A COURSE IN DYEING

BY EDWARD PRAG
A Course in Dyeing

FOR

GARMENT DYERS

BY

EDWARD PRAG

Editor "Modern Dyer and Cleaner,"
Teacher of Dyeing and Dry Cleaning

PUBLISHED BY

The Modern Dyer and Cleaner Publishing Co.

PRICE, $5.00
In writing "A Course in Dyeing" the author has omitted all theoretical matter and long elaboration upon the various subjects. His sole object is to place a useful work before the garment dyers, a book which will be of use to every dyer. The author has also omitted all matter regarding the dyeing of new goods or material and has solely confined himself to "Garment Dyeing" for which this book is intended.

Modern Dyer & Cleaner Publishing Co.
To The

Garment Dyers

and

To All Interested In

The Art of Dyeing

This Work Is Respectfully Dedicated

By The Author
A Course in Dyeing.

PREPARING GARMENTS BEFORE DYEING.

All garments before they are dyed must be properly prepared, they must either be scoured or placed into a solution which will cleanse the garments.

Heavy gentlemen's garments should be scoured, as an ordinary soap solution will not always eradicate all the dirt and grease. It is absolutely necessary that the goods be entirely free from dirt or spots as otherwise no clear color can be obtained.

A great many dyers use a soda bath, immersing the garments in this bath for a short time. This method is more injurious than useful. The soda makes the goods harsh and attacks the wool, and if not thoroughly washed the dyeings will be uneven.

Black, brown and navy blue are the most difficult shades to produce and nearly every dyer has trouble with these colors and consequently great care should be taken in preparing the garments before dyeing.
To obtain a good black, brown or navy blue it is always advisable to draw as much color as possible from the garments to be dyed.

A good scouring solution which will also draw the color is made in following way.

For fifty gallons of water.

18 ounces ground or chipped soap
12 ounces soda ash
¼ ounce Fuller’s Earth
½ ounce Ammonia

This solution for ordinary cleansing should be used lukewarm, for drawing color the solution should be brought to a boil and left for 10 or 15 minutes in the bath. The goods should then be thoroughly washed, no further scouring is necessary.

Ladies garments should receive a light scouring, principally the bottom of the skirts, as the street dust is ground into the fibre and if not fully removed no bright or even shade is obtainable.

After the garments have been cleansed it is absolutely necessary to rinse them thoroughly so that every particle of soap is rinsed out. Garments which are not well rinsed very often will not dye even or will have a greyish look. To obtain good shades and even colors the dyer must be careful in preparing the garments as otherwise he cannot expect good results. Very often complaints are heard from the dyer
that he cannot understand why his shade is off or where the spots are coming from; if the dyer would have taken care when he prepared the garments for dyeing most likely he would have had no complaints to make.

If the dyer does not care to use the scouring preparation described above he can use an already prepared compound which is sold under the name of Ellito. If he does not care to use any preparation and prefers soap it is advisable that he use a good neutral olive oil soap. It is wrong economy to use a bad potash soap just because it is a few cents a pound cheaper. Garments which are faded and scoured with a cheap potash soap are very hard to be dyed and if the dyer has been careless and has not thoroughly washed the garments the faded parts will come up uneven and in light goods will come up much darker than the rest of the garment. All cheap potash soap, naphtha and any soap showing a great deal of free alkali should be avoided. If a soap has too much alkali it can be easily detected as the alkali will penetrate through the soap and form a white substance.

Garments which have faded parts or which have been attacked by perspiration should, after they have been scoured, be immersed in an acetic acid bath, about one pint of acetic acid to each twenty five gallons of cold water and allowed to remain in this bath for fifteen min-
utes. If the garment is not very much faded and only has a few spots take a sponge and saturate the spots with a little diluted acetic acid. After the acetic acid bath rinse the garment.

Another essential factor in dyeing is the water which is used. The water which is used for dyeing should be free from lime and iron and should be soft. Water which contains a great deal of iron or lime will not produce even shades and will give the dyer a great deal of trouble. It is quite easy to find out if the water contains lime. Add to a gallon of water a handful of Glauber's Salt and boil the same for a few minutes and if a white sediment forms on top of the water the water contains lime. The best way to overcome this trouble is to boil the water and skim off the sediment and then cool the bath off ready for dyeing. It is a little more difficult to detect the presence of iron and whenever the dyer surmises that his troubles are caused by iron in the water it is advisable to consult a chemist and find out the percentage of iron in the water. To test the water if it contains impurities, drop a few drops of nitrate of silver in a tumbler full of water, if the water becomes milky, it shows the water is impure.
If the water contains very large quantities of iron it would be best to try and get the supply from another source and if possible by sinking an artesian well.

Hard water is absolutely unfit for dyeing but it is an evil which can easily be overcome.

To soften water use soda ash. Quite a number of dyers prefer a little acetic acid, again, the most experienced dyers use just ordinary potash soap, which is shaved into the bath, the bath is then boiled and all the impurities are skimmed off. These dyers claim that the dyeings in soap softened water are very bright, and that the dyestuff goes on very even.
The Dye House.

Skill and good judgment are necessary for a good dyer, but no matter how skillful a dyer is he cannot obtain results without the proper apparatus for dyeing.

A good dye house, well ventilated is just as necessary as good dyes. Dyeing in a wash kettle on a coal stove will not bring forth artistic colors.

The cost of a small dye house is not very great and a small but modern plant will turn out a great deal of work.

Tubs can be made of large casks. The tubs should have double bottoms, between them is the steam coil. In most of the smaller dye houses, only ordinary cask or tubs are used and the steam pipe is led directly horizontal into the tub.

The iron pipe should never come from the top. There are several reasons. First, when the steam pipe is lead in a horizontal way into the tub the steam is apt to hit the garments and very often holes are made in the same by the force of the steam. Second, after the iron pipe has been used for a short time it becomes rusty and quite frequently injures the dyebath and uneven dyeings are obtained as some of the dyestuffs are very sensitive to iron. Third, the
bath can never be heated evenly and most all the so-called heat spots are occasioned by the horizontal steampipes.

The steam should always enter from the bottom of the tub by a steamcoil covered with a perforated false bottom or where such is not possible the coil should be covered with asbestos.

A copper jacket kettle with a heavy cover is very often used. These jacket kettles do excellent work but the new dye kettle is much more preferable.

The floor of the dye house should be concrete with a drain in the middle of the floor. On the left side of the dye house should be a forty H. P. steam boiler and near the door the scouring tables. The dye house has large sliding windows giving ample ventilation. In the rear of the dye house should be built the drying room. The walls of the drying room are covered with radiators and the steam is brought from the dyehouse. The size of the drying room should be about 12 x 15 feet.

The dye house described above is naturally only considered a small plant. A firm doing a great deal of job dyeing must have much larger tubs. Most of the larger dye houses have large cedar tubs or large cask. The latter are considerably less expensive but not quite as useful as a good cedar tub. For dyeing union colors cop-
Height, 30\(\frac{1}{2}\) inches.
Diameter, 27\(\frac{1}{2}\) inches.
Depth of Tank, 16 inches.
Capacity, 40 gallons.
The steam enters at the bottom through a spray nozzle.
Manufactured by G. H. Bishop, Chicago, Ill.
per kettles are the most useful as they can be cleansed quicker and less danger of a sediment forming on the sides as is very often the case with wooden tubs, the sediment which at times forms itself on the side of the tub is the cause of spotted dyeings.

The dye house should be at least 22-25 feet high, should have swinging windows so that it can easily be ventilated which is very essential. The windows should be of ground glass so that the rays of the sun cannot freely penetrate. In a dye house where colors have to be matched it is well nigh impossible to do so if the sunlight is very bright. The wall should be painted a dull grey or green. This is also essential where shades have to be matched, white walls are very annoying. The floor should be of concrete and in front of the tubs should be a small canal to allow the waste water to run off. Without that the water spreads all over the floor. Opposite the dye tubs should be the rinsing tubs. The hydroextractor should be removed as far as possible from the dye tubs. If possible it should be in the adjoining room as the steam very often injures the true running of the extractor and the acid vapors corrode the inside basket.

Two of the principal factors for a modern dye house in which good and clean work is done, are plenty of light and good ventilation.
A great many of the smaller dye houses have in some corner a small closet, where the dye and chemicals are kept. This is absolutely wrong. The storeroom should be separated from the dye house for two reasons—one, economy; two, cleanliness. The steam attacks the tin cans in which the dyestuffs are kept. The cans get rusty and fall apart, and the dyestuff gets hard and caked and becomes useless. The careless handling of these cans brings forth a great deal of trouble; the dye is spilt on the wooden shelves, and the least draft blows the loose dyestuff either into the vats or on the wet garments and serious spots result which are hard to eradicate.
Hand Power Hydroextractor
Manufactured by Steel Roll Machine Co., Chicago, Ill.
The Drying Room.

A good drying room is very essential to bring forth good results. A small plant naturally cannot afford to install an expensive drying room. In such a case a drying room as described in a former paragraph suffices. If it is not convenient to have the drying room attached to the dye house and it is located in another part of the building, it is not expensive to have the steam-pipes connected from the dyehouse to the drying-room as steam heat is the best and safest heat for drying garments. Coal fire heat cannot be regulated and nothing is more injurious to re-dyed garments than an overheated drying-room. It is a mistaken idea that it is necessary to have the drying-room fearfully hot.

Ninety to ninety-five degrees is the hottest the room should be. If the room is overheated the garments will dry up brown, very often navy blues will come out of the drying room uneven which is caused by too great a heat.

Gas heat is also not very preferable for drying purposes as it causes the dyer all kinds of trouble.
HYDROEXTRACTOR

Manufactured by
American Laundry Machine Manufacturing Co.
For large establishments which can afford to place the latest improvements in their dyeing plants, the new special constructed drying rooms are the best. The heat can be regulated at will, which is very essential. The heat is evenly distributed and all danger of an over heated drying-room is done away with.

The cut on page 15 illustrates one of these new drying rooms.
Manufactured by
The American Laundry Machinery Co.
Dyeing.

Dyeing is an art which needs a great deal of skill and judgment. The reason that so many fail to become good dyers, is because they are lacking in good judgment and are not taking sufficient time to study the necessary rudiments. They rely mostly upon the advice of the salesman who sells the dyestuff. He seldom knows anything about dyeing and tells the dyer a wonderful fairy tale about the merits of his firm’s dyestuff. After he has the order, he leaves the dyer to find out the great merits of the half adulterated dyestuffs and if complaint is entered he has a great supply of plausible excuses.

If great skill and judgment are needed in a mill, where only new yarns or piece goods are dyed it takes greater skill and judgment to dye garments. The garment dyer has to contend with a great many difficulties which never enter into dyeing new material.

The foreman dyer of a mill, will not admit this and believes himself superior in skill to the garment dyer, but if he drifts into the garment dyeing business he soon finds his mistake.

Nearly every mill has a chemist who tests the dyestuffs and chemicals. The foreman
tries the dyestuff's, matches the shades, the material is weighed, the dyestuff and chemicals are also carefully weighed out, and every slightest detail is looked after to obtain good results.

It is vastly different in a garment dyeing establishment. Even in the largest plants a chemist is seldom employed. The goods and the chemicals are not weighed. A teaspoonful of dyestuff, a tablespoonful of salt and a dipperful of something else is used and so on. Consequently the troubles are manifold and a great deal of money is wasted.

There is no reason why the same care should not be taken in dyeing garments as in new material.

The only reason known is that a good many garment dyers are not dyers by trade and have drifted into the business and are doing the dyeing by formulas given to them by the dyestuff salesmen.

If the garment dyer would weigh his goods, chemicals, etc., he would save a great deal of money and avoid trouble.

A dyebath overcharged with dyestuff brings about bronzed colors. A dyebath overcharged with common salt very often is the cause of "Crocked" goods. In dyeing Union goods these items have to be taken in consideration. The alkali acts upon the wool, shrinks the wool fibre but leaves the cotton intact.
When such has taken place the garments cannot be successfully pressed. The alkali also has a bad effect upon the silk linings or trimmings. It dulls the lustre, makes them brittle and often gives the black a reddish tone.

When the dye bath eventually is emptied, pounds of dyestuff are emptied into the sewer which have never done any good, except to the dyestuff dealer.

Another mistaken idea is in dyeing black that if the garment does not come up to the desired depth to add more dye. A garment can only absorb a certain amount of dye and an overcharged dyebath brings about a black which rubs off or as the dyers say it “Smutts.”

The weighing of the garments and chemicals is not by any means troublesome.

For example; a hundred pounds of goods are dyed for which should be taken 5% of color and 10% of salt. It means that 5 pounds of dyestuff and 10 lbs. of salt are used. Now if a suit weighs 5 lbs. one twentieth of the above amount is used. Four ounces of dyestuff and eight ounces of salt and so on.

Scales are not a very expensive luxury and a whole outfit, a small platform scale and a good scale for weighing chemicals can be bought for fifteen or twenty dollars, and they will pay for themselves in a very short time.
The Metric system is the best system to adopt, it is easier in calculation and more accurate.

If your garments weigh 5 pounds, multiply \(454 \times 5 = 2270\), now you have to use \(5\%\) of dye-stuff or salt. Multiply \(2270 \times 5 = 113.50\) or \(113\) grams and 5 decigrams equal about \(3\frac{1}{2}\) ounces.

- 1 lb. equals 454 grams.
- 1 Ounce equals 30 grams.
- 1 Gram equals 10 Decigrams
- 1 Decigram equals 10 Centigrams
- 1 Centigram equals 100 Milligrams

Liquid Measure.

- 1 lb. equals 454 C. C.
- 1 ounce equals 30 C. C.

In garment dyeing the quite small measures are very seldom needed, and if the metric system is too difficult the old system is good enough. For correct tables of the metric system see back of this book.

To fully explain the liquid measure, suppose for example that the goods are dyed with sulfuric acid. The goods weigh twenty pounds and it is necessary to use \(4\%\) of acid for one hundred pounds, and for 20 lbs. you would use \(\frac{1}{3}\) of 4 lbs, or about \(13\) oz. Using the metric system 20 lbs. equals 9080 grams \(\times 4\) equals 363 grams, 2 decigrams or in practical use you would use 364 C. C. A graduated measuring glass can be bought at any wholesale drug firm.
The Dyeing of Union Goods.

The dyeing of Union goods is the most important branch and also the most difficult. Every day brings new materials into the market and these new goods are a mixture of wool, cotton, silk, mercerized yarn, artificial silk, shoddy, etc.

The demands of the customers are also growing daily which makes the task of the dyer more difficult. In years gone by an ordinary black, brown or blue was acceptable. This is entirely different now. The dyer must match the shades to sample and the slightest defect in shade will be rejected.

The greatest difficulties which present themselves to the dyer are black, dark brown and navy blue.

The garments which are brought to be re-dyed brown or navy blue are usually faded and these faded parts are a great annoyance to the dyer as they usually come up darker. Navy blues also give a great deal of trouble to the dyer as often the dress is streaked. All these troubles can be remedied and most of the time they would not occur if the proper attention would be given to the garments before dyeing.
To obtain good results in dyeing Union goods, three factors have to be taken into consideration.

First. The cleaning of garments before dyeing.

Second. Selection of dyestuff.

Third. Washing after dyeing.

All garments to be dyed, should be well dusted. The new dust wheels are very appropriate for the same.

After the garments are dusted they should be scoured with a good neutral soap and then well rinsed.

The scouring in large plants is now done by scouring machines and it is claimed that the machine gives better results than hand work. The cut below is one of the latest approved machines.

The next is the selection of the dyestuff. To obtain a good black a dyestuff should be selected which is specially prepared for garment dyeing. There are hundreds of good Union Blacks in the market but absolutely useless for garment dyeing.

A good Union Black, should dye the cotton, wool and silk a perfect fast black.
DYEING METHOD.

The dyeing method of all the special prepared Union dyes is very similar. These dyes either dye with the addition of Glauber’s Salt or common Salt.

QUANTITIES OF DYESTUFF.

A good black should be produced with five pounds of dyestuff for each one hundred pounds of goods. The bath does not exhaust and should be kept for future lots; for the second bath only three fourths of the original quantity is needed and for the third bath only one-half the quantity of dyestuff is added.

QUANTITY OF SALT.

If the dyestuff is dyed with the addition of Glauber’s salt, ten pounds to the hundred pounds of goods should be taken. If common salt is used not more than five pounds to each hundred pounds of goods. Usually ten to fifteen pounds of salt is recommended. Too much salt is injurious to the wool as also to the silk.

THE DYEING OPERATION.

Fill the vat with lukewarm water and add the salt to the bath.

Dissolve the dyestuff in boiling water and when fully dissolved add to the bath.
DUST WHEEL.

Manufactured by
Cleveland Laundry Machinery Co., Cleveland, O.
The salt should always be added to the bath first.

Enter the goods and work them for five minutes without steam. Put on the steam and bring the bath slowly to a boil, always working the garments with a stick. Boil from twenty-five to thirty minutes, shut off the steam and allow the garments to remain in the bath from twenty to thirty minutes.

If the garments remain a little longer in the cold bath the cotton will be richer in shade.

A good test to see if your dyestuff is appropriate for your work is to watch the cotton. If the cotton after a period of thirty minutes in the cold bath dries up bluish or red the dyestuff is useless for garment dyeing.

**WASHING THE GARMENTS.**

After the garments come from the dye bath, throw them over wooden horses and allow the dyestuff to run off, then wash first in lukewarm water and again wash in cold water. No soda should be used in the rinsing bath. After the garments are well washed, they should be at once hydroextracted and hung up to dry in a moderately heated drying-room.

Before the garments are placed in the dye-vat, the seams in the lining should be opened about two or three inches. This will prevent
the linings from sacking and gives the dye liquor a better chance to penetrate.

What holds good for dyeing black holds good for all other Union dyestuffs except navy blue. They are all dyed in the same manner.
Shade Dyeing.

In former years the garment dyers did not need to undertake to dye according to sample and customers were not so very particular. If a dyer was able to come anywhere near within four or five shades of given samples he was satisfied with the job and the customer also was quite pleased.

At the present time the demands of a customer are much greater, he or she wants an exact shade dyed to the given sample and cannot be satisfied with an off shade. Consequently, shade dyeing has become a difficult and troublesome task.

No matter how good a dyer may be on straight shades he might be a complete failure so far as creating shades is concerned.

If the goods were all wool, silk or cotton the difficulty would not be so great, but when the garments are mixed it is not an easy task.

It is impossible to give a set rule for matching a shade and fully depends upon the skill and good judgement of the dyer.

The dyer should confine himself entirely to "Union Dyestuffs" as it is very seldom that a garment is all wool or all cotton.
It is the habit for dyers to dye a garment brown with a Union dyestuff and shade off with a blue or green wool or cotton color. The result, naturally, in most cases is disastrous as either the wool or cotton will be darker or the dye-stuff used for shading is of an entirely different nature than the Union dyestuff and the goods come out of the dye vat spotted.

It is absolutely essential that when garments have to be dyed to a given sample that the dyestuff employed must be of the same nature. If Diamine colors are used all Diamine dyestuffs are used, if Benzo or Oxonite dye-stuffs are used, all Benzo or Oxonite colors should be employed and so on.

To give recipes for all shades in vogue at the present time would be a futile task and by the time the task would be finished hundreds of new shades would have made their appearance.

With the three Primary Colors every shade of the rainbow can be obtained. The Primary colors are Blue, Red and Yellow, the Secondaries are Green, Orange and Purple.

Now for instance, equal parts of blue and yellow make a green, if the shade should be more greenish a larger quantity of yellow must be taken, if the shade should be bluish naturally more blue has to be taken; in this way any green shade can be obtained from a pale Nile green to a dark Russian green. The addition
of a very small quantity of red is always advantageous if a dark green is wanted.

Brown shades are obtained with yellow, green and red, by taking a larger quantity of yellow, a dark brown will be obtained, by using a larger quantity of green, red and a smaller amount of yellow, lighter browns are obtained and by varying these three colors all mode browns can be made. The quantities for dark brown are, as closely as can be approximated, about three pounds of yellow or orange, one pound green and two and one half pounds of red. The quantities are figured for one hundred pounds of goods. It also has to be taken in consideration that every different brand of dyestuff gives a different shade.

Green and red makes grey. About three ounces of green and one ounce of red makes a light grey. Ten ounces of green and ten ounces of red and a very small quantity of yellow, creates a pretty dark grey.

Brown and green, make olive. Three parts of brown to one part of green.

Orange and red make scarlet, about one pound red and twelve ounces of orange.

Blue and violet will produce navy blues. One and one half pound of blue and one half pound of violet.

Very pretty and rich red can be obtained
by combining red and violet, only small quantities of violet should be used.

Royal blue is obtained by using about two pounds of violet and one half pound of blue.

Champagne is obtained by very small quantities of yellow and orange, the quantities should not be more than one tenth of one ounce.

Old rose, three ounces of red and quite a small quantity, equal parts, of yellow and green.

As already mentioned it is impossible to give recipes for all different shades, but a little practice and good judgment soon will enable a dyer to achieve good results.
Navy Blue.

Very few Union navy blues are appropriate for garment dyeing. The best blues are Oxzonite Union navy blue, Union navy blue (F. B. of E. Co), Union Royal navy blue, (cassella.)

The bath should be nearly cold when the garments are entered and should be worked at least for ten minutes before steam is put on.

The dyestuff is best dissolved by placing the same in a copper dipper or any other vessel and the boiling water poured over the same, instead of the usual custom of adding the color to the boiling water. In all navy blues there is a great deal of violet which will not dissolve and afterward forms a color lake upon the garments, which is ordinarily called "streaking."

After the garments are well washed, ladies dresses should be hung in the drying-room, waist downward. The drying room should not be hotter than 85° F.; too great a heat bronzes the garments.
BRONZED GARMENTS.

If garments are overdyed and look brownish after they come from the drying-room, place them on the scouring table and scour the same with hot soap suds containing a little ammonia, 20°.

If still brown after the scouring, draw them through a hot soap bath containing a few drops of hydrochloric acid and then rinse again.

FADED PARTS.

Dresses which are partly faded or are soiled under the arms from perspiration should have the faded parts washed with Acetic Acid before dyeing. The washing with Acetic Acid must be done after the scouring.

If the trousers are soiled with urine stains, wash the soiled parts after the scouring with Hyposulphite of Sodium.
Matching Samples.

In matching a shade to a given sample always employ the dyestuffs which are of the same nature as it is nigh impossible to obtain satisfactory results by mixing the dyestuffs promiscuously.

For instance if you use Diamine Blue, and you want to make a green do not take Benzo Yellow, but employ either all Diamine dyes or all Benzo colors. Every dyestuff is of a different nature and naturally brings about different results and sometimes will not combine with another kind.

A great many dyers use for shading, any color they can lay their hands on. If Union goods are dyed, a Union dyestuff should be used for shading. By taking a straight wool color or cotton color it is most likely the wool or the cotton will get darker.
GARMENT PRESSING MACHINE.
United States Hoffman Co., Syracuse, N. Y.
Wool Dyeing.

The dyeing of garments which are entirely of wool and stitched with silk is not difficult.

There are several processes for dyeing wool but there are only two processes which the garment dyer can adopt.

Following are the processes for dyeing wool.
1 Dyeing with Sulfuric Acid, and Glaubers' salt.
2 Dyeing with Acetic Acid and Glaubers' salt.
3 Dyeing with acid and then after-chroming.
4 Mordanting with Bichromate of Potash and Cream of Tartar and then dyeing with Alizarine, Anthracene colors or Logwood.
5 Dyeing with Basic colors which is also called Neutral dyeing.

The first three processes are adaptable for dyeing garments the latter two processes cannot be recommended. Process No. IV is too tedious and the result of mordanting garments which have already been dyed once is not satisfactory and the colors obtained are usually uneven.
Process No. V, dyeing with Basic colors is unsatisfactory as the shades obtained are not fast. A good Black cannot be obtained at all.

Process No 1
Dyeing with Sulfuric Acid

All garments must be thoroughly cleansed before dyeing and if colors such as red, green, golden brown or any light shade are to be dyed the goods have to be stripped. (See process for stripping) After the garments have been scoured they should be thoroughly washed in luke-warm water. Some dyers use soda in the rinsing bath, this should be avoided as the soda makes the fibre harsh and uneven dyeings are the result.

For 100 lbs. of Goods.

Prepare a dyebath as follows; fill up the dye-vat with sufficient water to cover the goods and add,

\[ 4\% \text{ (4lbs.) Sulfuric Acid} \]
\[ 10\% \text{ (10lbs.) Glaubers' Salt} \]

Now dissolve in boiling water the necessary quantity of dyestuff usually from 3-5\% (according to the strength of the color) and add this to the dye bath.

Bring the dyebath to 140°F, the heat can be tested with a thermometer which is one essential
instrument in a dye house and can be bought for 75 cents. Enter the goods, stir well and gradually bring the bath to a boil and boil for one hour. Lift and throw them over a wooden horse and when cooled off a little, wash thoroughly in cold water.

Most of the dyestuffs exhaust and the bath cannot be kept for future lots.

Some dyers have the habit of only boiling one half hour; this is a wrong method, even if the color has exhausted it is well to boil a little longer, the color will be brighter and faster.

When light shades or combination shades are dyed it is advisable to add the dissolved dyestuff in portions as otherwise uneven dyeings are obtained.

For very light shades the goods should be entered at a lower heat, about 110-120°F.

**ACID DYESTUFFS.**

Nearly every large firm has a great variety of good acid colors and it is impossible to mention all of them. For Black such colors as Naphthylamine Black 4 B. K., Cashmere Black, Oxonite Acid Black, Azo Merino Black, B. Patent Naphthylamine Black, T. T. N., for pretty blues and greens, the Cyanole colors are to be recommended, Oxonite blue and green, new Patent Blue G. A, Brilliant Acid Green C. B.

For yellow the Naphthol colors are the best


Orange, Orange II, Orange R., Orange R. O., Oxonite Orange.

Process No. II.

The dyeing is carried on in the same way as process No. I only that acetic acid is employed instead of sulfuric. This process is mostly used for light shades and really is not of great importance for garment dyers.

Rhodamine, Erythrosine, and Rosazeine are dyed with acetic acid. The above colors produce bright pink shades. Rhodamine can also be dyed with sulphuric acid.

Process No. III.

After-Chroming Process

This process is a very good one and has a great advantage over Process No. I as the blacks produced are very fast and the blacks are usually of a rich shade.

Nearly every large dyestuff firm has a large assortment of after-chroming colors.

The blacks are only of importance to garment dyers.
Colors like Alizarine Black B., Chrome Cyanine T., Anthracene Black, Oxonite Chrome Black are good for that purpose.

Prepare as follows: add to the bath,
10-15\% (10-15 lbs) Glaubers’ Salt
3-4 \% (3-4 lbs) Acetic Acid.

Enter garments at 130°F and bring bath gradually to a boil and boil one-half hour. Stop off steam and cool bath off to 160°F and dissolve 2\% (2lbs.) of bichromate of potash or 1\frac{1}{2}-2\% (1\frac{1}{2}-2lbs.) of Flouride of Chrome (the latter gives a bluish shade) and add to the dye-bath. Push the goods aside with a stick when adding the chrome, bring bath to a boil and boil one half hour, lift and thoroughly wash.

Process No. IV
Dyeing with Mordant.

This process as already mentioned is useless for garment dyers.
Goods to be dyed are first mordanted as follows.

Fill vat up with water enough to cover goods and add, for 100 lbs. of goods,
3\% (3lbs) Bichromate of Potash
2\frac{1}{2}\% (2\frac{1}{2}lbs) Cream of Tartar
The chrome and tartar should first be dissolved in boiling water.

Bring the bath to a boil and enter goods and boil one hour. Lift and thoroughly wash.
Now enter the goods into the dyebath. The dyebath must be cold or lukewarm and is brought very slowly to the boil and the goods are boiled for one hour and then washed.

All Alizarine colors and Logwood are dyed by this mordanting process.

Some dyers use no cream of tartar but use sulfuric acid instead or only chrome alone. This is done to economize, but is not advisable as the blacks usually are not fast. The Cream of Tartar is necessary to produce Chromic Acid which liberates itself in the dyebath and acts upon the fibre.

Lactic Acid can also be used instead of Cream of Tartar.

If goods are only chromed without the aid of Cream of Tartar or Lactic Acid, the colors obtained will not be fast and rub off.

Process No. V

Dyeing with Neutral Colors

Shades produced with neutral colors are bright, but not fast.

The dyestuff should be thoroughly dissolved and then be strained through a fine sieve or cheese cloth. When dissolved, add the same to the dyebath with the addition of a little acetic acid, about $1\frac{1}{2}$-2 lb. to the hundreds pound of goods.

The goods are entered at a luke warm tem-
perature and must be well worked. Put on steam and bring bath slowly to 160°F., stop off steam and work good for ten to fifteen minutes longer. Take out and slightly rinse. Boiling should be avoided as it makes the colors look dull.

Colors adaptable for this purpose are, Rhodamine, Methylene Blue, Methylene Violet, Brilliant Green Crystals, Diamond Fuchine, Auramine Chrysoidine (Orange). Thioflavine etc.
Felt Hat Dyeing.

Woolen Felt Hats, which are to be dyed black, can be dyed successfully with wool process No. III after-chroming process.

The hat should be thoroughly cleansed and should be boiled for at least an hour. To exhaust the bath a little sulfuric acid should be added after the bath has been boiling about one-half hour.

Process No. I can also be used but the blacks are not as good and fast as with process No. III the hats before blocking will have to be sized. One of the best blacks in the market for felt hat dyeing is Diamond Black, which comes in several shades.

Before dyeing old hats it is absolutely necessary that the hats should be thoroughly cleansed, otherwise it will be impossible to obtain an even black.

Soda should not be used for cleaning, the best way is to use Olive Oil soap.
Stripping Garments.

There are quite a number of preparations upon the market which are sold for that purpose. Heraldite C., Ringolite, Hydrosulphite, Camden Strippean, etc.

All the products are of the same nature and work nearly alike.

The goods to be stripped are treated in a weak ammonia bath and then rinsed.

Prepare a bath of,

- $3\%$ (3lbs.) of Stripper
- $2\frac{1}{2}\%$ (2$\frac{1}{2}$lbs.) Sulfuric acid

Enter goods at $120^\circ F$ bring bath slowly to a boil and boil one half hour. Then rinse well in cold water and again in warm water.
Cotton Dyeing.

Cotton dyeing is still a great factor in the garment dyeing branch. The garment dyer experiences a great deal of trouble in obtaining a good deep black.

If the garments are all cotton he should not have much trouble providing he selects the proper dyestuff, there are hundreds of good blacks in the market and if the dyer buys his dyestuff of a good reliable house he most likely will get what he asks for, but if he buys his dyes of some small firm he very often buys an adulterated article and then his trouble commences.

There are various processes to dye cotton, but there is really one which is useful for the garment dyer and that is the the direct dyeing process. For the benefit of the dyer who also does new work we will describe all the processes.

1 Direct dyeing with Common salt.
2 Direct dyeing with Glaubers’ salt.
3 Dyeing with Sulfuric colors.
4 Dyeing with Alum and Glaubers’ salt.
5 Dyeing with Basic colors.
6 Developing Process.
Dyeing with direct dyeing colors is the only practical process for garment dyers.

No. 1 Dyeing with Common Salt
Soak goods in luke-warm soap water for 10-15 minutes, rinse and prepare a dye bath as follows:

The necessary quantity of dyestuff
10% (10lbs.) of Common Salt
Enter goods at 150-160°F., stir well, put on steam and boil one hour. Stop off steam and allow to remain in bath fifteen minutes. Lift and wash. If the garments are scoured it will not be necessary for them to be soaked in soap water.

It is advisable at times to leave the garments a little longer in the bath after the steam has been stopped off.

No. 2 Dyeing with Glaubers’ Salt
The Diamine colors, mostly are dyed with Glaubers’ salt, the process is the same as Process No. 1 only that 10-15% (10-15lbs.) of Glaubers’ salt is used instead of common salt.

No. 3 Dyeing with Sulfur Colors
The dyeing with sulfur colors, has not proven a success so far as garment dyeing is concerned, though these colors are to be recommended if the goods are all cotton. The colors obtained with sulfur dyes are very fast and rich. Good judgment is necessary in handling these dyes as otherwise no results are obtained.
Copper kettles cannot be used nor should any iron steam pipe come in contact with the dye bath. Where horizontal steam pipes are used it is advisable to cover them with Asbestos or with heavy burlap. The new burlap dresses, which look like Pongee silk, in fact are an imitation of this material, dye very well with sulfur colors. All cotton upholstered curtains and hangings also dye well with these colors. It is best to cover the kettle or vat while dyeing as very often the air oxidizes the color and uneven dyeings are obtained.

For 100 lbs. of Goods
Prepare a dye bath as follows,
Fill up vat with just enough water to cover goods
10-20% of dyestuff
10-20% Sodium Sulphide Crystals
2% Soda ash
50-100% Common Salt
Goods are entered luke warm, then bring the bath slowly to 200°F and keep at this temperature for one hour. Lift and wash thoroughly. The black will improve in the air or dry room.

Some dyers cover the goods with burlap sacks for one hour before rinsing, but for garments this is not necessary, the covering process is more for raw stock.

There are quite a number of sulfur colors in the market. The Katigen and Immedial colors are very good.
The quantity of sodium of sulphide is regulated, according to the quantity of dyestuff, usually equal quantities are taken. In making up your baths, first add the sulphide of sodium, then the soda ash, then the dyestuff, thoroughly boil up baths, cool off and add the salt.

Sulphur dyes are very hard to dissolve and if not thoroughly dissolved, they will form color lakes and produce uneven dyeings. The bath does not exhaust and should be kept for future lots, when only one-half the amount of color is needed, three-quarters of the first amount of sulphide of sodium and full quantity of soda ash and salt; in the third bath the quantities of the chemicals can be reduced to one-half. Some of the sulphur colors are afterwards treated with metallic salts, but this after treatment is useless for garment dyeing. Glaubers' salt can also be used instead of common salt, but common salt is preferable.

Every brand of sulphur color, needs a little different treatment, principally so far as quantities of salt are concerned.

The Katigen colors are dyed with fifteen to fifty pounds of Glaubers' salt, or with twenty to thirty pounds of common salt, whereas Immedial colors are dyed with forty to sixty pounds of Glaubers' salt.

Boiling should be avoided, though some of the brown and red sulfur colors stand boiling,
it is advisable never to bring the dye bath over 200°F.

Alum and Glaubers' Salt Process

This is another process useless in garment dyeing.

Alum and Glaubers' salt colors are mostly used for dyeing carpet and yarns; the shades obtained are not fast and do not stand washing.

For 100 lbs. of goods: Prepare a dyebath, containing necessary quantity of dyestuff which should be thoroughly dissolved.

\[\begin{align*}
3\% & \text{ Alum} \\
10\% & \text{ Glaubers' Salt}
\end{align*}\]

Enter goods at 110°F and slowly bring bath to 140°F and dye at this temperature for one half hour. Lift, extract liquor, dry without rinsing.

Dyeing with Basic Colors

All the basic dyes, dye cotton neutral (without addition of any salt) but the goods must be mordanted either with Sumac extract or Tannic acid and Tartar Emetic.

The basic colors give very bright shades and are exceedingly well adapted for dyeing fine laces.

Laces dyed with direct dyeing colors usually shrink very much, having to be boiled for an hour, whereas, the basic color dyeing process
leaves the laces at their original width as the dyeing process is carried on at a low temperature.

For 100 lbs. of Goods

Prepare a mordanting bath containing,

3% Tannic Acid or
10-15% Sumac Extract

(For delicate shades Tannic acid should be used).

Enter goods in this bath at 100°F and allow to remain in Tannic acid for one to two hours, if Sumac Extract is used leave the goods immersed over night.

Squeeze or wring out the liquor and without washing enter the goods into a bath containing 1½-3% Tartar Emetic

(For light shades 1½ and for dark shades 3%)

Leave in bath for 20-25 minutes, working the goods from time to time.

Lift and thoroughly wash.

Now enter the goods into the dyebath, which should be perfectly cold. The necessary quantity of dyestuff is dissolved and added to the water with no further addition of chemicals. Raise the temperature of dyebath to 130-140°F and dye at this temperature for thirty minutes.

Dark Blue shades can be dyed at a temperature of 150-160°F. Boiling must be avoided. For light shades and laces, luke warm water will suffice.

Laces should be mordanted with Tannic acid.
MACHINE FOR MARKING GARMENTS.

The B. F. Cummins Co.

Chicago, Ill. Ravenswood Station.
Fifteen to twenty minutes are sufficient to leave them in the mordanting bath.

Antimony salt can also be used instead of Tartar Emetic.

Basic colors are excellent for redyeing silk ribbons or laces.

To dye silk add a few drops of acetic acid. No mordanting is needed.

Basic colors are quite strong and for light shades a very small quantity of dyestuff is needed.

Start bath luke-warm and gradually raise until 140°.

Light shades can be dyed at a lower temperature.

Topping with Basic Colors

Cotton goods dyed with direct dyeing colors very often the shades look dull and to give them a bright appearance they are topped with Basic colors. This method is usually employed for greens.

The ordinary way of topping is carried on as follows.

Add to the cold water bath a little acetic acid, about 3-4% for each hundred pounds of goods, allow goods to lay in this bath for a few minutes, now add the previously dissolved dyestuff to the bath, it is advisable to add the dyestuff in two or three portions. After the
bath is nearly exhausted raise the bath gradually to a boil.

Basic colors are, Rhodemine, Eosine, Erythrosine (Pinks), Auramine, Thioflavine (Yellow), Fuchsine (Red) Geranium, Brilliant green crystals, Malachite green (bluish green), Methyl Green, Methyl Violet, Chrysoidine (Orange), Methylene Blue.

Note. All basic colors should be dissolved in boiling water, with the addition of a little acetic acid.

Soft water should only be used if the water is hard add a little acetic acid. Sulphate of Alumina can also be used.

DIAZOTISING AND DEVELOPING

This process gives exceedingly fine blacks but the process so far has not found great favor with the garment dyer. There is no doubt that the process could be employed with good results if good judgment is used.

DYEING PROCESS

The garments are first dyed with the ordinary direct dyeing process as heretofore described. After the garments have been rinsed they are diazotised as follows.
Prepare a cold bath containing,
2-3% (2-3 lbs.) Nitrite of Soda
3-5% (3-5 lbs.) Hydrochloric Acid or Muriatic Acid, both acids are one and the same.
The goods stay in this bath for twenty minutes. Rinse in cold water.
The goods are now entered in the developing bath.
The principal developers used are Beta Naphthol, Resorcine, Phenylene Diamine. Some of the dyestuff firms have their own developers, which are sold as developer No. 1, 2 and 3 etc.
To develop with Beta Naphthol,
Dissolve in about 8-10 gallons of boiling water.
6 lbs. Caustic Soda lye (75° Tw.)
7 lbs. Beta Naphthol
For every hundred pounds of goods used about 1-1½ gallon of the above solution in a vat of cold water and add about two pints of Caustic soda lye. Enter the goods and work in bath for twenty minutes. Take out and rinse twice in luke warm and once in cold water.

Resorcine
Dissolve in 8-10 gallons of boiling water:
6 lbs. Resorcine
13 lbs. Caustic soda lye (75° Tw.)
For 100 lbs. goods use about five quarts of above solution.
Work goods in the same manner as described above.

Phenylene Diamine
Dissolve in 8-10 gallons of boiling water.
4 lbs. Phenylene Diamine
1 lb. Soda ash
For one hundred pounds of goods use two gallons of above solution and add about 1½-2 lbs. of soda ash to the cold bath.
Work in the same manner as given for Beta Naphthol.

Nearly all the other diazotisers work in the same manner, great care has to be taken that the quantities are correct. It is necessary that the causticsoda lye is of full strength, 75° Tw. This is tested with a Hydrometer which can be bought in any wholesale drug house.

Developing blacks can be obtained from any of the large dyestuff firms, which usually inform their customers what developer to use.
Dyeing Lace Curtains.

The dyeing of lace curtains is not a great industry, still some customers want their curtains dyed crème or very light shade of yellow. In former years the dyers used coffee or the German product called "Chickory."

Curtains can easily be dyed crème with Egyptian dye which is used for imitating Balbriggan. The process is the same as the direct dyeing process with common salt, only that the quantity of dyestuff used is very small, about one fiftieth part of one ounce is enough for a pair of curtains. The bath need only be hand warm.

Leave curtains in bath about thirty minutes, take out and put them on curtain frames.
**Speck Dyeing.**

This method was the universal method for garment dyers until the Union colors made their appearance.

Though the Union colors have revolutionized the ordinary methods in garment dyeing, Speck dyeing is still carried on to a great extent. The results are not as satisfactory as can be obtained with Union colors.

**Dyeing Process**

The goods are first dyed in an acid bath (see Acid dyeing) after the garments are well rinsed. They are then dyed in direct dyeing cotton dyestuff either with common salt or Glaubers’ salt; the bath should be lukewarm.

The goods are kept in the bath for thirty minutes.

To get an even shade it is of advantage to dye the wool a little lighter than the necessary shade, as quite a number of direct dyes will dye the wool a little and in this way an even shade is obtained.

Garment dyers often dye the garments in the direct dyeing cotton bath first and then in the acid bath. This is wrong and should be avoided, as the acid will destroy the cotton color.
Very often after this two-process dyeing, the garments will be very harsh and are very difficult to be pressed.

Immerse the goods in a weak soda bath for a few minutes, this will neutralize the acid and the goods can then be pressed easily.
Dyeing Jute.

All goods made of Jute must be boiled in water for 10-15 minutes.

The only articles of the material which are brought to a garment dyer are tassels and curtain holders. It is best to bleach them, before dyeing. Add to the boiling water a little soda and after the boiling, rinse.

Then put them into a bleaching bath of Chloride of lime. Dissolve one half pound of lime in two gallons of water and allow to settle, then strain the clear chloride water through a cheese cloth. The articles to be bleached should be allowed to remain in the bath 10-15 minutes, take out and without rinsing draw through an acidulated rinsing bath. This consists of a little sulfuric acid, about one half wine glass full, to three or four gallons of cold water.

After the bleaching the goods are dyed in the same manner as cotton is dyed. Not quite as much dyestuff is needed for dyeing Jute as is needed for cotton.

Jute can also be dyed with acid and basic colors.
Dyeing with Acid Colors

Add to the bath 4% (4 lbs.) of Alum (for 100 lbs. of goods), enter the goods at the boil, boil for twenty minutes, turn off steam and allow the goods to remain 15-20 minutes longer in the bath.

Dyeing with Basic Colors

Basic colors dye Jute without any mordant or addition of chemicals. Enter goods luke warm, bring bath gradually to 150-170°F, and dye at this temperature until the bath is exhausted. For light shades add a few drops of acetic acid and for bright red shades a few drops of oxalic acid into the dyebath.
Dyeing Linen.

Linen dresses should be boiled for one hour in a bath containing 3-5 lbs. of soda.
Linen goods are sometimes hard to penetrate. The goods are dyed in the same manner as cotton goods but it is advisable not to add the common or Glaubers' salt to the bath until it has been boiling for 15 minutes.
Dyeing Silk.

Dyeing of silk garments and goods is an important branch of the garment dyeing trade and is also the branch which gives the dyer a great deal of trouble.

Silk goods are to a great extent weighted with chemicals and after they have been worn for a length of time become very weak and often will break or big holes will appear after the dyeing. Every garment dyeing establishment should have a sign conspicuously placed in the store, that no responsibility is taken. As soon as the goods are handed over the counter the strength should be tested by rubbing. If they show deterioration the quickest method for dyeing should be employed.

There are several methods of dyeing with acid colors, salt colors, basic colors and over a mordant.

New silk has to be degummed which is done by boiling for one hour in a soap bath. The bath in which the silk is boiled off is saved and afterwards used in the dyebath. This liquor is known as the “boiled off soap liquor” and is of great importance in the dyeing.
It is seldom that silk yarn or floss is brought to a garment dyer, consequently, he seldom has any soap liquor. When soap is needed in the bath, the best and most neutral olive oil soap should be employed.

A good Soap Preparation

Dissolve in five gallons of water one pound good olive oil or white castile soap and 2-3 ounces of pure white gelatine (can be obtained in any wholesale drug house). This preparation when used in dyeing will also leave the goods in good condition, whereas usually the goods come from the bath in a very soft and flabby condition and have to be sized afterwards which gives the dyer a great deal of trouble.

Dyeing with Acid Colors

Fill the vat with luke warm water and add one half gallon of the soap solution, then add 3-4% of sulfuric acid, stir the bath well, while adding the acid. Now dissolve the necessary amount of dyestuff and add to the bath.

Some dyers work the goods in the soap bath a few minutes before they add the dyestuff, this is very good but not absolutely necessary.

Enter the goods and bring bath slowly to about 180°F, and dye at this temperature for one hour. Take out and draw to a cold water bath to which has been added some acetic acid,
about an ounce to three gallons of water. This is what the silk dyer calls a "Scroop".

Nearly all the acid colors will dye silk. For black, the Naphthalamine and Oxonite silk black are very good, the Diamine colors are also excellent for that purpose.

It takes about 6-8 pounds of dyestuff for one hundred pounds of goods to be dyed black.

Dyeing with Acetic Acid

The dyeing process is the same as with sulfuric acid. About 3-4% acetic acid is used.

By drawing the goods through a tannic acid bath, after they are dyed, the fastness of the shades is improved. Dissolve 2 lbs. of tannic acid for one hundred pounds of goods. The bath should be cold.

Dyeing with Basic Colors

All basic colors should be well dissolved before they are added to the bath. It is best to use a little acetic acid in the dissolving bath and if still not dissolved add a few drops of alcohol. Methylene blue is one of the most difficult to dissolve and should be dissolved in alcohol and a little acetic acid.

Prepare the dye bath with soap liquor as described in the acid dyeing process, add about 1-1½% of acetic acid. Enter goods at a lukewarm temperature and slowly raise to 150-160°F.
Rinse in a cold water bath to which has been added a little acetic acid.

**Dyeing over a Mordant**

The best black is obtained over a mordant, this process takes more time and more work but the results are very satisfactory.

**The Various Mordant Processes.**

1. The silk must lie over night in a bath of chloride of chrome 30°Tw. In the morning rinse out two or three times in clean cold water.

2. Treat the silk in a bath made up as follows. For one gallon of water add, 15 ounces of sulphate of alumina and 2½ ounces of soda, the latter should be separately dissolved in a pint of water. The bath should be about 15°Tw.; work in this bath about 15 minutes and allow to remain in bath for 3 hours, take out and rinse in a soap bath and then rinse again.

3. Lay the silk over night in a bath of ferric nitrate (Iron liquor), in the morning squeeze out and thoroughly rinse in warm water. Then enter the silk for one hour into a boiling soap bath and wash again.

The process No. 3 is the easiest and the most used. The mordant liquor can be kept, but should be kept up to its original strength.

**Dyeing the Silk**

The goods should be dyed at once without drying after the mordanting.
Add to the bath about two or three gallons of soap liquor, as described in the acid dyeing process, for every 15 gallons of water, 2% of acetic acid. Dissolve the dyestuff and strain through a cheese cloth and add to the bath.

Enter goods in lukewarm bath, work a few minutes, put on steam and raise bath gradually to 180°-190°F. and dye at this temperature for about one hour. Rinse the goods very thoroughly and then draw through a luke warm bath containing acetic acid, about one ounce of acetic acid to every gallon of water.

Dyeing with Salt Colors

The dyeing of silk with direct dyeing dyestuff is not useful for light shades as the shades look very dull. For black, brown and navy blue they can be employed. The range of colors for this purpose is limited and there are only a few direct dyeing colors which will produce results. The best colors to use are the Union colors, those which dye with common salt. Direct Deep Black Extra E, Oxonite Union Black, Union Black S, Benzo Brown, Oxonite Brown, Union Navy Blue and Royal Union Navy Blue are the best colors to use. They dye in the same manner as the Union colors (with the common salt) see Union dyeing.

If the goods are all silk, it is best not to boil the goods, dye at about 200°F. and \( \frac{1}{2} \) to \( \frac{3}{4} \)
hours will suffice. Rinse in acetic acid acidulated bath.

**Dyeing Pongee.**

Redyeing Pongee is a very unsatisfactory process and nearly every dyer has had his troubles.

Nearly every dyer has his own method but very few obtain any good results. Most of the Pongees after they are dry look bluish or grey. Navy blues are usually uneven, look bronzed or very dull.

Acid dyes do not give full satisfaction as a great many garments are stitched with cotton or mercerized yarn.

The best way to dye pongee is with a Union dyestuff as mentioned for silk and to allow the pongees to remain in the bath after the steam has been shut off for at least $\frac{3}{4}$-1 hour. Then take them out. Take a tub large enough to hold the garment and fill the tub with enough dye liquor, the same with which the garment has been dyed, and add $\frac{1}{2}$ wine glass full of acetic acid. Make the bath hot, 180°F., re-enter the garment and allow to remain for 20-30 minutes, take out and wash.

If the acetic acid would be added to the full vat, the dye liquor could not be used again for dyeing Union goods.

Dresses which have been dyed navy blue,
when taken into the dry room should be hung waist down, this will prevent streaking.

Pongees dyed in described method will give good results

**Dyeing Artificial Silk.**

By artificial silk is not meant mercerized yarn. In late years artificial silk has been made from wool pulp and is mostly used for trimmings. If dyed in a boiling bath the silk dissolves or breaks into little pieces. The writer knows of a case, where the garment dyer dyed a costly broadcloth dress with silk trimmings, the dress was well dyed but no trimmings could be found when it came from the dyebath, except a few shreds, which after examination proved to be artificial silk. By using a magnifying glass it can easily be detected, it looks very coarse, the fibre is similar to Rami and has an exceedingly high lustre.

**DYEING PROCESS**

Artificial silk is best dyed with direct dyeing salt colors, in fact all cotton colors can be used. Acid colors are absolutely useless.

The silk is entered at a very low temperature, the bath is gradually brought to 120-130°F. and dyed at this temperature for $\frac{1}{2}$ hour. Rinse in cold water.

The color goes on very easy. For light shades the dyestuff should be added in small portions.

Basic colors can also be used.
Dyeing Straw.

Very few garment dyers bother with the dyeing of straw hats as they have no facilities to reblock them. Black is the principal shade.

If the hat is very dirty it is best to boil the same for an hour in a soda bath before dyeing.

There are quite a number of blacks which can be used, some are acid dyes; Direct Deep Black Extra or Oxonite Union Black give good results.

For 10 lbs. of hats use 12 ounces of dyestuff and double the quantity of common salt and boil for $1\frac{1}{2}$ hours. Wash in cold water.

To stiffen the hat, make a thin gelatine size and draw the hats through the same and then hang up to dry.

If light shades are to be dyed the straw will have to be bleached.

For white hats bleach in the following manner:

Dissolve in boiling water, 3 ounces of Permanganate of Potash and add to this one gallon of cold water, (for every gallon of water three ounces of Permanganate must be added).

Enter the hats in this solution and allow to remain for 15 minutes (the hat will be nut brown).
Take out and without rinsing immerse the hat in a sulphurous acid bath (cold) work until all the brown has disappeared. Then wash twice in cold water.

For dyeing light shades use basic colors without any addition of acid only using the color alone.

Chip Plait can be dyed in the same manner.
Dyeing Gloves.

Dyeing kid gloves is profitable, but very few dyers take in gloves as the results obtained are often not very good.

Dissolve about \( \frac{1}{3} \) ounce of Nigrosine (soluble in paraffine oil) with six ounces of Chloroform.

Brush this solution on the glove and dry with a muslin rag.

There are several prepared dyes and pastes in the market which will do the work quick and well.
Dyeing Feathers.

The dyeing of Ostrich feathers is an art of its own and the feather dyeing has in late years been done for the trade by a few firms, ninety per cent. of garment dyers send their feathers away to be dyed.

To dye feathers successfully a great deal of skill and judgment is needed and any dyer who is not gifted with patience should not undertake this work. Though in the last few years through the introduction of so many new colors which are adaptable for this work, the dyeing of feathers has become quite easy.

The dyer should beware of dyeing willow feathers, if they are pasted they cannot be dyed as they will come apart.

Black is the only color of importance, 75% of all Ostrich feathers are dyed black.

How to Dye Black

The feathers should first be brushed with a soft brush to remove all dust.

No. 2. Fill a kettle with warm water to cover the feather and add enough olive oil soap to make a good lather. Soak the feathers over night.
No. 3. In the morning take out feathers and wash twice in lukewarm water.

No. 4. Dissolve in 5 quarts of boiling water, 5 ounces of Tumeric and add 1 tablespoonful of Archil extract. Enter your feathers and work the same for 4-5 minutes. Take out and wash twice in cold water.

No. 5. Cover two pounds of Logwood chips with $2\frac{1}{2}$ gallons of water and boil for $\frac{1}{2}$ hour. Pour off the logwood liquor and remove the chips from the kettle. Bring the logwood to the boil, shut off steam and enter your feathers and allow to remain 6-7 minutes. Take out and wash twice.

No. 6. Dissolve in 5 quarts of boiling water, $\frac{1}{2}$ ounce of yellow chrome, chromate of potash and $\frac{1}{2}$ ounce of red chrome (bichromate of potash) enter the feathers and work 2-3 minutes. Take out and wash twice in cold water.

No. 7. Bring the Logwood bath to a boil and re-enter feathers and allow to remain for 15 minutes. Take out and wash twice in cold water.

No. 8. Dissolve in one gallon of boiling water, $\frac{1}{2}$ ounce of yellow chrome, enter feathers and work for 2 minutes. Take out and wash twice in cold water.—

Note.—Yellow Chrome, is Chromate of Potassium
No. 9. In two gallons of cold water dissolve \( \frac{1}{4} \) lb. of pure corn starch, enter the feathers and work them for a minute. Take out, wring out the starch liquor and beat them on a clean board. Hang up to dry if possible in the air. When the feathers are half dry they are beaten again and when perfectly dry beat them hard over the board until all the starch is beaten out. Never allow the feathers to dry without beating.

If the instructions are followed out a black is obtained which will please any customer.

This process is only for feathers to be redyed. The garment dyer seldom or never gets raw stock to dye. For new feathers the same process can be used only that when the feathers are entered in the first logwood bath they are allowed to remain for two hours and in the second logwood bath for one hour.

Note. The dye and chrome baths should be boiling hot but the bath must never be allowed to boil as otherwise the feathers shrink.

**Dyeing Shades**

The dyeing of the light shades is quite easy providing good judgment is used. Acid colors should be avoided, though there are several acid colors which produce good shades, such as Orange II, Cyanole, Patent Blue, still it is not advisable to use them as the acid is injurious to the fibre, the shades can only be obtained
by boiling the feathers which also injures the fibre or flue. The basic colors are best adapted for feather dyeing and every shade can be obtained with them. For very pale shades the feathers must be bleached white and thoroughly cleansed.

For pale shades the best bleaching bath is a hot soap bath with a little dissolved bioxolate of potash. For dark shades the feathers should be placed for ten minutes in a cold permanganate of potash solution and afterwards drawn through a neutralized Sulphurous acid bath and twice washed in cold water.

How to prepare the Dyebath

Take a white basin fill up with cold water and add a good hand full of pure corn starch, when the starch is dissolved add the necessary amount of color.

The dyestuff should be previously dissolved in boiling water and those dyestuffs which boiling water will not dissolve, such as Methylene Blue must be dissolved in alcohol.

The easiest way is to have all the dyestuffs needed thoroughly dissolved and then filtered into bottles and well corked. When ready for dyeing take an eye dropper and drop a few drops into the starch water, if the shade is not deep enough drop a few more drops into the bath and so on until the desired shade is ob-
tained. The depth of shade can also be regulated by allowing the feather to lay in bath for a longer time or by adding a little hot water, but never so hot as to congeal the starch.

If the shade is too deep draw through hot soap suds and if that will not remove sufficient color add a few drops of dissolved Bioxolate of potash.

Brown,—use Thioflavine (yellow) Brilliant green and a drop of Fuchsine, yellow must be the largest part. Aniline brown and a little yellow will produce a good brown. Bismark brown, a few drops of Malachite green and a few drops of yellow give a pretty shade of brown. Brown can be also obtained with Logwood and bichromate of potash.

Give the feathers only half the amount of Tumeric. The logwood should only be \( \frac{1}{2} \) the strength as for black. Allow feathers only to remain 2 minutes.

The chrome bath should also be only half strength; work 1 minute.

Navy Blue,—Methyl Violet 2B and Methylene Blue M., Logwood, using the process for black only in weaker decoction and topping with Archil extract produces a very dark navy blue.

Green,—Yellow shades, Brilliant green crystals and Auramine II or O.

Bright Green,—Brilliant Green Crystals.

Green,—Bluish shade, Malachite Green.
Pink,—Rhodamine (Yellowish shade) Ploxine, Erythrosine.

Yellow,—Lemon shade, Auramine, Thioflavine.

Canary,—a few drops of Chrysoidine.

Orange,—Chrysoidine.

Blue,—Methylene Blue, for pale shades three drops will be enough.

Cerise,—Cerise, Rhodamine and Methyl Violet.

Red,—Geranium.

Grey,—Geranium and Brilliant green crystal, about one part of green.

Mode,—Geranium, Methylene Blue and Thioflavine, only use a few drops of each, the least of blue.

It is impossible in this book to give the recipes for all shades. By using Auramine, Rhodamine, Aniline Brown, Bismark Brown, Brilliant Green crystal, Malachite Green, Cerise, Geranium and Chrysoidine, all shades can be obtained, a little practice will soon bring the desired effects.
Dyeing Carpets.

This industry has become of late quite an income to the garment dyer. The dyeing of carpets can be undertaken in any plant where there is a square or long wooden vat. Attached to the top of the vat should be a wheel the width of the vat, a crank should be attached so the wheel can be conveniently turned or a pulley can be attached so the wheel can be run by steam.

On the spokes of the wheel nail a few pieces of rubber which will prevent the carpet from slipping.

Sew a few strips of carpet together, hang over the wheel and fasten the two ends with thin wire or small iron clasps.

The carpet must be thoroughly dusted, if possible in a dust wheel.

The dyeing is done with acid colors the same way as described in wool dyeing. The acid colors are best adaptable as they leave the back of the carpet undyed.

Dark Red and Blue are the best shades to be dyed.
As soon as they are dyed, they should be washed, rolled together and the water squeezed out. Unroll the strips and cut the single strips loose and either nail them to the floor or on a wooden frame and allow to dry in this way. To allow to dry in a stretched position will prevent them from shrinking.
Dry Dyeing.

Until the present time, Dry Dyeing is still in its infancy and no special success has been made. The great obstacle is that real dark shades are unobtainable and the shades obtained are not fast to light nor to washing.

Very recently one of the largest garment dyeing establishments has built a special plant for this kind of dyeing, but it will have to be proven that the plant has been successful.

For laces, small pieces of silk, for light shades on feathers, silk gloves, etc., the dry dyeing process can be successfully employed.

There are two processes of dry dyeing: 1st, with gasoline and oil paints. 2d, with Alcohol and Basic Colors.

For process No. 1, procure tubes of good oil paint, such as Chrome Yellow, Burnt Seneca, Umber, Prussian Blue, Vermillion, etc.

For a light shade only very little color is needed. Dissolve the paint in a little gasoline, and to prevent spotting the goods, strain the dissolved paint into a new vessel, now fill up the vessel with enough gasoline to cover goods, immerse the goods for a few minutes, take out and squeeze out liquor and hang up to dry.

The deeper the shade is wanted the more
color will have to be taken and the articles will have to be left longer in the bath.

Oil paints can be obtained in any art store.

Process No. 2. Instead of gasoline and oil paints, Alcohol and Basic colors are used. The Basic colors are dissolved in Wood Alcohol. The process for dissolving is the same as for process No. 1, and the dyeing is also done in the same manner. The latter process gives brighter colors on silk but is useless for feathers.

The shades obtained on feathers dyed in the above way are very fugitive.
The Use of Acids.

There is probably no other branch of dyeing so little understood and so thoroughly abused as the necessity and importance of the use of the various chemicals in the dyebath. In many cases but little attention is paid to the amount or quality of the ingredients used, while in nearly all cases the reasons for their use are entirely unknown. Glauber’s salt is substituted for common salt, sulfuric acid for acetic acid, and calcined Glauber’s salt for the crystallized product.

The varying results obtained by thus interchanging chemicals are always to be due to the dyestuff itself; whereas, as a fact different deliveries of the same dyestuff vary but seldom at present, as the most exacting care is taken by the large color manufacturers to insure uniformity of their products.

Uneven and unsatisfactory dyeings are practically always the result of unclean goods or of inattention, forgetfulness or negligence upon the part of the dyer.

SULFURIC ACID.

This is one of the strongest and cheapest of acids that can be used for dyeing. One part sulfuric acid 66° Bé. possesses the same amount of acidity as 2.18 parts of muriatic acid 22° Bé.,
or as parts of acetic acid No. 8. On account of its great strength care must be exercised in its use. It is used principally in the dyeing of the so-called acid colors upon wool. It is used to a slight extent in the chroming of wool with potassium bichromate, but its application for this purpose is not to be recommended, as it hardens and harshens the wool, causing the fibre to lose its strength and to dye unevenly. Colors produced upon a chrome bottom thus formed are not as brilliant or as fast as those upon a chrome tartar mordant. The use of sulfuric acid is advocated for the dyeing of all acid colors upon woolen yarn, but care must be taken that the amount of acid is not so great as to cause the color to spring too rapidly to the fibre. The more sulfuric acid present in the dyebath, the more rapid the dyeing and the more complete the exhaustion. In the dyeing of those colors which exhaust rapidly, not more than one-quarter of the acid should be used at the beginning of the operation, the remainder being added slowly during the dyeing. In no case should the strong acid be added directly to the bath, but the required amount should first be poured slowly and carefully into twenty times its own weight of water, and this dilute acid then added to the dyebath, the goods being always lifted before the addition.

Difficulty is often experienced in the dyeing
of goods with sulfuric acid. If too much acid is present in the dyeing of felts, heavy goods, etc., the color springs to the surface of the goods, preventing penetration of the dye-liquor and causing uneven dyeing. This can be entirely obviated if the goods are boiled for half an hour in the bath containing simply the dyestuff and the Glauber’s salt, and the necessary sulfuric acid then added slowly, the boiling being continued. By this process the goods are thoroughly penetrated with the solution of dyestuff before the color is set with the acid.

It is advisable to always introduce the goods into the dyebath below the boiling point, as no matter how evenly the dye may color the goods when introduced at the boil, the results are not as brilliant, or strong or as fast as if they had been introduced below the boiling point and the temperature gradually raised.

In dyeing with a mixture of colors which possess different exhaustion properties, the kettle should be started with the amount of acid required by the quickest dyeing color of the combination, and after one-half hour’s boiling, the additional amount of acid required by the slowest dyeing ingredient should be introduced. Careful attention to this method will result in the production of uniform and even dyeings that could not be otherwise obtained from the combination of dyestuffs used.
Every trace of sulfuric acid should be washed from the goods before drying, as the presence of acid will discolor the dyeing and ruin the fibre.

It is evident from the above that the abuse of the use of sulfuric acid is a source of great trouble in the dyeing of woolen goods, and yet but comparatively little attention is paid to it by dyers.

A careful study of the colors and goods used is absolutely necessary to determine the amount of acid required, and a watchful attention to each particular dyeing operation will of necessity result in the production of dyeings of the highest grade.

MURIATIC ACID

Muriatic or hydrochloric acid until the last few years was of little interest to the dyer.

The introduction of the diazotizable colors several years ago, has brought this acid prominently before the dyer.

The colors are dyed upon unmordanted cotton, and then subjected to the diazotizing process. This consists in immersing the goods in a weak solution of sodium nitrite and hydrochloric acid. The acid is first diluted with a small amount of water and then added to the very weak solution of sodium nitrite. Muriatic acid is best suited for this purpose and should not be substituted by sulfuric acid, as the latter
is too powerful and causes the liberation of the nitrous acid gas too rapidly, which then escapes into the air instead of being liberated slowly, in which case it attacks the color upon the fibre, producing the desired result. Sulfuric acid has a tendency to heat the bath, a state that must be avoided. The hydrochloride of the diazotized color produced upon the fibre when muriatic acid is used is more stable than the sulfate produced by the use of sulfuric acid.

For the above reasons muriatic acid should always be used in the diazotizing bath for the treatment of diazotizable colors.

**ACETIC ACID**

This is the most useful of all acids to the dyer. Of late years its value has been better appreciated, and its use more extended. Within late years a great many wool dyes have been introduced into the market that possess the property of extreme rapidity of dyeing in the presence of sulfuric acid. For such colors acetic acid is well adapted. It causes a much slower exhaustion of the dyebath than does sulfuric acid, and the results produced are therefore much more level. It should always be used where it is particularly desirable that even dyeings should be obtained, as in the dyeing of light shades upon piece-goods. Acetic acid is always valuable for the dyeing of heavy
garments, as felts, flannels, etc., which are difficult to penetrate. The use of strong acids in these cases should be avoided, as they cause the color to dye the exterior of the goods, leaving the interior undyed or of a much lighter shade. By using acetic acid the color dyes very slowly allowing the penetration of the goods, and the formation of a uniform color upon both the interior and the exterior of the goods.

OXALIC ACID

This acid has but little value in the dyehouse. It cannot be used where it is desirable to make use of its acidity, on account of its injurious effect upon wool when present in large quantities. Its chief use is in the chroming of wool, and its use for this purpose is not to be advised. It does not give the real value of the bichromate, and renders the wool rough and harsh causing uneven and dull dyeings.

Lately attention has been called to its usefulness in dyebaths where the water is hard, containing a large amount of lime, and where it is desired to dye with colors sensitive to this impurity. In these cases a small amount of oxalic acid should be added to the boiling bath, previous to the addition of any of the other ingredients. The insoluble oxalate thus formed separates and the dyeing operation can then be continued as usual.
Salt.

This assistant was little used before the introduction of the direct cotton dyeing colors, but the value of its use soon become evident, and to-day it finds a place in every dyehouse. Its cheapness and effectiveness make it invaluable in the dyeing of cotton and Union colors with the direct dyes.

By adding common salt to the dyebath, the water dissolves the salt and has a tendency to precipitate the coloring matter. The introduction of the cotton causes an attraction for the coloring matter by that fibre, and under the repulsion of the salt saturated water and the attraction of the cotton, the dyestuff leaves the former and becomes attached to the latter. With this plainly understood, the rules that govern the use of salt are evident. Too much salt must not be added to dyebaths containing colors difficult of solution, or a precipitation of the latter will result.

As water will dissolve only one-third of its weight in salt, so much of the latter must not be used to super-saturate the water, and for the same reason the amount must be gradually reduced in a running kettle, as the only salt that is removed is that contained in the water which adheres to the fibre when removed from the bath. Salt should be used in preference to Glauber's
salt in dyeing with cotton colors that are sensitive to acids.

On account of lack of care, it frequently happens that successive baths do not contain the same amount of salt, and as a result some kettles produce deeper results than others, the cause of the trouble being generally laid upon the dyestuff, whereas it is due entirely to unequal amounts of salt in the various baths. A good grade of salt should be used, and that containing calcium or magnesium salts should be avoided, as they will cause uneven dyeings.

The goods should be thoroughly washed after removing from the dyebath, as salt is difficult of removal from the fibre when it is once dried.

Careful examinations of the dyebath should be made each time before the introduction of the goods to determine if any precipitation of the coloring matter has been caused by too large an addition of salt. The reasons for the use of salt are so evident that a little thought will explain the cause and remedies for any inequalities due to this ingredient of the dyebath.
Measures of Weight.

The Gramme, the unit of weight, is the weight of a cubic centimeter of distilled water at 4° Centigrade.

1 Milligramme equals \( \frac{1}{1000} \) of a gramme, equals 0.0154 troy grain.
1 Centigramme equals \( \frac{1}{100} \) of a gramme, equals 0.1543 troy grain.
1 Decigramme equals \( \frac{1}{10} \) of a gramme, equals 1.5432 troy grains.
1 Gramme (as above), equals 15.4323 troy grains.
1 Decagramme equals 10 grains, equals 154.3235 troy grains.
1 Hectogramme equals 100 grains equals 3.5291 oz. avoirdup.
1 Kilogramme equals 100 grains, equals 2.20462 lbs. avoirdup.
1 pound avoirdupois equals 453.59 grammes.
1 ounce avoirdupois equals 28.34 grammes.
Measures of Capacity.

(Dry and Liquid.)

The Litre, the measure of capacity, dry and liquid, is the volume of a cubic decimetre.

1 Millilitre equals $\frac{1}{1000}$ of a litre, equals 0.06103 cubic inch.
1 Centilitre equals $\frac{1}{10}$ of a litre, equals 0.61027 cubic inch.
1 Decilitre equals $\frac{1}{10}$ of a litre, equals 6.10270 cubic inches.
1 Litre (as above), 1000 cubic centimetres, equal 1.7608 pints.
1 Decalitre equals 10 litres, equals 2.2009 gallons.
1 Hectolitre equals 100 litres, equals 22.0097 gallons.
1 Kilolitre equals 1000 litres, equals 220.0967 gallons.

1 gallon of water weighs $8\frac{1}{3}$ lbs. avoirdupois.
CONTENTS.

Bronzed Garments .......................... 31
Cotton Dyeing ............................. 43-53
Dyeing ...................................... 16-19
Dyeing Artificial Silk ...................... 66
  " Carpets .................................. 76-77
  " Feathers ................................. 70-75
  " Gloves ................................... 69
  " Jute ....................................... 57-58
  " Lace Curtains ............................ 54
  " Linen .................................... 59
  " Pongee ................................... 65
  " Silk ....................................... 60-64
  " Straw ..................................... 67-68
Dry Dyeing ................................... 78-79
Felt Hat Dyeing .............................. 41
Matching Samples ........................... 32
Navy Blue ................................... 30
Preparing Garments Before Dyeing ........ 1-5
Salt ........................................... 86-87
Shade Dyeing ................................ 26-29
Speck Dyeing ................................ 55-56
Stripping Garments ......................... 42
The Dye House ................................ 6-10
The Dyeing of Union Goods ................. 20-25
The Dyeing Room ............................ 12-14
The Use of Acids ............................ 80-85
Weights and Measures ....................... 88-89
Wool Dyeing ................................. 34-40