

A MONOGRAPH
ON
COTTON FABRICS

PRODUCED IN THE
North-Western Provinces and Oudh.

BY
C. A. SILBERRAD, B.A., B.Sc., I.C.S.

Published by Authority.



ALLAHABAD:

North-Western Provinces and Oudh Government Press.

1898.

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P R E F A C E .

This report was prepared in accordance with G. O. No. $\frac{3098}{1-73B-5}$ dated 24th August 1896.

In accordance with this order a list of questions was drawn up and circulated to all districts. In each a special officer was deputed to write a report on the lines of the questions respecting his own district, which reports were then submitted to me. These reports, together with the result of personal inquiries in the Etáwah, Lucknow, Fyzabad, Bijnor, Bareilly, Agra, Saháranpur, Muzaffarnagar, Aligarh and Farukhabad districts, have formed the material whence this report is compiled. Of the district reports those from Agra (by Munshi Muhammad Abdul Majíd Khan), Aligarh (by Bábu Jwala Parshad), Azamgarh (by Pandit Rama Smaran Lal), Fatehpur (by Mr. C. H. A. Emile), Garhwál (by Pandit Dharmanand Joshi), Mirzapur (by Mr. E. E. Tiernan), Naini Tal (by Mr. W. B. Cockburn), Rae Bareli (by Mr. A. C. Wiseman), and Sitapur (by Mr. G. R. Dampier, I.C.S.) were the best, and contained much interesting and valuable information. Useful reports were also received from Bareilly, Basti, Etah, Fyzabad, Mainpuri, Partábgarh and Saháranpur.

In conclusion, I must state that previous to writing this report I had no greater knowledge of textile fabrics than was obtainable from books : those to which I have referred will be found mentioned in the body of the report.

CHAS. A. SILBERRAD, B.A., B.Sc., I.C.S.

ETÁWAH :
The 18th June 1897. }

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N.R.—1 seer = 16 chhitaks = 80 tolas = 2lbs. approximately (14,400 grs.).

MONOGRAPH ON COTTON FABRICS

PRODUCED IN THE
NORTH-WESTERN PROVINCES AND OUDH.

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CHAPTER I.

TRADITIONS AS TO THE ORIGIN OF THE ART OF WEAVING AND OF THE COTTON PLANT.

WITHOUT contending for the strict accuracy of a Hindu tradition that the Rishis Tawishta and Me gave an account of the art of weaving in the Sarap or Salap Shastra "196 crores and several lakhs of years ago," or of one current among the Muhamadans that Gabriel instructed Adam and Eve to weave cloth in consequence of the unsuitability of fig-leaves or bark, we may claim a very remote antiquity for the subject of this monograph.

As to the country in which cotton-weaving first arose great uncertainty prevails. Sir G. Birdwood claims the distinction for India ("Industrial Arts of India," page 241); whereas Marsden ("Cotton-weaving," page 16) is inclined to prefer Egypt. But what is an undoubted fact is, that in all countries where the cotton plant has been found it seems to have been woven into some kind of cloth from time immemorial. I would refer the reader to the above-quoted books for some interesting information on the subject, and merely propose to confine myself to such traditions as I have been able to collect in these Provinces, without laying claim to any antiquarian or mythological skill in co-ordinating or interpreting them. I merely relate them as I received them, and give them for what they are worth.

The weavers are included in two castes, *Julahas* and *Koris*: the former being Muhammadans and the latter Hindus; but while the former are very zealous, calling themselves frequently *Mumin*, i.e., the Faithful, albeit somewhat incorrect in some of their practices, the *Koris* are far from being good Hindus, eating beef and showing considerable affinities in their practices to some of the aboriginal tribes. The *Julahas* are, as a rule, more skilful workmen than the *Koris*. They are much inclined to fanaticism and display a strong clannish feeling, helping one another, and to a great extent settling disputes between members of their own caste among themselves. As to the derivation of the word, there have been many suggestions. Thus one derives it from *jhalá* (Arabic), making it mean "the ignorant class." In support of this the *julahas* are to some extent regarded as proverbial fools. Other suggestions are that it is connected with "*jál*" or net, "*ujla*," white, * or "*jils*" "decorated," because the products of their skill decorated the body. Croke ("Castes of the North-Western Provinces and Oudh") derives the name from the Persian *jula* or *julla*, † a ball of thread.

The most widespread tradition is that above alluded to, viz., that after the fall and expulsion of Adam and Eve from Paradise, Gabriel taught Eve to spin and Adam to weave. Another version is that, after eating the forbidden grain (as it is

* Can this be connected with the *Julahas'* name for themselves—*Nárbás* ("weavers of light")? (Croke—"Castes," III, 70).

† This is apparently a rather rare word. It is said in the "*Burhán-i-Kát*" to be equivalent to the *kákrí* or yarn wound on a small reed (see p. 12). An alternative meaning given is a kind of grass growing in moist places.

according to Muhammadan tradition), Eve (Hawa), knowing of her nakedness, prayed to God, Who discovered to her the cotton plant and art of weaving. These traditions are obviously derived from the Koranic text: "O children of Adam, we have sent down unto you apparel to conceal your nakedness, and fair garments." (Sura VII, 25) Other versions are (1) that it was Shis (*i.e.*, Seth) who was taught weaving by Gabriel, and that previous to his learning the art mankind wore bark; (2) that it was Shis of all his sons whom Adam taught to weave; (3) that Idris, the son of Shis, was the first weaver, and that he is the patron saint of the weavers.

From Lucknow comes a tradition that *Julahas* arose in the time of "King Jamshed of Persia." In Mirzapur they are said "when offering any sacrifice, to do so to Arastu ate Rasul as the founder of their industry." In Moradabad, Muhammad Arif is the alleged founder, while in Naini Tal, Moses is said to be their patron saint.

These traditions, so far as I am able to see, throw no light on the origin of the *Julahas*. They are doubtless, as a whole, converts from Hinduism, and not immigrant Muhammadans.

The *Koris* similarly have several obscure traditions, and mention is made of the origin of the weaving art in several Sanskrit works.

I have been able to collect the following tales:—

- (i) "The cotton plant was first produced on the birth of Illa, one of the 13 wives of Káship, son of Mrich, son of Bráhma, and since her time weaving has been practised." This story is said to be found in the 6th Chapter of the Bhágwat. (Etáwah.)
- (ii) "One hundred and ninety-six crores and several lakhs of years ago Tawishta and Me, Rishis, described the art of weaving in the Sarap (or Salap) Shastra." (My informant says he was told this by a Pandit.) (Etáwah.)
- (iii) "When God gave intelligence to man, the necessity of clothing became recognised, and man observing the web of the spider and the nest of the weaver bird invented weaving." I have been unable to trace this to any book. (Etáwah.)
- (iv) "Ishwara first taught the *Koris* and showed them the cotton plant, and from their being first to do it they are called *Koris*." (Etáwah.)
- (v) "Vishwamitr (the teacher of Ráma) first caused the cotton plant to grow for the advantage of man in the Treta Yug, and ordered the *Koris* to be taught weaving." This is described in the *Vishwamitr Jiwan Charitr* (*i.e.*, Biography of Vishwamitr in the 6th Chapter of the Bhágwat). (Etáwah.)
- (vi) "A Bráhman and his daughter went to the Ganges to see a powerful *fakír*, and when they touched his feet the *fakír* blessed the girl and said 'may you have a son.' On her return she was found to be pregnant, and the story of the *fakír's* blessing not being believed she was sent away into the jungle, where she bore a son. One day a *Juláha* and his wife asked her to let them have the child, which she did, and they brought him up as a weaver, naming him Kabír Dás, and he it was who first taught the *Koris* to weave." (Etáwah.)

This tradition is obviously a variant or more probably an erroneous version of that given by Crooke in "The Tribes and Castes of the North-Western Provinces and Oudh," III, 316, where the *fakír* is Kabír Dás, and the child is said to have been born from a blister on the girl's hand; to have been exposed in the jungle and there

reared by a calfless heifer till adopted by the *Juláha*. The origin of the word *Kori* is traced to this story as connected with *kwánri* (virgin) or *kori*, a girl untouched by man. Many *Koris* state that they owe their craft to Kabír Dás, but on what grounds it is difficult to see, as he lived in the 16th century; still he is frequently invoked before weaving.

(vii) Another story regarding the birth of Kabír Dás is reported from Etah :—

“As a married Bráhmíni was returning to Benares from her father-in-law’s house she sat down to rest near a bush. Suddenly some white flowers fell into her lap from the sky; these she threw on the bush and on her return home told what had befallen her. Shortly after a man from Benares passed the same bush and saw a young male child lying under it, took him home, and brought him up, naming him Kabír. When Kabír grew up he left Benares for Magadha, and on his way restored a boy to life, and, becoming so impressed with the nearness of death, invented weaving as a trade in which no lives could be lost. He taught it to the boy, whose descendants are the *Koris*.”

(viii) The following legend (also from Etah) may be held to point to some connection between the *Koris* and the aboriginal tribes, as above alluded to :—“In remote times, *Koris* (who at that time had no special name) had no occupation, living in the jungle. The Rishis and Mahatmas of the time, taking pity on them, invented weaving and taught them the art, which they brought into the cities, where they were called *Kori* (unrefined).”

As regards peculiar customs connected with the cotton plant, the following account was received from Bareilly :—

“When the cotton seed has germinated the cultivator before noon on a Saturday goes to the field with *ghí* (clarified butter) sweetmeats and *pári* (a sort of cake fried in *ghí*), burns a *hom*, offers up some of the *ghí*, and eats the other articles in silence.”

“When the cotton comes into flower he takes *khil* (parched rice) to his field on a Wednesday or Friday, scatters some over the field, and gives the rest to children: the idea being that the cotton bolls should swell like the rice. When the cotton is ready to pick, the women pickers go to the north-east corner of the field with parched rice and sweetmeats. Here they pick two or three large bolls, pull out the threads of cotton as long as possible, and hang them on the tallest plant near by, which is called the *bhogaldái*. This plant they then sit round, fill their mouths as full as possible with parched rice and blow it out in every direction. A *hom* is burnt and picking begins. This ceremony is called “*phurakna*.””

CHAPTER II.

COTTON.

THE only kind of cotton grown in these Provinces which is of commercial importance is the short-stapled variety known as “*Bengals*”; this includes various kinds known to botanists as *Gossypium herbaceum*.^{*} For its botanical characters and the differences of opinion as to whether the different varieties amount to different species or not, I would refer the reader to the authorities quoted below,[†] and more

^{*} Called in Watt’s Dictionary a hybrid between *G. wightianum* and *G. neglectum*.

[†] Authorities—

Watt’s Dictionary, Vol. IV, S. V. *Gossypium*, and authorities therein quoted.

Report on Indian Fibres, Cross, Bevan and King: Spon, 1887.

Indian Agriculturist, 1887, pages 12 and 53.

Cotton Handbook, Bengal (Medlicot).

Review of measures adopted to improve cotton culture in India. J. F. Boyle, 1857, pages 23, *et seq.*

especially to Dr. Middleton's paper in the "Indian Agriculturist" for January and February of last year (1897).

These Provinces, as regards cotton-growing, may be divided into two parts. The first, including Oudh and the North-Western Provinces east and north-east of Allahabad, grows little cotton, the quantity diminishing as one proceeds east. Here production, as a rule, is insufficient to meet local demands. The second includes the remainder of the North-Western Provinces. The most important cotton-growing districts are those of the Jumna-Ganges Doáb and Bundelkhand. Here exports largely exceed local consumption. Cotton cultivation extends but a short distance up the slopes of the Himálayas, a little only being grown in the southern portions of Garhwál, Naini Tal and Almora.

The total area under cotton varies about $1\frac{1}{2}$ million acres, generally rather exceeding that amount, while the outturn probably lies between 750,000 and 1,000,000 cwts. Of this amount approximately three-fourths are exported, the remainder is used locally, about one-third probably being employed for quilting purposes and the remainder spun. But that which is used for quilting ultimately to a considerable extent is spun, the cotton being removed after the quilted article is worn out; the extent to which this is done varies with the price of the fresh cotton.

The ordinary cotton known as *kapás* or *desi* is sown at the break of the rains. But except on a very good soil always mixed with other crops, the usual mixture being *arhar* (*Cajanus indicus*), castor oil, sesamum, *mung* (*Phaseolus mungo*), and *urd* (*Phaseolus aconitifolius*). Picking begins at the end of October and lasts usually until January; but occasionally the plants are killed prematurely by frost. Excessive rainfall is, on the whole, more damaging than drought, water standing in the cotton fields being specially harmful.

This cotton is in some districts subdivided into varieties according to the parts of the district whence it comes. Thus in Etáwah the best is known as *Pár*, and is that grown south of the Jumna; next comes that grown in the strip of land extending for five miles or so along the north bank of the Jumna and termed *Karka des*; lastly, and this is deemed of worst quality, that from the remainder of the district known as *Pachár*.

The *Pár* cotton is grown in a very dry and well-drained tract, where the underground water level is usually at least 100 feet from the surface, while the *Pachár* comes from the irrigated parts of the district with the water level rarely 20 feet deep. The other variety being intermediate in quality is produced in a tract intermediate between those yielding the two first named. The difference in value of the worst and best varieties is about 12 per cent. on the value of the medium one. The numbers commercially assigned to the three varieties are, as a rule, respectively 5—6; 6—7; and 7—8.

In Muttra the *desi* cotton is graded into *Phule* and *Charadás*, according to the amount of rubbish it contains: the former is worth 10 per cent. more than the latter.

Other varieties are grown to a small extent, more especially in the districts where the amount grown is not more than suffices for local consumption.

Manua is reported to be grown to a small extent in Allahabad, Bahraich, Bánda, Bára Banki, Jaunpur, Lucknow, Mirzapur, Partágarh, Rae Bareli and Sultánpur.

Narma in Basti, Gházipur, Jaunpur, Mirzapur (where it is also termed *semar*), Saháranpur and Sultánpur.

Radha, Radhiya or *Raria* in Allahabad, Banda, Jaunpur, Lucknow, Mirzapur, Partábgarh, Rae Bareli and Sultánpur.

Jhulwa or *jethwa* in Bahraich, Ballia, Gházipur and Gonda.

Manua and *Jhulwa* or *jethwa* appear to be identical, the last name arising from the fact that the cotton is picked in *Jeth* (May). This is termed *G. neglectum* in Watt's Dictionary (IV—111), *G. herbaceum* by Duthie and Fuller ("Field and Garden Crops"), and *G. arboreum* by Cross and Bevan ("Indian Fibres," p. 59)—a good example of the confused nomenclature of this genus. A considerable amount of this variety is grown in Mirzapur. It is termed *tinirya* in Dúdhí in that district, where the ordinary variety is known as *chartirya*. There it yields but 25 per cent. of floss compared to about 33 per cent. yielded by the ordinary variety, and is worth about one-third less. It is grown with *arhar*, *bájra* and *juár*, and is picked in April after the *arhar* has been cut.

Radhia or *raria* closely resembles the foregoing, being a superior form of *manua* according to Watt's Dictionary, which authority assigns the name of *G. neglectum* to *narma*, though immediately after speaking of "*G. neglectum*, the *manua* cotton."

It is, however, certain that *manua*, *radhia*, *jethwa* and *narma* cottons are closely allied, so probably the most satisfactory way at present is to adopt Cross and Bevan's view, and call them all varieties of *G. arboreum*. The cotton is picked from March to May, the plants form small trees and sometimes stand several years, and always take at least a whole year to yield a crop. The cotton yielded is, as a rule, of finer quality, but less in quantity, than that from the *desi* plant, and gives a poorer profit. The variety *narma* is specially grown as a perennial, and is never cultivated as a field crop, but a few plants are grown near the cultivator's house or near temples; its floss is fine and specially used to make the Bráhmancial thread (*janeu*) and for temple lamp wicks. In Mysore this is known as *deo kapás*.

Nankin cotton (*G. religiosum*) is stated to have been grown in Bijnor and Cawnpore, but only experimentally, and some years ago.

A specimen of a *kháki* colour, apparently identical with, or closely allied to, Nankin cotton, was received from Aligarh, labelled *narma*. Further inquiries merely elicited the information that it was "generally known as American cotton," "had been introduced within the past 20 years," "was grown in small quantities," and "only used for weaving."

In Gorakhpur the variety known as *lukti*, mentioned by Medlicot in the "Cotton Handbook for Bengal," p. 181, is still grown in small quantities in tahsil Padsawna. The floss is of a reddish tinge.

Peri cotton is said to be grown in Bareilly, and *bani-ruhiya* and *manoran* in Jhánsi; but concerning these no more information was obtainable.

The only mentions of American cotton are from Bára Banki and Mirzapur. In Bára Banki it is said that a very small area is sown with a fine variety of American cotton in Mangal Parsar. In Mirzapur a small plot is reported to have been successfully raised in 1896-97. Extensive experiments were made with these cottons before 1850, but the result was failure. For details the reader may be referred to Medlicot's "Cotton Handbook for Bengal," p. 164 *et seq.*

These and subsequent experiments tend to show that but little is likely to be done in these Provinces in the way of acclimatizing exotic varieties, and that the only way of improving the crop lies in judicious selection of seed. But even of this there is small hope, when it is recollected that it is rare for one man to grow as much as two acres of cotton, and that the produce of many holdings is bought up by one man, who

has the whole ginned indiscriminately, thereby mixing all the seed, which then becomes the source of next year's crop.

The cotton seed (*binola*) is used for cattle feed, being generally boiled in water first.

The following table shows the opinion of an expert on samples of cotton received from the districts or places mentioned. To avoid any chance of prejudging the samples from the reputation of the place of origin, they were submitted with merely numbers attached :—

Agra (five samples)	...	...	Good to fine, Nos. 6—7.
Aligarh	(<i>desi</i>)	...	Superfine.
Allahabad	{	(<i>desi</i>)	Fine.
		(<i>radha</i>)	Do.
		(<i>manua</i>)	Fully good.
Almora	...	...	Bad, No. 4.
Bahraich	...	...	Silky fine.
Bánda	...	...	Fine to superfine.
Basti	...	...	5 to 6½.
Etah	...	...	Superfine.
Etáwah	...	...	Silky fine.
Garhwál	...	...	Fine.
Gházipur	{	(<i>narma</i>)	Silky fine.
		(<i>jethwa</i>)	Ditto.
Kheri	...	...	Rough, fine.
(Another sample)	...	...	Above superfine.
Lucknow	...	...	Fine.
Muttra	...	...	Superfine.
Muzaffarnagar (two samples)	...	...	Fully good to superfine.
Partábgarh	...	...	Silky fine.
(Other samples)	...	...	Fully good to superfine.

Two other plants yield fibres which are, like cotton, seed hairs, and often take the place of that fibre as material for stuffing pillows and quilts. These are *semal* and *madár*.

Semal cotton is derived from the *semal* tree (*Bombax malabaricum*), a red silk cotton. This is a tree growing to a considerable size, bearing large fleshy petalled red flowers in March, which all disappear before any leaves are produced.

Madár or *akáwa* (*Calotropis gigantea*) is a low-growing shrub bearing masses of dull mauve and white flowers and thick dull green leaves. When the stem or flowers are broken a large quantity of milky juice exudes. After the flowers a large pod appears wherein is the cotton. This plant grows wild in the dryest situations, and is most prolific in flowers and pods.

Neither of these fibres is capable of being spun, apparently from not being twisted like the cotton fibre is. They, more especially the *madár*, are considered cooler for pillows than ordinary cotton.

CHAPTER III.

GINNING.

COTTON is always picked before noon, so that the bolls shall be still damp from the dew, and so come away easily without much admixture of "leaf." The cotton so picked is termed *kapás* and is rarely ginned by the grower. He generally sells it as such to a *bania* at some large village, who has it ginned.

For ginning there is but one instrument in use throughout the Provinces. This is variously known as *Rahnth*, *Raht*, *Rahat*, *Raktia*, *Rhant*, *Rentha*, *Rent*, *Otni*, *Oti*, *Ota*, *Utta*, *Charkhi*, *Waia* or *Ghurcha*. The two last names are restricted to Almora, but the others appear to be used almost indiscriminately over the Provinces.

The accompanying figure shows the usual form: Fig. 1 shows the elevation, Fig. 2 the plan, Fig. 3 (p. 49) is from a photograph. The essential parts of the instrument are the two rollers (*belan*), one of which (A) is usually of iron; the other (B) (the lower one) of wood. These are geared together by an endless screw C, so that when the wooden roller is turned by the handle D the iron roller rotates also. The rollers are fitted into two wooden uprights (E, E) 18 inches to two feet in length, inserted into the flat piece of wood F forming the base of the machine. To secure greater stability the piece of wood G is fixed on to F as shown in Fig. 2. On F there is placed a heavy lump of earth, or the worker puts his foot on it. There is usually a piece of cloth fixed to the two uprights so as to hang down below the rollers to the wooden base of the machine.

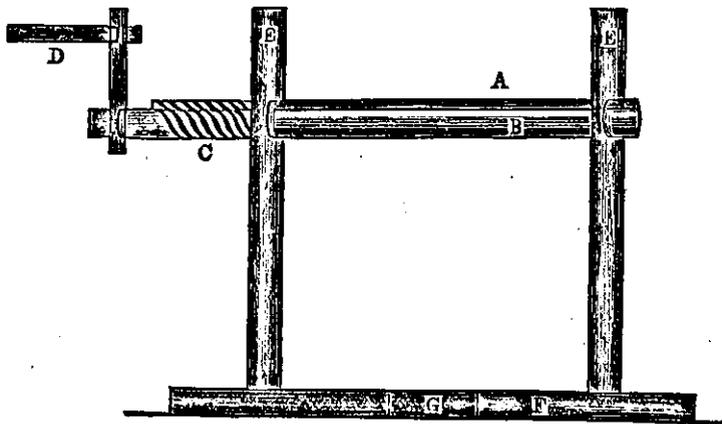


FIG. 1.

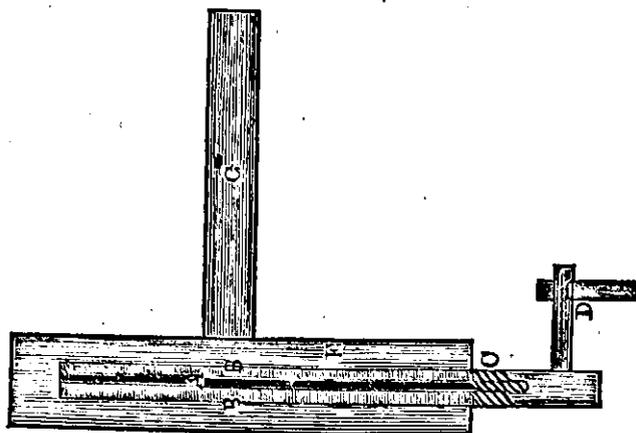


FIG. 2.

The workman sits on that side of the machine towards which the projecting piece G points, and turning the handle D with one hand (not necessarily the left, as would be the case with the gin figured) presses seed cotton between the two rollers,

which are so fixed as to press moderately tightly against each other. The floss is thus caught between them and dragged off the seeds, which fall down on the side on which is the workman; while the floss, then known as *rúí*, passes through and falls on the opposite side, seeds and floss being prevented from mixing by the cloth above mentioned.

Slight modifications are found in various places. Both rollers may be of wood or both of iron. The machine may be of greater size, and a handle is affixed at each end: in such case the handles are fixed one to each roller, and two workmen are required. In Gonda a gin in which the upper iron bar does not rotate is said to be used. Lastly, one or other of the rollers, usually the iron one, may be square or octagonal, the other being round. This is a doubtful advantage, as it crushes a certain amount of the seed, thereby certainly adding to the weight of the ginned cotton obtained, though not to its quality. At Jhānsi a gin, in which the upper iron roller is covered with small indentations like a carpenter's rasp, is reported to be used; this may be due to the influence of the sawgin much used in Bombay.

The price of a gin varies from six annas up to Re. 1-8-0 according to size, kind of wood used, and quality of workmanship; occasionally gins are found the wood-work of which has been carved. The cost of ginning is reported to vary between 10 annas and Re. 1-8-0 per maund of ginned cotton, the amount turned out by one person varying from four to eight seers of ginned cotton per day. This work is not restricted to any special caste, but is usually done by both men and women of the lower castes, though more often by women.

Steam gins have been established at Agra, Bánda, Etáwah, Kananj, Kosi (Muttra) and Cawnpore.

CHAPTER IV.

COTTON CLEANING.

AFTER being ginned, cotton intended for export is taken to the nearest cotton press, of which there are many in these Provinces, there made into bales, and then despatched to where required. That intended for local consumption requires to be opened up, cleaned and made into a form ready for spinning. The preliminary processes in the mill-industry are "opening," "scutching," "carding," "combing," "drawing," "slubbing" and "roving." In the hand industry the preliminary operations result in the production of a sliver (termed *páñtí*), corresponding closely to the state of the material after being carded in the mill industry. All the subsequent processes, which result in attenuating the sliver and imparting a slight twist thereto, are performed by the spinner at the same time as he does the actual spinning.

The ginned cotton is, as a rule, first roughly picked over by hand, usually by the person who will spin it or by some members of the family. In this way the more gross impurities are removed. This process is known as *támná*.

It is then handed over to the professional cleaner—known variously as *dhuna*, *behna* or *naddáf*, and almost always a Muhammadan—to undergo the process termed *dhunna* or in the hills *phatakna* or *phánna*. The basis of all methods is one and the same, *viz.*, to cause a tightly-stretched string to vibrate in a heap of cotton, the vibrating string separates and opens the matted masses of floss as pulled off the seeds in ginning, thereby greatly increasing the bulk and shaking out dust, dirt and other impurities, which gradually settle down to the bottom of the heap.

The simplest instrument used is a bow (Fig. 4) of bamboo with the string sometimes of gut, at others of some strong fibre, *e.g.*, hemp is used occasionally in Garhwál, where, however, it is sometimes replaced by a finely-split piece of bamboo. Such a bow is known as *dhanú*.

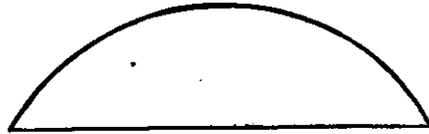


FIG. 4.

The bow is held in the left hand with the string partially buried in a heap of cotton—the operator being in the usual squatting position—and the string caused to vibrate either by being plucked by hand or by a suitably shaped piece of wood. This instrument is only used to clean small quantities and its use generally restricted to cases where the spinner cleans the cotton him or herself.

The more elaborate instrument [shown diagrammatically in Fig. 5, while Fig. 7 (p. 51) is from a photograph] is invariably used by the professional cleaner, who, in fact, rarely uses anything else than this, or a slightly modified form thereof.

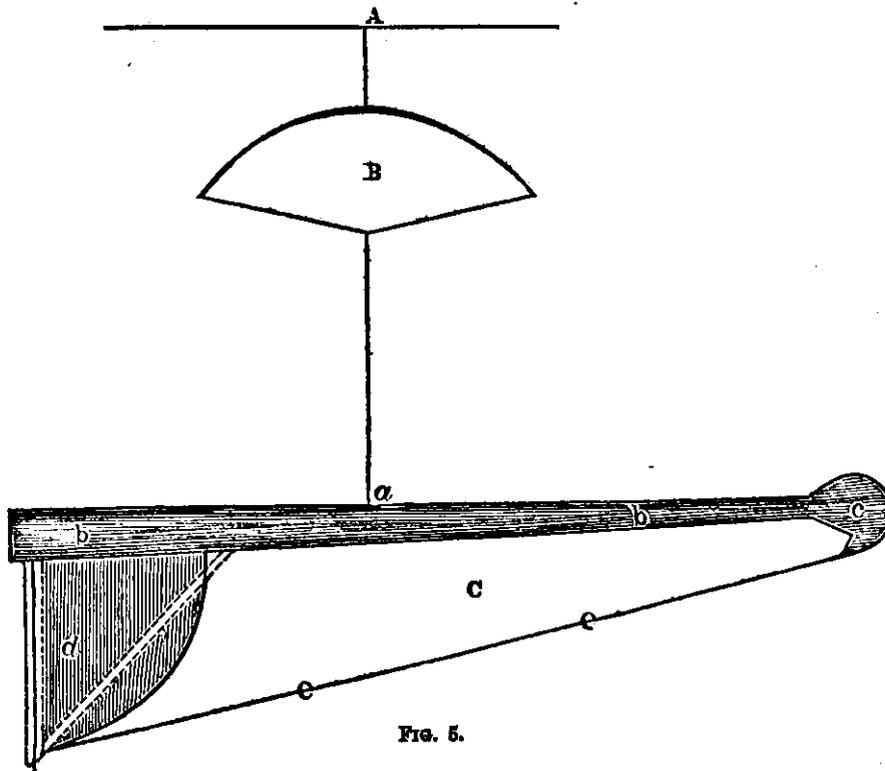


FIG. 5.

It consists of three portions—

- (i) *B*, the bow (*kamán* or *dhanú*).

This is quite similar to that described above.

- (ii) *C*, the instrument by which the cleaning is actually done—termed *dhunki*, *dhanua*, *dhanukni*, *pinja*, *pinna* or *phatka*.

This consists of a wooden frame in three pieces *c b d* of light and strong wood (*sál* and *ber* are used) to which is attached the string *e e*—usually of gut. This is stretched so tightly that when twanged it gives out a musical note. The construction will be obvious from the figure, the piece *D* may either be cut out of a plank or be formed of two separate pieces as shown by the dotted lines.



FIG. 6.

- (iii) the *muthiya* (Fig. 6), *belan*, *bána*, *hátha*, *beonga* or *dharta*. This is very like an ordinary dumb-bell, but about 12 inches long, and is usually of tamarind wood, but in the hills of *khair* (*Acacia catechu*); sometimes, however, of *bel* (*Egle marmelos*) or *pursidh*.

This process is always done under cover and in a place sheltered from the wind. The bow, *B*, is suspended to the roof, bamboo side up, to the middle of the string is attached a longer piece of rope or gut to which the *dhunki* is fastened so as to balance and to hang with the lowest point of the instrument six inches or so off the floor. The *dhunna* squats so that the piece *D* is on his left and grasps the instrument near the point *A* with his left hand, and causes the string *e e* to vibrate by catching the *muthiya* in it.

He places a heap of cotton to be cleaned immediately under the *dhunki* and depresses this latter till the string is well in the heap. The vibrations then scatter and disintegrate the masses of cotton as above described. The instrument is so worked as to remove the cleaned cotton away from the operator. When all has been so removed he collects it and brings it back to its former position, and repeats the process two or three times, after which it is properly cleaned. In many cases the bow, *B*, is omitted, but the work is not then done so well or so quickly.

The cost of the stock-in-trade of a *dhuna* probably does not exceed Rs. 3; that of the *dhunki* varying from 12 annas to Rs. 2; while the *muthiya* can be obtained for six to 12 annas, and the bow for four to six.

The work is tedious and unhealthy, the dust and small particles of cotton entering the lungs and giving rise to asthma and lung complaints.

The rate of payment is three pice to one anna per seer, and the rate of work is said to be about two to four seers per diem.

This method of cleaning is sufficient for the production of ordinary yarn; when, however, very fine yarn is required—*e.g.*, for weaving fine muslin—cotton so cleaned is carefully picked over by hand, while as a further precaution the cotton when subjected to the action of the *dhunki* is kept on a bamboo framework termed *tattar* instead of resting on the ground. But very little of such fine work is done.

Cotton, after undergoing the ordinary process of cleaning, is made either into *pánts* or *gálás* according as it is to be spun into yarn or either kept or used for stuffing quilts. The *pánts* (also termed *poni*, *peori* and *runwáls*) are about six inches long and of the thickness of a finger. To produce them sufficient cleaned cotton is pulled out and flattened by hand on a flat piece of wood (known as *sil* or *pirta*) or stone (*pathar*), and then rolled round a short thin piece of stick or reed made of *sarahri* or some other reed (termed *sarai* or *sirki*) which is then withdrawn from the centre. The result is an approximately uniform cylinder of cotton. The thickness varies with the fineness of the yarn to be spun. The *gálás* are very similar to the *pánts*, but about treble the thickness, and usually somewhat flattened.

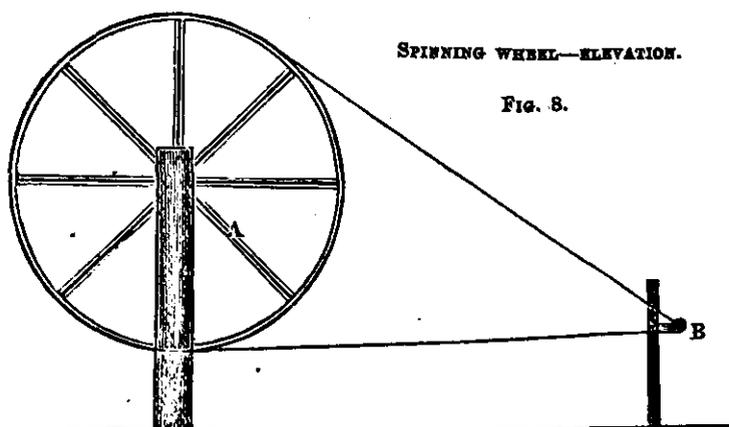
The cleaned cotton is frequently made up into *pánis* or *gálás* by the *dhuna*; but sometimes by the spinner.

CHAPTER V.

SPINNING.

THE sliver of cotton termed *páni* has to be elongated and twisted to form yarn. This is done by aid of the spinning-wheel.

The wheel is termed *charkha*, *rahta* or *phirka*, and consists ultimately only of a mechanism whereby the spindle or sharp pointed thin iron rod known as *takwa* or *takla* can be rotated at a high speed. This is effected by connecting the spindle by an endless string (*mál*) with a large wheel. The diagram (fig. 8) will show the mechanics of the machine; while fig. 9, (p. 53) from a photograph, shows the actual construction and method of working. The larger wheel is supported on a pair of uprights $1\frac{1}{2}$ to two feet high, separated about one foot. The axle is inserted in two holes in the uprights and at each end carries a number (8 to 12) of spokes. The spokes at one side are so arranged as to appear between those on the other. The end of each spoke is then joined by string to the ends of the two nearest spokes at the opposite end of the axle. The result is a series of stretched pieces of string forming the ribs of a cylinder (more correctly generators of an hyperboloid). The spindle is about 12 to 18 inches in length, and is supported on two wooden uprights into which are fixed horizontally two smaller pieces of wood, and to these again two small pieces of leather (termed *chamrakkh*), the spindle actually turning in contact with these. The pointed end of the spindle projects six to eight inches beyond the support and is connected by an endless string with the wheel. This may be of gut or hemp fibre, but is more frequently made by twining together 10 or 12 strands of yarn, and then applying a sticky semi-resinous substance obtained by boiling *rál* (resin) with mustard oil until the whole becomes semi-solid, on cooling the mass sets to a sticky solid. This is applied as resin is to a violin bow.



SPINNING WHEEL—ELEVATION.

FIG. 8.

A driving wheel. B spindle (*takwa*, *takla*).

To spin, the operator—usually a woman—squats with the wheel in front of her and the driving wheel on her right hand with which she turns it, the projecting end of

the spindle is thus towards her and on her left (see fig. 9); she then takes a *púni* and draws out a little of the cotton at one end and twists it by hand, so as to make about four inches of truly handspun yarn (which is left attached to the remainder of the *púni*). The yarn so made is made to adhere to the spindle, generally with the aid of some spittle, and the spinning proper commences. The spindle is caused to rotate very rapidly, and at the same time the left hand is drawn up so as to reach about two feet from the point of the spindle, the fingers simultaneously pushing out a little of the cotton of the *púni*, the rapidly rotating spindle twists the cotton as it is drawn out, thereby producing yarn. When sufficient twist has been imparted, the spindle is rotated slowly and the yarn allowed to coil itself on the projecting part of the spindle behind the point. To prevent the spun yarn working backwards and becoming entangled with the bearings of the spindle, a leather stop, called *dhibri*, is sometimes put on the latter. The process thus continues till the whole *púni* is spun, when a new one is taken and a little yarn spun from the end, but instead of being caused to adhere to the spindle it is twisted into the end of the yarn already spun.

The fineness of the yarn varies with the care with which the cotton has been cleaned and with which it is spun: a particular point being that the smaller the amount of cotton used in spinning the two feet spun at one stretch of the arm, the finer will be the thread.

Ateran or oena.

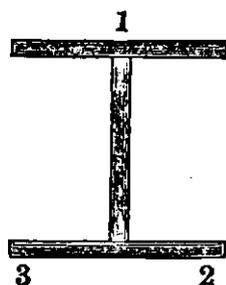


FIG. 10.

Paraita.

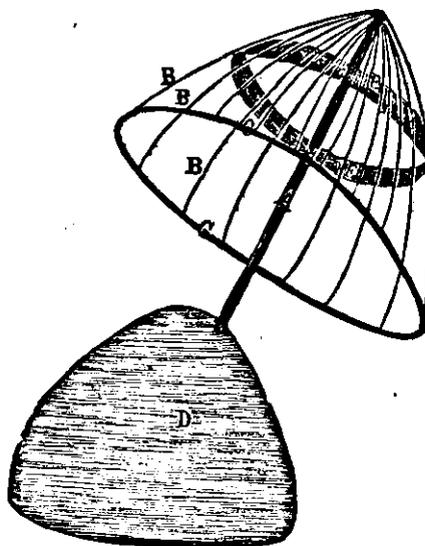


FIG. 11.

The yarn so wound on the spindle forms a double cone truncated at one end if a *dhibri* is used. This is known as a *kúkrí*, also *andea* or *túhúrí*. When no more can be wound on the spindle the *kúkrí* is removed and spinning begun afresh. The *kúkrí* is then wound into skeins known as *atti*, *pola* or *phenh* by aid either of an *ateran* (or *oena*) or of a *paraita*. The former (Fig. 10) consists merely of three pieces of wood in the shape of an H. The yarn is wound thus: beginning at 1 the

thread goes to 2, then to 1, next to 3, and back to 1, and so on. The *paraita* is shown in Fig. 11. It consists of the central stick A, to one end of which are fastened the curved radiating pieces B B, of which the other ends are attached to the circular piece C. The central stick A is fixed into a hole in a heavy lump of dried mud (D) (known as *thúná*), so that it can rotate easily, and when used to wind *attis* from the *kúkrís* is rotated by hand. The yarn when wound occupies the position as shown in the Fig. (E). This instrument is, however, more often used as a support for the hank, when it is to be wound on to the *nalis*, the small reels used in laying the warp (see Chap. VI).

Two or three *kúkrís* are usually joined, by twisting the ends together, to form one hank. When yarn is sold it is usually sold in hanks; occasionally, however, the *kúkrís* are sold as such.

Spinning is probably the only industry in India that is performed by persons of all castes, and concerning which there appear to be no caste prejudices. The only case of any persons using this as a sole means of livelihood appears to be that of the *Khatpatias* of Soron (Etah). Women of the *Kori* and *Juláha* castes undoubtedly spin more than those of other castes. Women of richer classes spin for amusement and for household use, often meeting and spinning somewhat on the English working-party principle; while those of the poorer classes spin both for home consumption and for sale. As a source of income the occupation is a poor one. The price paid for spinning a *seer* of yarn averages from two to four annas, while four to six *chhitaks* is about all that can be done in a day.

CHAPTER VI.

WARPING.

THE next process is to lay a sufficient number and length of threads of yarn parallel to form the warp of the fabric to be woven. The yarn, whether hand-spun or machine-made, is usually obtained by the weaver in the form of skeins or hanks. They are soaked in water for 24 to 48 hours and then wound on to suitable sized reels. To do this the skein is supported either on the *paraita* (already described) or on an instrument serving the same purpose, termed *pari* or (like the spinning-wheel) *char-kha*. This latter consists of a round axle a foot long, to each end of which are affixed six spokes arranged so that when the instrument is looked at along the axis, the spokes at one end appear to bisect the angles between those at the other (as in the driving-wheel of the spinning-wheel); a spoke at one end is connected by string to the two nearest spokes at the other. The 12 strings thus joining the ends of the spokes form a support to the skein. The reels are of two sizes: the larger, used for the warp, are termed *nála*, *chhunchha*, *nara*, *chhujja* or *kenda*, and are about five inches long; while the smaller, known as *náli*, *chhunchhi*, *nari* or *reta*, are not more than three inches in length, and are used to carry the weft yarn, being of such a size as to fit into the spindle. Some of the names above given appear to refer to the yarn when on the reels, and others to the reels themselves; but there seems no fixed rule, the names being used sometimes for one and sometimes for the other in the various districts. These reels are made either of *narkul*, bamboo or some other kind of reed, and are hollow. They are put on the free end of the spindle, a little thread being attached to the bearing of this latter and wound round it under the reel to prevent slipping. The skein is wound off the *paraita* or *char-kha* on to the reels by turning the spinning-wheel, the reels being replaced by others as they get filled.

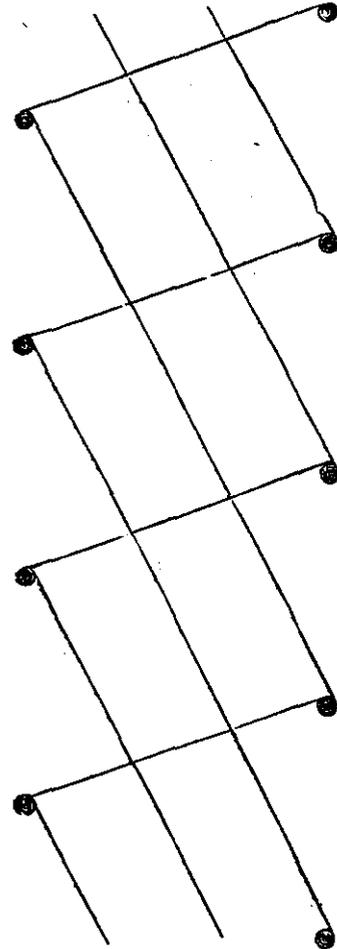
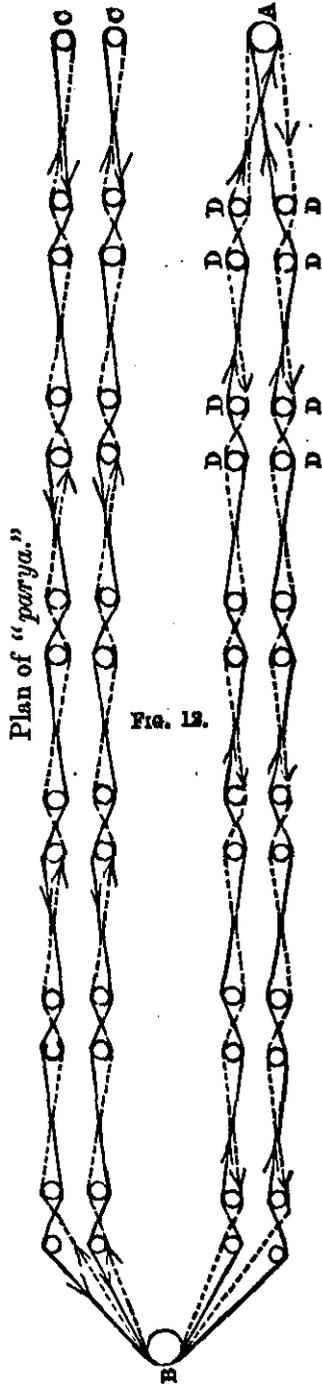
The warp is first laid on an arrangement of sticks termed *pariya*. Fig. 12 shows a plan. A, B, C and C are stout sticks firmly put in the ground; D, D, D, &c., are light straight sticks, small bamboos or *sarkandi* known as *suras* or *surwas*. These are 2½ to three feet long, and are placed in sets of four; all four are stuck in the ground as close together as possible, but diverging at the top so as to form the corners of a square, each side of which is about 10 inches. The distance between each successive set is three to four feet. A large reel (*nara*) of yarn C (Fig. 14) is slipped on an iron nail, termed *urī*, *dutakā* or *salāka* (B) some eight or nine inches long, with a head sufficiently large to prevent the reel falling off. This nail is inserted head downwards into a hollow stick about two feet long (*senṭha*, *dungi* or *dānda*, A in the figure) in which it is kept by friction. The warping is generally done by a woman or child. The warper takes two *dāndas* with attached *urīs* and *narās* in his two hands, and by beginning from the large stick A in Fig. 12 lays the yarn as shown by the dotted lines in the direction indicated by the arrows: on reaching C C the warper returns, the yarn following the course shown by the continuous line till A is again reached, when the dotted line again shows it. The yarn is supported by the tension and the friction against the sticks D D, against which it presses by reason of its being placed alternately one side and then the other, besides being supported by the slant at which they are. The warper continues the process till a sufficient number of warp threads for the breadth of cloth to be woven is laid. The result of the arrangement is to produce a cross between every pair of sticks whereby each successive thread is kept separate from its neighbours throughout its length, and to prevent successive threads from getting mutually entangled. The length A B C is that of two pieces of cloth, the warp being ultimately cut at A when ready to be put on the loom.

The arrangement for warping differs slightly in detail from district to district: e.g., the whole series of sticks may be in one straight line, thus avoiding the need of the turn at B and the stout stick there; but the principle is the same: exigencies of space causing most of the modifications noted. The *pariya*, of which the plan is given at Fig. 12, is one that was found in use at Ayāna in Etāwah district.

After sufficient warp is laid, a thin bamboo of a length slightly greater than the breadth of the cloth to be woven is inserted just one side of each set of four sticks (D), so that it slides between the two layers of warp. Its two ends are united by a piece of yarn. This maintains the crossed arrangement of the warp threads when, as is now necessary, the sticks D are removed. This system of bamboo and string that is thus inserted is known as *pān kā sare*. All the sticks (D) are then removed, but the large sticks are left at the ends, and the whole rolled up and starched by immersing in starch water in a suitable sized trough. The most approved kind of starch is that made from wheat flour and known as *māndī*. A sort of bread is made of wheat flour which is crumbled up and allowed to soak in water for a night, in the morning the bread is squeezed out well and the liquid strained through a cloth. It is then ready for use. Barley, *juār*, or rice flour sometimes replaces that of wheat.

The warp is then stretched horizontally on another system of sticks known as the *mānjhā*. This consists merely of a series of pairs of sticks stuck in the ground so as to form a letter X at such intervals as are needed to support the warp; the upper ends of the pairs of sticks are united by rope, while the warp is kept taut by attaching the stout sticks at the two ends to pegs firmly fixed in the ground. The warp threads are kept apart to a proper breadth by the bows inserted as before described. The starched warp is put on this arrangement and brushed longitudinally with a large brush termed *kūnch* made of *khaskhas* (the roots of the *gandal* grass, (*Andropogon muricatum*), or sometimes of cocoanut fibres. It much resembles an ordinary English carpet broom, but without the long handle. After the starch has dried the brush is usually oiled with oil of mustard. This operation smooths the yarn, causing loose ends to adhere to the main thread; at the same time any broken threads are mended (by twisting the ends together). The whole process is known as *pai karna*. Lastly, the bamboo sticks which have so far separated the two layers

of warp are replaced by stout yarn only, which is tied tightly so that the warp appears merely as a thick and long skein. It is all rolled or twisted about one of



the stout sticks (known now as *sirakra* or *sorora*) still remaining at the ends, and thus kept till required to be put on the loom.

Sometimes, instead of immersing the warp in the starch water as above described, the starch is applied by the *kunch*, when it is stretched on the *mánjhá*.

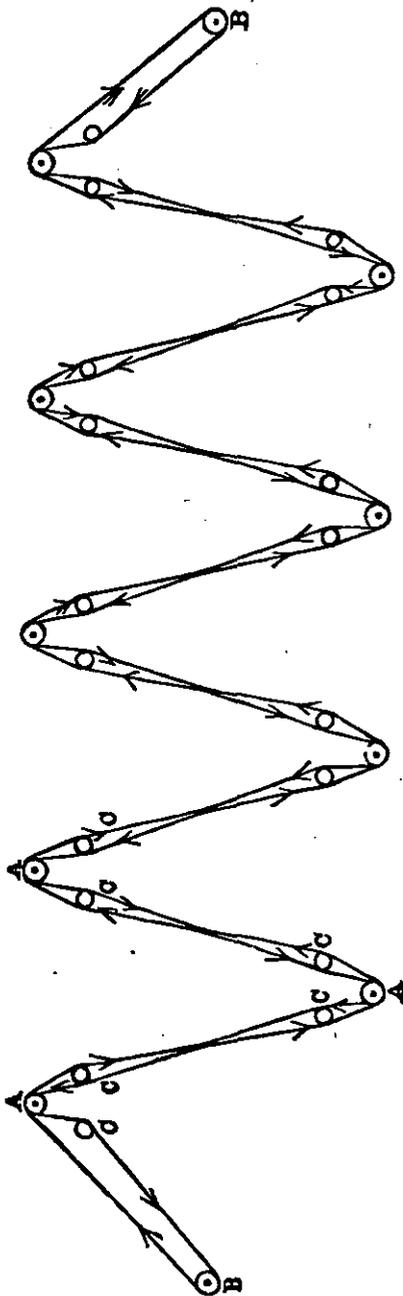


FIG. 15.

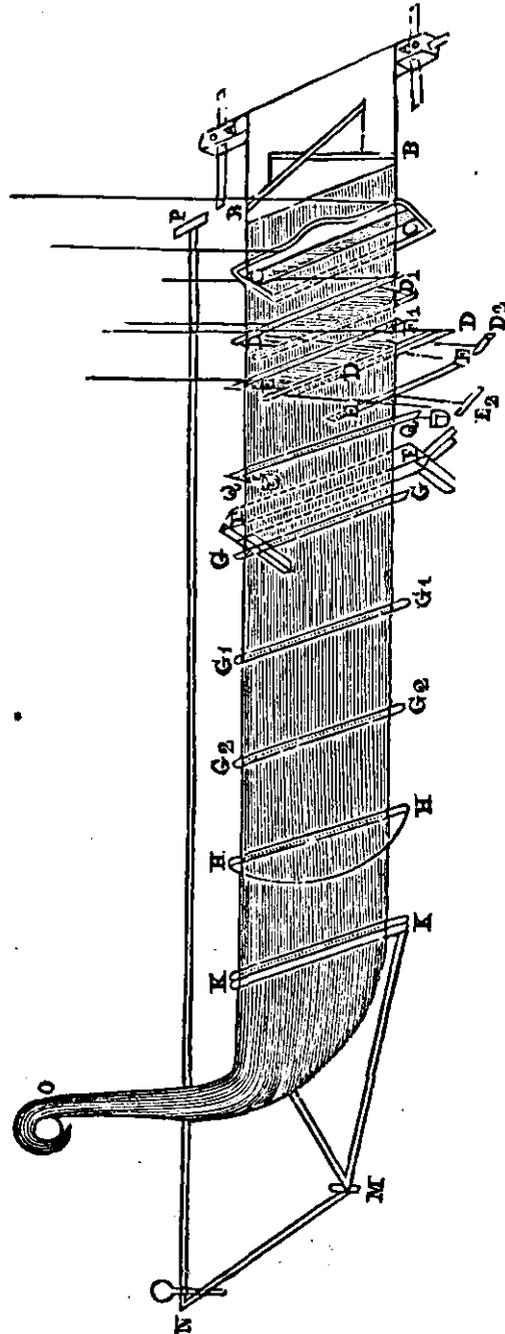


FIG. 16.

Where space is so valuable that it would be difficult to set up a *pariya*, or sometimes from choice, the laying of the warp is done on a framework termed *jatr*, or

in Garhwál *punhar*. The construction will be understood from the diagram in Fig. 15. A series of pegs (A A) are inserted into a wooden framework in two rows, there are usually 15 or 20 in each row, the distance between the rows being 12 to 18 inches. Near each of the pegs A A are placed two small pegs C C. The system of winding is shown in the diagram, the arrows showing the direction in which the warp is laid. It will be observed that in travelling from left to right the yarn is always outside the pairs of small pegs C C, while when returning it is inside these. There is thus produced the same system of crossing between each successive peg that there is between each successive stick in the *pariya* process. The whole frame is not more than four feet by two; the warper places it in front of him on the ground at a convenient angle, laying of course but one thread at a time. To cause the yarn to run more easily and to lessen friction it is passed through a small cylinder of smooth wood 3 inches long, and known as *punetra*. In Garhwál a piece of the legbone of a goat is used for this purpose. This tube is held in the hand which does not touch the yarn at all. The bows of bamboo and thread are then inserted in the space left in front of every alternate small peg C, i.e., one bow for every large peg A, and the warp then spread out on the *mánjhá*, where it is starched by means of the *kunch*. But in Garhwál in place of the bows the warp is simply tied after every large peg and the whole soaked in water for three days, dried in smoke, and starched. Then the threads are replaced by the bows and the warp stretched on the *mánjhá*.

When warp stripes are required in the fabric to be produced, the requisite number of threads of the required colours are laid in the warp.

In weaving certain coarse and narrow fabrics the warp is not subjected to the process of stretching on the *mánjhá* and being brushed with the *kunch*.

CHAPTER VII.

WEAVING.

THERE is practically but one form of loom in use throughout these Provinces. It is shown in Fig. 16, while Fig. 17 (p. 55) is from a photograph taken in the Agra district. The whole arrangement is always under cover, and raised but a few inches above the level of the ground: consequently to enable the weaver to sit at his work a hole is excavated some 18 inches deep, wherein he sits, so that the beam AA is immediately above his thighs.

Before proceeding further it will be advisable to describe in detail the various parts of the loom, which in its entirety is known as *addá, chán, mángá* or *githua*. The beam AA (*lapetan, lapetnt, tár* or *phaniyá lá*) on which the cloth as woven is wound up, is of some heavy wood, frequently *khair* (*Acacia catechu*), and about three inches square. At each end a stout iron rod projects, which is let into corresponding holes in a firmly fixed block of wood, so that the beam can rotate. At a short distance from each end two holes are bored at right angles through the beam. Into these a stout stick (*sál* or *gardana*) is inserted, whose end rests on the ground. The beam is thus kept from rotating, and the requisite tension can be maintained in the warp.



FIG. 18.

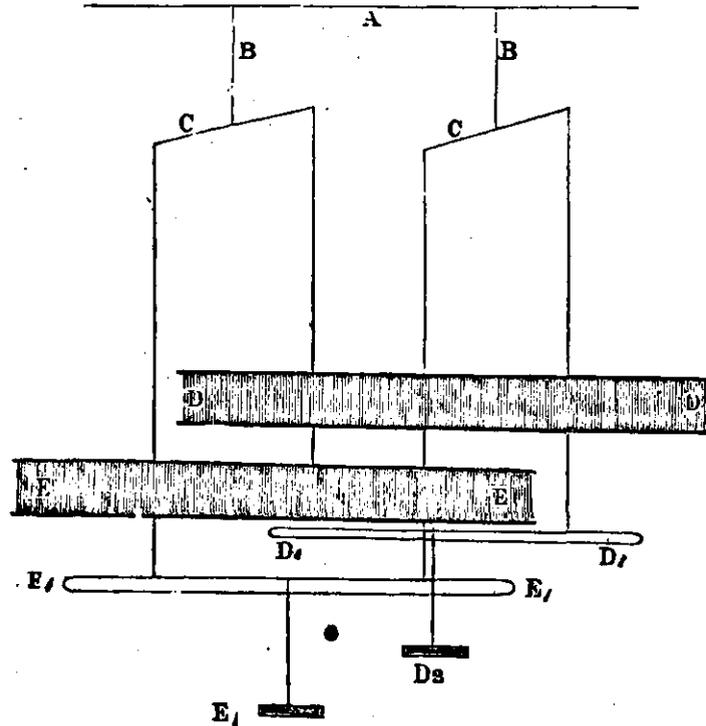


FIG. 19.

Figures 18 and 19 show the construction and suspension of the heddles (*bai*, *boula*, *kanghi*, *dam*, *baisar*) (DD and EE in Fig. 16). The heddle consists of a pair of sticks (AA and BB, Fig. 18), termed *kānri*, connected by a series of pairs of loops of well-waxed cotton thread CC, the upper loop passing through the lower. The warp threads are passed through both loops, *i.e.*, through the somewhat circular apertures formed when the two sticks are moved towards each other slightly as shown in Fig. 18. The two heddles are suspended from a beam overhead (A Fig. 19). (This is variously known as *kulvánsá*, *suttur*, *kulara*, *darheri*, *abhair* or *karmes*). To this are attached two cords (BB) supporting a pair of stout sticks (CC), (the *náchnís*, *i.e.*, "dancers," or *chaks*), and to the ends of these are attached by cords (termed *chakdor* or *tháre*) the heddles DD and EE as shown. To keep the loops of the heddles duly stretched, to each is attached below a piece of wood D₁, D₁, E₁, E₁, (*belan* or *ballan*) and to the middle of each of these are attached the pieces D₂, E₂ (*paonri*, *pelota*, *paoli* or *pansar*): these are short pieces of wood which are depressed alternately by the toes of the weaver, the arrangement of the parts of the loom (see Fig. 16) being such that these pieces are within easy reach of his toes as he sits at his work. If more than one pair of heddles are used the method of support is quite similar. The heddles are attached two and two to *náchnís*, and then these *náchnís* are again attached to others and finally to the beam. Where the warp threads are required to be closer together than is possible with a single pair of heddles, though but one pair is required for the weaving, each member of the pair is replaced by two heddles fastened together so as to move as one. The depres-

sion of a heddle depresses all the warp threads passed through it, thereby leaving a space between the two sets of warp threads through which the shuttle is passed.

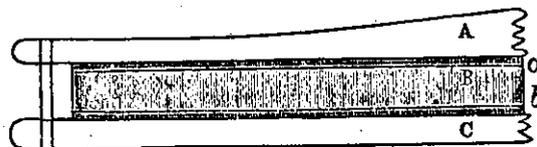


FIG. 20.

CC (Fig. 16) is the "lay" (*hatha*) whereby each successive thread of weft is driven home; it is suspended by two cords from the roof. Fig. 20 shows the detailed construction. It consists of two beams A and C (termed respectively *hathiya* and *taroncha*), the upper being shaped as shown in Fig. 16 for convenience of holding. These are connected together so that the *rachh* can play freely horizontally, whereby all strain on the warp due to incorrect suspension of the "lay" is avoided. The *rachh* consists of a comb of thin flat (split) pieces of reed. These are termed *kilk*, and are placed side by side, each being tied on to its neighbour by string above and below (*a, b*, Fig. 20); the thickness of the string gives sufficient space between the successive "teeth." This instrument is made by a special sub-caste of *Julahas* termed *rachhbandhyas*, or else by certain wandering tribes as the Doms or Kanjars. Two or more warp threads according to convenience are inserted in each division of the *rachh*. FF in Fig. 16 is a smooth beam of wood (termed *kharkut* or *karik*) on which the warp is supported.

The process of laying the warp as described results in an endless warp, each thread of it turning over the stick at the extremity, and continuing as the corresponding under-thread. The warp threads are now all cut at this extremity and one by one passed through the appropriate loops in the heddles and space in the "lay," and firmly attached to the beam (AA). As this is a very tedious process, it is usual to do it once and for all; a sufficient length of warp thread is left unwoven to pass through the heddles and *rachh*, and the new warp simply attached to the old, each thread being twisted (not knotted) on to the old warp. It is obvious that so long as the same arrangement of heddles is adhered to and the same breadth of cloth woven, no change is required. In fact, many weavers have *rachh* and heddles with a small strip of woven cloth and warp passed through them which have been in use from their fathers' times. This is specially the case with the choicer patterns. At Saharanpur I was shown such an arrangement containing 16 heddles which none of the weavers then living knew how to use.

The whole length of warp spread out horizontally (*i.e.*, from AA to KK in Fig. 16) is from two to four yards according to the space available. The warp is kept stretched properly by the arrangement at KK; this is known as *bhansre* or *bhanjhni*, and consists of three smooth and stout bamboos placed above and below the warp and tightly bound together, so that the threads cannot slip between them. To the ends of the *bhanjhni* are attached two cords (*jota*) which join as shown at M in Fig. 16, whence a single rope passes over one or, if necessary, more pegs (termed *pinda*, *mahtawan*, *munn* or *hathela*), and is attached to the peg P (*bartela*), which is within easy reach of the weaver's right hand. As weaving proceeds and more warp is required he loosens the rope at P and winds the woven cloth on to the beam AA. The remainder of the warp not yet stretched horizontally between the beam and the *bhanjhni* is hung loosely over a bamboo O (known as *atbanna*).

It will be remembered that in the warp after the final brushing the bamboos which kept the crossings of the successive threads intact were replaced by ties of thread. When stretched on the loom these ties are again replaced by sticks, of which several varieties (see QQ, GG, HH, Fig. 16) are used, sometimes one, sometimes another variety, and occasionally more than one.

To the stick QQ, immediately behind the heddles, a pair of weights is usually attached to depress the warp and prevent the stick working down on to the heddles as it otherwise would do by reason of the vibration produced in weaving. This stick with weights attached is termed the *naulakhi*. Next to these are usually two or more plain sticks followed by one or more similar sticks the ends of which are connected by thread. These are known respectively as *savar* and *dhanneya*, *sathia* or *tasgara*.

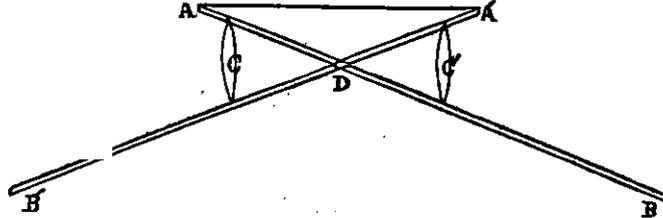


FIG. 21.

To keep the woven cloth stretched to the proper breadth a pair of instruments termed *kandála*, *kansari*, *pangat*, *panikh* or *tikit* is employed (BB, Fig. 16). Fig. 21 shows the construction of one of them. It consists of two pieces of thin straight stick AB, A'B', whose ends BB' are sharply pointed. The ends AA' are connected by cord. Sliding on the sticks are two pieces of wire or cord, CC'. The sharp points BB' are inserted in the selvages of the woven cloth, and the pieces CC' are slid to such a position that the distance between BB' is that of the full breadth of the cloth. It will be seen that the nearer C, C' are to A and A', the wider will be the separation between B and B'. Two of these are always in use; and as more cloth is woven, the hinder one is removed and put in front.

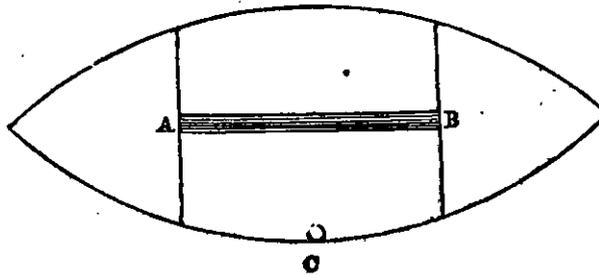


FIG. 22.

The shuttle is known as *bharnt*, *dhalki*, *dhirk*, *gir*, *khira* or *nár*. It is usually made of sheet iron, more rarely of a buffalo's or other animal's horn, and is very similar to the old shuttle used in Europe. In shape it is like a canoe (Fig. 22), the similarity being increased by the way the two ends are covered in. Along the centre is a thin iron pin (*salai*) (A B) which can be lifted up at will. On to this the *nari*, on which the weft yarn which is always moistened before weaving, has been wound (p. 13), is slipped and fastened down. At C there is a hole through the side on the inner side of which is attached by beeswax a smooth glass bead (*manka*) to diminish friction. The end of yarn is put close to the inner side of this bead and sucked through by the weaver. As each fresh *nari* is put into the shuttle the iron pin is oiled, for which purpose the weaver generally places an oil lamp near his right hand.

After the warp has been spread on the loom and all the instruments used made ready, weaving begins. The appropriate heddle (or heddles) is (or are) depressed, and the shuttle passed from one side to the other between the warp threads so depressed and those left above. The weft thread so put in is driven into the proper position by the lay (*háttha*), and the other heddle (or heddles) depressed, the shuttle passed back, and the process continued. When weft stripes are required, yarn of the appropriate colour is inserted in the spindle and the required number of weft threads of this

colour is inserted. As a rule, when this is done several shuttles are used. The dimensions of the loom and of its adjuncts vary with the breadth of the cloth to be woven, but it is rare to find a loom capable of weaving cloth much over three feet in breadth,

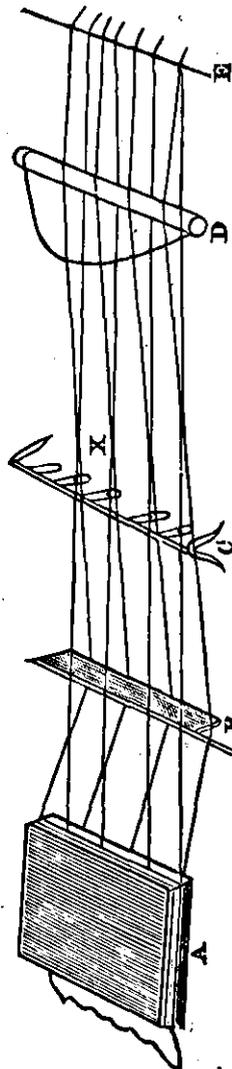


FIG. 23.



FIG. 24.

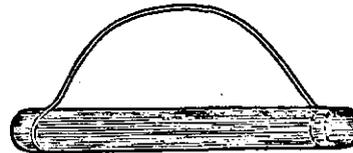


FIG. 25.



FIG. 26.

A very primitive method of weaving *tât* (a coarse canvas or sackcloth) is in use in parts of the Sitapur district, for the description of which I am indebted to Mr. Pike, Deputy Commissioner. Fig. 23 shows the arrangement of the various parts: AA consists of two flat pieces of wood wherein the part of the cloth woven is held, and thereby that end of the warp is kept fixed. C is the *ghori* (see Fig. 24): it merely consists of a piece of stick in length equal to the breadth of the cloth to be woven, supported so as to be about six inches high on two forked sticks; to the horizontal sticks are attached loops of string, the number of which is half that of the warp thread: every alternate warp thread is passed through a loop. In place of any shuttle the thread for the warp is merely wound round a piece of stick. D is the *sâras* consisting of a stout bamboo stick two inches thick, in length the same as that of the *ghori*, to the two ends of which is attached a cane handle (Fig. 25). Those warp threads that pass through the loops of the *ghori* pass under the *sâras* and the others above it.

B is the *beoni*, a hatchet-shaped wooden instrument fairly sharp on the "edge" side. Fig. 26 shows it, *b* being a sectional view. In Fig. 23 this is shown as inserted between the two layers of warp.

It will be noticed now that between A and D the two layers of warp cross each other. In Fig. 23 this occurs at the point X. Moreover, it is clear that if the thread for the weft be inserted first one side and then the other of the place of crossing of the warp threads and the successive weft threads be pushed home the result will be a woven fabric; for all that is required for such fabric is that any given warp thread be above or below one weft thread and below or above the next. This result is effected by moving the *saras* to and fro from its position as shown in Fig. 23 up to the *ghori* C. When it is near the *ghori*, the warp threads will cross each other to the left of this instrument and a weft thread, successive to the one that can be inserted with the instruments arranged as in Fig. 23, can be put in.

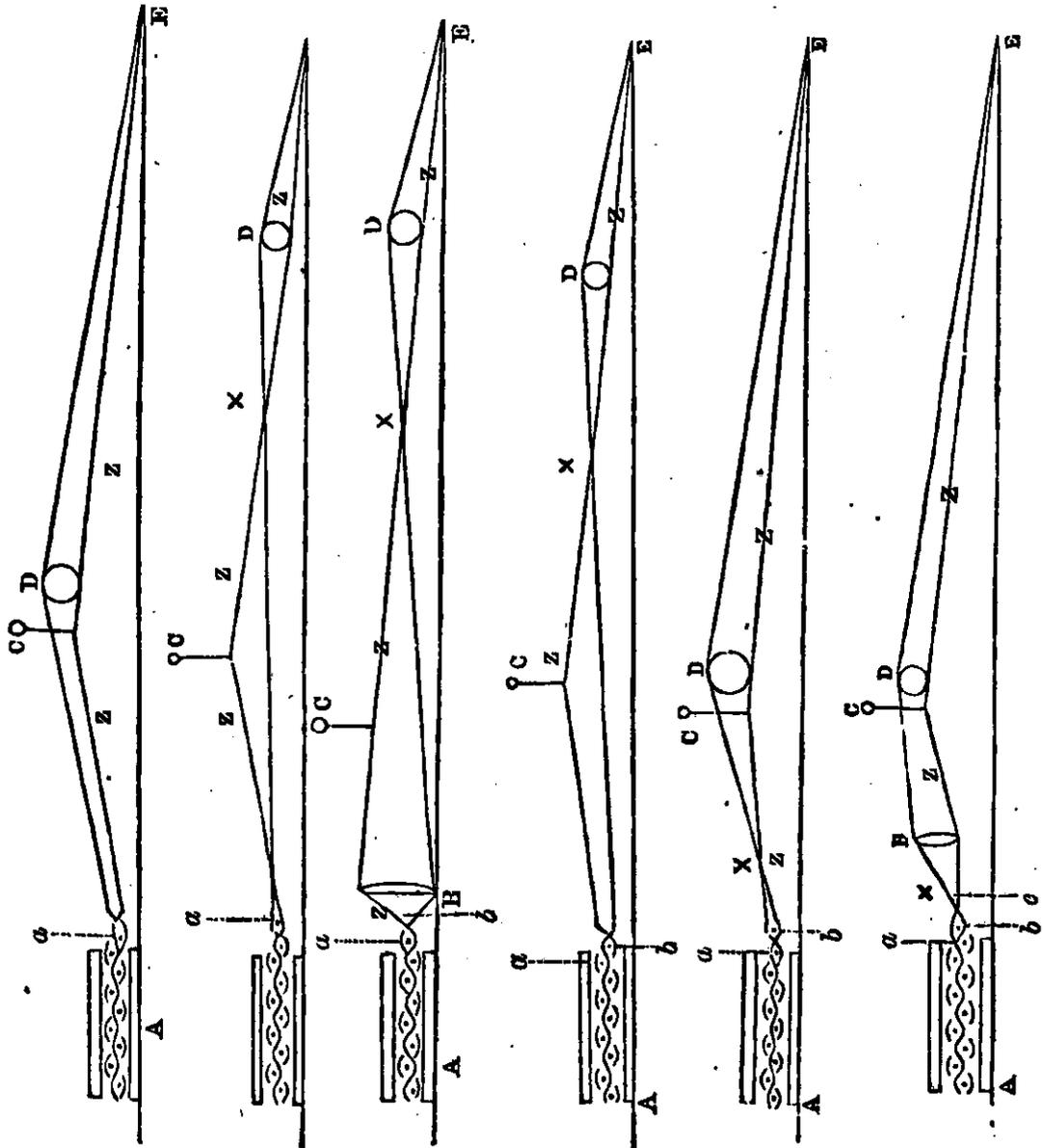


FIG. 27.

FIG. 28.

FIG. 29.

FIG. 30.

FIG. 31.

FIG. 32.

The process will be rendered clearer by the diagrams (Figs. 27 to 32) showing diagrammatically the changes in two successive warp threads. Throughout the letters refer to the same instruments as in Fig. 23; but here they are shown in section. An exaggerated diagram of the woven cloth is shown between the two flat pieces of wood A, while at C is merely shown a section of the stick and one loop of the *ghorí*. Figure 27 shows the arrangement after a weft thread has been driven home. The *sáras* D is then pushed toward E, whereby the warp thread (YY) not passed through a loop of the *ghorí*, which we will term the "free" warp, falls below the other (or "captive") ZZ warp, thereby introducing the cross X (Fig 28). Next the *beoní* (B) is inserted behind the *ghorí* and turned up (Figs. 23 and 29). A new weft thread b is then inserted in the space opened by the *beoní*; the *beoní* is then turned round, and this new weft thread (b) pressed home by its sharp edge. It is then taken out and Fig. 30 shows the resulting arrangement. The *sáras* is then pulled up close to the *ghorí*, whereby the free warp is raised above the captive throughout most of its length (Fig. 31). The *beoní* is then inserted between the *ghorí* C and the crossing of the warp X and turned upright, whereupon another weft thread (c) is inserted and driven home by turning the *beoní* flat. This leaves everything exactly as in Fig. 27, save that now weft thread (c) takes the place of weft thread (a). The cycle of operation is then repeated.

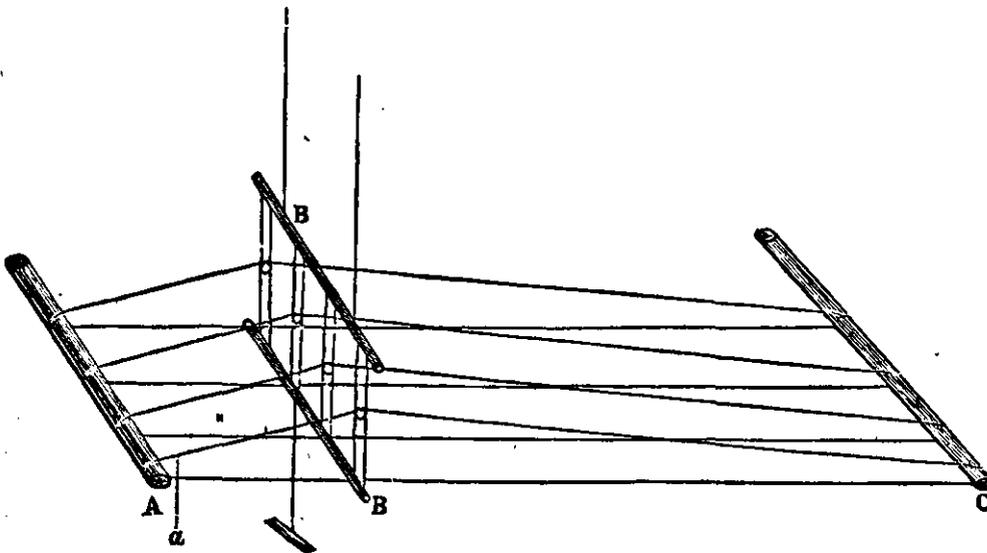


FIG. 33.

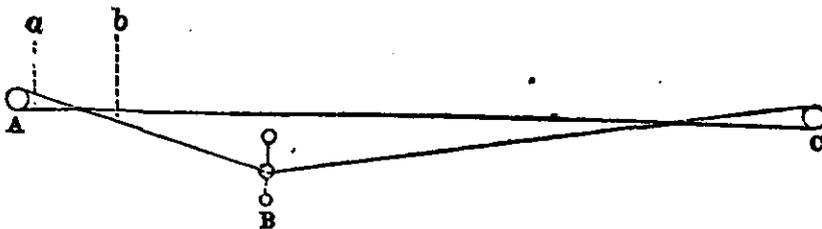


FIG. 34.

Another simple form of weaving is used for making *niwár*. This material is not unlike webbing; it is about two inches wide and very strong, and is used to make *chárpais*. It is woven in pieces up to 100 yards in length. For this extra thick yarn is always used, formed by twining together three strands of ordinary thick yarn

by means of the spinning-wheel. The warp threads are stretched between two horizontally fixed pieces of wood, of which that nearer the workman is termed the *udda*. A single heddle, called *gullai*, is used, which is quite similar to the *bai* ordinarily employed, only that its loops are not nearly so close together. This is supported by ropes overhead, so that when untouched it lifts the warp threads attached to it above those unattached, and has the usual arrangement beneath, so that it can be worked by the foot. Every other warp thread is passed through a loop of this. Fig. 33 shows diagrammatically the arrangement:—A is the *udda*, B the *gullai*, and C the stick over which the warp is stretched. There is an arrangement of the rope whereby A and C are fastened, so that as the *niwár* is woven it can be wrapped round A, while C is brought nearer the weaver; or more warp opened out, for the simple stick shown in the figure with warp merely wrapped half round it, may be replaced by the *bhanjhní* described in connection with the usual method of weaving. No shuttle is used, but the weft, which is also of triple yarn, is merely wound round a piece of stick known as *kanár*. We will suppose the *gullai* untouched (Fig. 33), holding half the warp threads above the other threads unattached to it—a weft thread (*a*) is put in and pressed into the right position by means of a piece of wood somewhat sharpened along one edge, termed a *hatta*. The *gullai* is then depressed (diagrammatically shown in Fig. 34, where the letters refer to the same instruments as in Fig. 33), and another weft thread (*b*) inserted and pressed home.

The yarn used is almost always hand-spun. The finished material sells by weight at 12 annas to one rupee the seer—a seer of hand-spun yarn makes about 30 yards, which is about the amount one man can weave in a day.

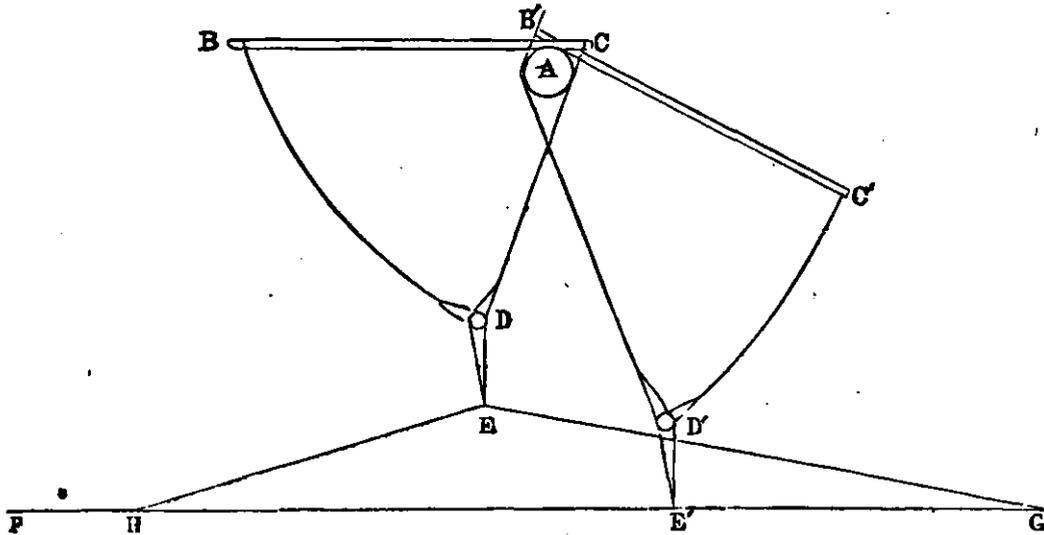


FIG. 35.

Dart-weaving.—The *dart* is of a very stout material made entirely of cotton, hand-spun yarn being employed. It is used in place of carpet. In it the weft threads alone are visible, the warp threads being always of undyed yarn, and the colour and pattern are solely due to the colours of the weft threads. The loom for weaving this material is of a simple nature. Fig. 36 (p. 57 from a photograph) shows a usual form. Two beams are firmly fixed a little above the ground, so that the distance between them is greater than the length of the longest *dart* to be woven. The warp is stretched to the required length between two stout bamboos, which are then strongly attached to the big beams by ropes. The beam nearer the weaver is termed the *charháo*, that more distant the *otár*. A simplified form of heddles is used. A stout beam (*gurria* or *jhillan*) is placed across the breadth of the warp and raised about two feet above

it. To this are suspended two thinner bamboos (known as the *bai ká báns* or *gullai*), and to these bamboos are fastened a sufficient number of string loops. Every second thread of the warp is attached to a loop of one *bai ká báns*, the others being attached to the loops of the other. Fig. 35 shows the method of raising the heddles—A is a section of the *guria*, F H is the woven *dari*, H E G the raised, H E' G the depressed, warp—DD' are sections of the *bai ká báns* with their attached loops—(two only are shown in the diagram)—DD' are suspended by the triangular instruments B C D, B' C' D' (termed *dam* or *makra*) of which B C, B' C' are bamboos, while the remainder is of string. The pieces B D, B' D' are longer than C D, C' D' and accordingly when the corner C (or C') is close to A, the warp threads attached to that heddle will be raised; while conversely if B (or B') be at A, those warp threads will be depressed. Two or more such arrangements are used according to the width of the *dari* to be woven. They are worked by hand, there always being at least two weavers, unless the breadth be very small, when but one *dam* is used. When the *dari* is so far woven that but little warp remains between the woven portion and the heddles, the whole heddles with their supports are moved further back, the warp remaining unmoved throughout. Further, the woven *dari* is not rolled up as woven, but, to prevent its getting dirty, sacking or some coarse cloth is put over the woven portion, for the weavers to sit on. In place of the usual shuttle a long piece of wood (two feet long) is used on which the weft thread is wound *lengthwise*; this is known as a *terf*. The weft is pressed home by a *panja*, an iron fork with 4 to 12 prongs. This, of course, requires repeated applications along the length of the weft. No *hatha* is ever used, or anything similar to it.

The yarn used is very coarse, that for the warp being formed by twisting together on the spinning-wheel four strands of ordinary yarn. The weft yarn is also fourfold, but is not twisted together, the four strands being merely wound together on the *terf*.

As the warp threads do not appear, and all patterns must be made by weft thread, the result is that weft stripes are the predominant pattern of *daris*, but other patterns are produced by introducing various lengths of various coloured yarn; thus at Aligarh *daris* are woven with letters.—English, Persian, Arabic, Sanskrit, &c., and the effect of a well-written Arabic sentence or monogram is distinctly good. A special form of *dari* is the *Jai namáz* or Muhammadan prayer mat, which varies in size from about two feet by one up to six by four or more. Aligarh, Bareilly and Agra are specially noted for *daris*, which are, moreover, made in most jails. At Bareilly the industry employs about 500 workmen, and the annual outturn is valued at Rs. 1,00,000. *Daris* are usually sold by weight, the price varying according to the fineness of the yarn and the pattern; one of average quality may be reckoned to cost 15 annas a seer or Re. 1-4 annas a square yard. But for difficult patterns the price rises rapidly, thus for a *dari* five by four feet with an Arabic monogram and text in the centre Re. 12 or more will be charged.

Carpet-weaving.—This is carried on mainly in Agra and Mirzapur, but especially in the former city, where a European-managed factory is at work.

The loom used is such that the warp is vertical; otherwise it closely resembles that used for *dari*-weaving, but there is usually an arrangement whereby the woven carpet can be wound round a beam at the bottom and more warp can be moved down as required. The arrangement of the heddles is either that just described as used in *dari*-weaving, or the more simple form shown in Fig. 37 is used. Here G E H and G E' H represent the two layers of warp, A' D and D' are sections of bamboos running horizontally the whole breadth of the warp. The two layers of warp are attached to the bamboos (*gulle*) D and D' by string loops, and these bamboos attached by rope to the ends of another bamboo stick B C (termed *kamant*), which is kept by the strain of the warp tight pressed against the bamboo beam A. The bamboos D D' are attached to one or more such arrangements according to the breadth of the carpet to be woven. It

will be seen that with the bamboo B C in the position shown in the diagram the warp layer H E G is pulled out; if the end C be near A, then the other layer will take its position.

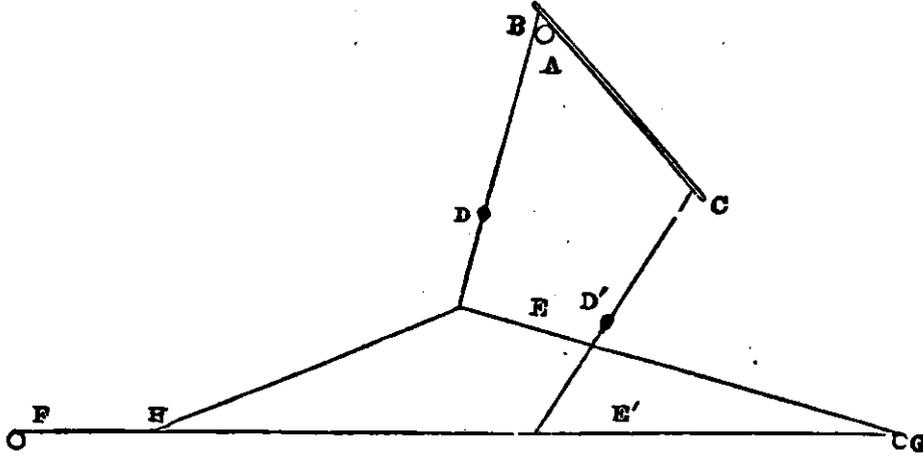


FIG. 37.

The warp for a carpet is always of strong yarn three or fourfold. The weft yarn is similar to that used for *daris*, but usually not so thick. To begin with, about one inch breadth is woven as for a *daris*, after that the carpet proper begins; a series of ties are made the whole breadth of the warp, one tie is made round every two threads of warp, one from the front and one from the back layer, and the ends cut off by a knife. The knife and the yarn for making the ties are hung up so as to be within easy reach of the weaver. When a line of ties has been thus put in, one or two more weft threads are inserted and pressed home with the *panja*, and then another line of ties. The pattern is produced solely by the colour of the yarn of which the ties are made, as the weft and warp threads are both completely hidden. For more complicated patterns or patterns not known to the workman, a man with a sample of the pattern to be produced tells the workman the number of ties to be put in and their colour. The number of workmen varies with the breadth of the carpet, there being on an average one to every two feet or thereabouts. The tying is done more especially by boys, who appear to like the work and to do well on the payment they receive, about Re. 1-12-0 per 6,000 ties. After a certain breadth is thus woven, the ends of the ties or "pile" as they are now, are cut to the right length with a large pair of scissors. Carpets may thus be made entirely of cotton yarn, or more usually the warp and weft threads are of cotton while the ties are of wool.

Very handsome carpets are produced in Agra, especially at the European-managed factory, Messrs. Otto Weylandt & Co., before alluded to. Those made entirely of cotton cost from 14 annas to Rs. 4-8-0 per seer, or about Rs. 3 to Rs. 15 per square yard; but anything cheaper than Rs. 6 or Rs. 7 per square yard is of poor quality. Carpets with woollen pile vary in price from Rs. 7 to as much as Rs. 40 per square yard. The price depends almost entirely on the fineness of the yarn used, the number of ties per square inch varying from about 50 up to 250, being more the finer the yarn used.

CHAPTER VIII.

FABRICS.

WE have seen by what processes fabrics are produced from the original cotton, and now will proceed to consider some of the more important fabrics produced.

These differ—

- (i) in the fineness of the yarn used in their construction,;
- (ii) in its colour ;
- (iii) in its arrangement ;

and these variations constitute the various patterns which are produced—

- (a) by the use of different coloured yarns ;
- (b) by the use of more than a single pair of heddles ;
- (c) by both these means ;
- (d) by specially interweaving yarn on a set system as the weaving of the fabric proceeds, e.g., *jámdáni* ;
- (e) by processes subsequent to the weaving, e.g., needlework.

This classification excludes patterns which are the result of printing and dyeing, (save so far as the use of coloured yarn involves dyeing) ; these will be considered later.

There is great confusion in the names of materials as reported from the different districts, the same material appearing under different names, and the same name referring to different materials in the various districts. I have endeavoured, therefore, to classify the materials into groups, the various members of each group being similar to one another.

I.—Plain woven, uncoloured materials.—The typical materials of this class are *gárha* and *gazi* ; they are usually of native spun yarn, but occasionally of machine spun, this is more especially the case in towns ; or the warp may be of the latter and the weft of the former. From specimens received from almost every district, there appears to be no general difference between *gárha* and *gazi*. In some districts *gárha* appears to be finer than *gazi*, in others the reverse. The yarn used is always coarse, the native spun variety being usually employed. According to quality the number of threads varies from about 24 to 40 per inch. It is a strong thick material, as closely woven as the yarn used will permit ; 10 yards 27 inches wide weigh about 2lbs. As it is never bleached, it is always of a pale fawn colour. It is used almost universally by the poorer classes for clothing, sheets, and for the external wrappings of *bastas* : these nondescript, shapeless bundles, so dear to the heart of the native, and without which he rarely travels. The price varies from nine pies to four annas a yard, according to width (18 to 27 inches) and quality ; but the average price is one anna six pies to two annas a yard. In Almora and Garhwál this material is called *ghar-bána*, and is woven only 12 to 15 inches wide. The price there is 11 to 12 yards the rupee.

Adhotar or *dhotar* is a similar, but coarser, material, having 20 warp and 20 to 32 weft threads to the inch. It is more loosely woven than *gárha*, and almost always of native spun yarn. Its use is for clothing, and average price one anna three pies the yard. *Dhotar* may sometimes have a red warp stripe on one side.

Mahmádi, *sallam*, *tallua*, and *tukri* are all very similar to *gárha*, but appear to be of slightly better quality. The usual price lies between two and three annas the yard.

Bhagai, *chadar*, *dhoti*, *dupatta*, *khes*, and *pagri* are names of garments rather than of materials ; but as the material is woven of the exact size and shape required, they deserve mention here ; all are merely rectangular pieces of cloth. *Bhagai* is a

small *dhoti* or loincloth ; the *dupatta* is a sort of scarf worn loosely round the neck or over the shoulders ; and the *pagri* is used for the turban. The material of which these are made varies according to the taste, caste and wealth of the owner. All but the *dupatta* are usually white or uniformly dyed : this latter may be white, coloured, or more or less elaborately embroidered. The *chadar* and *khes* are large pieces of thick, coarse material, which is frequently *gārha*, but sometimes of diagonal cloth requiring two pairs of heddles in its weaving. They are used for wraps ; a usual size is nine feet by six feet which would cost about one rupee. The *galef* is quite similar but is stronger and used for tying up grain and chaff (*bhūsa*).

Chandāha is very similar to *gārha*, but is twice as thick : it is woven in Mirzapur district. *Darab* and *domarga* are quite similar materials from the same district ; the only difference being that the former has two bordering red stripes, each half an inch broad, and the latter similar stripes one inch broad. *Darab* is said in Mirzapur to be worn exclusively by women of the *Majhwar*, *Kharwar*, *Punka*, *Pathār*, and *Bhuinhar* castes. These three materials are woven in pieces seven yards by 32 or 33 inches ; one piece weighs about 3lbs. *Bhāgalpuri* is of machine-spun yarn very similar to longcloth, woven in Fatehgarh and Mainpuri.

Girant, *addhi* and *tanzeb* are plain woven muslins of varying degrees of fineness ; *girant* being the coarsest, *tanzeb* the finest. *Girant* is produced in Basti, *addhi* in Lucknow, where it forms the ground material for the *chikan* and the *kāmdānī* work ; and *tanzeb* in Benares (Lohata), Bulandshahar, Fyzabad, Jaunpur, Mirzapur and Rae Bareilly districts.

Iktārā lamgaja and *thathawa* are peculiar, very flimsy materials. They are all quite similar to one another, and appear to be three names for the same material. *Iktārā* was reported from Lucknow only. *Lamgaja* is said to be the general name in the plains, and *thathawa* in the hills ; but a specimen of this material under the name *thathawa* was received from Bijnoor. It is woven of hand-spun yarn 8 to 24 threads to the inch, both of weft and of warp, but usually the warp threads are closer together than those of the weft. After weaving the fabric is bleached, heavily starched and well beaten with mallets. A piece 6 yards long 11 inches wide with 24 warp and 8 weft threads to the inch, sells in Naini Tal district for two annas.

The following information as to its uses was received from that district :—

“ The wicks for the *hom* sacrifice of the Hindus in which *ghī* is burnt, must be made of cloth that has never been used before, and the same with regard to the cloth used for wiping vessels used in worship, consequently the very cheapest cloth is used, in the plains *lamgaja* and in the hills and Thibet *thathawa*. There is a considerable export of this material to the shrines of Badrinath and Kedarnath and to Thibet. Also among low castes in the hills the number of pieces of cloth given at a wedding determines its respectability. Poor people get over this difficulty by presenting a large number of pieces of *thathawa* at two annas the piece.”

II.—*Coloured fabrics plain woven.* *Dobra* is a loosely woven coarse material, the yarn for both warp and woof being hand-spun and double (20 warp to 24 weft threads of double yarn to the inch). The pattern is usually a coarse check, and the use for a floor covering.

All other plain woven fabrics are very similar to one another ; they are coloured checks and stripes, used by males and females for apparel—*sāris*, *lenghas* (skirts), *paijāmas*, *kurtas*, &c. The finer varieties are of machine-spun yarn, the coarser of hand-spun, while many have the warp of the former and the weft of the latter. On an average these materials contain 40 threads to the inch in either

direction and cost one anna six pies to four annas per yard (the average width being 36 inches) according to pattern and quality.

The names *arha*, *churia*, *dhandar*, *doria*, *gilahra*, *kamtz*, *khara*, *máldáki*, and *sítalpatí* appear to refer to striped patterns; while *chárkhána*, *nagína*, and *páplin* are predominantly checks; *battu*, *bhílní*, *bhutiya*, *gabrún*, *gegám*, *kesarí*, *mungya*, *pattu*, *patuka*, *sínkhia*, *súsi*, and *tápti* are materials showing both checks and stripes. *Chárkhána*, *gabrún*, *gegám*, *sínkhia*, *súsi*, and *tápti* appear to be general names, the others being locally used; but the distinction between even these is practically *nil*. Further, the names *chárkhána*, *gabrún*, and *sínkhia* cover certain patterns requiring more than a single pair of heddles in their production. In fact most *gabrúns* do so. The *rumál* is a piece of cloth usually of one of the above patterns, about 18 inches square. *Dkúpchan* is a well-marked variety, the warp and weft are always of different colours, but either is all of the same colour; this produces a "shot" effect.

Dosuti appears to be a general name for any material in which the warp and weft are of double yarn. According to some reports it is an alternate name with *dobra*.

Doridár dosuti is a corded check, the cords being formed by the insertion every quarter of an inch, both in the warp and weft, of a thick cord made of 10 or 12 strands of yarn. Somewhat similar is *sozni*; but here the cords are confined to the weft, the warp being of uniform yarn; a sample from Sarauli in Bareilly district shows the following arrangement of weft threads:—

Twelve thick threads, then five pairs of one thick and one thin thread, followed by the 12 thick threads, and so on. This material, like *doridár dosuti*, is used for counterpanes.

III.—*Patterns requiring more than one pair of heddles.*—Here again we are met by the same confusion among the names applied to various fabrics. As noted above, *chárkhána*, *gabrún* and *sínkhia* may require more than one pair of heddles in their production, and so fall under this class. Such *chárkhánas* always show the characteristic check. The other two, as also *kánáwez*, *phúldár*, *samundar lahár*, and *unchndo* show nothing distinctive. They are generally woven in various colours with diagonal or W-shaped patterns, occasionally more complicated geometrical designs are produced. *Dotahi* is a loosely-woven material (30 double threads to the inch) used for a bed covering. *Chauthai* (Fig. 44) is a strong, closely-woven fabric, generally of undyed yarn, but sometimes with a red warp stripe down one side, and red weft stripes at intervals of a yard or so. The price of a well-woven piece will be eight or ten annas the yard. A specially good variety is woven at Deoband in Saháranpur. One of the favourite patterns for *chauthai* is called *bulbulchashm* (nightingale's eyes). It consists of a double set of diagonal stripes with small lozenges inside the lozenge-shaped figures formed by their intersection. The *gulbadans* (Figs. 47 and 48) form a well-marked variety. They are also sometimes known as *pattidár*; while one variety of this series made in Bara Banki is said to be an imitation of Benares silk (Fig. 39), and is specially known as *sangi*. These are characterised by having the pattern confined to one side only. The warp is usually all of one colour, while the weft is of various colours; but the heddles are so arranged that it is on the pattern side of the warp for at least three-fourths of its length. The prevailing patterns are combinations of stripes and steep diagonal or W-shaped markings.

Figs. 38 to 41 and *a* in Figs. 42 to 49 show the design, and *b* in Figs. 42 to 49 the weave plan of several of the more important fabrics of this class. In the figures the portions enclosed by the inner lines show the whole pattern that is repeated.

These figures (for which see pp. 59-63) are obtained as follows:—

Suppose the warp threads white, and weft threads black; then wherever the weft is uppermost, the fabric is black: this corresponds to those squares containing the

black dots. Thus the dots show where the weft is above the warp. (Save in Fig. 39, where it was more convenient to reverse this, and show by dots where the warp was above the weft.)

The weave plan (b in Figs. 43 to 49) shows how the warp threads are attached to the successive heddles, e.g., in b Fig. 43 the first warp thread (reckoning from the left) is attached to the fourth heddle (counting as the first heddle that furthest from the weaver), the second to the first, and so on.

Fig. 38 is a *kánáwez* from Aligarh: the warp is black or deep blue and weft red; and the result is distinctly handsome.

Fig. 39 is an imitation of Benares silk from Bara Banki (*sangt*). The draft shows the warp uppermost. The warp is composed of single threads and the weft of double—consequently the diagonal markings are much steeper than would appear from the diagram. The even numbered warp threads from 2 to 36 are all of the same colour, white and yellow, in alternate repeats. The odd numbered ones from 1 to 35 are red, as also is the whole of the weft. From 37 to 54 the warp is entirely of black yarn, and from 55 to 72 of yellow or white, according as the even numbered warp threads 2 to 36 are white or yellow. The warp threads connected by the continuous line in the figure are thus all white (or yellow).

Fig. 40 is a kind of *gabrún* from Agra, termed *nákhunda*: the warp is of white thread, while the weft is in stripes of various colours. The weaving is so done that the warp length of the lozenges is .27 inch and the weft length .21 inch. The price of this material is five annas a yard.

Fig. 41 shows the draft of the most complicated pattern I have met with: it is another variety of *nákhunda gabrún* and was probably woven in Aligarh district. The warp is of white and weft of blue thread, both being double, and is woven so that the pattern is completely symmetrical. The 74 threads in the complete repeat occupy rather over $1\frac{1}{2}$ inches. Its price is the same as that of the preceding. Fig. 42 is a *stnkhia* from Aligarh: the warp consists alternately of six white and six black threads, while the weft is all of white. Each contains about 48 threads to the inch. The width is $\frac{1}{2}$ yard, weight per yard $2\frac{3}{4}$ ounces, and price two annas nine pies per yard.

Fig. 43 shows the draft and weave plan of Muzaffarnagar *tobia* (woven at Káwal in that district), very similar to an ordinary huckaback towel. The order of depression of the heddles is shown in the following table (the heddles are numbered in the plan (b), and those heddles whose numbers are in the same vertical column are simultaneously depressed):—

$$\begin{array}{cccccccc} & 1 & 2 & 1 & & & & \\ \parallel & 3 & 3 & 3 & 2 & 3 & 2 & 3 & 2 & \parallel \\ & 5 & 3 & 4 & 3 & 5 & 2 & 3 & 2 & \parallel \\ & & & & 5 & & & & & \end{array}$$

In the material examined the warp was of machine-spun yarn, the weft of hand-spun. It is woven in a piece of 12 yards length and about 18 inches width. One piece required—

	Rs.	a.
$\frac{1}{2}$ seer machine-spun yarn at Re. 1 per seer	...	0 8
12 chhitaks hand-spun yarn at 10 annas 8 pies per seer	...	0 8
Total cost of materials	...	1 0

Such a piece sells for Rs. 2-4-0, leaving Re. 1-4-0 to pay for all the other materials required and four days' labour of one man.

Fig. 44 is a *chauthai*. The piece examined was woven at Shahpur in Muzaffarnagar district, and was entirely of hand-spun yarn both warp and woof being of double thread. It is woven in pieces of 10 yards with a red warp stripe on one side. One and a-half seers of yarn at 10 annas 8 pies per seer are required for this amount, and three annas worth of red yarn. The piece sells for Re. 1-8-0, having cost Re. 1-3-0 for materials, leaving a profit of five annas for three days' work. The heddles are depressed in the following order:—

$$\begin{array}{cccc} \parallel & 1 & 1 & 2 & 2 & \parallel \\ & 3 & 4 & 4 & 3 & \end{array}$$

Fig. 45 is a *gabrin* from Jansath in Muzaffarnagar. The depression of the heddles is according to the following scheme:—

$$\parallel 2 \ 3 \ 2 \ 3 \ 1 \ 4 \ 1 \ 4 \parallel$$

The yarn used is entirely machine-made (count 40). At Re. 1-4-0 the seer it costs Re. 1-12-0 for a piece of 12 yards length. This takes a man five days to weave and fetches Rs. 2 to Rs. 2-12-0, according to demand.

Fig. 46 is a *gabrin* woven in Farukhabad; the depression of the heddles is $\begin{array}{cccc} \parallel & 1 & 1 & 2 & 2 & \parallel \\ & 4 & 2 & 3 & 4 & \end{array}$, and the warp consists alternately of five white and five purple-brown threads, while the weft is entirely blue. This is wholly of machine-made yarn; yarn for a piece 12 yards long costs Re. 1-9-0, the dyeing is 10 annas: and the fabric sells at five annas a yard, leaving Re. 1-9-0 for starch, &c., and five days' work.

Fig. 47 is a *gulbadan* from Farukhabad, and is not unlike the fabric shown in Figure 39. The arrangement of the warp threads, which are coloured, is as follows:—

Four red, 2 yellow, 10 alternations of green and orange (20 threads in all), 2 yellow, 4 red, 2 yellow, 10 alternations of red and orange, 2 yellow, 4 red, 2 yellow, 10 alternations of blue and white, 2 yellow, and then repeat. The weft is entirely red. The depression of the heddles is—

$$\begin{array}{cccccccc} \parallel & 2 & 1 & 2 & 3 & 4 & 6 & 5 & 1 & \parallel \\ & 5 & 3 & 4 & 8 & 7 & 8 & 7 & 6 & \end{array}$$

The piece is $4\frac{1}{2}$ yards long, and the yarn required costs 12 annas; the piece sells for 18 to 22 annas. Fig. 48 also shows a *gulbadan* from Aligarh.

The depression of the heddles is—

$$\begin{array}{cccccccccccc} \parallel & 4 & 3 & 2 & 1 & 8 & 7 & 6 & 5 & 6 & 7 & 8 & 1 & 2 & 3 & \parallel \\ & 6 & 5 & 4 & 3 & 2 & 1 & 8 & 7 & 8 & 1 & 2 & 3 & 4 & 5 & \end{array}$$

The warp is of variously coloured threads arranged as follows:—

Sixteen yellow, 8 red, 16 yellow, 4 white, 4 purple, 4 white, 28 alternations of yellow and green (56 threads), 4 white, 4 purple, 4 white, 8 red, 4 yellow, 8 red, and then repeat. The yarn required for one piece (which is 40 yards in length) costs Rs. 4-2-6 and the fabric sells at $3\frac{1}{2}$ annas the yard, thus leaving Rs. 4-9-6 for the starch, &c., and the 14 or 15 days' labour required for the weaving.

Figure 49 shows a *phulwār jāldār* as seen on the loom at Aligarh. The depression of the heddles is :—

1	5	1	5	2	5	2	5	1	5	1	5	1	6	1	6	1	5	1	5	
3	6	8	6	3	6	3	6	3	6	3	6	2	7	2	7	2	7	2	7	
4	8	4	8	4	7	4	7	4	8	4	8	8	8	8	8	8	4	8	4	8
I																				
1	6	1	6	1	5	1	5	1	6	1	6	1	5	1	5	2	5	2	5	
2	7	2	7	2	7	2	7	2	7	2	7	3	6	3	6	3	6	3	6	
3	8	3	8	4	8	4	8	3	8	3	8	4	8	4	8	4	7	4	7	
III				IV																

The weft that is put in when the groups of depressions I and III are used is black, while for II and IV it is white. The warp threads 1—4 and 21—24 are black, the remainder white. The pattern is thus a kind of check. The yarn required for one piece (50 yards) costs Rs. 6, and the material sells at five yards the rupee leaving thus a profit of Rs. 4 for the 12 or 14 days' work required.

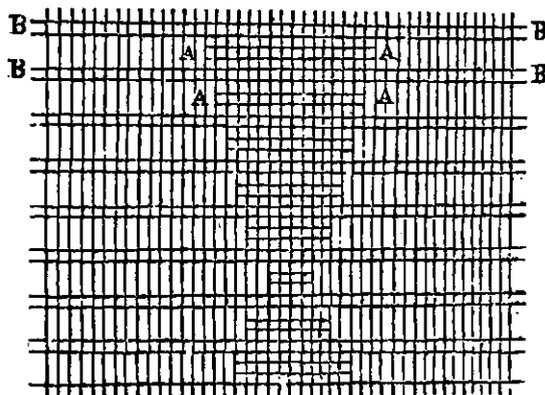


FIG. 50.

Jāmdānī.—This is a hand-woven figured muslin, made at Tānda, and in one or two other villages in the Fyzabad district. This town has long been famous for weaving; 30 per cent. of the population are engaged in weaving, and at the time of the mutiny several European firms existed here. But only some six families produce the *jāmdānī*, of whom half are *julāhas* and half *kasāis*. The body of the fabric is a fine muslin, quite similar to *tanzeb*, the pattern is interwoven while on the loom, being made up by a series of weft threads of suitable length. Between each pair of weft threads a pair of threads of the figure to be woven is put in, the heddles being raised, or depressed after one has been inserted. These are inserted between the requisite number of warp threads by a very small spool of very fine yarn. Fig. 50 will make this clearer: BB are threads of the ordinary weft, AA those of the weft to make the design. On the figure the spaces are much exaggerated, the yarn to make the figures is very fine, so that the ground work appears approximately even. The figures are made from memory or from a pattern drawn on paper. Three or four men or more often one man and two or three boys work together at one loom. The width of a piece is about 30 inches and length 10 yards, such a piece would take one man and three boys one to two months to weave, and fetch Rs. 6 to Rs. 13 according to the pattern. This kind of weaving is said to date from the time of the Nawāb Saīdat Ali Khān; but the present handicraftsmen do not appear very clear as to the origin of it. Like all superior hand-weaving, it appears to be dying out; the Mahārāja of Ajudhia is said to be the sole purchaser in Oudh, but there is some trade with Nepāl in this material.

Very similar work is done at Jais in Rae Bareli district by one Madár Bakhsh, and in Rae Bareli itself by a *juláha* by name Ahmad-ullah. But fabrics woven by Madár Bakhsh of Jais are the finest specimens of this work, and his family appear to have been the originators of this style. He makes caps and handkerchiefs with various patterns and words in Arabic or other languages interwoven in this way. Some of his caps fetch as much as Rs. 10, and some handkerchiefs (*rumál*) as much as Rs. 100. A *rumál* which sells at Rs. 50 will take 3½ to four months to weave. Madár Bakhsh estimates his earnings at Rs. 15 to Rs. 20 per month, and is the holder of several medals and certificates, among which may be mentioned one of the Indian and Colonial Exhibition of 1886, and one of the Calcutta Exhibition, 1883-84.

The origin of Madár Bakhsh's craft is thus related in the district report: "His family has been resident in Jais for some 800 years. Towards the end of last century one of the family, Bhika, being ambitious to excel his fellow *juláhas*, after several attempts hit upon the idea of interweaving words, flowers, etc., into fine muslins. He eventually prepared a *kurta* (a kind of coat) and *pagri* (turban) of the finest materials both entirely in one piece and elaborately interwoven with the names and praises of the then reigning Nawáb of Oudh, Asaf-ud-daulah, to whom he presented them, receiving in return a large grant of land in perpetuity. This is still held by his direct descendants, who have quite abandoned weaving, the craft having passed to a younger branch, of which Madár Bakhsh is the sole working member. After having been thus rewarded by Asaf-ud-daulah, Bhika made another similar *kurta* and *pagri* for the Nizám of Hyderabad, Sikandar Jah, and presented them to him. In return he received an order for Rs. 5,000 on the treasury at Nagar Karnul. This he encashed, and remitting part home by *hundis*, took the remainder with him, but on the way was strangled and plundered by *thags*."

Chikan and kámdánt work.—This is embroidery in silk or cotton, and gilt thread, respectively, and is a speciality of one or two firms in Lucknow, of whom Messrs. Ashik Ali and Yusuf Ali of Parchár Galli, Chauk, may be mentioned as holders of a medal of the Indian and Colonial Exhibition of 1886.

The ground material is a fine muslin termed *addhi*, and the *chikan* is made simply with an ordinary needle and thread. The chief varieties of patterns used are:—

"*Muri*," for which the thread is sewn on so as to produce an oblong raised lump, somewhat the shape of a minute carrot.

"*Jáli*," a net-work of holes, is made by tightly drawing together the threads of the muslin.

"*Bachia*," the thread sewn on forms a grain-like appearance similar to *muri*, but very much smaller and circular or square.

"*Tuppa*," a set of straight parallel stitches used in filling in large pieces in the pattern.

"*Zanjíri*," chainlike stitches used when long lines are required.

"*Pechní*," long continued lines, but not chain-like.

For the *kámdánt* hollow silver-gilt wire is sewn on; a very fine needle and very fine thread is passed through the hollow of the wire, and when a piece of wire of suitable length has been passed on the thread so much is stitched on to the muslin which is kept stretched horizontally on a framework. The two varieties of work are sometimes combined.

Some of the work is very good and tasteful. A fine *sári* of either *chikan* or *kámdánt*, 4½ yards long, will cost Rs. 10 about, though this sum will be exceeded for more elaborate patterns. The fault of introducing too much gilt thread and of so rendering the result tawdry is avoided.

In Azamgarh there is a considerable industry in the weaving of fabrics containing cotton and silk or *tasar*. The name *sangī* is there used for such a material, the pattern of which consists of stripes; others are *kalandra*, *ghalta* and *khātiri*, the patterns of these are various combinations of checks and stripes. Also many of the names of fabrics already given are applied to similar fabrics consisting only partly of cotton. The warp in these compound fabrics is invariably of cotton. This industry is specially carried on at Mubarakpur.

Although not strictly cotton fabrics, mention may here be made of two other kinds of cloth woven in the hills from the *bhāng*-yielding hemp (*Cannabis sativa*),* and the material known as *kapāst*.

The following note on the hemp cloth was contributed by Pandit Dharmanand Joshi, Deputy Collector of Garhwāl:—

“The hemp-plant used to be cultivated more largely in this district in former times; but even now it is grown more extensively than cotton. It is grown generally above an altitude of 4,500 feet, and in villages inhabited mainly by the Pavilas. These people rank socially above the Doms, but below the Rājputs. They do not wear the sacred thread.

“The preparation of the hemp fibre and weaving thereof is confined to these people and the Doms, being held in abomination by the Rājputs and Bráhmans, who, however, have no prejudice against wearing the woven cloth. If they cultivate the hemp-plant they employ men of these lower castes to extract and weave the fibre. The male plant is known as *phālānga* and the female as *kalānga*. The former yields the finer fibre, while from the female plant *charas* is produced, and a coarser fibre used for the manufacture of bags, whereas the cloth from the finer fibre serves as wearing apparel. The preparation of the fibre is the same in either case; the plants when ripe are cut, tied in small bundles, and immersed in water for 10 or 12 days, whereby the outer sheath becomes rotten and soft. The fibres are taken out by hand and spun into thread, which is woven in the usual way. The spinning and weaving are generally done by the women.

“The pieces woven are 2½ yards by one foot three inches, and three pieces sown together are sufficient for all the clothing required by an adult male or female. Children use but one or two pieces. This is the only clothing worn by the poorer classes, but for those better off a cotton or woollen jacket is worn in addition. It is a most durable material of great strength. The price of a piece varies from Re. 1 to Re. 1-8-0, the higher priced cloth is, however, usually only made to order. The fibre is also made into ropes.”

A sample containing 48 warp and 18 weft threads to the inch, priced at Re. 1-8-0 the piece, weighed slightly over 2½ ozs. (actually 993 grs.) per square foot. Another priced at Re. 1 the piece contained 36 warp and 13 weft threads to the inch, and weighed slightly over three ounces (1,363 grains) to the square foot.

Kapāst is the cotton-like tomentum growing on the under side of the leaves of *Gerbera lanuginosa*, a plant known as *kapsāla* or *párbotā* growing in the central Himálayas at elevations between 4,000 and 8,000 feet. It is not cultivated. It bears seven or eight leaves disposed radially like those of a daisy, each leaf being four to six inches long by 2 to 3 inches broad, glassy green on the upper surface and on the under covered with the *kapāst* which forms a non-continuous membranous coating. The leaves are collected in the rains, and before they wither the tip of the leaf is broken off for perhaps half an inch, and the *kapāst* which is not so broken off, is stripped off in one piece and twisted into thread on an ordinary spinning wheel. The unwoven *kapāst* is very like a mass of thin shreds of fine white kid both in appearance and to the touch, each shred usually being as long as the leaf whence it was derived and often half an inch wide, but so thin is it that the *kapāst* ‘yarn’ spun,

* See Cross and Bevan “Indian Fibres,” p. 27, and Watts’ Dictionary *Sub Æc. Cannabis sativa*.

so that the *kapás* from one leaf does not yield a much greater length of yarn than the length of the leaf, is not more than one-twentieth inch in diameter. If it be rubbed up with dry wood ashes, it makes excellent "touch" cotton for flint and steel. The yarn is woven in the ordinary way into blankets and more especially sacks, which are of great strength and durability, lasting (in constant use) 12 to 20 years, while the "kiddy" texture of the *kapás* admits of them being so closely woven as to hold water for a short distance. They make excellent flour sacks. One measuring three feet six inches deep by one foot ten inches broad, containing 21 warp and 6 or 7 weft threads to the inch, weighed 4lbs. and cost Rs. 2. The use of this material does not, however, extend beyond the limits of the tract where the plant grows.

CHAPTER IX.

BLEACHING OF COTTON FABRICS.

THE greater part of the cotton cloth produced undergoes no process of bleaching whatever beyond being washed in the ordinary fashion. When, however, the material is required to be whiter than it is naturally, it may be boiled with water containing *reh* (the alkaline efflorescence covering square miles of the plains of these provinces) or wood ashes, the ashes of *Butea frondosa* (*dhák*) being specially mentioned as good for this purpose. To secure greater whiteness the cloth is soaked for several hours in water containing the dung of sheep, camels, asses, horses or cows, or it may be smeared over with this material and then well washed, or sometimes boiled with water in which some *reh* or other alkali has been dissolved. In some cases the order of these operations is reversed; in any case the cloth is finally well washed in a tank or stream. Occasionally after this treatment the cloth is spread out in the sun and kept damp for a day or two, so that the sun's rays may effect the bleaching, after which a very faint tinge of blue is given by dyeing in a very weak indigo vat.

The use of the soapnut, *ritha*, *Sapindus mukorossi*, is only reported from Muttra.

CHAPTER X.

DYEING OF COTTON FABRICS.

As dyeing was specially treated in a separate monograph last year, these remarks must not be considered in any way exhaustive. They merely embody such information on the subject as I have been able to collect.

It appears that about half the cotton cloth woven is dyed after weaving, or is made of coloured yarn. I give below a brief account of the more important dyes with the methods of their application to cotton cloth, but restrict myself to native dyes. Dyeing with the imported coal tar colours as practised in India is so simple that no remarks thereon are needed, while for information as to those dyes themselves, their manufacture and application, I would refer the reader to any of the numerous works *specially devoted to this subject.

I. *Indigo* (*níl* or *úú*).

The method of extraction from the widely cultivated *Indigofera tinctoria* is well known. The active colouring matter is Indigo Blue $C_{16}H_{10}N_2O_2$, which exists in the plant as the glucoside Indican; this is dissolved out by water and decomposed into a glucose and indigo-white, which by exposure to air is oxidized to indigo blue, which being insoluble in water settles at the bottom. It has been made artificially by a complicated process (Ber. d. deutsch. chem. ges. 13.2260), which has recently been so improved as to enable the artificial product to be sold at a price but little above that of the natural dye.

*As e. g., Nietzki's "Organic Dyestuffs"; Benedikt and Knecht's "Coal Tar Colours."

Dry indigo as sold contains on an average 50 per cent. of indigo blue ; this is never dyed as such, but always reduced to the soluble indigo-white, into the solution of which the material to be dyed is dipped and the blue colour developed by exposure to the air.

The method adopted in this country to effect the reduction is to mix together with water, in a closed jar, indigo, some alkaline material and some organic substance. The alkali is usually lime or something containing it, as old mortar, or else soda (*sajji*) or something capable of yielding it, as *reh*. For the organic material, which is the true reducer, molasses (*gúr*) is usually employed. But occasionally other materials are used ; thus in Jhánsi a vat is said to be made by adding the boiled extract of 2 lbs *panwár* seeds *Cassia tora* to $\frac{1}{2}$ lb of lime and 1 lb of indigo mixed in 28 gallons of water. Such a vat is ready in 8 or 10 days. The following table will give some idea of the composition of an indigo vat:—

	Indigo.	Molasses.	Alkali.				Water.	Ready in	Keeps for
			Sajji.	Mortar.	Lime.	Reh.			
	Oz.	Oz.	Oz.	Oz.	Oz.	Gins.	days.	days.	
(I)	16	4	...	...	8	...	12	...
(II)	16	1.5	...	...	12	...	8	5
(III)	16	8	...	...	16	...	10	...
(IV)	16	16	...	...	16	8	6	1
(V)	16	4	...	64	...	6	12	$\frac{1}{2}$	
(VI)	16	16	16	...	16	...	10	4-7	

These materials are mixed in a large earthenware vessel buried in the ground with its mouth only above, which is kept closed ; they are stirred at intervals. When ready for use the surface is usually covered with blue bubbles, while the solution itself should be yellowish. The time before the vat is ready for use decreases as the temperature increases.

The cloth to be dyed is dipped in this solution without any other previous preparation than ordinary washing, and dried in the air, whereby the blue colour is developed. For darker blue the process is repeated once or oftener, while for very light shades the vat is diluted, or one which has already been employed to produce darker shades is used. As a rule, no subsequent treatment is given ; occasionally the dyed cloth is dipped in a weak solution of alum, or it is daubed over with some sweet (*sesamum*) oil cake (*míthi khalí*), dried and washed. This latter process removes the evil smell imparted by the vat. According to the amount of indigo with which the cloth is impregnated *ásmani* (light blue) or *nila* (dark blue) is produced.

When indigo is combined with any other colour the cloth is always dipped first into the indigo vat and then into the solution of the other dye. The other dye is never added to the vat. A whole series of bluish reds, purples and reddish blues are produced by dyeing first with indigo and then with safflower (*kusum*), according to the relative strengths of the two dyes. Beginning from an almost pure blue and ending with an almost pure pink or crimson, we have the series—*surmai*, *fálsai*, *abirí*, *bajini* (dark violet), *sausani*, *kasni* (mauve) *úda*, *náfarmáni* and *kokai*.

Greens are produced by combining indigo with turmeric (*haldí*, p. 38), pomegranate-rind (*náspál*, p. 38), *arúsa* (p. 40) and other materials. Thus indigo with turmeric, the turmeric being in excess, gives *dháni* (the green of young rice, i. e., a vivid yellow green), with still less indigo *pista* or pistachio green is produced. *Kahi*, or sap-green, is produced from indigo, turmeric and pomegranate-rind ; while if less turmeric and more pomegranate-rind be used, and a dip be given in an infusion of *dhák* (*Butea frondosa*, p. 40) flowers, a deeper green known as *tarbúzia* (or melon green) is produced. As an illustration of this compound dyeing the production of *kahi* (sap-green, also termed *sabz-kai*) may be described. The material is dipped first into a moderately strong indigo vat, dried ; then into an infusion of turmeric made as described under that material (p. 38), washed and dried ; dipped into an infusion of pomegranate-rind, dried ; then into the same infusion but with the addition of alum,

washed and dried. Dull olive greens are produced by dipping first in the indigo vat then successively in extract of myrobalans (see p. 39), a cold solution of alum and extract of *arúsa* (*adhatoda vasica*).

A blue-black (*kála*) is obtained by dipping in a strong indigo vat two or three times, drying between each, and then into a mixture known as "*lohár-ki-siyáhi*," or iron-black, which is made by filling a large vessel with old iron and water and adding about one part molasses to 40 of water. This is ready for use after a month's standing, during which it is well stirred every day. The active substance in the solution is probably *ferrous acetate*.

Indigo and infusion of *dhák* flowers (p. 40) produce, as the colour of the *dhák* predominates more and more, *angúri* (grape green), *keorai* (greenish buff), and *jojai* (a still less greenish buff). Indigo with verdigris (*basic acetate* of copper) and *dhák* give an orange red known as *pelai*. Indigo is also frequently used in combination with various coal tar colours. It gives a fast blue itself, and in combination with other dyes the tints produced are fast if these are.

2. Safflower (*Carthamus tinctoria*, *kusum*).

This plant used to be extensively cultivated, but its use as a dye-stuff having greatly diminished, very little is now grown. The colour is somewhat difficult to extract, and more expensive than coal tar dyes, yielding approximately the same tints, and not fast. Its use is now restricted almost to certain occasions: thus it is specially used for dyeing the bride's dress at the wedding ceremony. It is said to be forbidden to Sunni Muhammadans.

The colouring matter is extracted from the flowers, which are picked, dried and powdered. They contain two coloured substances—a yellow material $C_{24}H_{30}O_{15}$ which is soluble in pure water, but is useless as a dye, and a red one Carthamin, $C_{16}H_{16}O_7$,—very slightly soluble in water, but easily soluble in alkali, from which solution it is precipitated by an acid as a lustrous green powder. These facts determine the methods of its extraction and application. The bruised flowers are lixiviated with water till the water is no longer yellow coloured; they are then macerated with addition of carbonate of soda (*sajji*) or wood ashes, placed on a cloth filter, and again slowly lixiviated. The solution so obtained is collected in four separate vessels. If $2\frac{1}{2}$ lbs of flowers be used, the first quart of solution, which is of a deep red colour, is collected separately, then a second quart, and so on till four separate quarts are obtained in all. To dye, the cloth is first dipped into the solution of suitable strength and then into a bath containing lemon juice or some other acid as extract of mango peel or tamarind fruits. This neutralises the alkali and precipitates the carthamin in the fibre, just as indigo is precipitated on the oxidation of the indigo-white absorbed from the vat. If very deep colour be required the cloth is dipped first into the weakest extract, then into the stronger solutions progressively, dipping in acid and drying between each. A whole series of pinks and crimsons are produced by using progressively stronger solutions of safflower: beginning with the palest colour we have in order: *motia*, *chiráhi*, *piázi* (pale rose-pink), *kadeli*, *bandáni*, *gul shaftalu* (cerise), *shangráfi*, *gulábi* (rose-pink), *gulanár*, *surkhi* and *lákhí*. This order is not always adhered to, and occasionally some of these names are given to compound colours: thus *surkhi* is sometimes produced by the addition of a little turmeric extract to the carthamin solution; while *gulanár* is occasionally the result of safflower with addition of a little infusion of *harsinghár* (p. 40).

We have already seen that safflower is frequently combined with indigo; it is, or more correctly perhaps was, used in combination with many other materials. To produce these the cloth is usually dipped successively into the different solutions, being dried between. Safflower and turmeric produce a series of orange reds, oranges

and reddish yellows: *sonela* (orange), *narangī* (deep orange) and *sonahra* (a still deeper orange) are obtained by the use of progressively larger quantities of turmeric. Another series of oranges and yellows is obtained by the combination of safflower with *harsinghār* (p. 40). Thus if cloth dyed *gulābi* (rose-pink) with safflower be dyed in *harsinghār* the result is orange (*narangī*), whereas if the safflower solution be weaker, so that it only produces *piāzi* the result is golden yellow (*champaī*). Other tints of buff and orange thus produced are known as *badāmi* (almond yellow), *sharbati*, *jogai* (buff) and *amrasi*. In these the *harsinghār* is in excess, while if safflower predominate, the scarlet, termed *shangrāfi* is produced. Safflower and *tūn* (p. 40) with or without the addition of *harsinghār*, also yield a series of buffs and oranges. Equal quantities of safflower and *tūn* give orange (*sonahra*), while if *tūn* predominate, *zafraṅī* results. This may also be obtained by the use of turmeric and *harsinghār*. A brown (*kishmishī*), is obtained by dyeing successively with myrobalans, turmeric and safflower. As safflower itself does not yield fast shades, none of those colours produced by it in combination with other dyes are fast.

3. *Turmeric (haldī, morha)*.—This is a yellow colouring matter extracted from the root, or, more correctly, *rhizomes*, of *Curcuma longa*. The pure colouring matter *curcumin* $C_{21}H_{20}O_6$ ¹ may be extracted by ether from the powdered root, after a preliminary extraction with Carbon bisulphide. It forms orange-yellow crystals.²

For dyeing with turmeric the root is ground to a paste with water and the cloth to be dyed steeped in the extract so prepared. Sometimes the cloth is then dipped in a solution of alum or in diluted lemon-juice. The result is a yellow known as *zard*, which is not fast. The colours *hartālī*, *basantī* and *gandhakī* may be produced by using progressively less quantities of turmeric.

If cloth dyed in turmeric be dipped in alum solution and then in an extract of pomegranate-rind a more permanent yellow is obtained. An emerald-green, termed *sardai*, is produced by dyeing with a mixture of turmeric 4 parts, verdigris 2 parts, orpiment 1 part and water 16 parts. If the turmeric be omitted and the quantity of orpiment be doubled another shade of yellow-green, termed *pannai*, is obtained. A shade of yellow, termed *sandakī*, is prepared by combining turmeric with *tūn* (p. 40), while another shade known as *hartālī* (the colour of yellow orpiment) is the result of combining turmeric and *harsinghār*. Turmeric is also used in combination with indigo (p. 35) and safflower (p. 37).

4. *Pomegranate-rind (nāspāl)*.—From the rind of the fruit of *Punica Granatum* there is extracted by boiling in water (1 part rind to 4 of water) a yellow colour which yields a fairly fast yellow if the cloth be subsequently dipped in a solution of alum. As noted above this dye stuff is used mainly in combination with other materials (p. 36). A series of greys and browns are produced by combining in various proportions myrobalans and ferrous sulphate or *lohār-ki-siyāhi* (p. 37) with turmeric and pomegranate-rind, sometimes one sometimes the other and occasionally both, with or without the addition of *gtrū* (powdered haematite) and catechu.

The brown, *kishmishī*, is obtained by dyeing first with myrobalans and sulphate of iron and then in the extract of a mixture of equal parts of turmeric and pomegranate-rind with half that amount of powdered haematite and catechu; if a stronger solution of iron sulphate be used the result is catechu brown (*kathai*); while if the turmeric be omitted we have *telia māshī* or olive-green. *Zamurdi* (peacock green) results from the omission of the haematite and catechu, while without the turmeric again *kanjai* (ash drab) is obtained. *Māshī* (a lighter colour than *telia māshī*) is produced from myrobalans and ferrous sulphate followed by turmeric and alum; while with stronger solutions of myrobalans and turmeric the result is *botlī* (bottle-

¹ Ber. der. deutsch. Chem. Ges. 80.192. ² ib. 14.485.

green). The following table will show the relative proportions of the materials used in the above:—

Colour.	Myrobalans.	Ferrous sulphate.	Turmeric.	Pomegranate-rind.	Powered haematite.	Catechu.	Alum.
Kishmishf ...	2	1	20	20	10	10	...
Kathai ...	2	2	20	20	10	10	...
Telia mashi ...	2	1	2	20	10	10	...
Zamurdi ...	2	1	4	3	...	...	1
Mashi ...	2	1	2	...	...	...	1
Kanjai ...	5	1	...	10	...	...	...
Botli ...	4	1	4	...	...	...	...

5. *Morinda citrifolia*, (*al*).—A red colour is obtained from the root of this plant, which is grown in parts of these provinces. The colouring matter is morindone $C_{15}H_{10}O_5$ shown by Perkin and Hummel to be an anthragallolmethyl ether. (Journ. Chem. Soc., Trans. 1893, 1171). The dye bath is prepared by boiling the powdered root in water. The cloth is first mordanted by dipping in a bath made by extracting 1-part powdered myrobalans with 16 of water and then in a 6 per cent. solution of alum; after which it is boiled with water, pounded *al* root and usually some *dhau* flowers (*Woodfordia floribunda*) in the proportion of 1 part flowers to 16 of the root. These *dhau* flowers appear to be used as a dye only in conjunction with *al*. In place of myrobalans and alum the following method of mordanting the cloth is sometimes used. The cloth is soaked in water and rubbed with *sajji* (impure carbonate of soda). The insoluble part of the *sajji* is removed from the solution and cloth, and 1 part linseed or castor oil added for every 5 of cloth by weight, and this well worked into the cloth, which is then dried and steeped in a solution of a little camel or sheep's dung; dried, and then well washed, dipped in a solution of alum, and then boiled with *al*.

If cloth be dyed first with *al* and then dipped in *lohár-ki-siyahi* (p. 37) the chocolate-brown colour *kochki* results.

The name *kakrezi* appears to be sometimes given to the colour so produced, though it more properly corresponds to the English maroon.

6. *Myrobalan* (*Terminalia chebula*)—*Har.*—The fruit of this tree contains a large quantity of tannin, and also a yellowish colouring matter, both of which are extracted by steeping the dried and powdered fruit in cold water. The yellow colouring matter is rarely, if ever, used alone, but an application of myrobalan extract is a preliminary to that of many dyes (see *al*, above). But its special use in dyeing is due to the tannin, a black being produced by immersing the material first in this extract and then in one of ferrous sulphate (*kasis*). For more intense black the cloth is steeped alternately first in one then in the other several times, being dried between the successive immersions. Sometimes pomegranate rind is added to the myrobalans and both are extracted together. This material is also rich in tannin. It is usual to give a dip into a solution of alum after the last dip in the ferrous sulphate solution. According to the strengths of the myrobalan extract and the iron solution various shades of grey and black are obtained. These are known as *nukrai* (silver grey), *fákhtai* (dove grey), *khaki* and *dúdhia khaki*.

7. *Májuphal*.—The galls of *Quercus infectoria* are sometimes used in place of myrobalans. Cloth dipped in extract of galls and then in *lohár-ki-siyahi* of various strength gives the shades of grey above noted in connection with myrobalans.

8. *Acacia arabica* (*Babul*).—Both pods (*sangri babul*) and bark are rich in tannin, and are used in place of myrobalans to produce greys and blacks in conjunction with ferrous sulphate. The pods or bark are powdered and boiled with water. A subsequent dip in an extract of catechu produces a golden-brown termed *agrai*.

9. *Acacia catechu* (*Kath*).—Catechu is too widely known to need any description here.¹ It is used to a small extent in dyeing cotton fabrics. The wood is cut into

¹ An account of the methods of collecting catechu in India will be found in "The Indian Agriculturist" for 1896, p. 368. The important constituents are *catechin* and *catechu tannic acid*.

small pieces and boiled in water with addition of a little lime. The cloth to be dyed is steeped in the extract so obtained, whereby the maroon colour termed *kakrezi* is produced. The production of *kathaï* or catechu brown has been already described (p. 38).

10. *Cæsalpinia sappan* (*Patang* or *Bakam*).—The colouring matter is brazilin $C_{16}H_{14}O_5$. The wood is rasped into small pieces and boiled with water. Cloth dipped in an extract so obtained acquires a red colour, which is not fast. The cloth is sometimes first steeped in extract of myrobalans and alum solution. The result is a bronzy red.

11. *Cedrela toona* (*Tún*).—A light yellow colour (*basanti*) is obtained by dyeing cloth with water in which the flowers of this tree have been boiled and subsequently dipping in alum solution. Its use in combination with other dyes has been already noted (p. 38).

12. *Nyctanthes arbor-tristis* (*Harsinghár*).—The dye is contained in the yellow flowers which are collected and dried. These are boiled with water and the cloth dyed by dipping therein; the colour so obtained is not fast, but can be rendered less fugitive by subsequently dipping in alum solution or diluted lemon-juice. According to the strength of the extract various shades of pure yellow are obtained. This dye is frequently combined with indigo, safflower and other dye stuffs (pp. 37, 38).

13. *Butea frondosa* (*Dhák*, *Parás* or *Tesá*).—This tree grows widely throughout the Provinces and bears a brilliant flame-coloured flower, which is the source of the dye. The dried and crushed flowers are steeped in cold water and the cloth dipped therein. The colour so obtained is a slightly orange yellow and fugitive; addition of a little lemon-juice or lime deepens the tint and renders it a little less fugitive. A still more permanent colour is said to be produced by mixing the flowers with coagulated milk (*daht*), keeping the mixture moist by addition of water for eight to ten days, then squeezing out the water and boiling the extract so obtained with alum. This dye is used in combination with several others (p. 37). The colouring matter is a glucoside which decomposes on boiling with mineral acid into a glucose, and a dyestuff apparently very similar to fisetin; but as this decomposition is not effected by the processes employed in preparing the dye bath from the flowers the glucoside as such colours the cloth, which explains to a considerable extent the fugitive nature of the colour produced (Ind. Agr., 1897, 153).

14. *Cotton flowers*.—These are sometimes used similarly, but the colour obtained is weaker and very fugitive.

15. *Adhatoda vasica* (*Arúsa*).—A brownish yellow dye is extracted from this plant by the following process:—red haematite (*gírú*) is ground up with water and suspended therein; in this the cloth is immersed, next in a solution of alum and lastly in water in which *arúsa* plants have been boiled. The whole plant—stem, leaves and flowers—is used.

16. *Rubra cordifolia* (*Majith* or Indian madder) is also occasionally, but quite occasionally, used; the cloth is dipped in the aqueous extract and then in a solution of alum, but artificial alizarin has practically driven this dye out of the market. This is known in commerce as *munjeet*. The dyeing properties are due to the presence of purpurin (Trioxy-anthraquinone $C_{14}H_8O_6$) and munjistin.

17. *Ficus religiosa* (*Pipal*).—The bark boiled with water is said to yield a black dye.

A few other dyestuffs are used, but they are quite unimportant. In fact, the use of all the native dyes save indigo is gradually disappearing in face of the increasing use of the imported coal-tar colours.

The only method of producing a pattern solely by dyeing is that used for the production of *chúnrf*. This consists in tying up tightly small pieces of the cloth chosen according to a definite arrangement, so that when the whole is dipped in the

dye bath the portions tied will remain uncoloured with usually a coloured spot in the centre. This tying is termed *bāndhnā*, whence the word *bandanna*, applied to handkerchiefs whose pattern consists of spots so produced. Thus white spots on a blue ground are obtained by dyeing a knotted cloth with indigo. If turmeric-dyed cloth be knotted and dyed with *āl* yellow spots on a red ground are obtained. Sometimes the undyed spots are coloured in by hand. The work done is, however, of the coarsest description, very little but *gārha* being so dyed, while the shapes of the spots are very irregular.

CHAPTER XI.

PRINTING OF COTTON FABRICS.

COTTON cloth printing is carried on to a considerable extent. *Gārha*, *gazi* and such like coarse materials are printed in almost every district, whereas the printing of finer fabrics is confined to a few places, the chief of which are Bareilly, Basti, Jahangrabad in Bulandshahr; Farukhabad; Jáfarganj in Fatehpur; Lucknow; Mirzapur and Muttra.

The cloth, whether coarse or fine, undergoes almost invariably a treatment with an extract of myrobalans or some process equivalent to this treatment. The coarse cloth, *gārha*, *gazi*, etc., is merely washed in the ordinary fashion and then steeped in a solution obtained by extracting pounded myrobalans with cold water. A pound of myrobalans is considered sufficient for 12 pieces of *gārha* 10 yards long and $\frac{1}{2}$ yard wide.

For finer fabrics a more complicated process is used. Of these there are several variations. Thus at Farukhabad the process is to repeatedly rinse the cloth in an emulsion of castor-oil and water for 15 days, keeping it moist all the time, dry and immerse in the myrobalan bath for a day, and dry. At Jáfarganj the cloth is kept moist with water, *reh*, and sheep's dung for a night and washed in the morning, again wetted with solution of *reh* and well steamed. It is then beaten with wooden clubs on a flat block of wood known as a *kundi*. At Lucknow the fabric is repeatedly rinsed in an emulsion of water, oil of *sesamum*, *sajjt* and sheep's dung, being kept moist with this mixture for three weeks, save that at the end of each week it is well washed and dried in the sun. It is then steeped in a bath made by grinding together the following mixture and adding it to cold water:—

					<i>Scientific equivalent.</i>
<i>Har</i>	...	8	<i>chittaks</i>	...	...
<i>Bahera</i>	...	6	"	...	...
<i>Milchhi</i>	...	2½	"	...	...
<i>Zangihar</i>	...	2½	"	...	...
<i>Main</i>	...	2	"	...	...
<i>Dhaw ká phál</i>	...	2	"	...	...
<i>Balokhar</i>	...	2	"	...	...
<i>Kepúr kaohri</i>	...	2	"	...	...
<i>Sara Gola</i>	...	2	"	...	...
<i>Nágar Motha</i>	...	2	"	...	...
<i>Saugri Babúl</i>	...	2½	"	...	...
					Fruits of Terminalia chebula.
					Terminalia balerica.
					Root of Glycyrrhiza glabra.
					Dried fruit of T. chebula.
					Fruit of Bandia dumetorum.
					Flowers of Woodfordia floribunda.
					Nardostachys jatamansi.
					Hedychium spicatum.
					(?).
					Rhizomes of Cyperus scariosus.
					Pods of Acacia arabica.

The cloth is then dried and ready to be printed, but for the actual process it is always slightly damped.

The printing is invariably done by the application of suitably carved stamps (*sáncha*, *chhápa* or *tháppa*), moistened with suitably prepared colours. These stamps are almost always carved out of *shisham* wood (*Dalbergia sissoo*.) Ebony is said to be better, but not now used because of its price. The stamps are carved by a carpenter either from his own design or that of the printer. As a rule, the stamps are

in pairs, one being to produce the pattern proper, the other to put in the ground, which is usually printed some other colour and not left white. When a repeated pattern is required over a considerable area small guide dots are made at one side to correspond to certain definite portions of the pattern on the other. In price these blocks vary greatly according to their size and pattern, from 3 or 4 annas for a small one up to as much as Rs. 72 for a set to produce a non-repeated pattern on a curtain 4 yards by 2.

The cloth to be printed is spread on a low bench covered with several thicknesses of cloth to form a soft pad on which to press the stamp. The colour mixture is kept in an earthenware vessel at the right of the workman, who "squats" with the bench in front of him. In the vessel is placed a sort of bamboo framework, like a grating, on which is supported a piece of thick blanket. This becomes saturated with the mixture and on it is pressed the stamp which thus takes up the colour only on its raised portions. The stamp is then applied to the cloth to be printed.

The commonest colours for patterns are red, black and white: in fact it is rare to find *gárha* printed in any others. Blues, greens and yellows are introduced into the finer work, but the country dyestuffs have held their own to a much greater extent in this industry than in dyeing.

The special ingredient in all printing mixtures is the gum with which they are thickened. Two kinds are chiefly used (i) *dho ká gond*, the gum produced by *Anogeissus latifolia* (not *Woodfordia floribunda*, which produces the *dhau* flowers used in conjunction with *ál* for dyeing red), and (ii) *babúl ká gond*, that derived from *Acacia arabica*. They appear to be used quite indifferently as one or other happens to be cheaper or more conveniently procurable. The gum of the *khair* (*Acacia catechu*) is also, but less frequently, used.

To produce black, *lohár-ki-siyáhi* thickened with gum may be used. Thus one receipt gives:—

Old iron	...	...	...	...	...	4 to 5 seers.
Wheat flour	...	...	...	...	...	3 chhittaks.
Molasses	...	...	...	...	...	4 to 6 "
<i>Dho</i> gum	...	...	...	...	...	1 to 1½ seers.
Water	...	...	...	...	...	8 to 9 "

Mix and allow to stand a day or two before using. Others omit the flour and increase the quantity of molasses. In others again the iron is introduced already in the form of a ferrous salt, e.g., *kastis* (ferrous sulphate). Thus a good black is obtained by printing with the following mixture:—

<i>Kastis</i>	...	...	...	...	...	1 chhittak.
<i>Dho</i> gum	...	...	...	...	...	1 tola.
Alum	...	...	...	...	...	½ "

Pound and boil with 1 seer of water and strain; add 3 chhittaks more of *dho* gum and strain. If foam be present, remove it by adding a *tola* of wheat flour or *ghí*. In all cases to obtain a black with these mixtures the preliminary treatment with myrobalans or some other tannin-containing substance is necessary. When first applied the pattern is in a pale inky colour, which develops into a good black on drying and exposure to sun and air.

Red is usually produced from *ál* (p. 39). The pattern to be red is printed with a preparation of which *gírú* (haematite) and gum are the essential ingredients; alum and oil of mustard, one or both, are sometimes added. One example will suffice: grind together 4 chhittaks each of mustard oil and *gírú*, and add 1 seer of water with 4 chhittaks gum and the same weight of alum; stir well and strain from the insoluble portion of the gum. After drying, the cloth so printed is boiled with *ál* root and *dhau* flowers, or sometimes the *ál* root is replaced by alizarin paste, or by *chol*

or *majith* (p. 40), whereby, however, a somewhat different shade is produced. A deep rose tint termed *gulabi* is produced by printing with—

Turmeric	...	...	...	...	...	1/2 chhittak.
Alum	...	...	...	...	...	1 "
Gum	...	...	...	...	...	4 "
Ghi	...	...	...	...	...	1/2 tola
Water	...	...	...	...	...	1 seer.

The materials are ground together in the cold and strained. The cloth is boiled with *al*, *majith*, or alizarin paste as above.

Another tint is produced by printing with—

<i>Patkani lodh</i> (bark of <i>Symplocos crataegoides</i>)	...	...	...	...	...	2 tolas.
<i>Milehi</i> (p. 41)	...	...	...	...	...	2 "
Turmeric	...	...	...	...	...	2 "
Water	...	...	...	...	...	1 seer.

The powdered materials are boiled in the water and cooled, then 3 chhittaks *dho* gum and 2 tolas of alum added: the mixture stirred and strained. The subsequent treatment is as before. A crimson colour is obtained by printing with the extract of sappan wood thickened with gum.

Blue is produced from indigo, which is printed on with orpiment (*hartal*). One receipt will give a good idea of the mixture used:—

Boil together for three hours in a seer of water—

Old plaster	...	...	...	...	...	2 chhittaks.
Indigo	...	...	...	...	...	1/2 chhittak.
Orpiment	...	...	...	...	...	1 1/2 "
Gum	...	...	...	...	...	1 1/2 "

The mixture on cooling is strained and is then ready for use. The colour as printed is a pale greyish-blue, and only becomes blue on exposure to the air and washing. The orpiment probably reduces the indigo, which becomes reoxidised on exposure to air.

Green is generally produced from coal-tar dyes, but occasionally from indigo and turmeric combined. Thus the following preparation is used in Agra:—Steep 1/2 seer turmeric in 5 seers water and strain; add 2 tolas indigo ground up with 2 chhittaks of water, and finally 4 chhittaks gum; strain and print. Pomegranate-rind (*naspal*) is sometimes used with the turmeric.

For yellow, turmeric is mostly used with alum and gum; sometimes *dhak* flowers and pomegranate-rind replace it, when borax replaces the alum; or *dhak* flowers, gum and lime only may be used.

A buff (*badami*) is produced by printing with ferrous sulphate solution, thickened with gum, on cloth that has not been treated with any tannin-containing solution. The buff colour is then developed by immersion in a bath of carbonate of soda (*sajji*), whereby ferrous carbonate is produced on the printed portions which soon oxidizes to a more or less hydrated ferric oxide. This is the material used in printing the Bareilly curtains.

A brown colour is printed with a mixture formed by boiling 3/4ths tola catechu with 1 1/2 seer water and adding 1/2 chhittak sheep's dung and 1 tola of *reh*. The mixture is filtered and thickened with 2 chhittaks of *babul* gum.

At Bijnor one printer was found who printed patterns in white metal. To do this he pounded *vang* (tin or more probably some tin-lead alloy) and mixed it with a hot solution of glue in water. This was printed in the ordinary way and then burnished with a smooth agate.

Patterns are sometimes produced by printing with some sticky mixture of gum or glue and then sprinkling powdered mica (*abrak*), or spreading over the cloth pieces of tinfoil (*panni*) or even of silver or gold leaf which adhere to the sticky portions.

The mica and tinfoil are so used at Agra, while the gold and silver leaf work is done at Jaunpur. Any of these processes carefully done on suitably dyed cloth—red is a favourite colour—are effective.

A still more effective pattern is produced by attaching with glue pieces of mirror according to some definite arrangement. I have seen a very handsome pair of curtains produced in this way on a ground of *nainsook* dyed red.

At Bijnor a family of *máls* had devised another method of adorning cloth, which, however, can scarcely be recommended from either an artistic or hygienic point of view. Four parts of linseed oil are boiled with 2 of resin (*rál*) till the mixture is thick and sticky. When cold, one part of orpiment (*hartál*) is stirred in, and this bright yellow mixture daubed on variously coloured cloths with a steel rod called (*senk*) according to the desired pattern.

If the orpiment be replaced by cinnabar (*shingarf*) the daubs will be of a vermilion colour.

In printing designs containing several colours black is always first put in and then such parts as are to be red printed with the haematite mixture. Next these red parts are developed by boiling with the *ál*, etc., and lastly such other colours as may be required for the pattern are printed in. Often, where but small portions of the pattern are to be of some colour, these portions are put in by hand with a blunt stick. It is thus that the *kalamkars* of Jáfarganj in Fatehpur inscribe the verses of the Korán and other quotations they introduce into their printed cloths. At Muttra, where *rumáls* and such like articles are printed with Sanskrit verses for the pilgrims resorting to Brindaban and other shrines in that district, this is done with carved blocks.

The coarser materials after printing undergo no subsequent treatment beyond a wash and perhaps a beating with wooden clubs; but at Farukhabad, where English longcloth is printed for export to Europe, the material is exposed to the sun for some time, being kept moist by repeated sprinkling.

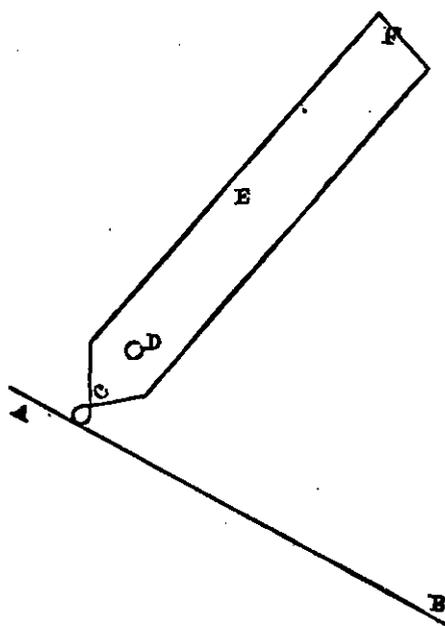


FIG. 51.

At Tanda in the Fyzabad district, where there is a considerable trade in printed cloths, they undergo a process of burnishing termed *ghontai* by means of an instrument known as a *mohra* (Fig 51). It consists of a heavy beam E some 4' x 8" x 8", attached at its upper end F by a pair of ropes to a beam and resting, as shown in the figure, on a smooth sloping board A B. At its apex is a hollow wherein is fitted a smooth stone C, which is in actual contact with the board. The cloth to be burnished is spread out on the flat board and the stone, pressed down by the weight of this beam, moved up and down it by a double handle at D. The worker, usually a woman, sits in a hollow at the end A of the board. The result is very rough and distinctly "stripey."

In this town red spots on a blue-purple ground or on a red-brown ground are printed by the following process:—The cloth is dyed in the ordinary way with *ál* and then the spots printed in with a mixture of lime and gum. Then for the blue-purple ground the whole is dyed with indigo and for the red-brown with pomegranate-rind. The *ál* colour remains unchanged wherever the lime mixture is applied.

The chief articles printed are—

From *gárha*, *gazi* and such like coarse fabrics, *jájams* (floor-cloths), *liháfis* and *toshaks* (quilts and cold-weather wraps), and *doga* (a sort of wrap). From finer fabrics, curtains, handkerchiefs (*rumál*), *sárís* and many articles for European use or export to Europe.

The curtains, *pankah* frills, &c., printed in buff at Bareilly are particularly artistic. Some good printing is done in Lucknow; but probably the best, though by no means always the most artistic, work is done at Farukhabad, where several firms of Sás import Manchester longcloth, print it in sizes suitable for curtains, and re-export it to Europe. A pair of curtains each 4 yards by 2 will sell in London for a sovereign. Gaily coloured prints of which the ground material is *gárha* or *gazi* are much appreciated by the hill people, and a considerable trade is done in these articles in Naini Tál.

The patterns produced are in many cases most elaborate, sometimes covering an area 4 yards by 2 without repetition. With respect to the patterns used by the ordinary *Chhipi* (printer) to which caste, however, the art is very far from being confined, they are, as a rule, very simple—conventional flowers and more conventional animals and figures, with various geometrical designs of not particularly complicated character.

CHAPTER XII.

GENERAL STATE OF THE SPINNING AND WEAVING INDUSTRY: COMPARATIVE PRICES, &c.

THERE is no doubt that the hand-spinning and weaving industries have declined very considerably since they have had to face the competition of the mills, but the rate of decline seems to have decreased during the last ten or twelve years. In fact in Bijnor, Farukhabad and Meerut the hand industry is said to be now maintaining its ground, while in the opinion of some of the millowners recent legislation has handicapped them. Hand-spinning has been considerably more affected than hand-weaving. The former is only now done by persons who practically can do nothing else, or more as a means to earn a little at odd times than as a trade properly so called. Thus old women of all castes, especially when they are poor, will spin, and the younger ones too in the intervals between their household duties, while their husbands or sons are working at their proper calling. To this extent it is probable that hand-spinning will continue so long as the yarn spun can be sold for any sum greater than the cotton from which it is spun, and this is likely to be a long time, as there will long remain

hundreds of secluded villages so far from a railway or city where machine-spun yarn can be obtained, that the sale price of the homemade article will admit of its being produced at a profit. It will be seen, however, that for some articles hand-spun yarn is preferred to the machine-made article.

It is with respect to weaving that there is now a real competition. As a general rule, it may be said that better class fabrics are machine-woven and the others hand-made. The machine-made article is usually more neatly and evenly made and so excels the other in appearance, but is frequently less strong and durable. These remarks apply with greater force to the difference between hand-woven fabrics of hand-spun yarn and machine-woven articles. The hand-spun yarn is always coarser, rougher and less even than the machine-made article, but this very defect makes it preferred for some purposes. Thus *gārha* of hand-spun yarn is preferred for wraps, quilts, and as the material for the printed cloths used for floor coverings. The looser and more uneven yarn makes the cloth heavier, and in a short time, owing to the felting together of the loose pieces of cotton, warmer than similar articles of machine-made yarn. For quilts (*razais*, &c.) it is preferred because its roughness keeps the cotton stuffing more evenly distributed—a state of affairs that can only be effected with machine-made cloths by the operation of quilting. Such a hand-woven cloth from hand-spun yarn is more durable than any machine-made article that can be procured at the price; it forms almost exclusively the clothing of men of the cultivating classes; the women of these classes wear in general hand-woven materials for their shirts and *sáris* (cheap *chárkhānas*, *táptís*, &c.), but they are more frequently of machine-spun yarn; one reason for this being that this can be readily procured dyed in faster colours than the country dyers can produce.

Practically, however, it may be said that price and accessibility are the controlling elements in this competition. There is hardly a trace of preference for hand-woven over machine-woven articles on caste or sentimental grounds. Some of the old fashioned zamindárs of Bára Banki are said to prefer the former, while a few of the higher native nobility appear to take special interest in the few remnants of superior hand work that are left, as the Mahárāja of Ajudhia with regard to the *jámdáni* work of Tánda.

There is one other reason in favour of the hand-made cloth of special effect among the agricultural classes in cotton-growing districts, and that is that the women of the cultivator's household spin some of their home-grown cotton into yarn, which is then handed over to the village *Korí* to be woven. This he does at rates of which the following, current in the Allahabad district, are a fair average:—

For weaving yarn into <i>gazí</i>	3	pies per yard.
ditto	<i>gārha</i> 4½	ditto.
ditto	<i>dhoti</i> 6	ditto.

The village *dhuna* will stuff cotton into a quilt, and this cotton when the quilt is worn out is spun and woven into *niwár* (p. 23), ropes or a coarse fabric of some kind.

The Azamgarh district is probably that in which the weaving industry is carried on on the largest scale. There are here some 13,000 looms. The chief centres are the towns of Mubárákpur and Mau, containing respectively some 1,700 and 1,200 looms; Kopaganj has over 500, and ten other villages possess from 100 to 500 each. Mubárákpur is especially noted for its compound cotton and silk, tasar or wool cloths, while Mau has been noted since before the time of the Nawábs for its fine muslins, in the weaving of which counts as high as 150s are used. The weavers throughout the district are nearly all *Juláhas*. The industry, though to some extent on the decline, is still moderately flourishing, and a fair export trade is done. Weaving is also carried on to a considerable extent in the Aligarh, Etah, Muzaffarnagar and Saháranpur districts. In Bánda the decline of the industry is attributed to the lack of

enterprise of the weavers and their not laying themselves out to meet the demand for new fashioned materials. On the other hand, the *Julahas* of Etah are reported to have made special efforts in late years to meet such demands, and as a consequence have to some extent recovered their lost ground. In Bareilly, it is said, that weavers regard the present depression of their trade as mainly temporary and due to the scarcity now (January 1897) existing. The *dart*-weaving industry there is flourishing, and *darts* to the value of a lakh of rupees are annually produced. For these coarse hand-spun yarn (costing $6\frac{1}{2}$ annas per seer) is used. A considerable export trade to Bombay and Nepal is said to be done by the Fyzabad district.

In Mirzapur the *Julahas* are turning their attention to carpet weaving or deserting their ancestral occupation entirely. This city was before the introduction of railways a great centre of the cotton trade, it being a depôt whence cotton for export was sent down the Ganges. The extent to which the industry has declined from what it was 50 years ago is well seen by what has happened at Jais in Rae Bareli. Here, there were then 600 families of *Julahas*, all of whom supported themselves by weaving; now there are but 200 left in the town, of whom but 20 live by their looms. In Rae Bareli itself but 15 out of 150 weave. It is further said that 100 years ago yarn was spun at Jais so fine as to be worth its weight in silver, but which was woven into muslin so light that it cost but Rs. 5 the yard.

In the three hill districts the conditions of the industry are somewhat different. The only place where weaving to any great extent is carried on is in the Káshipur pargana of Naini Tál: here there are some 3,000 looms, and cloth equal to any produced in the plains woven. A weekly market is held at Jáspur, which is attended by the merchants trading with the hills. In all other parts of these districts only the coarsest *gárha* is woven, and even this industry is confined to the lower lying parts where cotton will grow, and is decreasing with the decrease of the cultivation of cotton. In Garhwál this decline is said to be the result of the stopping of the hill tribes cultivating the land on their old wasteful system of cutting down a patch of forest, taking one or two crops from the area so cleared, and leaving the land fallow for five or six years. In this district the grower of the cotton has it spun at home and weighs the yarn over to the weaver, usually a *Kort*, who will then, if the cloth required is to be of ordinary thickness, divide it equally into two parts for warp and weft, but if it be required extra thick, more is allowed for weft. After weaving, the cultivator receives it back and weighs it. If the weight be found correct, the weaver is paid in full, at the rate of 2 seers of grain for $2\frac{1}{2}$ yards (the width being 13 to 18 inches). Cloth so woven for private use is always stronger and better than that woven by the *Kort* for sale. A piece of the former 16 yards long if sold, which is rare, would fetch Re. 1-4-0 against Re. 1 for the same amount of the latter. The utmost a *Kort* can so earn is Rs. 5 or Rs. 6 a month. Moreover, as grain has risen in price and the *Kort* will make no abatement in the rate he has received from time immemorial, his trade is declining. In fact the majority of *Korts* are said to live by agriculture, only rarely practising their ancestral craft. In the central and northern parts of this district cotton is little used by the bulk of the population. In the centre their wants are satisfied by the hemp and *kapást* cloths already described (p. 34), while in the northern portions woollen clothes are mainly worn, the wool being to a considerable extent imported from Thibet.

Though spinning is carried on almost indifferently by members of all castes, weaving is almost restricted to the *Korts* and *Julahas*; the only instances of its being done by other castes are those of the *Doms* of Almora and *Pankas* of Mirzapur, who are said to weave to a small extent. This restriction is doubtless due to the more complicated machinery and greater skill required.

A few details as to the relative prices of hand and machine-spun yarn and of the amounts of fabrics producible from given amounts of each of the two may be of interest.

The counts of machine-spun yarn most generally used are 16s to 20s. The price of the former is usually about 12 annas a seer, being less nearer a source of supply and more at a distance; 20s cost from 12 annas at Cawnpore to 14 annas in small towns at a distance from the railway. These are by no means the highest or lowest counts used; 10s (costing 10 to 11 annas the seer) are used in many districts, and 40s at Aligarh, price Re. 1-4-0 the seer, and, as has been seen, yarn as fine as 150s is used in Azamgarh.

Hand-spun yarn likewise varies in price according to its fineness, from as low as $6\frac{1}{2}$ annas the seer for yarn containing but 300 yards to the chhittak and used for *daris* or the coarsest *gārha*, up to Re. 1-2-0 for the same amount; of this latter a chhittak will contain some 2,000 or more yards. Intermediate qualities are obtainable at intermediate prices. It will thus be seen that the finest spun yarn produced in any quantity (that at Re. 1-2-0 the seer) is roughly equivalent to 20s, which when machine-made costs but 12 annas for the same quantity. Accordingly it is only in the coarse qualities that the hand-spun article can compete at all with its rival.

Gārha spun of 10s or of fairly fine hand-spun yarn (costing in either case about 10 annas the seer) weighs about 1·8 chhittak the square yard. If of 16s the weight is about 1·3 chhittak, while an ordinary *gārha* of ordinary coarse hand-spun yarn weighs 2 to $2\frac{1}{2}$ chhittaks the square yard. The cost of the yarn for a square yard of material in the three cases works out to about $1\frac{1}{2}$ anna, $\frac{9}{10}$ anna, and 1 anna respectively. These may be taken as average rates.

It is difficult to state with any real accuracy the profit obtainable from spinning or weaving; it may be said with certainty, however, that it is rare to earn more than 1 anna a day by spinning or $2\frac{1}{2}$ annas by weaving, while in many cases the earnings are much less. Details regarding the cost and selling prices of several fabrics have already been given (p. 26 *et seq.*).



FIG. 3.
GINNING.



FIG. 7.
COTTON CLEANING.



FIG. 9.
SPINNING.

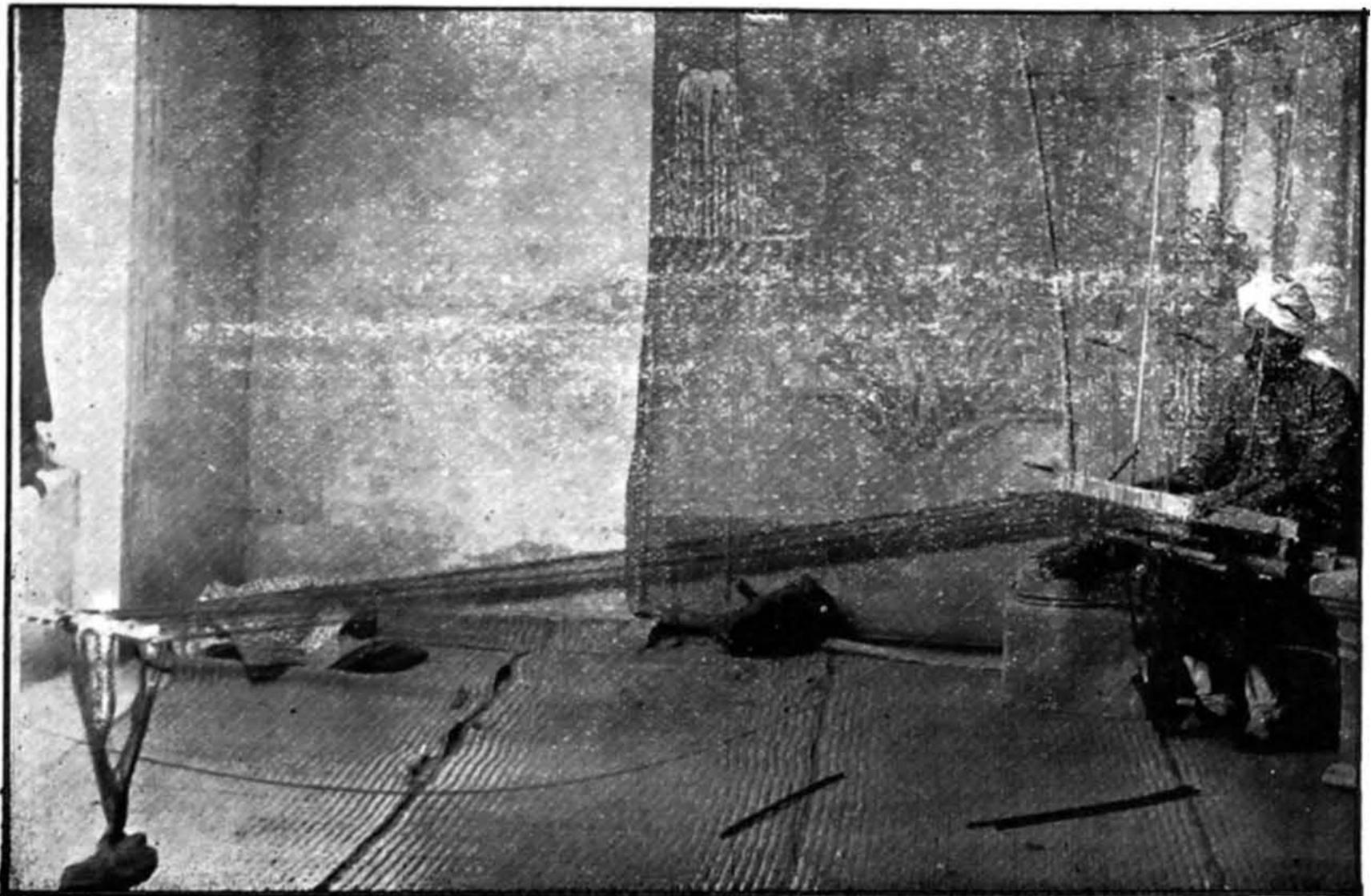


FIG. 17.
WEAVING.

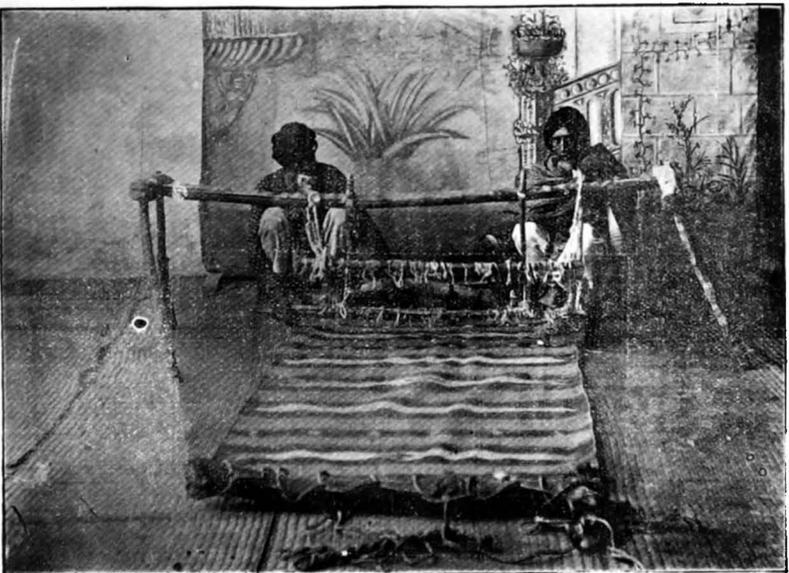


FIG. 38.
DARI WEAVING.

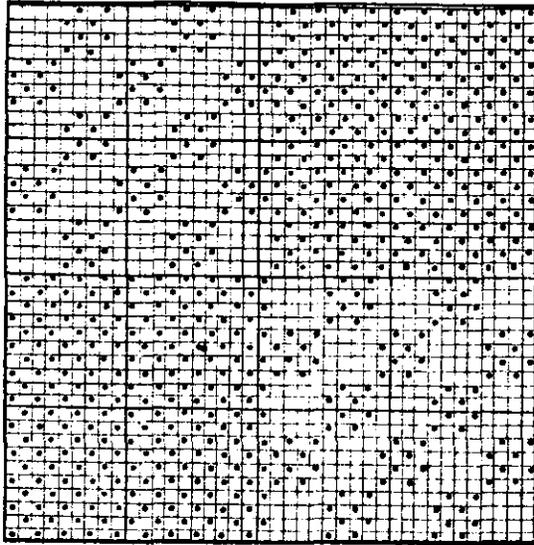


Fig 38.

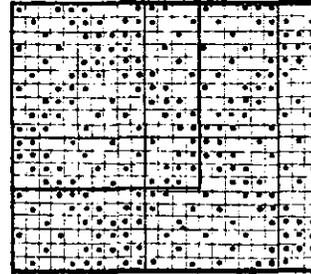


Fig 40.

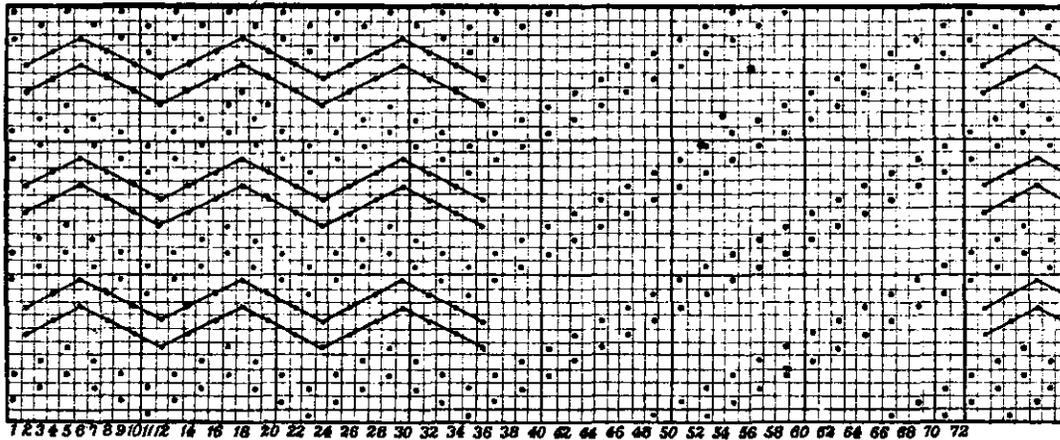


Fig 39.

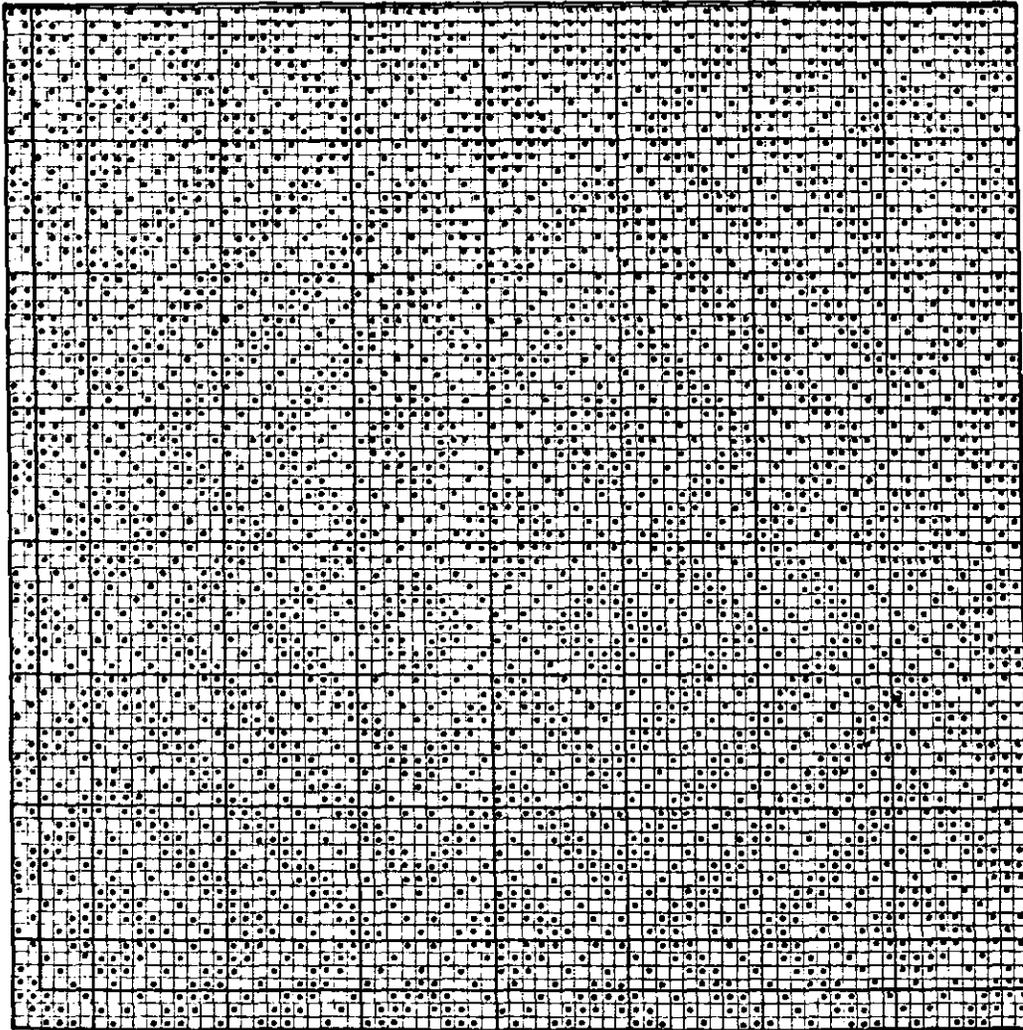


Fig 41.



Fig 42.

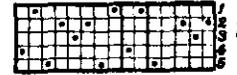
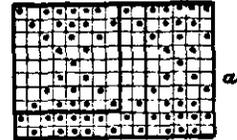


Fig 43.

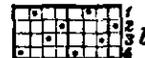
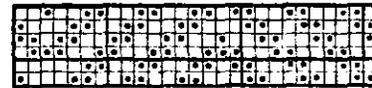


Fig 44.

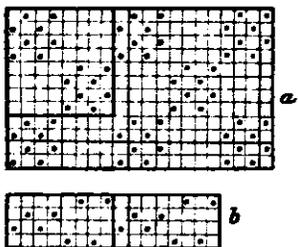


Fig 45.

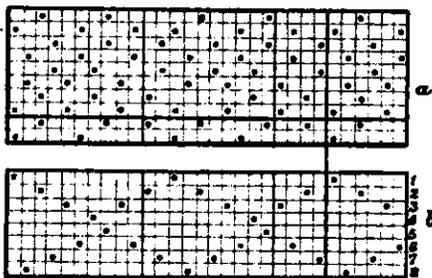


Fig 47.

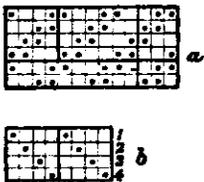


Fig 46.

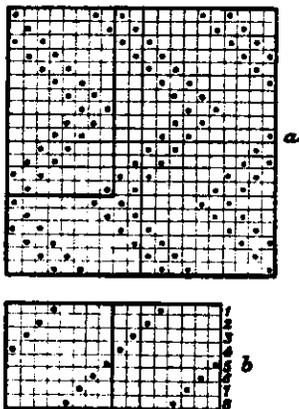


Fig 48.

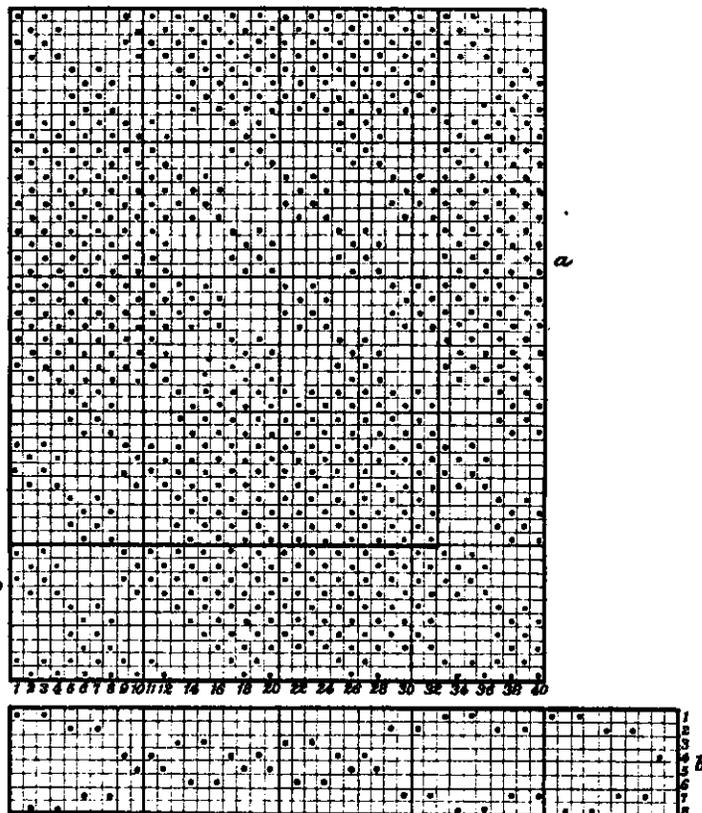


Fig 49.

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