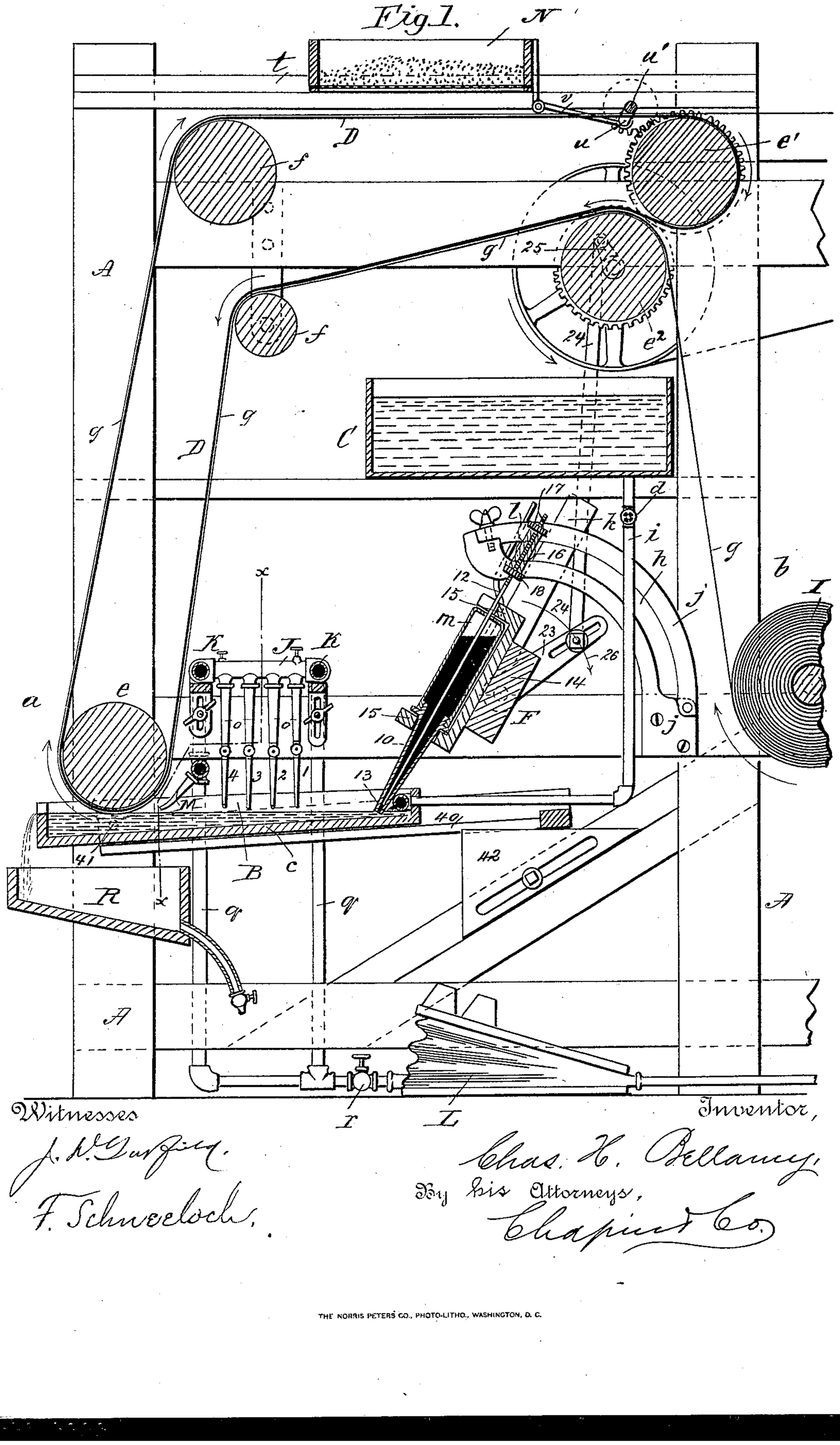
(No Model.) 2 Sheets—Sheet 1.

C. H. BELLAMY.

METHOD OF AND APPARATUS FOR MARBLING OR COLORING PAPER, &c.

No. 492,933. Patented Mar. 7, 1893.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

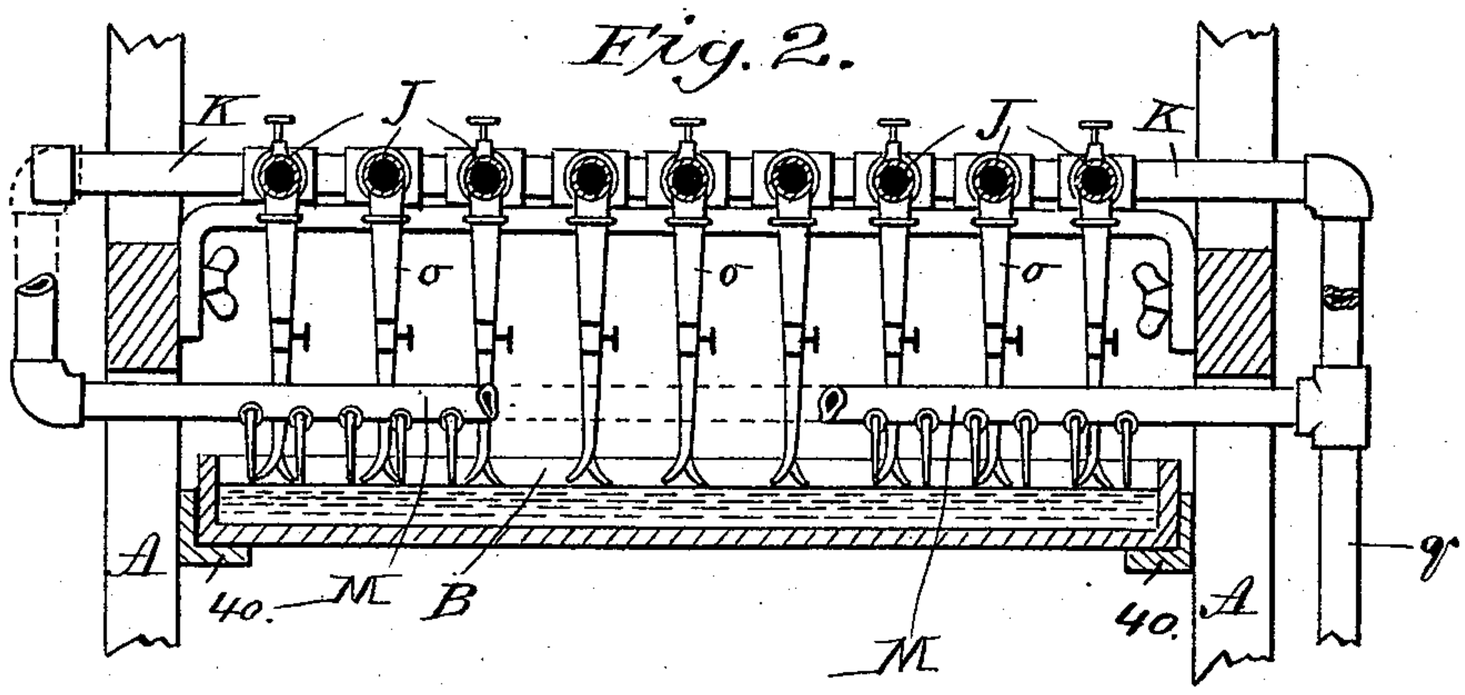
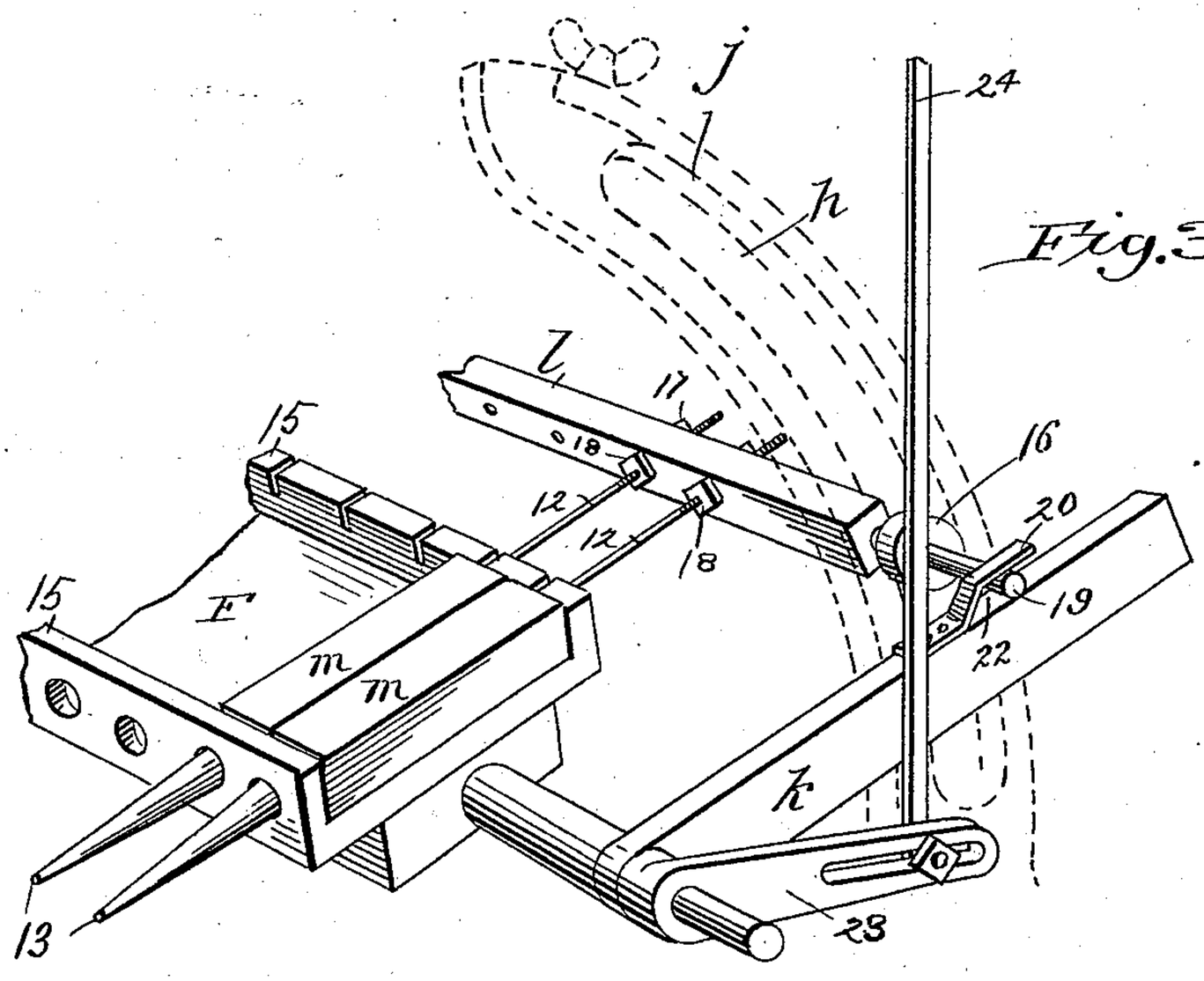


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES H. BELLAMY, OF SOUTH HADLEY FALLS, MASSACHUSETTS.

METHOD OF AND APPARATUS FOR MARBLING OR COLORING PAPER, &c.

SPECIFICATION forming part of Letters Patent No. 492,933, dated March 7, 1893.

Application filed June 9, 1890. Renewed August 18, 1892. Serial No. 443,367. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. BELLAMY, a subject of the Queen of Great Britain, residing at South Hadley Falls, in the county of Hampshire and State of Massachusetts, have invented new and useful Improvements in Methods of and Apparatus for Marbling or Coloring Paper or other Sheet Material, of which the following is a specification.

This invention relates to an improved method of marbling paper and to improved apparatus for carrying out the said method.

The improved method consists primarily in floating the colors on a liquid support, imparting a travel to the paper to be marbled giving it a bent course of movement and causing the portions of the paper which successively pass said bend to impinge upon and "lick" or take up the floated color.

The improved method may be also stated as involving other characteristics of procedure which are however subservient to the above statement, and which will be hereinafter fully mentioned and explained, and which will be hereinafter duly pointed out in clauses of the claim.

The apparatus or mechanism for carrying out the said improved method will also be hereinafter clearly described and set forth in the claims.

Referring to the accompanying drawings, Figure 1 is a sectional elevation of the machine, the plane of the section being centrally from front to rear thereof. Fig. 2, is a view taken transversely of a portion of the machine showing parts thereof in front elevation; the intersecting planes for the sectional parts of said view being indicated by the line *x*—*x*, Fig. 1. Fig. 3 is a perspective view of a portion of the mechanism for effecting the deposition of the color upon the surface of the color supporting liquid.

Referring to the present drawings, *a* will be termed the front end of the machine and *b* the rear end.

A represents the framework of any suitable design and material; and on and near the front of said frame is horizontally supported a shallow vat or tank B, the bottom *c* of which inclines at a suitable angle downwardly and forwardly,—an angle of inclination about as shown being found a practical one. The forward top edge of the vat is cut down or made with an outlet opening lower than the other edges whereby only a height for the liquid level corresponding to such edge or outlet opening may be maintained.

C represents a reservoir or supply tank for containing a gum solution or other suitable liquid support for the color located above the vat B, and a conduit *i* leads from said tank C to vat B and is preferably provided with a valve or stop cock *d*.

The vat B, as shown, is placed on an adjustable support 40, (which is pivoted as at 41 to the sides of the frame) and with which support the inclined plate, 42, engages. The said inclined plate is adapted to be adjusted whereby the slant of the bottom of the vat B may be varied. The liquid flowing from the front edge of the vat B is received by the sub-tank R, and the liquid may be withdrawn therefrom at pleasure and returned to the supply tank C, to be re-used.

D represents an endless apron which is supported and guided on the rolls *e*, *e'* and one or more intermediate rolls *f*, as found desirable or necessary; and the roll *e* at the front of the machine is so placed, relative to the liquid level in the vat, that paper (indicated by *g*) carried along with the endless apron, will, as it passes around under the said roll *e*, impinge through its entire surface upon the liquid, and as the portion of the endless apron which is under said roll *e* moves forward and upward the paper will be carried therewith and new areas of the paper presented to take up the color upon the surface of the liquid under the roll. The progressive movement may be readily given to the endless apron by the driving of the one *e'* of the rolls by means of belt and pulley, on another roll e^2, which is geared to the one *e'*, as shown, or otherwise. The color is distributed on the surface of the gum liquid in the vat at the rear of the said roll *e;* and this distribution may be effected in any approved manner, either by hand or automatically. If the distribution of the color is effected by hand it may be done in the manner now common in the hand manufacture of marbled paper. After the distribution of the color has been effected at the

rear of the roll *e*, the color with the forwardly flowing supporting liquid moves forward under the roll *e* the color being then practically all taken up by the paper as the latter travels past the bend in its course which is caused by the said roll *e*.

It is to be understood that the even and continuous forward flow of the liquid is occasioned by the inflow of the gum liquid at the rear of the vat B, and the outflow thereof at the forward cut down edge of said vat.

In the operation of the machine now being described, paper thirty inches wide is by its end portion drawn off from the supply roll I, and carried over the roll e^2, to lie under and upon the endless apron, being temporarily pinned or otherwise fixed thereto and then the said apron is caused to travel until the paper has been carried around under the roll *e* and then on the upper side of the endless apron over the upper roll *f*, and past the roll e^2, when the end of the paper is unpinned from the apron and carried over suitable drying drums or contrivances to a suitable take-up roll (not shown). The paper traveling at from five to eight feet per minute, as it easily and without violence impinges upon the surface of the vat liquid, "licks" as it were, or takes up such an amount of the color as to entirely cover its surface, there being, when a sufficient volume and proper distribution of the color is first insured on the vat liquid, no uncovered and uncolored places on the paper, for some one color will usually form a ground or body and the others will appear in fantastic and irregular marbled or mottled effects on the surface of the paper relatively thereto, all interstices between the waves, streaks and clouds of color being filled in and occupied by that ground color which is best adapted for the most general and universal distribution on the surface of the gum solution.

While as hereinbefore intimated, the distribution of the color upon the liquid in the vat B, may be accomplished by hand, such color distribution will usually be performed automatically, and may be by means of various forms of contrivances, and in the accompanying drawings one form of automatic color-distributing device is illustrated, which will be now described.

I provide a series of color-holding receptacles *m m* each of which is practically closed at its upper end and is provided with a nozzle 10 at its lower end, and the color receptacles of said series are supported transversely over and near the rear of said vat B, on a suitable carrier F, therefor. Each color-holder *m* has an axial or longitudinal rod 12, running through it,—the said rod normally standing by its lower end just inside of the orifice 13, of the nozzle, and by its upper portion is extended upwardly for a considerable distance above the top of the color-holder, and is screw-threaded. The said carrier F, consists of a cross-bar 14, which has gudgeons on its ends, whereby it is mounted for a partial rotation in suitable bearings in the sides of the frame A, said carrier bar being provided with upper and lower forwardly extending flanges or ledges, on and between which the color-holders are supported with their rear sides against the front of the carrier-bar F. Opposing cheek-plates *j*, are provided at each side of the machine frame each of which plates is provided with a slot *h*, which is eccentric or angular to the axis of rotation of the bar F.

l represents a cross-bar having on its extremities friction rollers 16, which run in the said slots of the cheek-plates *j*, *j*. The rods 12, of the color-holders by their screw-threaded portions pass through the thickness of said bar *l*, and nuts 17, 18, are placed upon said rods 12, above and below the upper and lower edges of the bar *l*.

k represents an arm which extends radially from the gudgeons of the said carrier bar F, at each end thereof and into proximity with the spindle-like neck or end 19, of said bar *l*. Each arm *k*, has a clip 20, or other contrivance, whereby a way 22, is formed for guiding the bearing neck 19, at each end of the bar *l*, on and along the said arm *k*, at each side of the machine.

A rocking motion is imparted to the carrier F and the color-holders supported thereon, by means of the crank-arms 23, the pitman rod 24, and the crank 25, which latter is on the shaft carrying the pulley for driving the endless apron and paper. As the carrier-bar F, is rocked downwardly in the direction of the arrow 26, Fig. 1, the bar *l* which is caused to rock therewith, is, as will be plain, constrained to move in the course of the slot *h*, and said bar *l*, will at such time be carried outwardly and in a direct line away from the color-holder *m*, carrying the rods 12, thereof upwardly and well within the nozzles. In such swing of the carrier F all of the nozzles will be swung upwardly and away from the surface of the liquid in the vat B. As the crank 25, continues to rotate the carrier F will be rocked in the opposite direction, the bar *l*, will then have, with its swinging movement, also a movement toward the color-holders, and the rods 12, of the latter will be thrust downwardly toward the orifices of the nozzles, and as the nozzle ends are brought upon and slightly below the surface of the liquid in the vat the said forwardly moving rods 12, will effect the expression of globules or small quantities of the color from all of the color-holders upon the surface of the gum liquid, which globules will range in a line across the vat from side to side thereof, and will be in advance of the place of ingress of the gum solution. The rods 12, may be individually adjusted by properly turning the nuts 17, 18.

It will be noticed that the pitman rod 24 is adjustably secured to the arm 23, of the carrier F, whereby the extent of rock of said

carrier F, and the color-holders thereon may be nicely determined so that the proper presentation of the holder nozzles upon the liquid in the vat may be insured, at each downwardly rocking movement of the carrier.

As the variegated colors flow forwardly they are to be given an arrangement relative to each other in accordance with the taste of the attendant, whereby the marbled effect may be most prominently assured, and therefore means are to be at hand to cause some of the colors to be deflected sharply from their line of flow to the one side, while the other of the colors are deflected to the opposite side. One means for the accomplishment of this is illustrated in the accompanying drawings, and consists in a series of nozzles *o o*, ranging longitudinally of the machine and in advance of each color-holder nozzle, 13, said nozzles *o*, being downwardly extended from suitable air supply pipes or receptacles supported thereabove, and the alternate air nozzles, or different ones thereof, being turned toward different sides of the vat B. For instance, referring to Fig. 1, the air nozzles *o o*, therein shown are arranged in the longitudinal line of the machine which intersects the color-holder *m* therein shown, centrally, and assuming that a suitable air pressure is given through said air nozzles it will be understood that the particular air nozzle 1, having the downward direction and also a cross direction toward the farther side of the machine, will blow the color correspondingly out of the longitudinal line of flow and toward the farther side of the machine, and whatever color is upon the liquid in or near the line of said series of air nozzles *o* and in the line of the current of the particular air nozzle 2, will be caused to flow toward the near side of the machine; the color in said longitudinal line which has advanced under the particular air nozzle 3, of the aligned series will be driven toward the farther side of the machine, while that which has come under the one 4, will be oppositely deflected. The number of these air nozzles in each series aligned with each color-holder *m*, may be of a greater or less number, as may be desirable, and the direction of the deflection of the nozzle ends may be varied in an infinite extent to correspondingly vary the marbling effect.

The air nozzles *o o* of the longitudinal series thereof, in the plan illustrated, constitute downward extensions of longitudinally ranging pipes J, which are carried between and have communication with horizontal and transversely ranging air-pipes K, each of which latter pipes receives air under pressure from the conduits *q* which lead from an air receiver which receives air under pressure from any suitable blower or compressor. A valve *r*, is provided at the egress conduit of the said receiver L, and each of the pipes J, may be valved whereby any of the series *o o*, may be deprived of their blowing action, and again the air nozzles of each of said series may individually have stop-cocks whereby any thereof may be deprived of its blowing action.

M represents a comb or rake mounted transversely above the vat B, and adapted to be swung downwardly to present its teeth below the surface of the vat liquid thereby to effect a combing of the color to insure a further modification in the arrangement thereof, which relative arrangement is transmitted to the paper as the latter takes up the color in the manner already described.

Inasmuch as it may be desirable at times to distribute mica points or other glittering atoms upon the marbled paper whereby the effect of the paper may be enhanced, means to that end may be provided substantially as follows: Above a horizontal portion of the course of the endless apron and of the marbled paper, a shaker sieve, N, is supported in slide-ways *t* of the frame A, in which the glistening particles are placed. A crank *u* is provided on a suitably mounted shaft *u'* which receives its rotation in any convenient manner and a pitman rod *v*, is engaged with said crank and with the shaker sieve; and it will readily be seen that as the marbled paper progresses under the said sieve there will be showered upon the paper a greater or less number of the glittering particles according to the mesh of the sieve and to the rapidity with which the same is reciprocated.

While an endless apron is preferably employed in the machine for carrying out the present improved process of marbling paper, the employment of such reinforcing contrivance and support for the paper is not absolutely essential, and the same may, if desired, be omitted, and the paper *g*, may be drawn off from the supply roll and carried over proper guide and feed rolls and around under the roll *e*, and then away therefrom to proper take up rolls, resulting in many instances in very satisfactory and practical results.

In the description hereinbefore given, for the purposes of brevity the material for receiving the coloring or marbled effects has been mentioned as paper; nevertheless it is to be understood that the capabilities of the invention extend to the coloring of cloth, or other flexible fabric or material.

In lieu of the teeth of the rake M, entering below the surface of the vat liquid, they may be caused to merely approach said surface with a forward and downwardly directed pitch, and said teeth being made tubular and carried by a suitable common air-supply pipe, may have currents of air pass through them which will be directed upon the vat liquid and color thereon in parallel longitudinal lines, effecting the combing of the color, or imparting thereto substantially the same aspect as if the comb teeth entered below the liquid surface.

What I claim as my invention is—

1. The improved method of coloring paper, &c. which consists in floating the colors on a

liquid support, imparting a travel to the paper to be marbled, giving it a bent course of movement and causing the portions of the paper which successively pass said bend to impinge upon the floated color, for the purpose set forth.

2. The improved method of marbling paper which consists in floating the colors on a liquid support and imparting to said color a forward movement, imparting a travel to the paper, giving it a bent course of movement and causing the portions of the paper which successively pass said bend to impinge upon the forwardly moving color, for the purpose set forth.

3. The improved method of marbling paper which consists in floating the several colors on a liquid support, effecting a commingling of the colors, imparting a travel to the paper, giving it a bent course of movement, and causing the portions of the paper which successively pass said bend to impinge upon the floated and commingled color for the purpose set forth.

4. In the process of marbling paper, the improved method of securing the distribution of the colors, which consists in depositing the various colors upon the surface of a suitable color-supporting liquid body, and in then directing currents of air against the floating colors whereby their deposition may be modified.

5. In an apparatus for marbling paper, the combination with a vat B, having a forwardly and downwardly inclining bottom, and an outlet opening at its forward side, the roll *e*, and one or more other paper-supporting and guiding rolls, substantially as and for the purpose described.

6. In an apparatus for marbling paper, the combination with a vat B, provided at its forward end with an egress opening, of a supply tank for holding a liquid suitable for constituting a color-supporting body, an outlet pipe leading from said tank into the rear portion of said vat B, a horizontal roller *e* having its under surface in proximity to the liquid level in said vat B, and other suitable supporting and guide-rolls for paper, substantially as and for the purpose described.

7. In an apparatus for marbling paper, the combination, with a vat for containing a color-supporting liquid, of a series of color-holding receptacles having orifices in their lower extremities for the emission of color therefrom, a carrier for said color-holders mounted to have a rocking motion whereby the orifices of the holders carried thereby may be swung upon and away from the surface of the liquid in the vat, substantially as described.

8. In an apparatus for marbling paper, the combination, with the vat for holding a color-supporting liquid, of a series of color-holding receptacles having orifices in their lower ends, a holder-bar F, suitably journaled for a rocking motion on a horizontal axis and provided with an arm, 23, a rotatable crank, 25, and a pitman-rod 24, connecting said crank and arm, substantially as described.

9. In an apparatus for marbling paper, the combination with one or more color-holders, each having its lower extremity of nozzle form and provided with the rod, 12, extending longitudinally from near the nozzle orifice upwardly beyond the top of the color-holder, and said holder being mounted for a rocking motion on a horizontal axis, a bearing surface with which a part of, or extension from said rod, 12, engages which is angular or eccentric to said horizontal axis, substantially as described.

10. In a machine for marbling paper, the combination with a vat for holding a color-supporting liquid, the holder-bar F, journaled for oscillation substantially as described and supporting a series of color-holders having their lower extremities formed by nozzles and having the rods 12, extending longitudinally of said holders from near the nozzle orifices thereof upwardly, cheek-plates J, at either side of the machine, provided with the slots, *h*, eccentric as described, the bar *l*, having by its extremities an engagement with said slots and with which bar said rods 12, are engaged, means for imparting an oscillation to said holder-bar F, rigid extensions of said holder-bar F, having ways therein extending radially from the axis of oscillation, and in which ways portions of said bar *l*, have a sliding engagement, substantially as and for the purpose described.

11. In an apparatus for marbling paper, the combination with the color-holders having the rods 12, provided with the screw-threaded upper portions and said holders mounted on the rocking carrier F, of the bar *l*, mounted for movements as described, and with which said rods are engaged, and the adjusting nuts for said rods, substantially as set forth.

12. In an apparatus for marbling paper, the combination with a vat for holding the color-supporting liquid normally supported with its bottom in an inclined position and adapted for a tilting movement, and having a liquid outlet at its forward end, of means acting in relation to said vat whereby the inclination thereof may be varied, substantially as described.

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