

Various methods of coupling lead pipes, dispensing with the use of solder, have been invented. One of the best of these is that known as Leland's (American), represented in the engravings, Figs. 27 and 28 being a sectional and exterior view of the joint. A is a ferrule of brass or other metal tapered inside, having an inner shoulder, a collar, B, and threaded end. The ferrule is first slipped over the end of the lead pipe, which is then opened by means of a shouldered tamp-pin, struck a few blows with a hammer, the shoulder of the tamp-pin forming a facing of the pipe against the inner shoulder of the ferrule. On the end of the other pipe, the ferrule, C, is similarly applied, secured by a shoulder on which is the other portion of the union, D. A thimble, E, of brass or iron, is then inserted in the mouth at one end, the other end is brought over it, and the union, on being screwed up, draws the parts together till the two ends of the lead pipe meet, when a gas-tight joint is formed. The time occupied in making the connection does not exceed two minutes, and it is applicable also to the connecting of lead to wrought-iron service-pipes.

PREPARATION TO SERVE INSTEAD OF ARGOL, IN DYEING WOOL WITH COLORS REQUIRING THE USE OF THE SALTS OF TIN.

By M. MALFAIT.

DISSOLVE on the one hand 22 lbs. of alum in 70 pints of boiling water, and on the other 7 lbs. 10½ ozs. of oxalic acid in 35 pints of hot water. Mix the two solutions, and add 4 lbs. 6 ozs. of acetic acid, stirring carefully. This mixture of 105 pints of hot water with 34 lbs. of other matter produces, on cooling, about 123 pints of a mordant, which costs about ten shillings.

The quantity of tartar employed in dyeing is always one-half less than that of cochineal used. To 2 lbs. 3 ozs. we take, therefore, 1½ ozs. of tartar, costing about 1s. 1d. On the contrary, if the new mordant is employed 4 litres are sufficient, which will not cost above 6d.

As the colors upon wool, for which the use of salts of tin and of tartar is indispensable, are got up with cochineal and young fustic, the only question will be the manner of working with these two coloring matters. (N.B.—The use of young fustic along with cochineal is not in England so invariable a rule as in France.)

COCHINEAL DYEING.

We begin with boiling the ground grain with the mordant in the same manner as is usually done with argol, that is to say, for 15 minutes. It is then allowed to settle, and the clear liquid drawn off. Three boilings are generally made, but only the two first are employed for scarlets and other such colors, whilst the third, but feebly charged with coloring matter, is placed in reserve, and is used merely to reddish shades whose principal coloring matter is something other than cochineal, such as salmons, orange-yellows, etc. To 2 lbs. 3 ozs. cochineal we take 7 pints of the mordant, and add 35 pints of water. After the first boil, we merely boil the cochineal again with 35 pints more water, and we operate in the same manner with the residue derived from the second boil, adding in both cases no more mordant.

We then make up the beck with the solution of cochineal thus obtained and the tin composition, and work the wool in it at 150° F., till it takes the desired shade. If the shade is rather yellowish, we add to the beck a little young fustic; if, on the contrary, it is rather red, we add a small proportion of ammoniacal cochineal, or, what is better, take the wool through a beck of hand-warm water. In either case the amount of these additions is regulated by the tone of the shade.

For amarantins and crimsons we use ammoniacal cochineal, which, according to proportion, gives shades more or less tending to a violet.

We may also dye the wool by entering it at once in a beck made up of mordant, tin composition, and ground cochineal; but the shades obtained in this manner are not as bright. Before making use of the cochineal, it is therefore better to exhaust it with the mordant as described above.

The following, then, are the proportions to be used:—

Ground cochineal.....	3 lbs. 7 ozs.
Mordant.....	11½ pints.
Tin composition.....	3½ pints.
Water.....	210 pints.

The necessary quantity of water is added to the beck, and the wool is worked for 45 minutes at 158° to 176° Fah.

DYEING WITH YOUNG FUSTIC.

The mordant, the tin composition, and the young fustic are put in the beck together in suitable proportions. A decoction of the ware is most commonly employed, and for this purpose we boil for 1½ hour 110 lbs. of young fustic in chips with 875 pints of water. If the shade required is reddish, a small quantity of ground cochineal may be added.

PREPARATION OF THE TIN COMPOSITION.

Dissolve gradually, at common temperatures, 22 lbs. of tin, in rods, in a mixture of 70 pints of commercial spirit of salt and 35 pints of nitric acid.—*Teinturier Pratique.*

FIXING INDIGO ON TISSUES.

By M. PRUD'HOMME.

INDIGO may be fixed on printed tissues in divers ways, but the principle which presides over this fixation is one and the same, and may be expressed thus: reduce the indigo blue to a state of white indigo, soluble in alkalies, capable of penetrating the fibre, then let it remain there imprisoned whilst repassing by an ulterior oxidation to the state of indigo blue. The industrial processes employed realize all these conditions, but in different ways.

China Blue contains blue in a fine powder. The printed goods pass alternately into baths of sulphate of iron and of slaked lime. We enter thus into the conditions of the most common indigo vat, that of copperas and lime.

Fast Blue, properly speaking, contains a precipitate of white indigo and oxide of tin. The process, in this case, may be reduced to a simple passage in milk of lime, which dissolves white indigo and carries it into the fibre. An exposure to running water effects the reoxidation or the degreening of the blue. We merely remind the reader of pencil blue, where we print the vat of reduced indigo, conveniently thickened.

Finally, indigo steam blue, like the latter, carries with it all the elements of the color. The indigo may be found here previously reduced. The color should in all cases contain an excess of reducing mixture, which will act at the moment of steaming. The conditions which a good stream

blue should combine, and which industrially are still to be found, have been clearly defined by M. Schutzenberger, when he calls for the discovery of a combination which would permit to print indigotine and to render it momentarily soluble on tissue, under the influence of steam. An alkaline reducer, adds he, which would not act in the cold, but only in the heat, during the steaming, would fulfil this object.

The blue which most approaches these conditions that of M. C. Zurcher, composed of indigo blue, alkaline carbonate, and oxide of tin in paste. Unfortunately, the results which are obtained on the large scale with this process are not very satisfactory.

There are few coloring matters as ancient as indigo, few which have given rise to more researches. Nevertheless, a few years ago, MM. Schutzenberger and Lalande succeeded with a new and powerful reducer, hydrosulphite of soda, in fitting up a vat of indigo, which has since received the striking confirmation of industrial practice on a large scale. We have discovered recently a new method of the reduction and fixation of indigo, which, without great practical importance, nevertheless presents some interesting peculiarities.

A mixture of glycerine, carbonate of soda, and protoxide of tin in paste reduces perfectly warm indigo. The reduction is complete towards 248° Fah. The same elements, if water is used instead of glycerine, only yield an incomplete reduction. How do we explain this reaction?

The carbonate of soda decomposes in presence of oxide of tin to form stannite of soda. The liquid becomes strongly alkaline, and the soda set at liberty reacts on the glycerine, giving a mixture of acetate and formate, with disengagement of hydrogen.

We have directly verified that soda and glycerine, heated together, reduce indigo very well. To this action is joined another. Oxide of tin in paste and glycerine reduce indigo in heat, probably by an analogous process.

If we take account, besides, of the solvent properties of glycerine, which serves as a vehicle to the oxide of tin to bring it better in contact with the indigo, we conceive that all these conditions, reunited, make a mixture of which we speak an excellent reducer. Let us come to print a mixture of blue indigo, of tin, and carbonate of soda, and to pass the tissue in glycerine heated up to 248° Fah., the indigo is reduced, and by withdrawing in time the fibre from the action of glycerine to prevent it running in the bath, we obtain, by reoxidation in air, indigo blue.

M. Jeanmaire has already stated that on cloth prepared with glycerine, indigo blues gain in intensity. The reducing elements which it contains make of it a sort of fast blue. Finally, the raised temperature necessary for the reaction and the fixation of the coloring matter would almost assimilate it to a steam blue.—*Moniteur Scientifique.*

CLEANSING TISSUES WITH MINERAL OILS.

By M. ZAENGERLE.

SOAP has been till lately the principal agent employed for cleaning woven goods, both for domestic and manufacturing purposes. This use, which depends on the property which it possesses of dissolving fatty matters, can only be applied to articles of a simple make, and especially to fast colors, if we do not wish them to become impoverished.

Every one knows that when garments are sent to be cleaned, trimmings, embroideries, ribbons, and ornamental work of wool, silk, fur, etc., must be taken off. To obviate this inconvenience, agents have often been sought for which might supersede soap without requiring the same precaution. The attempt has been successful with the volatile products extracted from petroleum, and known under the names of naphtha, benzine, ligroine, etc. The so-called "dry cleaning" effected with these liquids is applicable to all sorts of tissues, whether the colors be fixed or fugitive. It does not affect the peculiar appearance of each tissue, and succeeds with all articles, whether trimmed or not, always excepting certain cotton articles, such as stockings and under-waistcoats of light colors.

M. Zaengerle describes a method of cleaning in use at Berlin, and depending on the employment of mineral oils. It is due to M. H. Drosses.

The articles to be submitted to this process must be first classed and assorted as follows:

1. Garments of white silk or of very light patterns in the same material.
2. White articles of wool, or mixed wool and cotton, or those of the same material in which white predominates.
3. Velvets and other silken articles of the same class.
4. Garments of pure wool, or wool and cotton of light shades.
5. Woollen articles of deep colors and mixed tissues, if very dirty.

These are treated one after another in the order indicated.

The apparatus consists of a fixed outer casing of wood lined with zinc or galvanized iron, in which turns a drum of wood formed of two end pieces connected by wooden ribs or bars. The drum may be moved by an axle placed horizontally, which passes through the outer case, and carries a pulley over which passes a driving-band. The whole is so arranged so that the box may be easily and rapidly opened and the drum charged.

The operation begins by introducing the liquid to be used in cleaning, naphtha, benzine, or ligroine, so that the drum may plunge into it for some three to four inches.

The articles to be cleaned are then taken and spread upon a sloping zinc table, fitted with a ledge, and are then well brushed with a brush well saturated with the detergent liquid. It is easy to see that the nature of the goods to be cleaned must regulate the hardness of the brush to be used as well as the force and duration of the friction. The liquid which flows off is conducted by a gutter into a vessel placed for the purpose.

After this brushing, the articles are put in the drum, selecting, to begin with, the articles of the first class. If these are laces, or other fine objects capable of escaping between the bars, they should be previously enclosed in a net. After this the box is closed, and the drum made to revolve for 25 to 30 minutes, at the rate of 20 turns per minute.

The articles of the second class may have 25 turns per minute for half an hour. They will have been brushed whilst the first lot was revolving, and for them the liquid may be used which ran off during the brushing of the first lot. After the first lot has been withdrawn from the drum the second lot may be at once entered without renewing the naphtha, etc.

The articles of the third class must not have more than 8 to 12 turns per minute for half an hour; those of the fourth

lot turn likewise for half an hour, but at the speed of 25 turns a minute; and those of the fifth class rotate at the same speed but for three-quarters of an hour. Each lot must be brushed whilst the former one is turning, and the five classes will all in succession pass into the drum without any change in the liquid.

As each charge is withdrawn from the drum it is placed in a wooden vat lined with zinc, and containing pure, clear liquid, to be rinsed; after which the articles are whizzed with the greatest energy compatible with their strength and texture. It is required, in fact, to extract from them the largest possible quantity of naphtha or benzine without the risk of tearing them. The liquid which flows from the centrifugal may be poured into the washing machine. Velvets bear whizzing worse than any other goods.

As soon as they are withdrawn from the turbine, the objects are taken to a drying stove, and submitted to the most elevated temperature which they can bear without injury.

By following in the treatment of goods to be cleaned the progressive course just described, the liquid may be used till it becomes quite black. After which it may be allowed to settle in the closed washing machine, when a clear and pure stratum rises to the top and may be immediately decanted, and can be at once used again. Nevertheless, at the end of several operations the detergent liquid becomes finally turbid, yellow, and dirty, and can only be purified by distillation. (It may be doubted whether it will be worth the time and trouble of the garment-dyer to perform this operation, except he works upon a very large scale.)

The cleansed articles are withdrawn from the stove after an hour or two completely dry and inodorous, and then looked over to see if they retain any saccharine or amy-laceous spots.

Such stains are easily removed by means of gentle friction, after spreading the articles upon a waxed cloth, applied with a sponge or with a brush, hard or soft, according to the texture of the articles. Those of cloth, compact wool, etc., may be simply brushed with clear, cold water; those of silk, more or less fragile, must be carefully rubbed with pure water, mixed with a little alcohol or acid according to the nature of the colors. This moistened spots are then immediately rubbed dry with a very clear skin, and then dusted over with gypsum in an impalpable powder (we should rather recommend magnesia) to prevent the formation of a dark ring round the spot. When thoroughly dry this powder is removed with a soft and very clean brush, and if some traces remain they are carefully effaced with the crumb of stale bread.

All these manipulations should leave no trace nor injure the freshness of the colors.

Sometimes the dry cleansing process leaves unremoved traces of stearine and of sealing wax; these may be removed with alcohol.

It is not the same with old spots of oil paint, which are exceedingly tenacious; it is necessary to dissolve them with the finest olive oil; this operation is long, and renders it necessary to pass the garment once more through the cleansing process above described to remove the oil, which has dissolved the paint.

In severe weather the naphtha, benzine, etc., may be carefully warmed.

The great inflammability of all these liquids makes it needful to proscribe all fires and open lights in the work-room. If heat is required it must be obtained by means of a steam-pipe.—*Dingler's Polytechnisches Journal.*

NEW YORK handles about five thousand alligator skins per annum. The business is entirely in the hands of a single firm, who employ men to pursue the reptile in the bayous of the Mississippi river, and the work is usually done at night by the aid of lanterns, the rifles used being aimed straight at the creature's eyes. If the alligators are too old or too young, the ammunition used on them is thrown away, for in such cases the skin is either too horny or too small. A good size is eight or nine feet, counting nothing beyond the thick part of the tail. Florida is a great place for alligators, but skins from that direction are badly mangled, indicating strong objections by the animal against parting with his natural integument. The market price for finished skins in New York is \$36 to \$48 per dozen; extra, something higher; raw, according to condition.

SOLDERING SILVER.—The best solder for general purposes, to be employed in soldering silver, consists of 15 parts (by weight) of silver, 10 parts of brass, and 1 of copper, carefully melted together and well incorporated. To use this for fine work it should be reduced to powder by filing; the borax should be rubbed up on a slate, with water, to the consistency of a cream. This cream should be applied with a fine brush to the surfaces intended to be joined, between which the powdered solder or wire is placed, and the whole supported on a block of charcoal to concentrate the heat. In the hands of a skilful workman the work can be done with such accuracy as to require no scraping or filing, it being only necessary to remove the borax when the soldering is complete by immersion in jewellers' pickle.—*Watch-maker and Jeweler.*

CHEMISTRY AND MINERALOGY.

The Attraction and Repulsion of Bubbles by Heat.—Mr. Hartley, of King's College, communicated to the Royal Society last month some interesting results of a long series of experiments on the bubbles in the fluid cavities of quartz, and others observed in sections of granite. He finds that those bubbles are attracted by a source of heat, and that under certain conditions they may be repelled. A rise of temperature, amounting to 5° or 6° C., causes attraction, and an increase of 0.5° C. will in some cases produce repulsion. In certain instances the same bubble was repelled under ordinary conditions, but attracted if its temperature was raised to 60° C., the source of heat being always from 0.5° to 5° C. warmer than the specimen operated upon. These phenomena, moreover, were observed in the case of cavities containing liquid carbonic acid, as well as water; and the exposure of carbonic acid to a temperature higher than that of its critical point did not affect the result. This affords a means of controlling to some extent the conditions of the experiment, since carbonic acid, when it just passes the critical point, exerts a tension of 109 atmospheres. The author considers the explanation, proposed by Profs. Tait and Swan, of the movement of bubbles in the cavities of calcite, noticed by Mr. Sang, of Edinburgh, to be insufficient; and, after showing that the warmth of the finger can propel even in a vertical direction a plug of water in a capillary