

UNITED STATES PATENT OFFICE.

FRED FEAR, OF BROOKLYN, NEW YORK.

SOLUBLE DYE IN SHEET FORM.

1,279,679.

Specification of Letters Patent. Patented Sept. 24, 1918.

No Drawing.

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To all whom it may concern:

Be it known that I, FRED FEAR, a subject of the King of Great Britain, residing at the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Soluble Dyes in Sheet Form, of which the following is a specification.

My invention is a soluble dye in sheet form, the subject matter of this application being a continuation of my prior application filed June 3, 1914, Serial No. 842,589 in so far as concerns matter common to the two said applications.

The dry sheet of soluble dye is capable of being packed and handled without loss of the dye material or of the transfer of the dye material of one sheet to the dye material of another sheet or sheets in contact with each other, whereby sheets of assorted colors may be incased or packed within a suitable container without exposing or subjecting said sheets to a change in the color of the dye material.

The new article of this invention secures many advantages from a practical standpoint. The common method now in vogue of placing dye materials on the market is to put them up in tablet form, or to incase the dry powder in separate envelopes. These methods are objectionable for many reasons, chief among which are the loss of the dye materials by the powders sifting out of the packages, the admixture of the dye of one color with the dye of another color, the absorption of moisture by the dye material to such an extent as to impair, if not destroy, the usefulness of the product, and the operation of handling the powder or tablet results in soiling the hands and clothing owing to the loose nature of the powder and the tendency of the tablet to disintegrate.

All these objections are overcome by my invention which consists in a sheet of absorbent material, usually of a fibrous nature such as paper, impregnated with a soluble dye material. The impregnated sheet is in a dry form so that the sheets with assorted dyes can be handled with ease, without the possibility of soiling the hands and clothing. The dye material adheres to, or is incorpo-

rated with the fibrous sheet so that it will not separate therefrom, either by handling the sheet or by rubbing contact with other sheets, whereby the dye materials of different colors are effectually prevented from mixing with each other. The sheets having the dye material incorporated therewith will absorb moisture to a very limited extent, as a result of which the dye material will be unaffected by climatic or atmospheric conditions.

In preparing the sheet for the market, the process consists, briefly, in preparing a suitable liquid dye, sheets of paper, or other fibrous material, are immersed in the liquid dye so as to become impregnated with the same, and thereafter the sheets are removed from the bath and allowed to dry, the drying operation being conducted artificially or by exposure in the air.

Sheets of assorted dye colors having been prepared, a suitable number of differently colored sheets are placed within an envelop with or without other matter. Owing to the dry condition of the sheets, and the character of the product, the dye material cannot rub off the sheets by frictional contact with other sheets within the envelop or inclosure, without manifesting a tendency of the dye material separating from the sheet of fibrous material in the ordinary handling or manipulation of the prepared dye.

To use the dye, a strip of suitable size is cut from the prepared sheet and immersed in water, it being preferred to use hot water. The sheet becomes saturated and the soluble dye material dissolves in the water, thus producing a colored dye bath in which can be immersed the articles to be dyed. Should it be desired to blend two or more colors to secure ultimately another color, pieces are cut from the sheets of selected primary colors, and such cut pieces are immersed in hot water so as to dissolve the dye material and produce a bath the resulting color of which is due to the blending or mixture of the primary colors. It is apparent that instead of cutting pieces from the impregnated sheets, a whole sheet may be immersed in water to produce a bath of the desired volume.

The process of preparing the colored sheets, and of using such sheets, is so simple

that it can at once be appreciated by children, thus placing within their reach a convenient, safe and economical means of dyeing eggs, etc.

5 I am aware that it has been proposed to employ bluing in sheet form, but to my knowledge such prepared sheets of bluing material have been provided with a superficial coating only upon the surfaces thereof, which coating is in a viscid, non-dry, and
10 more or less adhesive condition.

The essential purpose of my invention is to produce a dye saturated, or dye impregnated, paper sheet, in a dry condition, in
15 contradistinction to a paper sheet with a more or less adhesive coating on the surface thereof.

The problem in the production of soluble dyes in sheet form is solved in my invention
20 by the employment of paper possessing certain characteristics, the same being unbleached in the process of preparing it and being, moreover, free from size, coloring matter or chemicals of any kind, except that
25 in the treatment of the paper stock, a solution of sulfuric acid is used, as will presently appear.

In the usual process of making paper material such as would ordinarily be considered
30 suitable for use in the production of sheet dye material, the procedure involves dusting, sorting and cutting preliminary to cooking the stock in a rotary boiler, after which the stock is washed and bleached, the stock is
35 then reduced to "half stuff", and thereafter emptied into drainers wherein the substance is permitted to remain for several days. Subsequently, the material is subjected to the action of beaters for reducing the fiber to
40 sufficient length to form the same into a sheet of paper, and while under the beating operation suitable coloring matter is added to the stock to meet the requirements.

Paper employed in the production of my
45 sheet dye material is not bleached, for the reason that any trace of chlorin, used as the bleaching agent, is found to be detrimental; nor is any coloring material or size added to the "stuff" in the beating operation, nor are
50 any chemicals of any kind added to the stuff, except that in the beating operation a solution of sulfuric acid is incorporated into the stuff. The use of sulfuric acid is not
usual in paper making, because the presence
55 of such acid in the stuff is detrimental to the machinery employed; but in the production of the paper stock for the purposes of this invention, such use of the acid is desirable in order to render the resulting paper
60 web free from alkaline tendencies.

It is not desirable to employ paper containing tannic acid, such as exists in a natural condition in wood fibers, for the rea-

son that the woody fibers retain the dye material and will not give up freely when the
65 sheet is immersed in water; but the material found to be most suitable consists of cotton, or similar fibers, usually prepared from old or used rags or fabric so as to be free from salts the presence of which tend to precipitate the dye stuff upon the fibers.
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From the foregoing it will be apparent that it has been found difficult to produce
paper in sheet form which will carry a relatively large amount of dye material and at
75 the same time will readily yield the dye material when immersed in water, and which, furthermore, will become impregnated with the dye material so as to remain in a thoroughly dry condition, interiorly throughout
80 the fibers, and upon the respective surfaces thereof.

The paper used in this invention is not only unbleached stock and is free from size and coloring matter, but it is subjected to
85 the beating action so as to result in the right length of fiber for the production of paper characterized by a degree of hardness such as will enable the material to be run without breaking through a bath of liquid dye.
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The preparation of the sheet or web to produce paper suitable as a vehicle for carrying the soluble dye is an important step
in the manufacture of the resulting commercial product, for the reason that said web
95 or sheet must have sufficient tenacity to run through the dye bath without breaking, otherwise the operation of impregnating the web results in breaking the latter due to a softened condition of the web occasioned by
100 the saturation of the dye bath so that the web will not stand the pull or strain necessary to draw the web through the rolls, as a result of which the web folds and becomes massed to
such an extent as to stop the working of the
105 machine. Nor must the sheet or web be too hard, otherwise it resists the ready absorption of the liquid dye. Furthermore, in the preparation of the sheet or web it is artificially dried prior to impregnation of the dye
110 bath by the action of appropriate heated rolls in order that substantially all moisture be eliminated from said web prior to impregnating it with the liquid dye. In fact, the
web or sheet is of such character, and is prepared
115 under such conditions, that it serves as a vehicle for carrying a maximum of the dye material and in a thoroughly dry condition, and, moreover, it will bleed readily in a suitable solvent, such as water, in order to
120 free the paper used as the vehicle from all of the dye material, for all practical purposes.

In this invention, the dye bath is, preferably, a concentrated solution, a low percentage of water relatively to the quantity of
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dry dye being used in the preparation of the bath, although it should be stated that the quantity of dye material to be carried by the paper is regulatable by varying the strength of the solution. For many purposes, it is desirable to use a strong or concentrated bath of the liquid dye, particularly when the product is to be used for certain purposes, such as in dyeing the fabrics of women's apparel; but for other purposes, as egg dyes, the paper is or may be impregnated with a dye bath of appreciably decreased strength, so that the resulting liquid dye will not penetrate through the shells to the meats of the eggs.

It is to be understood that the dry sheet dye of this invention involves the following process for its production:—preparing the paper stock, preferably from fibrous waste, such as cotton, in the presence of a solution of sulfuric acid to neutralize an alkaline tendency of the stock, the same being free from the influence of chlorin or other bleaching agents; beating the stock and reducing the fibers to a condition which results in the production of a web or sheet having the required tensile strength; drying the resulting web to an extent which substantially eliminates the moisture therefrom; preparing a bath of liquid dye of the desired strength, preferably a concentrated solution; impregnating the web with the liquid dye by immersing said web in the bath, and subsequently drying the impregnated web by leading it in contact with heated rolls, the temperature of which rolls is regulated to dry out the moisture while permitting the dye material to remain in contact with the material of the sheet or web, the color being crystallized upon both surfaces of the sheet or web.

It may be stated that in a preferred form of my invention the dry sheet or web is so thoroughly charged or impregnated with the dye material that the color is crystallized upon the surfaces of said impregnated sheet or web and presents a mottled appearance, said impregnated sheet and the crystallized color therein being in a thoroughly dry condition both interiorly and exteriorly and being adapted to bleed freely in a solvent (water) so as to part, for practical purposes, with all such dye material in order to make the latter available to produce with the solvent a liquid dye available for coloring eggs, fabrics and other materials.

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

1. As a new article of manufacture, a prepared dye comprising a sheet of material having cotton fibers incorporated therein,

said sheet being impregnated with a soluble dye material, the impregnated sheet and the surfaces thereof being normally in a dry condition.

2. A prepared dye in sheet form comprising a sheet of absorbent paper composed of cotton waste the fibers of which are impregnated by a soluble dye material and the dry surfaces of which sheet carry the soluble dye material in the form of crystals.

3. A prepared dye embodying a sheet of fibrous material composed of cotton waste and impregnated with a soluble dye material, said dye material being present in a dry crystallized condition on the respective surfaces of the sheet and being separable therefrom by immersion in a solvent to produce a bath of liquid dye.

4. A prepared dye in sheet form embodying a soluble dye material composed of cotton waste and a sheet of absorbent material impregnated with the dye material, said dye material being present in a dry non-viscid condition in the fibers and on the respective surfaces of the absorbent sheet and said dye material being free from a tendency to separate from the sheet by abrasion, handling or atmospheric changes.

5. A new article of manufacture comprising soluble dye in dry sheet form, the same embodying a sheet of unbleached paper stock free from size and from an alkaline tendency and the fibers of which are impregnated with the color, the latter being crystallized upon the respective surfaces of the sheet.

6. As a new article of manufacture, soluble dye in dry sheet form comprising a piece of unbleached paper material the stock of which is free from size and coloring matter and is subjected to the action of a solution of sulfuric acid, said paper material being impregnated with dye color and said color being in the form of crystals upon the respective surfaces of the sheet.

7. The process of making soluble dye in sheet form which consists in beating unbleached paper stock and simultaneously therewith subjecting it to the action of a solution of sulfuric acid; producing from the stock a sheet of fibrous material; saturating the unbleached sheet with liquid dye color, and drying the sheet so that the dye color crystallizes upon the respective surfaces of the sheet.

8. In the art of producing a soluble dye in dry sheet form, the process which consists in beating unbleached paper stock while subjecting it to the neutralizing action of a solution of sulfuric acid; producing from the stock a web of fibrous material; eliminating moisture from the web; impregnating the unbleached web with liquid dye

color, and drying said web to effect the crystallization of the dye color upon the surfaces of the web.

9. In the art of producing a soluble dye
5 in dry sheet form, the process which consists in beating unbleached paper stock composed of cotton fibers while subjecting the stock to the neutralizing action of a solution of sulfuric acid, producing from the stock a

web of fibrous material; drying the web to 10 render it absorbent, impregnating the web with liquid dye color by leading said web through a bath of said color, and again drying said web so as to crystallize the dye color upon the surfaces of said web. 15

In testimony whereof I have hereunto signed my name.

FRED FEAR.