THE PRINTING OF SILK WARPS FOR THE MANUFACTURE OF CHINÉ SILK.

Translated for Posselt's Textile Journal from "Osterreich's Woolen and Leinen Industry."

Chiné silk, which is produced principally as piece goods in Lyons and Zürich and as ribbons in St. Etienne, Basel and Krefeld, is a most elaborate branch of the silk industry. At regular intervals, fashion demands for the manufacture of ladies' trimmings and dress goods, as well as for men's neckwear, the pretty patterns which chiné silk offers us.

The characteristic feature in design of chiné silk consists in the veiled, vague prints, as they appear to the eye, caused by the silk warp having been first printed in selected, harmonic colors, previously to warping and weaving. A thus printed silk warp may be woven either with white or colored filling, again two or more colors may be used for the filling. Besides these different combinations in color, as will be readily understood, the use of different weaves will also result in novelties. This all explains why chiné silk is meeting with such universal favor with the public, *i. e.*, is used in connection with such a great variety of articles.

As mentioned before, the important part of this industry lays in the printing of the silk warp, which enters the printing establishments wound on rolls. In order to obtain even, smooth rolls, strips of paper are rolled in between the layers of the warp, said strips of paper being somewhat wider than the width of the silk warp as wound on the roll, spool or bobbin, as the case may be. The warp to be printed is first interlaced at regular distances of about 40 inches apart, with filling threads, which on said places fill out a space of about one-quarter of an inch in width. This is necessary in order to give the warp a good hold for the operation of printing it. Some manufacturers interlace the warp loosely throughout its entire length to give it the resemblance of a loose net work.

"Boiled-off" silk is used as the raw material for these warps, for which reason no further treatment before printing them is necessary, except a very light moistening, which, however, is scarcely noticeable. When the printer has the length of the printing table covered with the warp, this slight dampness is then given with the help of a water spraying apparatus. This apparatus is held by the operator in his hand, in a suitable position above the outspread warp, and when he blows into the mouth-piece of the apparatus, the water is blown out in a fine spray onto the warp, which imparts to the latter the necessary dampness. Some silk printers do not use this apparatus, they place the water in their mouth and blow it direct onto the warp in the same way that the Chinamen moisten shirts for ironing.

After then printing the length of the warp stretched on the table, in its required colors, the operator waits until the last printed colors are completely dry. The drying is hastened by airing the thus printed length of warp yarn, which is done by placing smooth pieces of wood, or glass rods at different places under the warp. This raising of the warp, for the purpose of airing, on the printing table has to be done with great care, in order to avoid tearing of warp threads, which may adhere to the printing table. More particular care must be taken when dealing with warps where the greatest part of its surface has been printed, and when the threads therefore more readily adhere to the table.

The thus printed part of the warp is then rolled up on a roll, bobbin or spool, with a strip of paper from a roll of paper run between the individual layers of the warp, in a similar manner as was done with the warp previously to printing it.

All the colors, as used in printing this class of fabrics, are thickened with Senegal or Gum Arabic. Black and other very dark colors can be thickened with burnt starch or dextrin, provided cheapness of cost is an item.

For fixing the color, the printed warps are steamed at least one hour, with dry steam under pressure, which pressure, however, should not amount to more than 1.5 atmospheres. For this purpose the warps are rolled up in woolen cloths (which have the appearance of ordinary packing cloth) on perforated reels of a diameter of from 10 to 12 inches. In order to obtain a thorough steaming, two, or at most three of the warps, depending on the length of the warp, are placed upon one reel. The reels are provided at one end with hooks by means of which they are hung in the steam chest. In order that the warps and the woolen cloths do not change their relative position in this vertical hanging position, or in other words, in order that the rolls remain unchanged during this process of steaming, the winding up on the reel must be carefully carried out, *i. e.*, the rolls must be wound fairly tight, and there should be no folds or wrinkles.

After the steaming, the warps are unrolled from the reels, separated from the wrapping cloths, and a hank of from 40 to 60 inches is made from each warp. The warps with simliar printed patterns are then laid in large sacks of clean linen and carefully washed in large tanks in which there is a continual flow of fresh water in order to dissolve and separate the thickening material, previously added when printing the warp. The sacks with these steamed warps, are then moved by hand to and fro in the tank with the utmost care, in order to avoid tangling of the warps in the sacks, thus guarding against tearing of the threads. The method of moving about of these sacks, which contain this valuable material in the washing tank with thick clumsy sticks, as was practiced in former times has been discarded, since tearing of the warp was frequently the result of this procedure. After agitating the warps in the tank for at least a quarter of an hour, all the gum should be

dissolved, when the sacks with their contents are then taken from the tank, left to drain, and finally freed from most of their water in a hydro-extractor.

The warps are then taken from the sacks, loosened and hung in a drying room until completely dry. After drying, each warp is rolled up into a nice, broad roll, on a table, in a similar manner as they are delivered by the silk manufacturers to the printer. In this rolling up process, the warp threads are slightly stretched, at each table length, and are smoothened out by means of a fine brush. In all the operations, which these warps pass through at the printers, care must be taken that no threads are torn, which could easily occur on account of the tenderness of the thread. It may be well to state here that the excessive breaking of the threads during the printing process will result in a warp more or less unfit for weaving, or anyway result in a poor quality of woven fabric.

The dyes for the printing of the silk warps are delivered to the printing room from the color preparing department of the establishment, in earthen vessels, already prepared, each vessel containing a special stirrer.

A view into the mystery of the color preparing department will be of the greatest interest, for which reason we will now take up this subject. The colors for printing consist of the thickening material already referred to, also of a small amount of glycerin and acetic acid as well as the dye. The addition of glycerin raises the smoothness of the color. Gum is a necessary thickening substance for these colors for printing silk warps, and is prepared into two fluid grades:

(1) a viscous gum solution for the preparation of the chief color,

(2) a limpid gum solution, used for thinning the thick viscous gum preparation.

The preparation of the thickening material is very simple. The proportion of gum is 2 pounds of gum to 1 quart of water. Ordinarily 100 pounds of gum and 50 quarts of water are heated in a copper kettle with a double bottom, which is heated by steam, and is fitted with a stirring device. It is heated gradually to the boiling point and at the end of an hour all the gum is dissolved to a thick fluid which is allowed to cool. In cooling, it forms on the surface a thick scum of albuminous matter, pieces of wood, dirt, etc., which scum is carefully removed and thrown away. The boiled gum is now pressed through a sieve supplied with a brush-like stirring device, and caught in a vessel. In passing through the sieve, the gum solution is freed of all foreign impurities, like sand, etc. To the liquid is then added about a teaspoonful of ordinary acetic acid and a teaspoonful of glycerin for every quart of the gum solution.

The thin gum solution is made up in the proportion of 1 : 1, *i. e.,* one pound of gum to one quart of water, or 1 : 2 according to the quality of the gum. A test shows immediately the boss printer what proportion is required. A large supply of this thick gum fluid, and thinning fluid, can be prepared ahead, because it resists the influence of the air for months and does not become sour like cooked starch and other material. For the preparation of the color, the aniline dye is dissolved in hot water, filtered and mixed with the thick gum solution. The print colors are prepared in different strengh, $\frac{2}{3}$, $1\frac{1}{3}$, 2 or $2\frac{2}{3}$ ounces of aniline dye may be contained in one quart of the dye solution; as a rule $\frac{2}{3}$ to $1\frac{1}{3}$ ounces being used in connection with basic dyes, acid and azo dyes generally containing from 2 to $2\frac{2}{3}$ ounces to the quart.

In the selection of the aniline dyes, which are required for the printing, care must be taken that they will resist the action of water and steam. Neither in the steaming after the printing, nor in the washing that follows the steaming, dare these colors run or fade. Not all the aniline dyes are suitable for this kind of printing, but all classes of aniline dyes offer good representatives.

The author of the article in turn quotes a list of dyes that he recommends for silk warp printing, basing his list upon the well-known products of Cassella; S. C. I. Basel, Geigy, Bayer, etc. Since products used here and abroad differ as to name, etc., we addressed their offices here for full particulars, in this way making the article of more interest to our silk manufacturers.

With reference to *Cassella Color Company,* they informed us that the colors most suitable for silk warp printing are their Diamine colors, without exception, as well as most of their Acid colors, such as Lanafuchsines, Brilliant Scarlets, Brilliant Cochineal, Croceines, Naphtol Red, Orange G G, Orange E N L, Indian Yellow, Acid Yellow A T, Fast Yellow S, Brilliant Milling Green, Cyanole Fast Green, Acid Green Extra Conc., Brilliant Milling Blue, Cyanole and Tetra Cyanole, Indigo Blue S G N, Formyl Violets, Alizarine Black 4 B, Anthracite Black. In a further correspondence on the subject Naphtol Black B D is added to the list given, the same being the identical of Brill. Black B D as quoted by the German authority, the former being the correct American designation.

With reference to the products of The Society of Chemical Industry in Basle, their American agents, Messrs. *A. Klipstein & Co.,* quote that all their dyestuffs (acid, basic and direct dyestuffs) listed as suitable for wool printing in the hand book of their correspondents (on pages 326-327) are equally suitable for printing silk warps.

They further want it to be known that the composition of the printing pastes of their products, in connection with silk printing, is to be similar to that of the pastes used in wool printing, with the exception that the addition of glycerin or other hydroscopic bodies is omitted, as this is not necessary in silk printing.

The preliminary treatment of the goods to be printed, which is required for wool goods, is usually unnecessary for silk; however, in some cases, a treatment with stannate of soda and sulphuric acid greatly increases the brilliancy of the printed color.

As thickening agents, gum arabic, tragacanth paste and dextrine are principally employed; for dark shades also British gum is used. These possess the important advantage of being easily removed from the fabric by a simple washing; as fixing agents for acid and basic dyestuffs, acetic acid or oxalic acid are used; for direct dyestuffs, acetic acid, and for direct dyestuffs sensitive to acids, sodium phosphate. If the prints with basic dyestuffs are required to be particularly fast to water and washing, they are frequently printed, as on cotton, with addition of 2-3 times the quantity of dyestuff of tannin, and passed, after steaming, through a bath containing tartar emetic.

The Usual Printing Recipe for Acid, Basic and Direct Dyestuffs is given by the S. C. I. thus:

1½ — 3	ozs. Dyestuff; dissolve in
2½ — 2¾	pints water, and add
6½	lbs. Gum Solution 1/1,
½	pint Acetic Acid 12° Tw.
10	lbs.

Dyestuffs soluble with difficulty, particularly direct dyestuffs, are boiled with the thickening (British gum, dextrine); with Alkali Blue, Pure Blue, Orange II and IV, Ponceau, Rocceline, Cochineal Substitute, Acid Black and Acid Rhodamine, an addition of 2½-3 ozs. tartaric acid per 10 lbs. printing paste is very beneficial. The printed goods are steamed one hour without pressure, and washed well. To obtain prints fast to washing with basic dyestuffs, 2-3 times the weight of dye stuffs of tannic acid, dissolved in acetic acid, is added to the printing paste. The goods, after steaming are passed through a bath containing 2-3 lbs. tartar emetic per 100 gallons at 86 to 104° F.

Bleu d'Alsace is also suitable for silk printing. For black, Acid Black D and D K may be used; but the amount of dyestuff required is considerably greater than that required to produce a black on wool. For small patterns Jute Black has been successfully employed.

With reference to the products of the *Berlin Analine Works*, the following colors are suitable for Chiné prints: Methylene Blue 2 B D, Guinea Violet 6 B, Guinea Violet S 4 B, Wool Black G R, Naphtol Yellow L, Guinea Fast Green B, Ponceau 2 R, Mandarine G Extra, Chinoline Yellow, Indocyanine B, Resorcine Brown, Ponceau 4 R B.

With reference to the products of the *Badische Company* in the interest of our readers they call our attention to their Black for printing silk warps, *i. e.*, Naphthomelan S B & S R, suggesting the following formula:

250	grams Naphtomelan S B or S R
50	c. c. m. Acetic Acid 6° Bé (30%)
80	c. c. m. Acetate of Chrome 24° Bé
550	grams Starch—Tragacanth Thickening
70	c. c. m. Water.
1000	Grams.

With reference to the products of Kalle & Co., they call attention to the following colors as suitable for printing silk warps:

Yellow, Orange & Brown dyestuffs: Orange II, 4 and R; Phosphine, Bismarckbrown R Conc.

Red dyestuffs: Eosine J, Rhodamine G, B and 6 G; Silk Ponceau, Croceine Scarlets, Safranines.

Blue dyestuffs: Biebrich Acid Blue B and G G, Alkaline Blue.

Green dyestuffs: Brilliant, Malachite and Acid Greens.

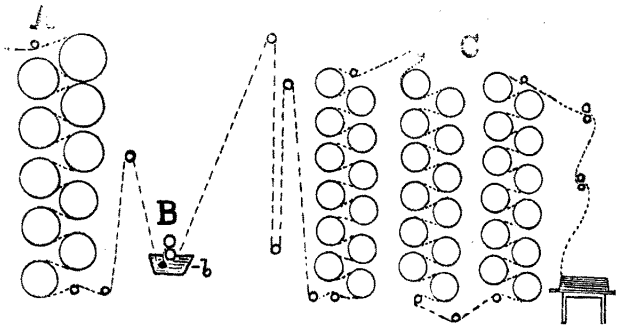
Violet dyestuffs: Methyl and Acid Violets.

Black dyestuffs: Biebrich Patent and Alizarine Blacks, Wool Black D G.

(*To be continued.*)

A New German Process for Preparing Cotton Fabrics for Printing During the Drying Process.

THE GIST OF THE NEW PROCESS consists in printing the fabrics between two series of drying cylinders, in this way doing away with the rolling up of the fabrics after the first drying process, *i. e.*, previously to



printing. The new process at the same time has the advantage that the fabrics have not to be completely dried, the printing solution simply being made somewhat stronger, in order to compensate for the moist condition of the fabrics.

A DESCRIPTION OF THE NEW MACHINE AND PROCESS. In order to explain the subject to the reader, the accompanying diagram is given. The wet fabrics, as coming from the bleachery, are guided over the drying cylinders of the upright dryer *A*. As a rule twenty cylinders, *i. e.*, a double column upright dryer of ten cylinders each is used, only half of it being shown in the illustration. The arrangement of the dryer is such, that after the fabric leaves the latter, about two-thirds of its moisture is removed, and when then the fabric enters at once the preparing machine *B*, which contains a solution of 30 grams of the acid sodium salt of elaidic acid in one liter of water. The fabric then is guided to the upright three column dryer *C*. Ten drying cylinders are shown in each column of the dryer, *i. e.*, 30 cylinders in the complete machine, although more or less may be used. The average speed of the fabric in traveling through the machine is given at thirty to forty yards per minute.

Provided fabrics have to be dried by this process, requiring no printing, the trough *b*, containing the preparing liquid, is simply lowered on the preparing machine and thus brought out of reach of the immersing rolls, *i. e*, out of reach of the fabric.

Natural vs. Synthetic Indigo.

Much publicity has recently been given in the Indian and English papers to an announcement that a discovery had been made whereby the process of extracting natural indigo from the plant and preparing it for the market would be cheapened to such an extent that it would compete with synthetic indigo in price. There is some reasonable show of earnestness and sincerity behind the statement, but a lack of tangible proofs of its entire truthfulness. The latter are promised.

In the absence of these, says "The Textile Recorder," it serves to show that the fight between natural indigo and the synthetic product is by no means at an end, as some would have us believe. We may leave out of consideration the respective and contradictory statements advanced during the last ten years by the partisans of both products, and there still remains very little doubt in the minds of indigo users that of both coloring matters each possesses its particular and peculiar merits for specific purposes; synthetic indigo may give decided advantages in some circumstances, while others cannot be satisfied but by natural indigo. This expresses the state of opinion up to April of this year, when new possibilities came into sight.

Mr. Cyril Bergtheil, the Indian Imperial bacteriologist, had occasion to make an official pronouncement to the effect that from comparative trials made on a large scale on woolen pieces at the Cawnpore Woolen Mills most unexpected, though satisfactory, results had been obtained in favor of natural indigo. These trials were conducted in vats made up according to the ordinary routine method, and the conditions were said to be identical in the two vats. For the one series natural indigo of a standard and known quality was used, and for the other indigo pure B.A.S.F., 20 per cent. paste.

In each case the indigo was reduced, and the vats made up, with hydrosulphite and lime. Comparison showed that natural indigo gave not only a darker shade, but also a richer one. This result was regarded as sufficiently encouraging to warrant the carrying out of more extensive experiments, and these were promised. The question remained at this point until September, when it was again brought in the same quarters to public notice by a communication from the Badische's representatives at Bombay, Messrs. Ostermayer and Co. This communication pointed out that the particular brand of synthetic indigo supplied by them and used for Bergtheil's tests was not the ordinary "B.A.S.F. 20 per cent.," but a special brand known as "B.A.S.F. 20 per cent. E." This also contains 20 per cent. of indigotin and additional bodies, beside water, which are not in any way adulterants, but simply fermentable substances, and preservative alkali added for the specific object of producing a brand of indigo suitable for use in the cold fermentation vat, frequently used by the natives in such countries as India and China. The commercial E brand contains caustic lime to the extent of about 25 per cent. of the amount of indigotin contained in the paste, consequently the vat of synthetic indigo at the Cawnpore Woolen Mills contained, besides indigo, a considerable quantity of caustic lime, and as both the plant and the synthetic indigo were reduced by treatment with exactly similar quantities of hydrosulphite and lime, it follows that the comparative dyeings did not take place under identical conditions in both vats, but, on the contrary, the vat containing the synthetic indigo was essentially more alkaline than the other vat.

This in itself would, it is claimed, account for the difference in shade obtained by Mr. Bergtheil. A neutral vat yields the indigo up to the fibre most readily, and by making the vat acid in character it is possible to drive the indigo white completely from its solution on to the fibre. On the other hand, a small excess of alkali is sufficient to hinder materially the exhaustion of the indigo white. A difference in shade corresponding nearly to that obtained by Mr. Bergtheil in his experiments when comparing plant and synthetic indigo has been obtained, and is illustrated by patterns from specially prepared vats, the one normal, the other containing a known excess of lime. Replying to this criticism, Mr. Bergtheil says that he cannot at present express agreement or disagreement with the conclusions drawn, and that he proposes to carry out further tests, and until these are made he cannot form an opinion.

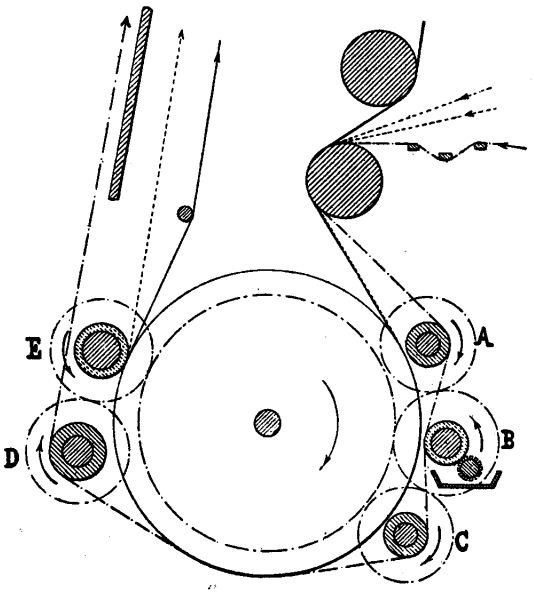
This uncertainty, however, is followed by a further development. This time Mr. E. C. Schrotty, writing to the Indian papers on the research work in connection with indigo carried out by him during the present year, claims to have proved that by a second steeping process, and with the established merits and greater yield per acre of the Java-Natal indigo, natural indigo can now be produced and sold at a good profit at a figure which is considerably below the manufacturing cost of synthetic indigo.

A Novel Process of Producing Changeable and Silk Effects Upon Fabrics.

THE CHARACTERISTIC FEATURE of the process consists in imprinting upon the extreme points of the fibres as protruding from the fabric, a fine smooth layer of a dye, by means of engraved rollers; the fabric during the process being kept at an equal tension by means of a proper arrangement of a series of drafting and delivery rolls, in order that the color is most evenly applied. These delivery and drafting rolls, or as we might call them, guide rolls, are covered rolls, in order to present a rough surface to the fabric and thus accomplish the proper friction with the latter, *i. e.*, produce an even smooth running of the fabric to be treated, through the machine.

As will be readily understood, the process refers more particularly to fabrics having a napped face, the layer of the dye being of a color differing from that

of the fabric. The same procedure can be used provided it is desired to make use of "discharging the color." In either instance, whether adding or discharging color, only a small amount of the face of the fabric is treated, the original color of the fabric remaining in excess, and not treated.



The design or effect desired for the printing, *i. e.*, the coloring of, or the discharging of color from the ends of the protruding fibres, is regulated by means of an engraved roller, and consequently differs from the older process, where a similar result was obtained by means of a brushing process, which however, does not produce the nice smooth even result as the new process does.

A Description of the New Machine and Process: In order to explain the process, *i. e.*, the machine used for it to the reader, the accompanying illustration is given, representing a diagram of the new printing machine. In the same *A, B, C, D,* and *E* are five rollers arranged on the two sides of the main cylinder of a printing machine, and of which roller *B* is the actual printing roller, *i. e.*, and engraved copper roll, and which is driven direct from the main shaft of the machine, driving in turn through suitable gearing rollers *A* and *C* in opposite direction from it.

E is a copper roller, driven direct, and which in turn drives the draft roller *D* and thus revolves the main cylinder of the machine by friction of the fabric. *A, C* and *D* are wooden rollers turned smooth and perfectly true and are covered with strips of sheet iron, into which fine holes have been drilled (in a spiral direction), the indentations of the rolls having been made so as to protrude outside when on the roll, in order to present the required rough surface to the fabric, so that the latter will adhere closely to the rolls and travel evenly and under a proper uniform tension throughout the process through the machine. Rollers *A* and *C* are feed rolls, and are of equal diameter and have the same surface speed, and since the fabric closely follows the surface speed of these rolls, an even tension of the fabric during the printing process will be the result, *i. e.*, an even, uniform printing of the fabric is accomplished. After leaving roller *C* the fabric structure is taken along by draft roll *D* and from there enters direct to drying room, a feature which is of the greatest importance in connection with these printed fabrics.

Any change of design or effect required, is produced by means of using different engraved rolls *B*.

The machine also may be supplied with two or more printing rollers *B*, provided two or more different colored effects are required in the fabric.

The process is of Russian origin and is claimed is meeting with practical success, not only in that country, but also in France and Germany.