'*, over which pad the film passes, and is thereby moistened on its under surface after having received the coating of emulsion; a metal plate *h*, having a flat and level surface, to which the moistened under face of the film adheres while

passing over it, the object being to prevent any liability of curling or buckling of the film and to keep it perfectly flat and level while the coating is in a fluid state; a refrigerator for causing the coating to set, consisting of pipes h' h', (see Fig. 5,) arranged between the said plate h (see Fig. 5) and the table a, which pipes communicate at their ends with boxes h^2 h^3, the box h^2 being connected to a supply of cold water by a pipe h^4 and the box h^3 being provided with an outflow-pipe h^5 for escape of water entering and passing through the said pipes and boxes from the supply, and a wiper for removing moisture from the under surface of the film, consisting of an endless band of flat cotton lamp-wick or other suitable absorbent fabric i, passing over rolls i' i', mounted in fixed bearings, and part hanging in loop form in a bucket i^2 and supporting a roll i^3 of sufficient weight to keep the said band in tension throughout its length and gripped at an intermediate point between adjustable rolls i^4 i^5, to one of which rotary motion is imparted, as hereinafter described, whereby the part of the said band between the rolls i' i' is caused to move in a direction opposite to that in which the film moves after receiving the coating of emulsion. The said band i while passing between the rolls i' i' is in contact with the back of the film and wipes off moisture received by it from the pad g'.

On a stand j, provided with feet j' j', secured to the table a above the part occupied by the block d, are mounted the emulsion-reservoir and its appurtenances, which are hereinafter described.

The emulsion-reservoir consists of a vessel k, supported in a tank k', containing water, which when the apparatus is in use is heated by a gas-burner k^2, (see Fig. 3,) supplied with gas by a pipe k^3 and surrounded by a light-proof casing k^4, closed by a sliding shutter k^5, by raising which shutter access to the burner k^2 may be obtained. The products of combustion from the said burner pass from the casing k^4 into a chamber k^6 beneath the water-tank k' and escape through a flue k^7 in the water-space of the said tank, with which tank the pipe e', leading to the aforesaid heater e, communicates.

k^8 is a funnel placed in an aperture in the top of the tank k' for receiving a regulated supply of water and directing it into the said tank k'. k^9 is a thermometer entering the said tank, by which the temperature of the water is indicated.

The construction and mounting of the cup f, from which emulsion passes onto the film and which is situated above the box e, are best shown in Figs. 3, 4, and 6, by reference to which figures it will be seen that the said cup has slits f' f' formed in it and is free to move vertically, but is restrained from moving horizontally partly by engagement with tubes e^3 e^3 in the box e of pins f^2 f^2, carried by a fork f^3, between the branches of which the said cup is secured by pins f^4 f^4, and partly by engagement of a hook f^5, carried by the said fork f^3, with a slot j^2 in a plate j^3, secured to the stand j. f^6 f^6 are screws engaged in the branches of the fork f^3 and bearing against the sides of the cup f, by means of which screws the said cup is secured after adjustment of its position on the said pins f^4 f^4, as required. The said cup f is supplied with emulsion from the reservoir k by means of the arrangement hereinafter described. In connection with the said reservoir is an arrangement by which delivery into the cup f of a regulated supply of the emulsion may be produced and stopped, according to requirements, and by which when delivery of the emulsion into the cup is stopped return thereof to the reservoir is produced, the object of causing such return of the emulsion being to avoid cooling of the emulsion in the delivery-passages, and consequent obstruction thereof. The said arrangement consists of a conduit formed of a bent pipe l, communicating with the interior of the emulsion-reservoir k and having connected to it one end of a flexible pipe l', which passes around the inner surface of a cylindrical opening l^2 in a block l^3 and is connected at its other end to a pipe l^4, having near its upper end a branch l^5, opening over the emulsion-reservoir k and the lower end of which is over the cup f and is provided with a valve l^6, connected to a rod or wire l^7, provided with a knob l^8 at its upper end, by raising or depressing which the valve l^6 may be actuated so as to close or open the lower end of the pipe l^4. In order to prevent descent of the rod l^7 and valve l^6 by gravity when released after being raised, the rod l^7 is slightly bent, so as to cause friction between it and the pipe l^4, in which it works. To insure passage of the emulsion as required through the conduit consisting of the aforesaid pipes, rollers l^9 l^9, mounted on arms carried by a rotatory shaft l^{10}, supported by bearings in bars l^{11} l^{11}, are so arranged within the opening l^2 that the said rollers l^9 l^9 bear on and compress the said flexible pipe l' against the curved face of the said opening, the action of the said rollers on the pipe l' when the shaft l^{10} is rotating being either to govern passage of the emulsion from the reservoir k into the pipe l^4 and thence out of the lower end of the said pipe or to produce return of the emulsion into the said reservoir by way of the branch l^5, according as the lower end of the said pipe l^4 is open or closed by the valve l^6.

Motion is communicated to the shaft l^{10} from a pulley m, secured to a shaft m', through the medium of a belt m^2 and pulley m^3, which pulley works on a pin m^4, affixed to a bracket a^2, projecting from the side of the table a, and carries a projecting plate m^5, which engages with a pin m^6 on a disk m^7, secured to the said shaft l^{10}, and the rollers l^9 l^9 are caused to bear against the pipe l' with sufficient force to produce compression of it

by a spring l^{12}, secured to the block l^3, (see Figs. 1 and 3,) the free ends of which spring are engaged with slots l^{13} l^{13} in the ends of the sliding bars l^{11} l^{11}. The shaft m', carrying the pulley m, may be driven by an electric or other motor. (Not shown in the drawings.)

The conveyer illustrated in Figs. 7, 8, and 9, which receives the film when coated with emulsion and in passing through which the coating becomes dry, consists of pairs of rollers n, n', n^2, n^3, n^4, n^5, and n^6 n^7, mounted in a frame formed of uprights o o' o^2 o^3, connected by bars o^4 o^4 o^4 o^4, to and over and between which rollers the film is conducted by the means hereinafter described.

Rotatory motion is communicated to the roller n by a driving-chain p, gearing with a chain-wheel n^8 on a shaft carrying the said roller, which chain passes around a chain-wheel m^8 (see Fig. 1) on the shaft m', carrying the pulley m, with which the driving-belt m^2 of the coating portion of the apparatus is engaged. The said chain p also passes over a chain-wheel i^6 on the shaft of the roll i^4, between which and the roll i^5 the band i is gripped, and also around a chain-wheel q, (see Fig. 7,) affixed to a shaft q', (see Fig. 8,) running in bearings carried by the upright o. On the said shaft q' is loosely mounted a roller q^2, over which the film entering the conveyer passes downward on its way to the roller n'. From the shaft of the roller n rotatory motion is communicated to the shaft of the roller n^2, and therefrom to the shaft of the roller n^4, and thence to the shaft of the roller n^6 by chains p' p' p', gearing with chain-wheels n^9 n^9 on the said shafts. By means of a chain r, gearing with a chain-wheel n^{10} on the shaft of the roller n^6, (see Fig. 9,) rotation is communicated to another chain-wheel r^* (see Fig. 7) on a sleeve r', capable of rotation on a fixed pin r^2, secured to an upright r^3 and carrying a spool r^4, on which the coated and dried film collects prior to being removed from the conveyer.

The direction of motion of the whole of the gearing is indicated in the drawings by the featherless arrows.

The mechanism of the conveyer is thrown into and out of gear with the motor as required by means of a lever m^9 and rod m^{10}, actuating a clutch, (not illustrated,) which is situated between the chain-wheel m^8 and shaft m'. (See Fig. 1.)

The speed of the rollers n n' n^2 n^3 n^4 n^5 n^6 n^7, being in consequence of the driving arrangements described relative to that of the parts which govern or control the flow of emulsion into the cup f, it will be seen that the amount of emulsion applied to a given length of film is determined by the relative sizes of the pulleys m and m^3 and may be regulated according to requirements by suitable variation of size of the said pulleys. s (see Figs. 7 and 9) is a roller carried by an arm s', jointed at s^2 to the upright o^3 and pressed against the roller n^6 by a spring s^3, and r^5 is a roller carried by a fixed pin secured to the upright r^3, over which rollers s and r^5 the film passes on its way from the roller n^6 to the spool r^4. The rate of rotation of the sleeve r' is such that the said spool r^4, which is carried by it, rotates at sufficient speed to obviate any slackness of that part of the film between it and the spring-roller s when the collection of film on the latter is beginning. To prevent undue strain on the film being caused by increased rate of collection of film on it due to the increasing diameter of the coils of collected film, as the collection proceeds the rotation of the said spool with the said sleeve is provided for solely by making the spool bind or fit somewhat tightly on the sleeve, the degree of tightness being such that the spool is caused to slip on, and consequently rotate at less speed than, the said sleeve by more than slight tension of the part of the film between the said spool and the spring-roller s.

t (see Fig. 8) is a bracket affixed to the upright o, having projections t' t', between which is a glass rod t^2, the said projections acting as guides for the film, which passes over the said rod t^2 on its way into the conveyer.

u is a guide consisting of a block affixed to the upright o, the face of which block forms an angle of about thirty degrees to that of the said upright and has secured to it a glass rod u', in contact with which the film entering the conveyer passes on its way from the roller q^2 to the roller n', the passage of the film into the required position on the said roller n' being thus assisted.

The course of the film as it is conducted into and through the conveyer by the mechanism hereinbefore described is indicated by the feathered arrows. From these it will be perceived that after the film has entered the conveyer and passed between the guides t' t' and over the roller q^2 and guide u it passes down to the roller n' and under that roller and up on the opposite side to the roller n and over that roller, and so on in layers side by side (a few only of which are illustrated in Fig. 8) over and under the said rollers n and n' until nearly their whole length is occupied, when it passes to and over the roller n^2 and under the roller n^3 until nearly the whole of their length is occupied in like manner, when it passes to the pair of rollers n^4 and n^5 and afterward to the last pair of rollers n^6 n^7, on arriving at the end of which the film is conducted from the roller n^6 under and over the roller s and over the roller r^5 to the spool r^4, on which it collects and with which it is removed from the apparatus ready for use.

For the purpose of keeping the several layers of film out of contact while passing around the rollers n n' n^2 n^3 n^4 n^5 n^6 n^7 bars w w' w^2 w^3 w^4 w^5 w^6 w^7, having glass rods w^8 w^8 set in recesses in their faces and having projections w^9 w^9, are secured to the uprights o o' o^2 o^3, between the projections w^9 w^9, of which bars

the several layers of film lie, and for the purpose of keeping the several layers of film separate at intermediate points glass rods $x\,x$ are secured in supports $x'\,x'$, affixed to the uprights $o\,o'\,o^2\,o^3$, against which rods the back of the film bears in passing through the conveyer.

$y\,y$ are bars faced with glass rods $y'\,y'$ and connected to the ends of arms hinged at their other ends to the uprights $o\,o'\,o^2\,o^3$ and bearing against springs $y^2\,y^3$, secured to the said uprights, which rods being pressed by the said springs against the backs of the layers of film prevent slackness thereof.

The method of using the apparatus hereinbefore described and its action are as follows: A waste length of film is passed into the conveyer over the rollers thereof, so as to occupy the position hereinbefore described with reference to Figs. 7, 8, and 9—that is, so as to entirely fill the conveyer—one end of the said film being connected to the spool r^4. The other end of the said film is then passed over the band i and along the plate h, and between the cup f and heater e, and between the block d and plate d', and under the glass rod c, and connected to the end of a length of film to be coated, which is coiled on the spool b, which spool is then turned until the portion of the waste film between the guides $t'\,t'$ and the said spool b is pulled tight. The vessel k is then charged with emulsion, the valve l^6 being in position to close the lower end of the pipe l^4, and the tank k' is charged with water, preferably from a tap situated over the funnel k^8, which tap is so adjusted that the required level of water is maintained in the tank k', notwithstanding passage of water therefrom through the pipe e' and heater e and escape-pipe g^2. The burner k^2 is then lighted, and cold water is introduced into the refrigerator under the plate h through the pipe h^4. When the water in the tank k' has attained the required temperature, the apparatus is ready for use, and its action is started by means of the motor hereinbefore referred to, by which at this time motion is communicated only to the shaft l^{10}, in consequence of the clutch between the shaft m' and the chain-wheel m^8 being out of gear. By the rotation thus produced of the said shaft l^{10} and of the rollers $l^9\,l^9$, carried by it, emulsion is caused to pass from the reservoir k through the pipes l and l' into the pipe l^4 and thence to return through the branch pipe l^5 into the said reservoir. All being now ready for coating the film on the spool b, motion of the conveyer is started by gearing the chain-wheel m^8 with the shaft m' by means of the clutch which is actuated by the parts $m^9\,m^{10}$. On this being done the length of film in the conveyer connected to the film on the spool b is set in motion and the film from the said spool b is drawn by it between the block d and plate d', and on arriving under the cup f supply of emulsion thereto for coating the said film is started by depressing the rod l^7, whereby the valve l^6 is removed from its seating at the end of the pipe l^4, and emulsion is permitted to flow from the said pipe into the said cup, from which the emulsion issues through the slits $f'\,f'$ in it onto the film, traveling between it and the heater e, which heater keeps the emulsion in the said cup and on the part of the film resting on the said heater in a fluid state. After being coated the said film passes over the pad g', whereby the back of the said film is moistened. It then passes onto the plate h, the moisture on its back causing it to adhere to the said plate, and thus keeping it flat and level, so that the coating of emulsion, which is still in the fluid state, is of equal thickness at all parts of the film. As the film travels along the said plate h the effect of the refrigerator under the said plate is to cause the film to set or solidify to a sufficient extent to prevent inequality of thickness of the coating being caused by variation of position of the film. On arriving at the end of the said plate h the coated film passes therefrom over and in contact with the band i, which by the gearing of the chain p with the chain-wheel i^6 is caused to move in a direction the reverse of that in which the film is traveling, the effect being that the moisture which was received by the back of the film from the pad g' is absorbed and removed by the said band i, from which the moisture thus absorbed is afterward squeezed by the gripping-rollers $i^4\,i^5$. After passing over the said band i the film passes between the guides $t'\,t'$ of the conveyer and thence passes over the roller q^2, past the guide u and bar w, and thence under the roller n', past the rod x and bar w', to and over the roller n, and thence entirely through the conveyer. By the time the first-coated portion of the film from the spool b arrives at the spool r^4 the whole of the length of waste film originally passed into the conveyer will be coiled on that spool, which may then be removed and replaced by an empty one for the film just coated to collect on. When the last portion of the length of film being coated passes from the spool b, the conveyer is thrown out of gear with the motor by reversing the position of the clutch between the chain-wheel m^8 and the shaft m', and the passage of emulsion from the lower end of the pipe l^4 to the cup f is stopped by raising the valve l^6 by means of the rod l^7. On this being done the emulsion passing from the reservoir k through the pipe l^4 is caused to return to the said reservoir through the branch pipe l^5, as hereinbefore described. The said spool b is then removed from its pin b', and if it be desired to continue the coating of films another spool charged with uncoated film is substituted for it, and the end of the new film is connected to the end of the uncoated remainder of the film in the coating apparatus, and the coating of the said remainder and of the said new film is proceeded with, as hereinbefore described. After coating as much film as required the spool b is removed

from the pin b' and the spool bearing the waste film originally passed into the conveyer is put in place on the said pin b' and the end of the waste film is connected to the end of the uncoated remainder of the film last coated, and the said waste film is drawn into the conveyer and left there for the purpose of leading freshly-coated film into the conveyer when the apparatus is next used.

It will of course be understood that during the whole of the operations hereinbefore described the coated films must not be exposed to actinic light.

The object of the glass rods at those parts of the apparatus on which the film rubs while passing is to minimize friction.

Instead of moistening the back of the film to cause it to lie flat and level while the coating of emulsion is in a fluid state water may be applied to the surfaces over which the film passes while the said coating is in that state.

The capacity of the conveyer may be varied, according to requirements, by varying the number or the dimensions of the roller-carrying uprights. In all cases its capacity and the rate of motion imparted to the rollers thereof should be such that the coating of emulsion received by the film before entering the conveyer will be dry before the film arrives at the roller s.

To some extent the distance apart of the rollers of each of the several pairs of rollers of the conveyer must be governed by the width of the film. Thus for films one inch and a half in width the rollers of each pair may be about eight feet apart and for films three inches in width the said rollers may be about sixteen feet apart.

Where desirable or necessary for the purpose of drying the coated film, a current of dry and heated air may be passed through the chamber containing the conveyer.

To guard against breakage of the film in the event of any impediment occurring to proper passage thereof through the conveyer, the rollers $n\,n^2\,n^4\,n^6$ are caused to rotate with their shafts by friction only, the resistance to turning of the said rollers on their shaft due to such engagement being sufficient to overcome ordinary resistance of the film, but insufficient to cause rupture thereof.

The length of the plate h and of the refrigerating-pipes beneath it should be such that the coating of emulsion on the film will become set while passing along the said plate. For working at ordinary temperatures of the atmosphere and where the film is caused to pass through the apparatus at the rate of about ten feet per minute the length of the said plate h may be about six feet.

I claim as my aforesaid invention of "improvements in apparatus for use in and in connection with the coating of photographic films with sensitive emulsions" and desire to secure by Letters Patent of the United States of America—

1. Apparatus consisting essentially of a reservoir for emulsion, a heater for the said reservoir, a conduit with two exits for passage of the emulsion from the said reservoir one of the said exits being arranged to discharge into a delivery vessel and the other constituting a return-passage to the reservoir, means for governing the direction and means for governing the rate of passage of the emulsion through and from the said conduit, a delivery vessel for reception of emulsion from the said conduit and delivery thereof onto the film to be coated, a heater in juxtaposition to the said delivery vessel for keeping the emulsion therein and passing therefrom in a fluid state a flat and level surface for the coated film to pass over, means for introduction of water between the said surface and the film, a refrigerator for insuring setting of the coating of emulsion on the film while it is passing over the said surface, a wiper for removing moisture from the back of the film after leaving the said surface, and a conveyer for the coated film consisting of a system or series of rollers actuated relatively to the means for governing passage of the emulsion through the aforesaid conduit the whole being arranged and operating substantially as hereinbefore described.

2. The combination with an emulsion-reservoir and a conduit by which emulsion passes from said reservoir, of a pipe having delivery and return exits for issue of the emulsion, and a valve for said pipe, the position of which determines the direction of passage of the emulsion and delivery or return thereof substantially as and for the purpose specified.

3. The combination with the emulsion-reservoir, of a compressible conduit in communication therewith, traveling rollers for said conduit substantially as and for the purpose specified.

4. The arrangement substantially as and for the purpose specified of the heater which supports the film while it is passing under the delivery vessel.

5. The combination with the heater for supporting the film while being coated and the flat and level surface for reception of the coated film during setting of the coating, of provision substantially as described for application of liquid to the under side of the film after it has passed from the heater for the purpose of preventing buckling or curling of the film while the emulsion thereon is in a fluid state.

6. The combination with the flat and level surface for reception of the coated film during setting of the coating and the liquid-supply for preventing buckling or curling of the film, of the refrigerator consisting of cold-water conduit-pipes arranged below and in contact with the said flat and level surface for the purpose specified.

7. The combination with the flat and level surface and liquid-supply to the film for preventing buckling or curling thereof, of a wiper for the back of the film consisting essentially

of a traveling band of absorbent fabric gripped at part between squeezing-rollers whereby the liquid removed from the film by the said band is discharged therefrom.

8. The combination of the emulsion-reservoir, the compressible conduit in communication with the said reservoir, the rotatory compressing-rollers, the delivery vessel, the heater, and the refrigerator substantially as herein set forth.

9. The gearing connecting the rollers of the compressible conduit and the conveyer with one and the same driving-shaft substantially as and for the purpose specified.

10. In an apparatus for coating photographic films, an emulsion-reservoir, a conveyer for feeding the film to be coated, means connected to the reservoir for feeding the emulsion to the film for coating the same, means for setting the emulsion upon the film, means for moistening the back of the coated film during its passage to prevent the buckling thereof and means for wiping the moisture from the said film.

11. In an apparatus for coating photographic films, an emulsion-reservoir, a conveyer consisting of a series of rollers for feeding the uncoated film to be coated and drying the film after the emulsion has been applied thereto, means connected to the reservoir for feeding the emulsion to the film for coating the same, means for setting the emulsion upon the film, means for moistening the back of the coated film during its passage to prevent the buckling thereof, means for wiping the moisture from the back of said film, and means for simultaneously operating said conveyer and wiping means.

CHARLES EDWARD HEARSON. [L. S.]

Witnesses:

PERCY CHARLES RUSHEN,

WILLIAM HOLMES.