Oct. 4, 1932. R. S. HOPKINS 1,880,451

METHOD FOR FLATTENING PRINTS

Original Filed Feb. 15, 1930 3 Sheets-Sheet 1

Fig. 1.

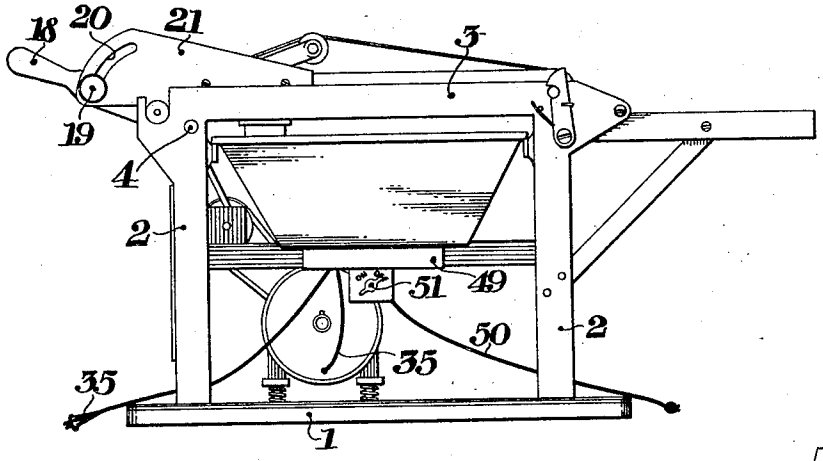
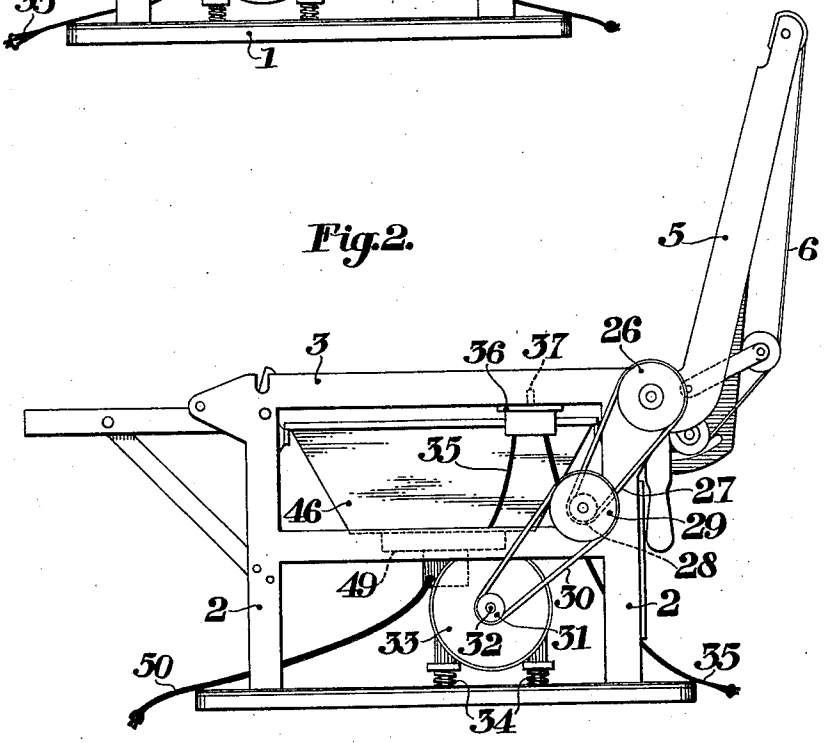


Fig. 2.



Inventor
Roy S. Hopkins,

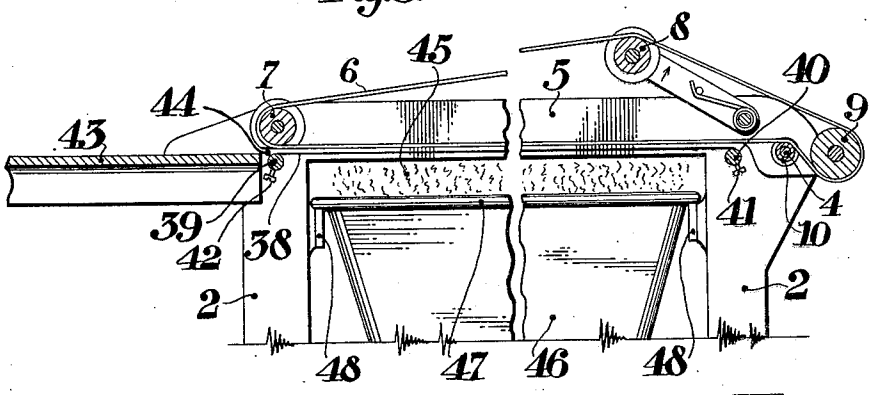
By Donald H. Stewart,
Attorneys

Oct. 4, 1932. R. S. HOPKINS 1,880,451

METHOD FOR FLATTENING PRINTS

Original Filed Feb. 15, 1930 3 Sheets-Sheet 2

Fig.3.



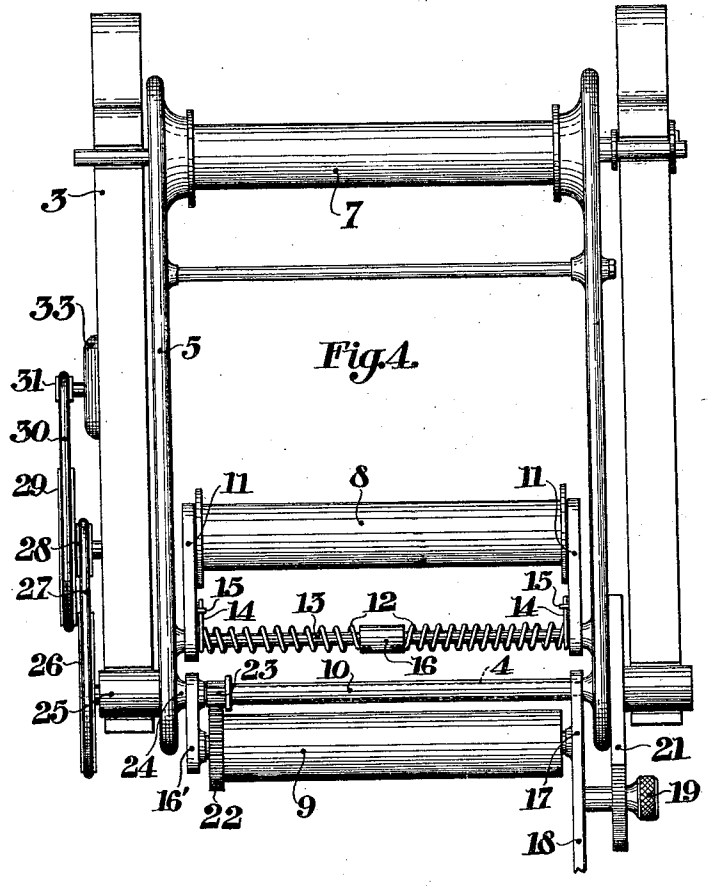


Fig.4.

Inventor,
Roy S. Hopkins,
Newton M. Somers
Donald H. Stewart
By
Attorneys.

Oct. 4, 1932. R. S. HOPKINS 1,880,451

METHOD FOR FLATTENING PRINTS

Original Filed Feb. 15, 1930 3 Sheets-Sheet 3

Fig.5.

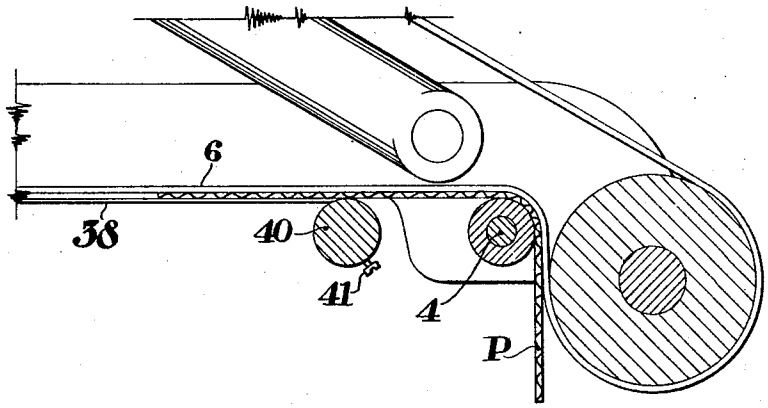
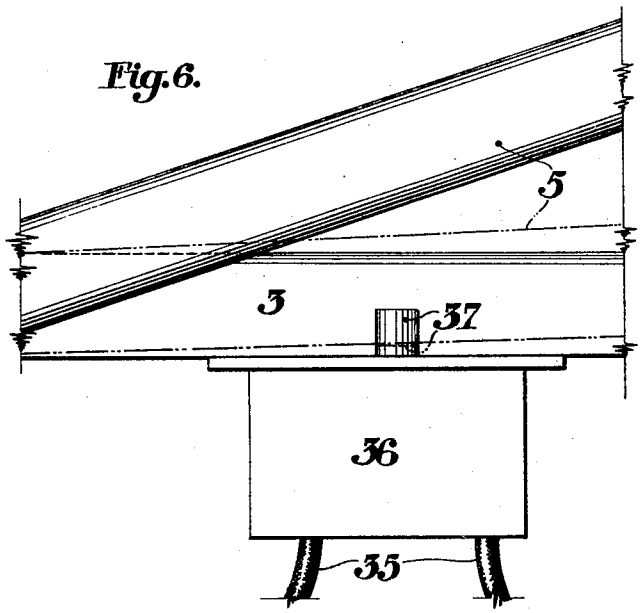


Fig.6.



Inventor,
Roy S. Hopkins,
By Newton M. Parker
Duell K. Stewart
Attorneys.

Patented Oct. 4, 1932

1,880,451

UNITED STATES PATENT OFFICE

ROY S. HOPKINS, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK

METHOD FOR FLATTENING PRINTS

Original application filed February 15, 1930, Serial No. 428,639. Divided and this application filed April 22, 1931. Serial No. 531,956.

This invention relates to photography, and more particularly to a method and apparatus for flattening prints. One object of my invention is to provide a method of treating photographic prints, particularly glossy photographic prints, so that they can be made to lie flat without manual operations. Another object of my invention is to provide a method of flattening prints which does not in any way injure the prints and which will render them permanently flat. Another object of my invention is to provide a machine through which the prints may be passed to flatten them. Still another object of my invention is to provide a machine with a conveyor by which the print is first carried past a steam chamber and then is passed about a roller which flexes the print while in a steamed condition. Other objects will appear from the following specification, the novel features being particularly pointed out in the claims at the end thereof.

Considerable difficulty has arisen in the photographic business in that after prints are made there is a tendency for the print to curl, usually with the emulsion innermost. This is probably due to the fact that the support, whether it be paper or a cellulosic support, shrinks and expands under the effect of moisture to a different extent than does the light sensitive emulsion coated side. This emulsion coating is usually prepared with a gelatine carrier. When the prints have been developed, fixed and washed in the various fluid treatment baths, the paper or other base has a chance to expand and contract a number of times, as does also the emulsion coated side.

Since the amount of moisture which the two parts of the print, that is, the base and the sensitive coating, may receive is different, there is normally a stretching action in one part which is greater than that of the other part. This results in a print which buckles or curls and usually the emulsion coated side expands less and is, therefore, curved in a concave direction. It is to overcome these difficulties that the present invention is particularly directed.

Coming now to the drawings wherein like reference characters denote like parts throughout:

Figure 1 is a side elevation of a machine constructed in accordance with and embodying a preferred form of my invention.

Figure 2 is a similar side elevation but taken from the opposite side of the machine with the conveyor in a raised position.

Figure 3 is a fragmentary view, partially in section, through the machine shown in Figure 1.

Figure 4 is a top plan view of the machine shown in Figure 1, with certain parts being removed for the sake of clearness.

Figure 5 is an enlarged detail view, partially in section, showing a small portion of a print conveyor and a print flexing roller.

And, Figure 6 is an enlarged fragmentary view of a switch which may be operated by a portion of the conveyor frame.

This application is a division from my copending application Serial No. 428,639, filed Feb. 15, 1930, for "Method and apparatus for flattening prints".

This machine preferably consists of a base 1 from which legs 2 extend upwardly, these legs being connected by a frame 3 which is substantially rectangular in shape. To the frame 3 there is hinged upon the shaft 4 a second frame 5, as is best shown in Figure 3. This frame carries a belt conveyor 6 which passes over a series of rollers 7, 8, 9 and 10.

Rollers 7 and 10 are fixedly mounted with respect to the frame 5 although, of course, they are moved when the frame 5 is swung about its pivot.

Rolls 8 and 9 can be moved relative to the frame 5. Referring particularly to Figure 4 it can be seen that the roll 8 is carried by a pair of arms 11 which, by means of the springs 12 are normally turned about a shaft 13 in the direction shown by the arrow in Figure 3, the ends 14 of the springs 12 engaging the pins 15 of the arms 11. This roller merely curves as a tensioning device to always exert an equal pressure upon the conveyor belt 6.

In the center of the shaft 13 there is an adjustable nut 16 which can be used to vary the tension on both of the springs 12. This is merely for an initial setting since after the

tension on the springs has once been adjusted correctly it does not need further adjustment.

The roller 10 is mounted to turn freely upon a shaft 4 which extends through the inside of roller 10, as indicated in Figure 4 in dotted lines. Upon this shaft 4 there are mounted a pair of side arms 16′ and 17, the latter being provided with an extension 18 which serves as a handle as best shown in Figure 1.

This handle can move about the shaft 4 and can be held in an adjusted position by means of a set screw 19 which passes through an arcuate slot 20 in the plate 21, this plate being permanently affixed in a suitable manner to the frame 5.

By altering the position of the handle 18, the position of roller 9 can be altered in such a way that the belt is drawn more tightly or less tightly about the roller 10 and the angle to which the belt contacts with the roller 10 can be varied.

In order to drive the belt, the following mechanism is used: Roller 9 carries affixed to the end thereof a gear 22, a gear 22 meshing with a pinion 23 permanently affixed to the shaft 4.

The shaft 4 extends through a bearing 24 on the frame 5 and through a second bearing 25 which forms a part of the upper frame 3. A pulley 26 is affixed to the outer end of the shaft 4 and this pulley, as best indicated in Figure 2, is driven in the following manner:

A belt 27 connects pulley 26 with a small pulley 28 which, in turn, is fastened to move with a large pulley 29. Pulley 29 is connected by means of a belt 30 with a pulley 31 carried on a motor shaft 32, the motor 33 being preferably mounted upon springs 35 to eliminate noise and vibration as far as possible.

The motor may be operated through a duplex wire 35 which leads from a line to the motor through a switch 36.

As best shown in the detail Figure 6, the switch 36 is provided with a spring pressed contact making member 37 of a well known variety in which when the contact member is pressed down a circuit is made and when it springs up into the position shown in full lines in Figure 6, this contact is broken. Portions of the relatively stationary frame 3 and the relatively movable frame 5 are shown in Figure 6. When the frame 5 is moved away from its operating position, that is to say, when the frame 5 is swung up toward the position shown in Figure 2 the circuit is broken since the bottom of the frame member 5 no longer contacts with the spring pressed plunger 37. As soon, however, as the frame 5 is swung down into an operative position, the frame strikes the plunger 37 and makes the circuit, causing the motor to run and causing the belt 6 to move through the chain of pulleys and belts above described.

As best shown in Figures 3 and 5, in order to hold a print P against the conveyor belt 6, a plurality of wires 38 are stretched between two relatively fixed rods, 39 and 40. The ends of the wires are turned around these rods and attached to screws 41 and 42 in the rods.

The belt 6 moves whereas the wires remain stationary, but as the surface of the print contacts with the conveyor belt and only a very small surface of the print contacts with the stationary wires, the prints are moved.

There is a table 43 supported by the main frame 3 of the machine. This table furnishes a place from which prints are moved toward the conveyor. A print is directed between the opening 44 just beneath roller 7 and just above the rod 39.

A print is then caught by the moving belt 6 and moved to what I call a steam chamber 45 and from this chamber they pass above the rod 40 and about the roller 10. The prints are flexed by the belt pressing them upon the roller 10 and they face from this roller in a flattened condition.

The steam chamber 45 is that part of the machine which lies between the lower side of the belt 6 and the upper side of the hot water pan 46. This pan is equipped with a flange 47 which rests on the rails 48 carried by the legs 2 of the machine.

In order to steam the prints, water is placed in the pan 46 and this water is kept at the proper temperature by means of any standard type heating unit here shown as an electric heating element 49 which may be connected with a circuit by means of a duplex wire 50, there preferably being a switch 51 as shown in Figure 1 to control the circuit.

I prefer to heat the water until a small amount of steam passes up into the chamber 45. I have found that it is not necessary to have the water boiling to any considerable extent as good results can be obtained from vapor arising from the water without any considerable quantity of steam.

I have found out that by steaming the back of the print, that is, the support or paper side of the print and while the print is in a steamed condition by rolling or flexing the print about some object such as a roller that the prints will flatten out and will remain flat thereafter. Just what the action of the steam on the print is I am not certain, but I am advancing the following reasons which appear to me to be correct.

I believe that when the usual paper back of a print is steamed it softens the emulsion as well as the paper to a certain extent. When a paper back of a print is submitted to steam it does not become damp but just becomes soft. Ordinarily when an emulsion surfaced print, particularly a glossy emulsion surfaced print becomes dry, the emulsion is quite brittle and if it is bent about a roller or ruler for flattening it will crack and thus be spoiled.

However, if the paper on the back of the

print is steamed first the emulsion surface, although not directly submitted to steam itself, becomes softened to such an extent that it may stretch. When the print is flexed the emulsion surface is stretched to a greater extent than is the paper base and the emulsion surface seems to retain this stretched action so that it will not thereafter cause the print to curl.

I believe that the reason why photographic prints curl when they are dried in the first instance is that the emulsion has not stretched sufficiently to compensate for the shrinkage of the paper after that has stretched by being submitted to the various fluid treatment operations, but whether or not this theory is correct, by the method I have just described which can be conveniently accomplished by means of the machine which I have also above described, I can produce prints which lie permanently flat after they have once been treated by the steaming and flexing method.

The operation of my machine is as follows. An operator places a stack of prints to be flattened upon the shelf 43 and directs them, one at a time, into the opening 44.

From this position they will be moved by the moving belt 6 across the steam chamber 45 and from the steam chamber 45 they are moved about the roller 10 by which they are flexed according to the amount of the belt 6 which lies in contact with the roller 4.

As this contact can be changed by moving the handle 18 and adjusting the set screw 19, the degree of flexing can, if necessary, be nicely adjusted.

I have found, however, that the amount of flexing is not particularly critical because the print is in a softened condition and seems to readily take a set in a flat position after being steamed and flexed.

It should, of course, be understood that the prints which are introduced into this flattening machine are made in the usual way and dried in the usual way, that is to say, a print may be dried on stretchers or they may be dried upon ferrotype plates or on the drum drying machines such as are on the market.

I have found out that where prints are dried on a drum dryer, they are considerably easier to flatten than those which are dried by other usual methods. For instance, I have successfully flattened prints from a drum dryer by merely passing them over the steam bath without flexing them about a roller 10. While this flattens the prints entirely satisfactory, if the prints are dried by some of the other methods it seems preferable to flex the prints at the end of the steam operation to make sure that the emulsion has stretched a sufficient distance to permit the print to thereafter lie flat.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A method of flattening photographic prints including steaming one side of the print and protecting the other side of the print from steam.

2. A method of flattening photographic prints having an emulsion coating on one side of a support which includes steaming the support side of the print.

3. A method of flattening photographic prints having an emulsion coating on one side of a support which includes steaming the support side of the print and protecting the emulsion side from steam.

4. A method of flattening photographic prints including steaming the print and flexing the print while in a steamed condition.

5. A method of flattening photographic prints including steaming one side of the print and flexing the print about the steamed side.

6. A method of flattening photographic prints including steaming one side of the print and protecting the other side of the print from steam and flexing the print while in a steamed condition.

7. A method of flattening photographic prints including steaming one side of the print and protecting the other side of the print from steam and flexing the print about a roller while in a steamed condition.

8. A method of flattening photographic prints having an emulsion coating on one side of a support which includes steaming the support side of the print and flexing the print about the same side of the print.

9. A method of flattening photographic prints having an emulsion coating on one side of a support which includes steaming the support side of the print and protecting the emulsion side from steam and flexing the print while in a steamed condition with the emulsion side outermost.

Signed at Rochester, New York, this 15th day of April, 1931.

ROY S. HOPKINS.