

G. EASTMAN.

APPARATUS FOR COATING PHOTOGRAPHIC PAPER.

No. 370,050.

Patented Sept. 20, 1887.

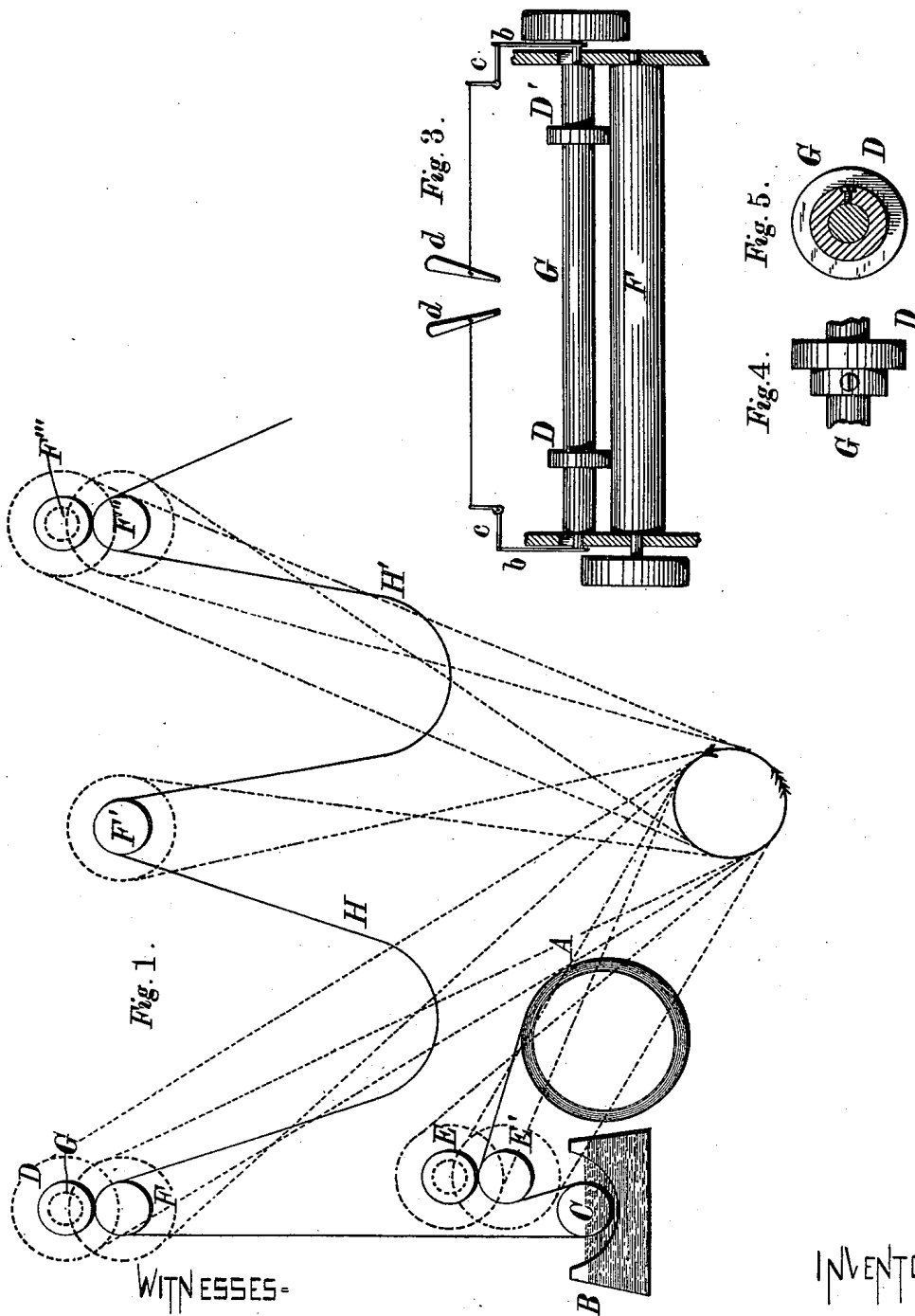


Fig. 1.

Fig. 3.

Fig. 4.

Fig. 5.

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Fig. 6.

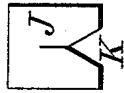
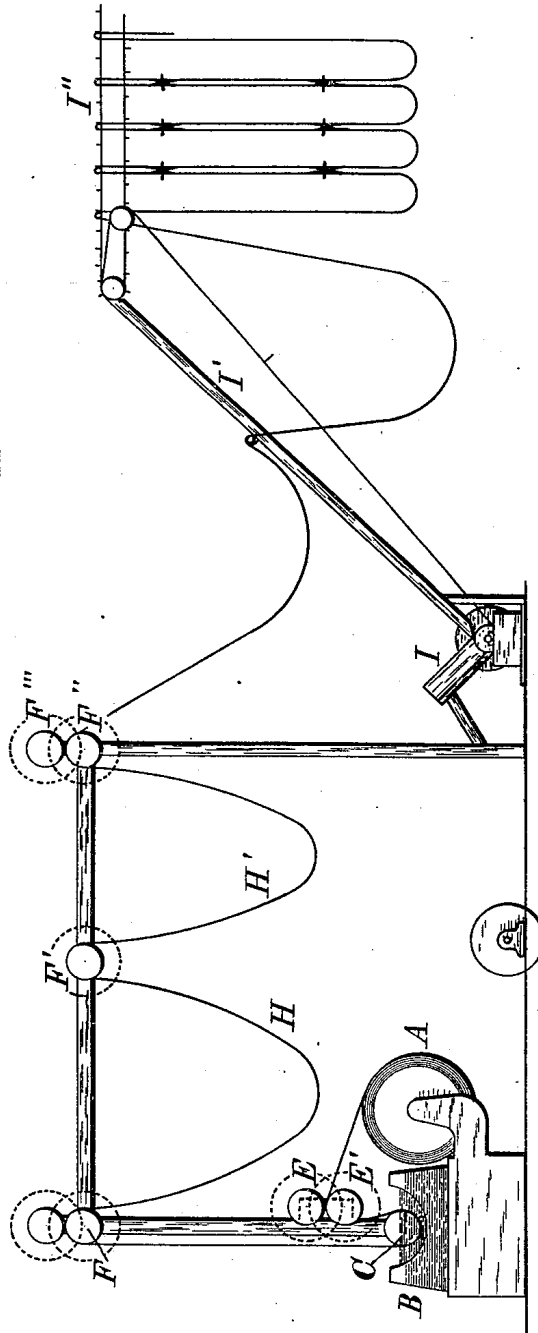


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR COATING PHOTOGRAPHIC PAPER.

SPECIFICATION forming part of Letters Patent No. 370,050, dated September 20, 1887.

Application filed January 13, 1887. Serial No. 224,189. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EASTMAN, a citizen of the United States, residing at Rochester, in the county of Monroe, in the State of New York, have invented certain Improvements in Apparatus for Coating Photographic Paper, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improved machinery for automatically coating a continuous web or strip of paper with a thin and uniform film of gelatino-argentic emulsion, and for manipulating and drying the same, to produce what is known to the trade as "bromide paper" for pictures and negatives. In carrying out the coating process the paper is drawn through a trough containing a fluid mixture of the sensitized emulsion, the paper being held in close contact with the surface of a roller, around which it is drawn to prevent the emulsion from flowing onto the back of the paper, and to cause the latter to be carried in contact with the fluid and emerge therefrom in a flat condition, so that a uniform amount of the fluid emulsion will be caused to adhere to the surface of the paper and be carried off thereon. After the paper has passed through the bath it must be moved continuously in the same direction and at a uniform speed until the coating has become cooled and sufficiently hardened to prevent running, when it is suspended upon a frame until the moisture, which in the meantime has permeated the paper, is evaporated. The main difficulty heretofore experienced in performing these necessary operations by machinery has been with the feeding and carrying devices. If the coated surface of the paper is brought into contact with any foreign substance from the time it emerges from the bath until thoroughly dried and hardened, the integrity and uniformity of the film will be disturbed and the part thus borne upon or rubbed will be defective for practicable purposes. It is, moreover, to be observed that the paper when coated and while still wet if pulled or drawn with any considerable degree of force is liable to form in wrinkles, due to unequal stretching, and the fluid or semi-fluid coating will be caused to flow from neighboring points toward and into

the wrinkles, thereby producing streaked and consequently defective paper.

The object of my present invention is to produce a mechanism which shall perform the necessary operations with a minimum loss of material and produce a continuous web of paper having a film or coating of sensitized material of uniform thickness and free from streaks.

In the accompanying drawings, wherein I have illustrated an embodiment of my invention, Figure 1 is a side view of the coating mechanism, the frame-work being omitted. Fig. 2 is a similar view of the coating and drying machines as arranged for co-operation. Fig. 3 is a detail of one pair of feeding-rolls, showing devices for raising one roll. Figs. 4 and 5 are detail views of the collared feeding-rolls. Fig. 6 represents a card, J, provided with a slit or notch, K.

Similar letters indicate corresponding parts in the various drawings.

The letter A designates the roll of unsensitized paper; B, the trough or receptacle for the emulsion maintained in a fluid state by heat; C, the immersion-roll, its lower surface dipping below the surface of the emulsion; E E', driven rolls, between which the paper is passed and drawn from the roll A. These rolls E E' are not required in the treatment of all kinds of paper, but they are usually necessary, their especial function being to unwind the paper and deliver it at a uniform speed and in a flat condition, free from wrinkles, to the immersion-roller C.

In passing the web of paper through and in contact with the emulsion it not only receives a coating of the sensitized gelatine, but absorbs a considerable quantity of moisture, which has the effect of expanding the paper and rendering it pliable to such an extent that unless drawn very evenly and with only sufficient tension to retain it in a flat state wrinkles will be formed as the paper passes from the bath onto the support of the feeding mechanism, into which wrinkles or depressions the semi-fluid coating will be diverted in streaks, thereby destroying the uniformity of the coating or film. In order to effect the feeding of the freshly-coated web of paper with the least damage I pass the paper over a driven roll,

F, in contact with the under or uncoated surface of the web, and to maintain a sufficient frictional contact to draw the paper evenly and regularly I arrange upon the opposite side of the paper a driven shaft, G, provided with narrow collars D D', preferably adjustable, which bear upon the web at or near the edges and press and hold the paper down and in contact with the roll F. As before intimated, the particular function assigned to these narrow collars is to hold the paper strip down upon and cause it to be drawn evenly over the roll F, and although by the application of the collars to the coated face of the web the margin of the film is in effect destroyed, this loss is more than compensated for by the superior quality of the film deposited upon the body of the web or sheet. It is not sufficient, in order to secure the even feeding of the paper, that it be grasped at its edges only between the roll F and collars D D', but the paper must be supported and carried positively at all points intermediate the collars D D', and to this end the web is caused to pass over and rest in contact with the roll F from one edge of the web to the other.

As it takes some little time for the film or coating to set or harden to such an extent that the web can be suspended for drying without danger or liability of injuring the uniformity of coating, it is necessary to maintain the web in motion for a short period after it leaves the feeding-roll F and before it is deposited upon the drying-frame, in order that the coating may set in an evenly-distributed condition. To accomplish this result the web, after leaving the roll F, is passed on a roll, F', and between a roll, F'', and collared roll F''', sufficient slack being allowed to form two loops, H H', the one between the rolls F F' and the other between rolls F'' F'''. The rolls F'' and F''', constituting the delivery-rolls, are both driven, as is also the roll F, so that the paper web is caused to travel continuously in the same direction after leaving the bath. The quantity of paper composing the two loops is about equal, and the one counterbalances the other, so that while the paper is held under sufficient tension to maintain a flat smooth surface it is not subjected to strains such as would form wrinkles. After the coated web of paper emerges from between the delivery-rolls of the coating-machine it is deposited upon a drying-frame, where it is allowed to hang until perfectly dry. A drying-frame suitable for the purpose is illustrated in the drawings, wherein I represent a receptacle for the bars; I', the incline up which at predetermined intervals a bar is carried by an endless belt and deposited upon a horizontal track, I'', along which the bars, properly spaced, are caused to move. Other well-known forms and constructions of hang-up machines may be employed in this connection, and I have merely illustrated this one as exhibiting the general features deemed desirable in such a device. It will be observed that in my improved coating-machine

while the web of paper is always maintained under a sufficient tension to keep the paper flat it is at no time subjected to such a degree of tension as will occasion unequal drawing of the web and the consequent formation of wrinkles in its surface. By the use of collared rolls operating upon the margins of the web I am enabled to employ positive feeding mechanism such as has never heretofore been made use of in machines of this character, where a continuous web of paper is operated on and after being coated with sensitized emulsion is delivered in a free and loose condition upon the drying-frames.

To facilitate the insertion of the paper between the feeding-rolls, and at the same time make provision whereby the web can readily be shifted in case it should run unevenly, I connect the journals or boxes of the upper roll, G, by links b to bell-crank levers c c, the latter connected to hand-levers d, supported in position to be readily grasped by the attendant.

It is not essential to the working of that part of my invention which embraces the positive feeding devices for drawing the web of paper through the bath that the web should be hung in loops, as described, as other forms and arrangements of carrying mechanism for maintaining the web in motion while the coating is setting or hardening may be employed; or instead of hanging the paper in loops it may be passed directly from one roller to another. It is found in practice that during the drying process and while suspended in loops from the drying-frame the coated paper is liable to twist or warp to such an extent as to bring the coatings of contiguous parts into contact, to the injury and destruction of the film, while the dried web will not lie smooth and even. With a view to remedying this defect in the process, I connect the dependent folds back to back while the paper is yet damp, so that the coated faces will not be brought together and the twisting of the folds will be averted. One of the simplest and at the same time effective means for thus uniting the edges of the dependent folds is a notched cord or split stick similar to a clothes-pin. These are applied to the edges of the web so as to clamp and hold contiguous folds with the uncoated faces in contact.

To those skilled in the art it will be unnecessary to remark that the operation of coating paper or other fabric with sensitized emulsion by my improved apparatus must be conducted in a room lighted only by a suitable non-actinic light.

I claim—

1. In a machine such as described, the combination, with the trough containing the emulsion, the immersion-roller, and the rollers for conducting the paper to the immersion-roller, of a driven roll over which the coated web is conducted, a moving surface applied to the edges of the web of coated paper and the face side thereof and operating to press and hold

the web in contact with the said roll, driven rolls upon which the paper is supported and kept in motion while the coating is setting, and a hanging or drying frame upon which the web is delivered and retained until dried, substantially as described.

2. In a machine such as described, and in combination with the trough containing fluid emulsion, the immersion-roll for conducting the web of paper through the emulsion, a pair of rolls, the one cylindrical and the other collared, the paper web passing over and resting with its uncoated face upon the cylindrical roll while the collars bear upon the opposite face of the paper, one or more driven supporting-rolls over which the coated web of paper is suspended and at the same time kept in motion, a driven delivery-roll, and a hang-up or drying frame onto which the coated web is delivered after the emulsion is set, substantially as described.

3. In a machine such as described, and in combination with the coating devices for applying liquid sensitized emulsion to one face of a web of paper as it is drawn, continuously operating feeding devices located intermediate the hang-up and coating devices, said feeding mechanism operating to grasp the web of paper at the edges and draw it forward over a smooth supporting-surface moving in the same direction as the coated web, substantially as described.

4. As a means for retaining the paper flat and the coated surfaces separated while on the drying-frame, the combination therewith of clips applied to the edges of contiguous folds, substantially as described.

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Witnesses:

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