

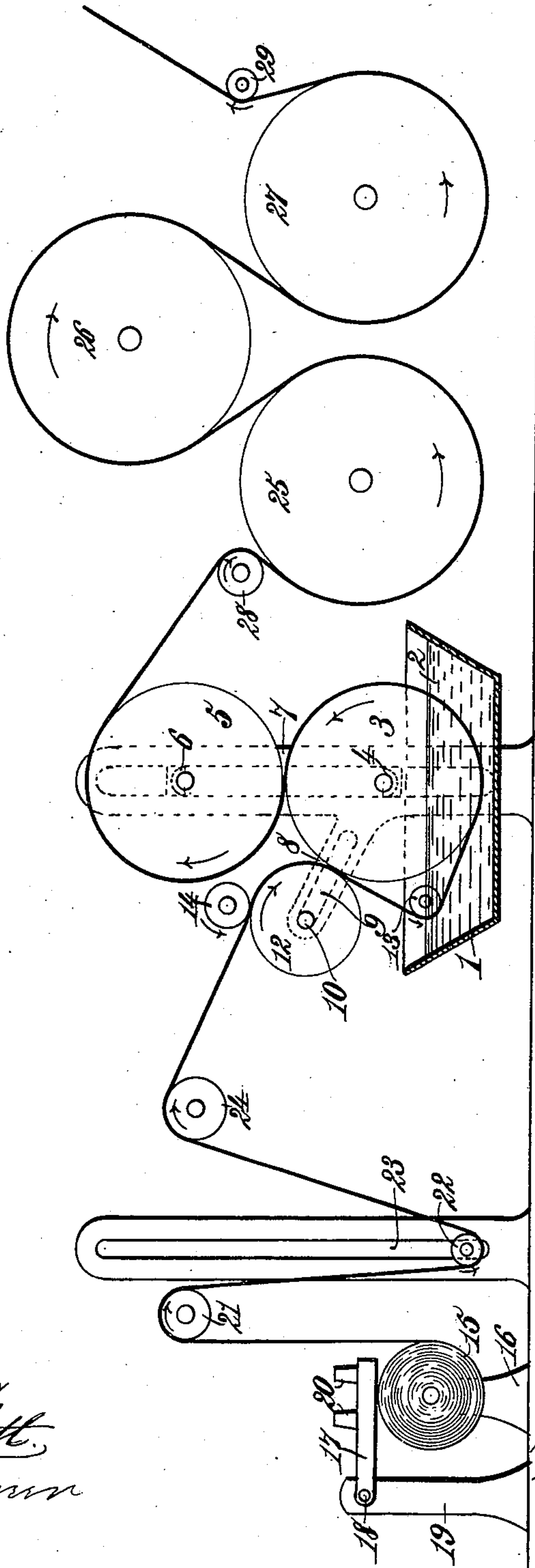
(No Model.)

S. R. WAGG.

METHOD OF AND APPARATUS FOR COLORING WEBS OF PAPER.

No. 564,353.

Patented July 21, 1896.



Witnesses,  
*Robert G. Smith*  
*Thos. A. Gunn*

Inventor:  
*Solomon R. Wagg.*  
By *James L. Norris.*  
*Atty.*

# UNITED STATES PATENT OFFICE.

SOLOMON R. WAGG, OF APPLETON, WISCONSIN.

## METHOD OF AND APPARATUS FOR COLORING WEBS OF PAPER.

SPECIFICATION forming part of Letters Patent No. 564,353, dated July 21, 1896.

Application filed October 15, 1895. Serial No. 565,743. (No model.)

*To all whom it may concern:*

Be it known that I, SOLOMON R. WAGG, a citizen of the United States, residing at Appleton, in the county of Outagamie and State of Wisconsin, have invented new and useful Improvements in Methods of and Apparatus for Coloring Webs of Paper, of which the following is a specification.

In the common or ordinary method or process of coloring paper the paper-stock is operated on by a beating-engine, wherein the fibers are floated through the coloring liquid to produce the color desired in the completed sheet of paper. The colored fiber is carried from the beating-engine to chests ready to be formed into a sheet by paper-making machinery. Whenever a distinctive or different color is required, it is necessary to thoroughly wash all the chests, pumps, sand-settlers, and other parts of the apparatuses, which obviously is laborious, and also expensive, due to the time required in the cleansing operation, to say nothing of the loss occasioned by washing away valuable paper-stock preparatory to preparing paper of a different color.

Paper sheets are produced in a variety of colors and in many different shades, and in the manufacture of paper of various colors the washing of the different parts of the apparatuses, whenever a change of color is made, is a serious objection, for the reasons before stated.

The object of my invention is to provide novel, simple, efficient, and economical means for coloring a web of paper for commercial use by saturation in a bath of coloring material, whereby it is possible to provide paper, especially tissue or very thin paper, having a superior color, uniform throughout, and free from specks and similar defects, and the danger of damaging, injuring, or tearing the saturated paper web in passing to and from the color-bath is avoided.

To accomplish this object, my invention consists in the features of construction and the combination or arrangement of parts hereinafter described and claimed, reference being made to the accompanying drawing, in which the figure is a sectional side elevation of sufficient of the apparatus to enable my invention to be clearly understood.

In order to enable those skilled in the art

to make and use my invention, I will now describe the same in detail, referring to the drawing, wherein—

The numeral 1 indicates a tank for containing the color-bath, which is indicated by the numeral 2. The bath will of course depend upon the color to be imparted to the web of paper, and obviously the tank is susceptible of receiving any desired coloring solution.

A roll 3, of comparatively large diameter, is journaled in suitable bearings 4, so arranged and supported that about one-third, more or less, of the periphery of the roll will be submerged in the color-bath. Above the partially-submerged roll 3 is a presser and delivery roll 5, of a diameter substantially the same as the roll 3 and bearing against the latter. The presser-roll 5 is mounted in bearings 6, similar to bearings 4, and these bearings are carried by a frame or standard 7, from which extends an inclined frame 8, having inclined slots, as at 9, to receive the journals, as at 10, of the draft-tension roll 12, which gravitates toward the roll 3 and is rotated by the latter.

A guide 13, in the form of a roller or cylindrical rod, is arranged in the tank 1 with its axis approximately level with the surface of the color-bath, so that about one-half of the guide is submerged in the bath. The guide 13 serves to hold the paper away from contact with the surface of the roll 3 for a definite distance, as will hereinafter appear, so that the paper will be caused to enter directly into the bath to become saturated with the coloring-matter.

A roller 14 is journaled above the draft-tension roll and presses the paper web against the latter.

The paper to be colored is in the form of a continuous web, made into a roll, as at 15, which is supported by standards, as at 16, in such manner that the roll 15 can be rotated.

A friction-brake, in the form of a weighted block or plate 17, pivoted at one end, as at 18, to standards, as at 19, is adapted to press upon the periphery of the roll 15 of paper. The friction block or plate 17 is provided with weights 20, so that by adding or removing a weight, one or more, the pressure of the block or plate is increased or diminished, and the tension is thereby regulated according to the



degree of resistance offered to the rotation of the paper roll 15. The web of paper from the roll 15 passes over an elevated web-supporting roller 21, and thence passes downward and under a dance-roll 22, adapted to rise and fall in a vertically-slotted frame or in standards, as at 23. From the dance-roll the web passes upward over a paper-supporting roller 24, and thence passes over the draft-tension roll 12, between the periphery of the latter and the roller 14. The paper web also passes between the draft-tension roller 12 and the partially-submerged roll 3, and thence extends around the guide 13, which serves to hold the web away from the periphery of the partially-submerged roll for a definite distance, so that the web passes from the guide 13 directly into the color-bath before the web again comes in contact with the partially-submerged roll. The web then passes partially around the roll 3 and between the latter and the presser-roll 5, and runs off of the latter to drying-cylinders 25, 26, and 27. The passage of the web onto the drying-cylinder 25 is facilitated by the guide-roller 28, and the delivery of the web from the drying-cylinder 27 is facilitated by the guide-roller 29.

The drying apparatus may be of any type desired, but, as here shown, it comprises the three drying-cylinders 25, 26, and 27, before mentioned. The number of drying-cylinders may be increased or diminished, and I wish it to be understood that as regards the drying apparatus it may be variously modified without affecting the spirit of my invention.

The various rolls and rollers may be of any material suitable for the purpose in hand. They may be of wood, or partly of wood and partly of metal, and they will all be mounted in bearings of any desired or ordinary construction, for which reason I do not deem it necessary to illustrate the same more fully in the drawing or more specifically describe the same in the specification.

The paper forming the roll 15 is preferably of ordinary white paper as it comes from the paper-making machine.

The roll 3 is designed to be positively rotated, so that both rolls 3 and 5 will rotate in unison. The roll 3 will impart rotary motion to the draft-tension roll 12, thereby placing the paper web under tension and drawing the same from off the paper roll 15, so that the paper web will be carried through the color-bath in a smooth, unwrinkled condition. The coloring material has free access to both sides of the paper web, and will saturate and uniformly color the same throughout.

As the paper web is drawn forward by the draft-tension roll 12 the dance-roll 22 will rise more or less, according to the friction applied to the paper roll 15 through the medium of the friction-brake composed of the friction block or plate 17. The height to which the dance-roll rises indicates the degree of tension on the paper web. The tension mechanism for the paper web is a very

important feature for the practicable operation of my invention, and it will be observed that this tension can be regulated to the required degree in a most delicate manner. The tension on the web entirely avoids all slack, and thus prevents the paper wrinkling between the partially-submerged roll 3 and the presser-roll 5.

The draft-tension roll 12 is designed to press with greater or less pressure against the partially-submerged roll 3. I prefer to arrange the draft-tension roll 12 so that it will gravitate toward and against the roll 3, but obviously any suitable devices can be employed for yieldingly pressing the draft-tension roll against the partially-submerged roll. The presser-roll 5 acts to squeeze the paper web to remove surplus coloring solution.

The action of the draft-tension roll 12 is such that it steadies the web and draws the paper under tension, after which the tension is relieved and the paper is submerged in and moves through the color-bath and is relieved of the tension produced by the action of the draft-tension roll in drawing the paper from the paper roll 15. This is important, in that the slack and twitching of the paper are avoided, and breakage of the paper is prevented. The twitching motions are liable to break the paper when wet. Therefore, it is important to avoid such motions, which, as before stated, is accomplished by the arrangement and operation of the draft-tension roll. A moist or wet web of paper requires to be carefully manipulated to avoid damage and loss, due to breakage, and the slack must not be permitted to such extent as to create wrinkles in the paper as it passes through the bath, around the partially-submerged roll 3, and between the latter and the presser-roll 5. The arrangement described and shown effectually prevents the paper from wrinkling, both before and after it passes around the draft-tension roll.

The coloring of the web of paper by saturation in a bath of coloring material possesses many advantages over the ordinary method of coloring paper, wherein the mass of paper-pulp is subjected to the action of a coloring solution, and the pulp subsequently formed into a sheet by paper-making machinery.

The guide roller or rod 13 is important in connection with the submerging of the paper in the color-bath in that this guide prevents the paper from hugging the partially-submerged roll 3 after leaving the draft-tension roll 12, whereby uniform saturation and an even color on both sides of the paper are obtained.

The roller 14 is particularly designed to aid in avoiding the twitching of the paper and the liability of the paper breaking when wet; but this roller is not indispensable.

As before stated, the usual practice is to color paper in mass in a beating-engine, where the fibers are drawn down in such manner



that they are placed in a condition to be floated in water to be formed into a sheet of paper for commercial use. The beating-engine usually carries a large mass of paper-stock, and this mass receives the color, whatever that color may be. The prepared fiber thus colored passes from the beating-engine to spouts and then to receiving-chests, and is thus in a condition for the paper-making machine to be formed into a sheet of paper. The fiber from the chest passes through a series of sand-settlers and thence to a screen for separating out coarse particles of fiber. From this screen the fiber passes to a vat and thence to a head-box, where it is drawn into the paper-making machine in a liquid form, similar to running water. The paper is formed into a sheet on the ordinary wire screen.

Colored paper is produced in many different shades, and each time a distinctive color is desired it becomes necessary to wash out all the spouts, chests, pumps, vats, sand-settlers, and head-boxes, which requires considerable time, and results in the loss of valuable paper-stock. The paper made in the manner described loses some of the coloring material by the wash of water drawn away on the wire screen, and consequently very deep colors cannot be produced, as the paper-making material will only absorb a limited amount of color when wet, and very much more when dry.

According to my invention the paper is colored by saturation after it is made up into plain white sheets, whereby I obtain a much deeper and more brilliant color and am enabled to greatly economize in the manufacture of colored paper, besides producing a superior article.

By my invention it is possible to pass through a specific color only the quantity of paper desired, and therefore orders can be more quickly filled, as the coloring in the tank can be quickly changed for a different color in a short time, at a saving in cost.

In my invention I color the web of paper by saturation in contradistinction to coating the surface thereof with a color, whereby I produce, on a commercial scale, a uniformly-colored web, which is very advantageous, desirable, and useful.

Having thus described my invention, what I claim is—

1. The method or process herein described

of coloring a web of paper, which consists in drawing the web under tension, subsequently relieving it of tension, submerging and saturating it in a coloring solution while relieved or nearly free of tension, and then drying the color-saturated web, substantially as set forth.

2. An apparatus for coloring a web of paper, consisting of a tank for holding a color-bath, a roll partially submerged in the color-bath, a paper-guide for causing the paper to traverse the color-bath prior to contact with the partially-submerged roll, and a draft-tension roll which draws the paper under tension and delivers it relieved or nearly free of tension to the paper-guide, substantially as described.

3. The combination, in an apparatus for coloring a web of paper, of a tank for holding a color-bath, a roll partially submerged in the color-bath, a presser-roll arranged above the partially-submerged roll for pressing the colored paper, a paper-guide arranged in operative connection with the partially-submerged roll to cause the paper web to traverse the color-bath before contact with the partially-submerged roll, means for holding a roll of paper, a draft-tension roll arranged in juxtaposition to the partially-submerged roll and acting to draw the web under tension and to deliver it relieved of tension to the color-bath, and a friction-brake acting on the paper roll to offer resistance to the rotation thereof, substantially as described.

4. The combination, in an apparatus for coloring a web of paper, of a tank for holding a color-bath, a roll partially submerged in the color-bath and round which the web passes through the color-bath, a presser-roller arranged above said roll, a draft-tension roll which draws the web under tension and delivers it to the partially-submerged roll, a paper-guide for causing the paper to traverse the color-bath prior to contact with the partially-submerged roll, and a tension mechanism for holding the paper web under tension, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SOLOMON R. WAGG.

Witnesses:

H. B. LEWIS,  
W. S. KELLOGG.