



CHINESE HAND-TUFTED RUG

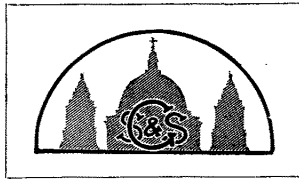
# CARPETS AND RUGS

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WITH FOURTEEN PLATES IN COLOUR, ONE  
FOLDING PLATE AND NUMEROUS ILLUSTRATIONS  
AND DIAGRAMS IN MONOCHROME



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## PREFACE

THE manuscript of this book was left by my father, the late Professor Roberts Beaumont, almost ready for the press, and has been published exactly as written by him. It was his intention, however, to add a further chapter on "Design and Colour," but only notes had been made.

Samples were also received from China and Japan too late for his attention, but a reproduction of the Chinese Rug sent by Mr. Lo Ting Yu forms the frontispiece and particulars from Mr. R. Nara are placed in the Appendix at the end of the volume.

As a few of the diagrams had been prepared only as rough sketches, I am greatly indebted to Mr. Thomas Woodhouse of Dundee who has kindly re-drawn Figs. 117, 125, 125A, 137, 137A, and also to Mr. Hudson of Messrs. Hutchinson, Hollingworth & Co., Ltd., of Dobercross for similar work for Figs. 144 to 155, 166 and 167.

Sincere thanks are due to the following firms for the loan of the samples of Carpets used as illustrations: Messrs. Alexander Morton, Sons & Co., Carlisle; John Crossley & Sons, Ltd., Dean Clough Mills, Halifax; James Templeton & Co., William Street, Greenhead, Glasgow; The Royal Wilton Carpet Factory Co., Ltd., Wilton, Salisbury; T. F. Firth & Sons, Ltd., Clifton Mills, Brighouse; Brintons, Ltd., Kidderminster; and Mr. Edward Hollingworth, C.B.E., Dobercross, Yorkshire.

I wish to express great appreciation of the services of Miss C. Benton, a former assistant of my father, for her valuable assistance in reading the proofs.

I also wish to acknowledge the kind consideration and interest taken by the Publishers in bringing out the book to the best advantage.

FRANK BEAUMONT.

*Convoy,  
Co. Donegal,  
September, 1924.*

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# CARPETS AND RUGS

## EASTERN AND WESTERN IN CONSTRUCTION

### CHAPTER I

#### HISTORIC PRINCIPLES—EASTERN LOOMWORK

Pre-historic Origin of the Textile Arts—Plaiting and Weaving—Primitive Loom—Vertical-Warp and Horizontal-Warp Weaving—Ancient Loomwork—Egyptian Pile Fabrics—Nature Types of Pile Structure—Early Origin of the Elements of Tapestry Weaving—Striped Patterns, 3721–3500 B.C.—Problem of Textile Surface Decoration—Antiquity of Tapestry Weaving—Babylonian and Assyrian Woven Art—Assyrian Architecture illustrative of Textile Ornament—Pile-Carpet Weaving a Development of Tapestry Weaving—Grecian and Roman Decorative Textures—Tapestry Construction in Western Europe—Notable Historic References to Carpets—Felt Cloths and Felt Carpets—Process of Pile-Carpet Invention—Persian Origination of Tufted-Carpet Weaving—Minutiae in Craftsmanship—EASTERN PRACTICE :—Wool Sorting, Wool Washing, and Yarn Preparation—Dyeing—Use of Natural Dyestuffs—Range and Quality of Colour Tones Obtained—Chemical Dyes—Manual and Machine Methods of Yarn-Making—Eastern Wools—Vegetable Fibres—Silk—Jewelled Carpets—Animal-Fibre a Staple Material—Variations in Carpet Materials and Structure—Mohair, Cashmere, and Camel's-hair—Yarn Application in Carpet Weaving—RUG AND CARPET PRODUCTION :—Home and Atelier Work—Women Weavers—Labour Cost—Weaving Methods—Turkish Carpet and Rug Nomenclature—PERSIAN, TURKISH, TURKESTAN, CAUCASIAN, AFGHANISTAN, INDIAN, CHINESE, and JAPANESE Carpet Manufactures.

THE tentative efforts which led to the production of threads from fibrous materials and of fabrics from spun yarns belong to pre-historic times. Certain of these were undesignedly carried out, but others were the result of thought, adaptation, and contrivance. It is, for instance, conceivable that the idea of fibre grouping and spinning grew out of "the half-thoughtless ravelling of creepers and strands of bark into a skein or cord," or from the listless twisting of hair or filament into tangled pieces of thread. Similarly it is conceivable that the notion of plaiting evolved from the unconscious observation and study of the criss-crossing of grasses, rushes, and the branches of trees as presented in nature, or as unthinkingly effected. Yet the development of

this elementary notion according to an improvised plan gave the primary principles of strand interlacing on which the art and practice of weaving are formulated and built up.

Weaving is, however, more than plaiting. The latter is the simple alternate intersection of a selected number of pre-arranged strands, with single strands successively placed in position by the fingers of the plaiter. In weaving, the basic strands, whether extended in a vertical or horizontal plane, require to be drawn forward and backward, or lifted and lowered, in serial order for providing an opening or division in the threads into which the crossing thread or weft yarn may be inserted. Plaiting is a process of interlacing individual strands with each other; elementary weaving is a process by which the same result or textural type is obtained by dividing the warp strands into two groups consisting of the odd and even strands respectively, and passing between these an intersecting strand or shot of weft. The origination of the means for doing this formed the initial step in the invention of the primitive loom.

This was little more than an upright frame in which the warp threads were grouped, spaced, and tensioned. In placing the warp threads in a vertical relation they were brought within the immediate view of the weaver, and conveniently situated for being manually operated, as required, for the passage of the shuttle carrying the weft yarn. This position of the warp also enabled the fabric to be readily inspected and, if need be, corrected during weaving.

While in this elementary form of loom variations in methods of interlacing are not practicable, as in the horizontal-warp loom, it admits of individual groups of warp threads being, at will and without the aid of mechanism, intersected with the shuttling yarn; and also of the insertion of any particular colour of weft into selected sections of the fabric. On this system of intertexture the field for design and colour admixture and location is only restricted by the number of warp threads in the width of the loom, and by the assortment of coloured wefts available. Hence, simple as this original loom is in build and arrangement, it lends itself to textile surface decoration, and for this reason it is still employed in the weaving of tufted-pile carpets and pictorial tapestries, and in the same way as it has been used from the invention of these fabrics.

Without this modern textural evidence of the application of the high-warp principle of weaving, it would be barely conceivable

HISTORIC PRINCIPLES—EASTERN LOOMWORK 3

that, in its practice, the varied Oriental fabrics—plain and decorative—described in history should have been producible. These comprise Egyptian, Babylonian, Assyrian, Grecian,

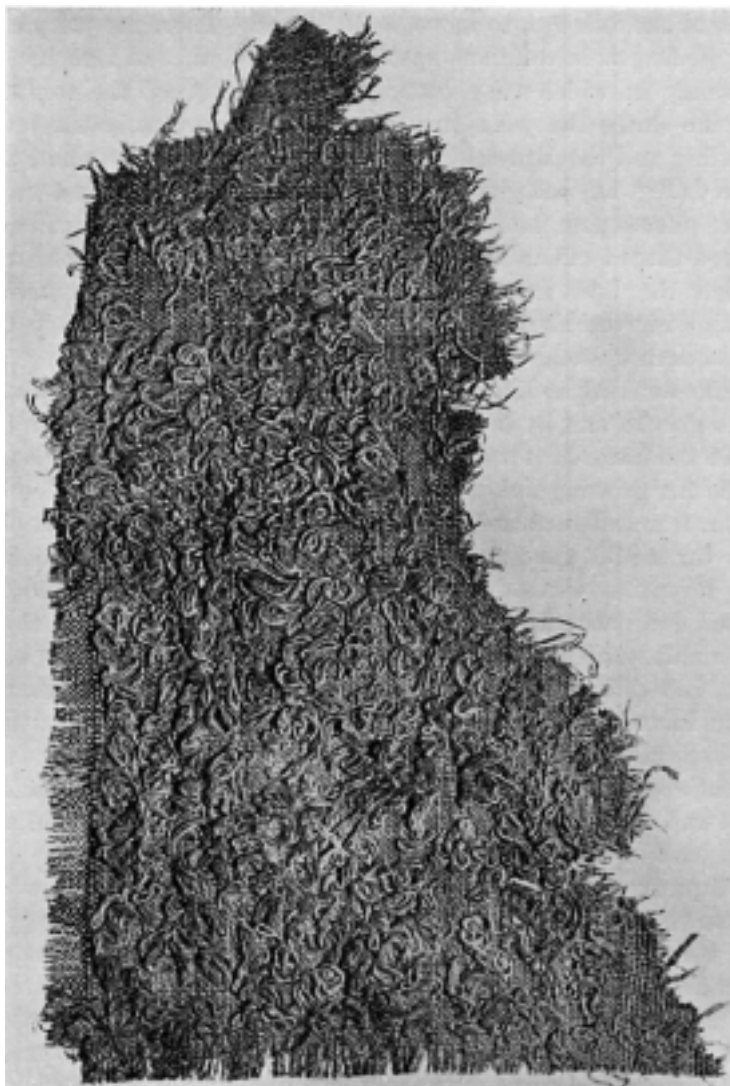


FIG. 1.

Roman, and Western Europe tapestries, the gossamer-like textures and linen pile fabrics of the looms of ancient Thebes and Memphis, and the richly-coloured figured textures of other Eastern centres of loomwork.

Pile and tapestry weaving bears a definite relation to that obtaining in rug and carpet production. In Egyptian fabrics—the earliest variety of pile structure—the pile characteristic is the consequence of drawing selected shots of weft, at intervals in the width of the fabric, into loops, as in Fig. 1. These looped yarns vary in length in different specimens dissected, and also in the frequency in which they occur on the surface of the texture. In some cloths the yarns are in a buckled form, as in the terry towelling and the Brussels carpet, in others the looped shots are severed (Fig. 1A) and give “cut” pile features, as in Axminster and velvet-pile carpets, and in a third style of fabric both looped and severed-thread effects are combined. This scheme of loomwork yielded the first known type of woven pile, or the structure anticipating the Eastern carpet, as the latter in turn anticipated the modern systems of pile-carpet manufacture.

Pile weaving is likely to have been suggested by grass and shrub growth and by the fine fibrous fur of animal skins. In the use of the latter as a covering or in floor decoration, the fineness of the fur growing out of the skin—the equivalent of a closely-woven textural surface—was the valuable and esteemed quality. This fur would appear possible of imitation in fabric weaving. The Egyptian weaver achieved the production of a “pile”—looped and cut as in present-day manufacture—but in his cloth, made chiefly of linen yarns, the pile is deficient in density, softness, and diffusiveness, and fails, except in certain laboriously made looped-pile specimens, to cover the foundation texture. These primitive efforts simplified the task for a subsequent generation of weavers, directing them in their labour to use yarns made of wool and dyed in various colours for the pile, and to use tufts of such yarn in its development.

Tapestry weaving forms another link in the processes which led up to the origination of the tufted carpet. The discovery of pile weaving indicated the feasibility of forming a nap of looped threads, or ends of threads, on the face of a fabric undecorated with colour or pattern. Tapestry weaving produced a plain-interlaced fabric ornamented with geometric and floral forms, or with pictorial representations diversified in tinted treatment. One system of work acquires the pile characteristic of a carpet surface, and the other the design embellishment and elaboration. Both constitute essentials in carpet weaving, and were apparently attained at different periods and by distinctive inventive efforts, in which the fashioning of the elements of tapestry production is

likely to have preceded the origination of those entering into the making of a pile texture.

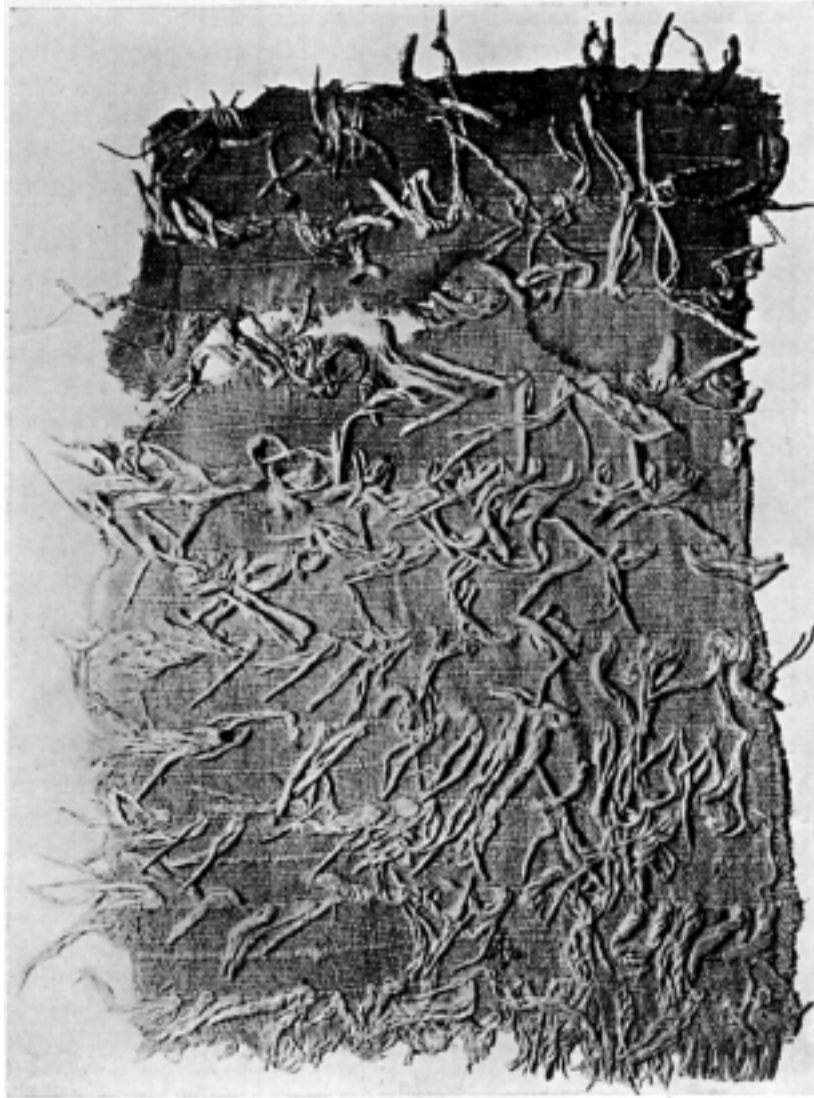


FIG. 1A.

Strictly, tapestry weaving, as carried out in the high-warp loom, is, in design features, a product of coloured weft yarns. These are tinted, and varied in length in shuttling to accord with the dimensions and grouping of the pattern forms. By this

weaving practice design is developed in colour in a plain-woven structure, in which it is distinct from design developed in different schemes of intertexture, as, for example, in brocade, damask, and other figured fabrics.

As pointed out, the very limitations of the principle of dividing the warp threads in the vertical loom for the insertion of the shots of weft rendered it impracticable to produce weave effects such as twill, sateen, cord, etc., but it had the result of focussing the ingenuity of the weaver on the means by which colour could be so applied as to develop decorative qualities in the fabric.

What, therefore, must be considered as a restrictive factor in the primitive system of warp shedding led to the conception of a textural type which has given the true tapestry cloth—one uniquely adapted for the depiction in colour tones of elaborate schemes of ornament. Oriental tapestry weaving may be compared with painting in the range of art which it covers, no other variety of fabric construction equalling it in this respect. Whereas, however, the artist's effort is confined to the reproduction in colour of a subject on a prepared surface, that of the tapestry weaver combines the practice of thread interlacing and fabric building with the ordered association of shots of coloured yarn in the development of the form and tinted composition of the subject treated.

Simple varieties of striped patterns were woven by the early Egyptians. These, of which specimens are still extant dating from 3721–3500 B.C., were, in principle of construction, prototypes of the tapestry texture. The striped features were formed in alternating series of shots of woollen (dyed) and of linen (natural tint) yarn. For ages the pattern units were such as to be obtainable by the picks of coloured weft crossing from side to side of the warp, as is done in horizontal-warp weaving. So long as the textile craftsman failed to go beyond this idea, decorative work in the loom remained unproducable. Ornament of a geometric kind was the result of embroidery or of the addition of other materials than those used in the making of the fabric.

The genius who discovered that, in weaving, the shots of weft need not traverse the entire width of the warp but only sectional parts thereof, solved the problem of decorative fabric production in the high-warp loom. With the possibility of developing each weft line of the fabric in several colours instead of in one colour, the practice of arranging and grouping shots of certain colours and lengths in the weaving of the texture after

the structure of a known pattern would follow. The system of colour setting and sequence thus arrived at constitutes the basis of the textural construction of the Babylonian and Assyrian tapestries. It also obtains in principle, but in another technical form, in design origination in pile carpets. In a five-colour Brussels carpet the unit colours appear in the sequence prescribed by the design in one *warp* line of the carpet, that is, grouped as in the Eastern tapestry cloth, in which, however, the colour units appear successively in one *weft* line and intersect in plain order with the warp threads. Another feature in which the two structures differ is, that in the machine-made carpet the number of colours is restricted by the mechanism of the loom, but in the tapestry, and also in the hand-tufted carpet, the range of colouring is only limited by the dimensions of the fabric.

Ancient tapestry weaving represents, with vertical-warp carpet weaving, the highest branch of textile art. The date of its origin is extremely remote. It had attained a conspicuous standard of perfection prior to the building of Nineveh, the excavation of the site of which has revealed the use of textile-design schemes as architectural models for tile flooring and wall decoration.<sup>1</sup> The designs, executed in burnt and glazed plates or tiles, consisted of plant forms, palm branches, open and closed lotus blossom, and of the detail types peculiar to the interlaced patterns produced in the loom. The occurrence in the ornament of Egyptian floral features points to the textile art of Babylonia having been influenced by the loomwork of Egypt. The evidence is conclusive that such decorative styles as that illustrated in Fig. 2, from the palace of Kujjunc, were copies of the famous tapestries of Babylon. The structure and composition of this variety of ornament are such as to indicate that the designs were, in the first instance, produced in colour and by the interlacing of warp and weft, and on the system of the ancient tapestry fabric described. In Assyrian architecture generally, as applied to pediment and façade decoration, as well as to floor and wall construction, the presence of woven ornament is observed.

The historical confirmation of this fact is significant as showing the ideal reached in decorative art by the craft guild weavers of Babylon, whose work gives indications of having been encouraged, if not in a measure controlled, by the priesthood, being designed and wrought for temple and palace decoration. That tapestry weaving should have been fostered in Assyria is but a natural

<sup>1</sup> *History of Art*, W. Hübke.

consequence of the degree of appreciation it received in the Assyrian schools of architecture.

From these two historic centres—Babylonia and Assyria—of decorative weaving the art of tapestry manufacture became intimately associated with the textile crafts of Persia and India, both in subsequent centuries renowned for carpet weaving. Its development by the Persian weaver resulted in the production of the hand-made velvet-pile carpet,<sup>7</sup> and by the Indian weaver in



FIG. 2.

the rich and gorgeous silk textures which so favourably impressed the pioneer explorers of India.

Carpet weaving, as accomplished in the vertical loom, being an extended system of tapestry weaving, the incorporation of the weaving practices of Babylon into the textile craft led to the establishing of the Oriental carpet industry. The Grecian period of tapestry weaving dates from the conquests of Alexander the Great (356–323 B.C.), who, being obsessed with Asiatic refinement and luxury, had his common tent covered with tapestries woven in gold; while that in which the Macedonian



conqueror celebrated his marriage was still more elaborate and costly, consisting of purple, scarlet and golden tissues suspended from pillars “overlaid with gold and silver and inlaid with precious stones.” The tapestries of Alexandria eventually rivalled those of Babylon, the Alexandrian weavers introducing a system of combining several warps in one and the same piece of tapestry. At Syracuse such progress was made that it was said “to have no need of competitors in the art of weaving gold-brocaded fabrics, or fabrics in which Babylonian art produced human figures, and did not need the purple colours of Tyre, the splendid tapestries of Attalus, nor the cloths of Memphis.”

Rome acquired the art of high-warp weaving from Greece, as the latter had acquired it from the East. The writings of Ovid, Virgil, and Tacitus contain various suggestive references to the Roman weaver and his work. The theatre curtain mentioned in *Georgics*, iii. 25, woven in purple hues and decorated with figures of conquered Britons, and that which concealed Agrippina as she became acquainted with the deliberations of the senators convened at her son’s palace, noted in Tacitus, *Annals*, xiii. 5, are suggestive of weaving proficiency; but much less so than the elaborate theatre covering inspired by Nero, in which the heavenly bodies, and Apollo driving his chariot, were depicted.<sup>1</sup> Relative to the actual task of weaving, Ovid gives the following description: “Minerva and Arachne having taken their places opposite each other, begin each to set the slender threads that form the warp and to fasten them to the loom; these threads are separated by a reed. The woof, directed by the nimble shuttle, unrolls beneath their fingers, interlaces the warp, and is united with it by the strokes of the sharp-toothed comb. The skilful workers use all speed, and, fastening back their robes, hasten the quick movement of their hands, their wish to excel making them unconscious of fatigue. In their weaving they employ the purple of Tyre, prepared in brazen vessels, and blend the tints so delicately that the eye cannot separate one from the other. Under their fingers flexible gold is mixed with the wool, while stories derived from antiquity are displayed on the fabric.”<sup>2</sup>

It is notable that the method of mingling the coloured shots of weft here defined, as well as the whole procedure of weaving, strictly conforms with the more ancient and Eastern practice; while the materials and dyes are such as were used in Babylonian

<sup>1</sup> *La Tapisserie dans l’antiquité*, De Rouchand.

<sup>2</sup> *A Short History of Tapestry*, Eugène Müntz.

tapestries: this also applies to the development of tapestry weaving following the Renaissance in Western Europe. The historic tapestries of Flanders (Antwerp, Bruges, Brussels and Ypres); of France (Arras, Beauvais, Nancy, Rheims, Lille and Paris); and of Germany, Spain, Russia and England, were woven in the upright or Egyptian type of loom, and in the identical fabric structure as that conceived and ornamented in ancient times.

Preceding this European movement in the art of tapestry manufacture, pile-carpet weaving was introduced into Spain by the Saracens in their conquest of that country, 714-732 A.D. In the Moorish city of Cordova, and in other places, carpets of an Eastern structure and design were woven. Moreover, the Italian mercantile dealings with the East, especially in costly fabrics, made this system of pile-texture construction known at an early date to the weavers of Venice and Florence.

It is not now clear how far the principle of tapestry weaving was applied to the production of carpets. The supposition is that the build of the fabric was, by the ancient weavers in the East, modified in thickness and in yarn quality to render it suitable for floor decoration. Ordinary makes of thick, strong fabrics, constructed of coarse vegetable fibre-grass, rush, hemp, palm-nut, etc., and embellished with simple plaited patterns, as done by the "natural" races of Malaysia, the Polynesian Islands, Madagascar, and South Africa,<sup>1</sup> would form the first description of carpeting. But, with the application of colour to the textures in the loom, other and more decorative types would be produced in mats and rugs, followed by the tapestry style of manufacture. These productions, and also those of dyed felts, preceded the tufted-pile carpet designed and woven at an early date in Persia.

In the Cairo Museum there is an Egyptian specimen dated 1400 B.C., which anticipates tufted-pile weaving, having a linen yarn foundation on which is woven a woolly surface but not of the Oriental pile structure. Athenaeus, in an account of a banquet given by Ptolemy Philadelphus (3rd century B.C.) at Alexandria, describes the carpets as being made "of the finest wool with the pattern on both sides," and the rugs as "embroidered and beautifully ornamented with figures." It is not unlikely that these had been produced in Persian looms. At an earlier period the tomb of Cyrus, King of Persia 546-529 B.C., was covered with a Babylonian tapestry, underneath which was a carpet of the richest purple dye. Whether these notable textiles

<sup>1</sup> *The History of Mankind*, Ratzel.

of the carpet and rug variety were pile-woven or otherwise is not now determinable. That, however, carpets were made in the manner of tapestry weaving, that is, with a simple foundation texture and the warp interlaced in sections with the desired colours of woof or weft to produce ornamental designs, and also in a firm plain-woven linen or hemp cloth embellished with pattern worked in close needle stitches, points to the existence of different systems of carpet construction prior to the invention of the art of pile weaving.

Seeing that, in the historian's description of the above purple-dyed carpet, no reference is made to its surface decoration, it was probably a felt manufacture. Preceding the discovery and practice of the manual crafts of carding, spinning and weaving, the skins of domestic and wild animals were used as clothing and also as mats and rugs on which to sit or recline. These applications would, in the course of time, suggest the feasibility of working the fibre, hair, or fur into a matted or felted texture of some degree of uniformity, thickness, and substance. The employment, in this way, of the fibrous materials in the natural state would result in the filaments or staples assuming an entangled quality. With further use, and the skins exposed to variable atmospheric conditions, a compacted mass of fibres, resembling a rough texture, would be formed. Whatever the order of the occurrence, the observant faculty of the user would be arrested by the gradual matting, felting, and unification of the filament strands. The cause would be apparent and indicate the better results attainable by the manual separation and opening of the fleece or fur of fibres, and of re-uniting the fibrous units into a texture of material of a prescribed density and thickness.

Felt cloths and carpets were originally an Eastern production, their manufacture having been practised from primitive times in various parts of Asia. The art of felting hair and wool was also known to the Romans, who are stated to have "embroidered felted fabrics in a different manner from the Parthians and the ancient Gauls." Pliny observes that "wool is compressed for making felt," and refers to the *gausape* or *gaxsopam*—a thick cloth made of fine wool and dyed purple, and "used especially for covering tables, beds, and for making cloaks to keep out the wet"—"which was brought into use in his father's memory," and also to the *amphimalla*, "a cloth napped on both sides."

More concise illustration of the fuller's work, as understood by the Romans, is, however, found in the excavated ruins of

Pompeii. From these it is evident that the fuller's craft formed a part of the industrial life of the city. It included the felting of prepared or hand-carded wool into cloth as well as that of felting a woven fabric into a thick, heavy piece. The fullery was well organised, and employed fullers, bleachers, and cloth dressers. One fullery excavated is seen to be equipped with a series of tanks, conveniently arranged with water-supply and outlet drains, for scouring, and tramping or fulling; and storage compartments for fuller's earth and other materials. Still the Romans do not appear to have manufactured felt for floor covering, though at the period when this and similar fulleries would be in operation, in Persia the felting, particularly of camel's hair and wool, was done in the making of carpets dyed in one colour or varied in colour and in pattern.

The hand-made tufted carpet is, as shown, a development of the Babylonian principles of tapestry weaving and of the Egyptian principles of pile weaving. It covers the former in the scheme of producing the design in colour units, and the latter in the scheme of acquiring the pile features in the process of wefting. In structure the carpet is a distinct textile invention. As a type of loomwork it differs from the types applicable to all other descriptions of woven fabrics. The groundwork of the carpet is a plain warp-and-weft interlacing, but neither the warp nor the weft threads, as commonly understood, are used in making the pile. This consists of tufts of yarn of a fixed length, each tuft composed of one or more strands. Such tufts are passed round pairs of warp threads and knotted to them. They do not intersect with the latter. All pattern features in the carpet are due to colour insertion and grouping as in ancient tapestries, but with the colourings developed in yarn tufts instead of in shots of weft yarn. With the use of fine wool, mohair, or silk in producing the pile yarn, and with the pile made in closely-knotted tufts, the carpets resemble natural fur in softness and texture.

The exact period of the origin of this practice in pile weaving is not definitely known. The occurrence of Egyptian and Babylonian styles of ornament in Eastern pile carpets does not necessarily signify that these originally formed the decoration of pile-woven fabrics. But it does show that the pile-carpet weaver consulted, utilised, and borrowed historic types of design, and those of a textile utility because of their earlier application to fabrics of the tapestry order. The tufted carpet, in its existing form, was possibly originated in Persia in the centuries

immediately preceding the Christian era. Its manufacture is likely to have been a secret craft, carried on under strict regulations both as to manipulative routine and the actual operation of weaving. No records of the design and colour schemes would be kept. These would be committed to memory, as is done in the East at the present day, and handed down from one generation of weavers to another. What a task this imposed may be imagined, but it is difficult to realise. With an average of 40 knots per square inch, a carpet two yards by six would contain over 300,000 knots, or the design would be composed of this number of yarn tufts all arranged in specific order as to colour tone to fit with the cast of the pattern. The difficulty of transmitting the working out of given styles in the loom—the key of which only existed in the mind of the craft weaver—was in itself a hindrance to the weaving practice being speedily adopted in fresh centres of textile work.

In addition, the whole scheme of manufacture was based on minutiae in craftsmanship. Every phase of the work was involved in mystery. The quality and make of the carpet depended on the choice of the wool or other fibre for the making of the pile yarns, on their dyeing and preparation for the weaver, on the practice in securing the pile tufts in pattern and serial order to the warp threads, and on the method of binding them into the ground of the carpet by the interlacing of the foundation shots of weft. These technicalities meant attention to detail and the exercise of knowledge acquired by experience and observation.

The manufacturing and weaving procedure as first evolved still obtains in the East, where, in some districts, the shepherd combines the duties of his calling with those of shearer and wool sorter. The finest fibre is obtained from lamb's wool by combing out the undergrowth of filament while on the animal's back; other and less valuable sorts are made in fleece wool with judgment and nicety and with regard to the classes of yarn into which they are to be spun and the style of carpet to which the yarns are applicable. On this system, fibre classification is as searchingly done as in the modern departments of the woollen and worsted industry. Similarly, skilled practice is observed in the treatment of the raw material in each stage of yarn construction. Soft water is requisitioned for wool washing, the preliminary work being performed in successive baths of cold water, then in a mild alkali solution, followed by rinsing in a running stream as accomplished in the olden days of woollen manufacturing in some parts of this country. Uniform drying

and loftiness of condition are secured by spreading the wool in even layers in the sun, preferably in a fresh breeze. The latter is considered important for imparting a proper quality of freeness to the lock or staple of the wool.

The separation of filament from filament and the re-mixing of the fibres corresponding to the operation of carding, is, and was, accomplished in two ways, in both of which every care is exercised (which long practice has proved important) so as not to break the staple of the wool unduly. Short wools are stretched on a bow string and whipped into a loose condition lock by lock or wisp by wisp. The coarser and longer wools are drawn between projecting pins or teeth arranged in rows on fixed bars. The carded or opened material is now spun by hand into three qualities and thicknesses of yarn—a small thread for foundation weft or filling; a medium count for warp; and a thick dense thread—made of the choicest wool sort—for the pile or nap of the carpet.

In the dyeing of the yarns natural dyes are still largely used. These, as prepared and applied, give the colour freshness and brilliancy, in association with softness of toning, which are as much a characteristic of Eastern carpets as the velvet-pile structure. To the Oriental the tinctorial ingredients of the dyer's art are generally known, being cultivated in the native fields. Corresponding vegetable dyes were employed in the colouring of the yarns of the hand-spun and hand-woven Scotch tartans. In the colour tones of these plaids, which so closely agree in mellowness and maturity of hue with the colour tones in the tufted carpet, *black* was obtained in decoctions of extract from alder-tree bark, dock-root, and water-flag root; *blue* from blueberry with alum, and elder; *purple* from sundew and lichen cupmoss; *red* from rock lichen, white lichen, rue root and tormentil; *scarlet* from limestone lichen; *orange* from bramble; *magenta* from dandelion; *yellowish brown* from lichen; *brown* from dulse, currant with alum, and blueberry with gallnuts; *crimson* from white lichen and *dark crimson* from dark lichen; *flesh colour* from willow bark; *green* from broom, whin-bark, teasel or fuller's thistle, and heather with alum; *violet* from wild cress; *yellow* from bog-myrtle, ash-tree root, bracken root, St. John's wort, common heather with alum, and sundew with ammonia; and *grey* from the root of yellow water flag.<sup>1</sup> In ancient times vegetable dyes of this category were skilfully selected and used. Each part of the plant—root, bark, leaves, flowers, seeds and rind of

<sup>1</sup> *The Scottish Clans and their Tartans*, W. and A. K. Johnston.

the fruit—yields a percentage of colouring matter. The art of dyeing with such dyes consists in the preparation of the decoction of the colouring ingredients, and in applying them in solution in such a manner as to produce the tinted quality without injury to the fibre of the material. In this work the Oriental dyer has succeeded to a supreme degree. The colouring matters and processes he utilises rather tend to add to the value of the wool—its softness, feel, and flexibility—than to impoverish it.

The range of colouring covers the various hues, tones, and tints of red, blue, purple, green, orange, yellow, brown, fawn, etc., with grey and black. The dyeing of the hanks of yarn in this gamut of colours is accomplished in solutions of the colouring matters mentioned below. In the process the same batch of yarns may be immersed in one, two or more solutions—thus green is acquired by dyeing in indigo and turmeric baths, or with blue and yellow colour decoctions. During the operation the hanks are repeatedly dipped in the dye vessels to circulate the liquor through and through the yarns. After dyeing the hanked yarns are well rinsed and dried in the open air. The colour tones and the dyes commonly employed in their production are described in Table I.

In recent years coal-tar and aniline colours have been introduced into the East. Their employment is not likely to enhance the colour quality of the carpets produced, which has been principally due to the use of dyes that have yielded, in skilled manipulative practice, beauty, freshness, and fastness of tinting in dyed yarns that work up well in the pile and body of the carpet. The dyes or colouring ingredients have hitherto been native-grown or acquired from native sources. Their properties have, by immemorial practice, been investigated and tested, and the methods of their utilisation have developed into a well-organised art craft. The employment of foreign and chemical dyes may lead to a cheaper product but not to better loomwork.<sup>1</sup>

<sup>1</sup> It should be observed that the same objection does not apply to the supplanting of hand by machine processes of carding and spinning. European factories have been established for this purpose at Oushak, but the innovation is not favourably regarded by the Orientals, who see in it a possible curtailment of craft labour. The production, however, of yarns from fibrous materials is better accomplished by machinery than by the most adept manual work. It results in the staple of the wool being more satisfactorily opened, the fibres being better intermixed, and in the yarns being more evenly spun. Therefore, on the ground (1) of superior yarns being producible, and on the ground (2) of economic yarn manufacture, carding and spinning by machinery should be increasingly practised, as in the making of cotton goods in India, and of silk fabrics in Japan.

TABLE I

## NATURAL DYES

- FOR BLUE TONES.—The basic colouring matter for blues, and also purples and greens, is indigo, obtained from the indigo plant (*Indigofera tinctoria*) found wild in some parts of India, but also extensively cultivated for its colouring properties. The process of indigo dyeing, with the vat fermentation it comprises, is fully understood by the Oriental dyer, as also that of producing with indigo clear and fast tones of colour in deep, medium, and light hues.
- FOR RED TONES.—Madder is one of the common dyes for red, though cochineal, kermes, Brazil-wood, sappan-wood, sanders-wood, rochella, etc., are likewise employed. Madder is from the root of *Rubia tinctorum*. A Persian practice consists in mixing an alum solution with grape-juice and a decoction of madder. For brilliant reds and scarlets, cochineal and kermes are the principal dyes. The first is from the insect *coccus cacti*, which feeds on the cochineal plant cultivated in Mexico, the Canary Islands, Algeria, Java, and Australia. Kermes is a colouring matter of similar properties to cochineal, being derived from the same variety of insect. It is much prized in Persia for carmine tinting. Various reds are dyed with Brazil-wood and sappan-wood; pinks with sanders-wood and rochella, a species of rock lichen; also nondescript reddish hues in decoctions of ivy berries, beet, etc.
- FOR YELLOW TONES.—Yellow dyeing is principally done with Persian berries (*fruit of Rhamnus infectorius*), also known as Turkish, yellow, and French berries. From a decoction of the berries a yellow dye is obtained which yields pure tints of this colour in the treatment of wool. Turmeric, the root of *Curcuma longa*, a plant cultivated in Southern Asia, forms another yellow colouring agent which is freely applied. It does not yield so fast a colour as Persian berries, but is usable for mordanting as well as dyeing. Indian dyers also use a yellow colouring ingredient obtained from the fruit rind of the pomegranate.
- FOR GREEN TONES.—The many shades of green seen in Eastern carpets are the result of using indigo in combination with yellow-dye solutions. Indigo with buckthorn gives pure, bright greens, and indigo with Persian berries or turmeric the intermediate and more subdued shades of green.
- FOR BROWN TONES.—Catechu (*Acacia Catechu*) is employed for dark brown shades, and also for tan, fawn, and drab tones. It yields a permanent colour, and is on this account favoured by the Indian carpet producer. Another practice in dyeing these shades is to use madder and indigo. Brown and grey tones are, in addition, dyed with gallnuts.
- FOR PURPLE TONES.—The rich-toned purples esteemed in Eastern carpets are dyed with various red colouring matters, such as rochella for imparting bloom, in different proportions with indigo as a base. Black is only sparingly applied for outlining design forms and in the demarcation sections of bordered patterns. Deep indigo purple shades are, however, generally preferred for these purposes. The colouring decoction for intense black is, by one system, obtained from iron filings, with vinegar and the rind of pomegranate to which campeche wood may be added, and by a second system from the East Indian catechu.



As in the instance of colouring matters, so in regard to the raw materials of which the carpets are manufactured. These have for long ages been obtainable in the countries in which the historic carpet-weaving centres are located. The extensive pasture lands of Asia Minor, Kurdistan, Persia, Turkestan, Baluchistan, Kashmir, Afghanistan, and South Russia offer climatic and grazing conditions favourable to sheep, goat and camel rearing. They are the natural habitat of the fibre-growing animals, from which abundant supplies of wool and hair are procurable for textile purposes. This accounts for the importance of wool growing in the development of the economic life of the peoples of the East. Wool appears as a valuable commodity in the oldest receipted bill of exchange in the world, that inscribed on the Chaldæan tablet—4000 B.C.—in which mention is also made of shepherds, weavers, metal workers, and of the members of other trades and professions.<sup>1</sup>

In addition to wool, the Oriental carpet industry is well provided with fibres of a vegetable origin and with silk. Cotton, flax, and hemp—suitable fibres for the foundation threads of the carpet—are grown in Egypt and India, and sericulture is one of the ancient arts of China, India, and Persia. To the Western mind the application of the costly fibre of silk to carpet manufacture is inappropriate. The fineness of silk threads is in itself sufficient to preclude the use of silk in the modern systems of carpet weaving. These considerations do not affect the Eastern carpet producer. He views the carpet or rug as the woven surface on which to lavish decorative treatment, as it constitutes the chief decorative feature in the furnishing of the mosque or place of prayer, the palace or the home. Silk, being obtainable in the centres of weaving, is relatively less costly than in European countries; and to the Oriental the fineness of silk yarns offers little difficulty. On the contrary, silk is appreciated on this account, as it yields a pile of extreme softness and density. The additional cost which its utilisation involves in labour is secondary to the making of a rug of exquisite richness.

The carpet is the *chef-d'œuvre* of Eastern loomwork, the expression of the ideal in design and colour of Eastern decorative art. No materials are too choice or priceless to be combined in its structure and ornament. Threads of the finest silk, as of the finest animal fibre, and of gold and silver, are selected for its textural and decorative qualities. To these the craft weaver

<sup>1</sup> *The First of Empires*, Boscawen.

added, in producing notable examples in carpet structure, pearls, gems, and precious stones.

The famous Baroda pearl carpet is of this description. It is equally suitable for mural and floor decoration, being of a tapestry formation, closely resembling, in the ground sections, a loop or terry pile fabric; but, strictly defined, the texture is a species of embroidered jewellery or a superb tissue of pearls, rubies, sapphires, and diamonds. Designed as an offering to the tomb of Mahomet at Medina, it was wrought in the reign of Gaekwar Khanda Rao by the master craft artists and skilled embroiderers and weavers of Baroda, who were occupied three years—1866–69—in its production. It is said to have been valued at a million sterling, but only a modicum of this sum (£2000) was expended on labour. That the mullahs imposed a condition that, if the offering were accepted, they should unravel it and distribute the jewels among the priests and pilgrims was doubtless owing to its non-Moslem origin.

The carpet is Arabesque in design, with a deep border pattern, and is some two yards square. In the centre of the field is an ornamental medallion composed of 405 diamonds, encircled with rows of pearls and rows of pale and deep blue stones. There are twenty-four similar but smaller medallions of fifty-two diamonds each in the border, which is richer in decorative detail and in colour—green, blue, and terra-cotta—than the central portion of the carpet, and forms in these features an effective contrast with the prevailing creamy whiteness of the latter. The centre design is a free-running composition of palmettes and conventional leaf and floral elements, proceeding from the stemwork traversing the whole field and developed in like colour tones as the pattern types in the border. The ground sections of both the field and the border of the design are formed in iridescent seed pearls, compactly and regularly set, and making lines as straight and even as a series of pile loops across the width of a woven carpet. Disregarding the medallions set in diamonds and mounted in gold, and the rosette ornament produced in pearls, rubies and tinted stones, the carpet presents, when viewed from the natural distance of a floor decoration, the distinctive features of a looped-pile fabric, but exceeding it in brilliancy of tone and in richness of colouring.

Purely as an example of Arabesque design, expressed in jewels and in interlaced warp and weft yarns, in two tones of green, blue, and coral red on a pearly-white ground, the carpet is

an interesting study in applied art. Technically, it is illustrative of the disposition of the Eastern carpet-producer to combine in loomwork costly materials, and in a form in which the art of the weaver is supplemented by that of the embroiderer and the jeweller. The carpet has a third significance in that it demonstrates within modern times, the lavish expenditure on textile work displayed by Eastern rulers, and this confirms, in view of the unchangeable nature of the East, the historic records of ancient fabrics produced in threads of gold and silver, or in wool and silk embellished with costly gems.

While, however, silk rugs are still made in Persia, India, and China, the tufted-carpet industry relies for its staple material on animal fibres. This being so, and each centre of weaving depending on the local supply of wool or hair, the carpets vary in structure, fineness, and quality with the district in which they are made. "For example, in some places the foundation upon which the pile is woven is of cotton, and in others of wool. In Kurdistan the foundation is usually made of wool, and the pile of goat's-hair or camel's-hair. Great differences exist in the qualities of these materials in different places. The wool of the sheep, as is well known, changes in character according as the habitat of the animal is a warm, a cold, or a temperate climate. In Kurdistan and Khorassan the wool is extremely soft, and in some parts very lustrous. This is due in part to the breed of the sheep, and in part to the pasturage on which they are nourished. In many places, also, the fleeces are of varied shades of colour, deepening to actual brown and black, and are used in the designs in their natural condition without dyeing."<sup>1</sup>

Such changes in the quality and type of manufacture are normal in home or part-home and part-works industries deriving raw materials from local sources. Coincident differences, as those named, are traceable in the home-spun tweeds of the cottagers of the Highlands of Scotland and of the cottagers of County Donegal, Ireland. In both districts the practices in yarn spinning and weaving correspond, yet with the wools used in the former of a somewhat coarser staple than the wools used in the latter district, the Highland tweeds are, on an average, of the rougher character. Like contrasts are noticeable, from similar causes, between Herez and Kirman, or between Daghestan and Sarakhs or Bijar carpets. The wools applied in the Herez productions vary in length and in quality, while those applied in the weaving

<sup>1</sup> *Eastern Carpets*, Robinson.

of the Kirman are even and short in growth, giving a close pile. Daghestan manufactures are composed of wool from sheep finding pasturage on the highland plains between the Caucasian mountain range and the Black Sea, such wool being of a regular structure yielding a good species of nap. The wool of which Sarakhs carpets and rugs are made—obtained in the district of the frontier town of Sarakhs on the extreme north-east of Persia—is irregular in filament length. It produces a rather long, straight pile but one of less density and smoothness than that of the Daghestan rugs.

In the East generally, the wool supply is not of the finest-grown quality as judged by the quality of the Merino wools of Australia, New Zealand, Tasmania, and South America. It is of a drier nature, containing a smaller percentage of wool fat, than the better grades of the crossbred wools of these countries. The supply includes wools of the average filament length and diameter of the Cheviot and crossbred wools of Britain, with wools of the Downs varieties of the western and southern counties of England and the Irish Roscommon, as well as wools of a lustrous character approaching Lincoln and Leicester fleeces. The yields, however, of the flocks of East India consist mainly of a straight-haired wool, strong and wiry in the staple and applicable to the production of durable classes of fabrics and rugs. East Indian wools are purchased by British manufacturers for thick blanket and coarse carpet yarns. The sheep of Persia, Syria, Palestine, and other parts of Asia are of the broad-tailed variety. The *Argali* or wild variety of sheep is found on the mountainous ranges and elevated plains of Central Asia. Its fleece consists of short hair, covering a coat of soft fine wool: under domestication the yield of hair is reduced and that of the wool increased.

While, in comparison with the wools available in the European and American textile industries, the Eastern wools are, on the whole, deficient in fineness and waviness, they are true-grown wools, with the staple sound, elastic, and strong, and the fibre of a diameter measurement well adapted to the manufacture of yarns which result in clothes, carpets, and rugs of excellent wearing consistency.

In the carpets made for native use, as in those for export, the essential, in the better classes of production, is a close nap, and this is procurable in short, medium, and semi-lustre wools. The structure of the fibre and also of the staple of Persian, Afghanistan, and Turkestan fleeces is such that the wools yield well in

yarn preparation and in carpet weaving. In addition, these wools are of good dyeing property. For yarns intended for delicate shades—light blue, fawn, ochre, etc., or pure colours such as scarlet, orange, pink, green, etc.—wools are chosen of a clean white tone. Those streaked with dark hair are rejected, as also those varying in shade in different parts of the fleece. The practice in this relation accords with that followed in Western manufacturing.

The Eastern carpet producer has other and important supplies of raw material than sheep's wool. The Angora goat is indigenous to Asia Minor, the Cashmere goat to Tibet, and the camel—which sheds its coat twice annually—to Arabia, and is, moreover, bred in various parts of Asia. Mohair is long in the staple, wavy, lustrous, and a pearly white. Though somewhat more difficult to work into yarn by hand manipulation than wool, it is employed in rugs having a bright, silky tone. Its lustrous and other properties have led, in this country, to its extensive use in the manufacture of “lustres,” “plushes,” and “long-pile” and “double-pile” rugs. Cashmere is a fine downy material obtainable in grey, brown, light brown, and mixed shades. The coarse surface hair of the fleece covers an undergrowth of soft filament which constitutes the cashmere used industrially. The Oriental applies cashmere in the weaving of figured shawls and superior qualities of pile carpets, and the Western manufacturer to twilled fabrics and plain-woven textures. Camel's-hair is one of the principal varieties of hair employed in the spinning of the pile yarns of Persian carpets. It possesses a high degree of softness and smoothness, and is specially suitable for making a close, warm pile, one kind to the touch and yielding to the tread. The fineness of the filament, combined with the staple qualities, has caused camel's-hair to be selected by European manufacturers as a choice material for various makes of soft-handling cloths, produced in the natural colour of the hair.<sup>1</sup>

As pointed out, the Eastern weaver is provided with a variety of materials either of vegetable or animal origin for the foundation yarns of the carpet. Tensile property is a primary requisite in such yarns. They form the fabric structure into which the pile tufts are bound. In double-pile productions this structure occupies a central position. While the warp threads and the ground shots of weft do not modify the character of the pile,

<sup>1</sup> *Union Textile Fabrics*, Beaumont; also *Dress Cloths*, Beaumont and Hill.

they affect the wear of the carpet, and need to be well spun and made of strong material. In districts in which a plentiful supply of different sorts of wool is available, both the foundation warp and weft yarns are of wool. A second practice consists in making the warp yarns of vegetable fibre and the weft of animal fibre; and a third practice in using cotton and other vegetable fibres for both these yarns.

With the spinning and weaving manually performed, the craft tools are so primitive in arrangement and construction that rug making may be practised in the home, or in ateliers in which dyers, spinners, weavers, and designers are employed. Both systems of manufacture are under the control of carpet dealers, or the headman of the town in which the rugs are made. The home producers receive the yarn from the dealer who follows the progress of the loomwork. Most of the weaving in Persia, Turkestan, the Caucasus, and Afghanistan is done by women and girls, the yarn preparation and dyeing being done by the men. In India men weavers are the rule, and also in such important centres as Ispahan and Tabriz for the better qualities of carpet intricate in colour range and in decorative design.

Labour in all departments of activity is indifferently remunerated. The Persian weavers are paid on a "pick" scale, which means per row of pile woven twenty-seven inches in width. This, in a carpet with eight tufts per inch across the web, would be on the basis of knotting 196 lengths of pile yarn with the warp threads, including the insertion of the binding shots of weft. The payment is in kind—groceries and necessary commodities—and not in actual cash, and is made in accordance with the advance effected in the weaving task.

Young girls of eight years of age begin their weaving apprenticeship on plain-coloured sections of the rug, such as the border bands at the ends. Proficiency in this work has to be attained before varied colouring and design forms are attempted. It comprises the accurate looping of the pile tufts on to the warp threads, the interlacing in the prescribed order of the picks of weft, and the firm beating of the rows of pile into erect formation with the beater or comb after the insertion of the binding shots.

Designing is not so much exercised in originating fresh decorative types as in varying structural elements in standard and historic styles, though it includes changes in colour assortment and grouping. In the absence of working out the designs on scale paper as in the Western practice, the weavers take

directions, as they proceed with their task, from the head woman. She sketches the pattern on the ground and chants, during the weaving operation, the sequence of pile knots, their colour in different parts of the carpet, and the whole order of procedure in the development of the pile surface.<sup>1</sup>

According to the Turkish rug nomenclature, which has become prevalent with Constantinople as the chief emporium of carpet trading, the productions include: Prayer rugs, *Nama:lik*; hearth rugs, *Odjaklik*; floor covering, *Sedjadeh*; bath rugs, *Hammamlik*; divan mats, *Yestiklik*; runners, *Makalik*; saddle covers, *Hehbehlik*; grave carpets, *Turbehlik*; and hangings or carpet tapestries, *Berdelik*.<sup>2</sup> The hearth rug is one of the finest and choicest of these manufactures, both as to colour toning and as to decorative ornament. The prayer rug is also a fine example in skilled textile craftsmanship. A characteristic in its design embellishment is a representation of a mosque. Otherwise the pattern style varies with the districts in which the rugs are woven, though the design types approved are mainly of a geometric order. The term *sedjadeh* is applied to rugs of about seven feet in width and ten feet in length, and to carpets of somewhat larger dimensions. Being woven in various centres of manufacture, they differ considerably in design and colour treatment. Bath rugs have a marriage significance for the bride as showing her skill in weaving and her judgment of rug tinting and ornament. *Yestikliks* or mats are made by the Chinese in camel's-hair and silk, and those by the weavers of Mirzapore and Anatolia in fine wool. In keeping with their application and use, mats are ornate in character, the Chinese designer introducing into his work flowers, birds, and animals. Mats are made in such sizes as 2' 2" by 1' 7", 2' 10" by 1' 3", 3' 1" by 1' 10", 4' 1" by 2' 1", and 4' 2" by 2' 3".

Runners or stair carpets are some three feet and a few inches wide and fifty or more feet in length, frequently with the border and centre woven in contrasting colours, or, in a Sparta example, with a cream ground in the centre pattern and a rose-tinted border. In the East, saddle-bag covers are a necessary equipment to the equestrian, whose æsthetic feeling for design is shown in the style of cover he favours. The saddle covers of the nomadic

<sup>1</sup> Organised carpet manufacture in Tabriz, Oushak, etc., is performed under different conditions. A plan of the design is attached to the warp for the weavers' guidance, and this is followed throughout the rug production.

<sup>2</sup> *Oriental Rugs*, Mumford.

tribes are extraordinary in colour quality, but those of the cultured classes are tastefully decorated.

Sombre pattern types, suggested by the cypress, willow, and myrtle trees, are combined in the weaving of *Turbelihs*, relieved with bright specks of colouring. The pile-carpet tapestry, or decorative hanging, is not intended for floor covering but for wall-space embellishment and for portières and curtains. It is a fine, thin, well-made pile structure, elaborately ornamented, and in the manufacture of which silk, as well as wool threads are used.

The supply of Oriental carpets for European and American markets is derived from the looms of Persia, Turkey, Turkestan, India, Afghanistan, the south-eastern parts of Russia bordering on Armenia and the Caspian Sea, China, and Japan.

Persian carpets, in structure, design, and colour, are the models on which the whole of this Eastern craft industry has been formulated and developed. Ancient Persian weavers discovered the schemes of intertexture for producing a durable rug fabric, and the sorts of yarn best adapted for obtaining diversity and richness of pile surface, as they originated what have become the classic styles of carpet decoration. Technical changes in construction and in designing practice have been made, but the weaving and decorative principles remain essentially unaltered. Thus the best productions of Turkey and India evince the influence of historic Persian work. The Turkoman has introduced bolder pattern forms executed in standardised red and blue colouring, and the Indian craftsman decorative types of a purely national feeling and character, but in each result the design treatment and carpet make are plainly of Persian origin. Chinese and Japanese rugs are of a somewhat different category. The former employ silk yarns freely, and adhere to the art traditions of China in textural surface ornament; and the productions of Japan are made of cotton, and in design schemes largely borrowed from foreign loomwork.

Carpet-weaving is a national industry in Persia, being practised alike in the village and the city, and by tribeswomen in the mountainous districts. Diversity of craft centre and different grades of weavers are, in a measure, responsible for the several varieties of carpet structure and design, ranging from the Sarakhs heavy rug, made entirely of woollen yarns, to the closely-knotted, thin, fine rugs of Tabriz, made of selected wool or of wool and silk mixed.

The productions of Ispahan, Tabriz, Teheran, and Kirman



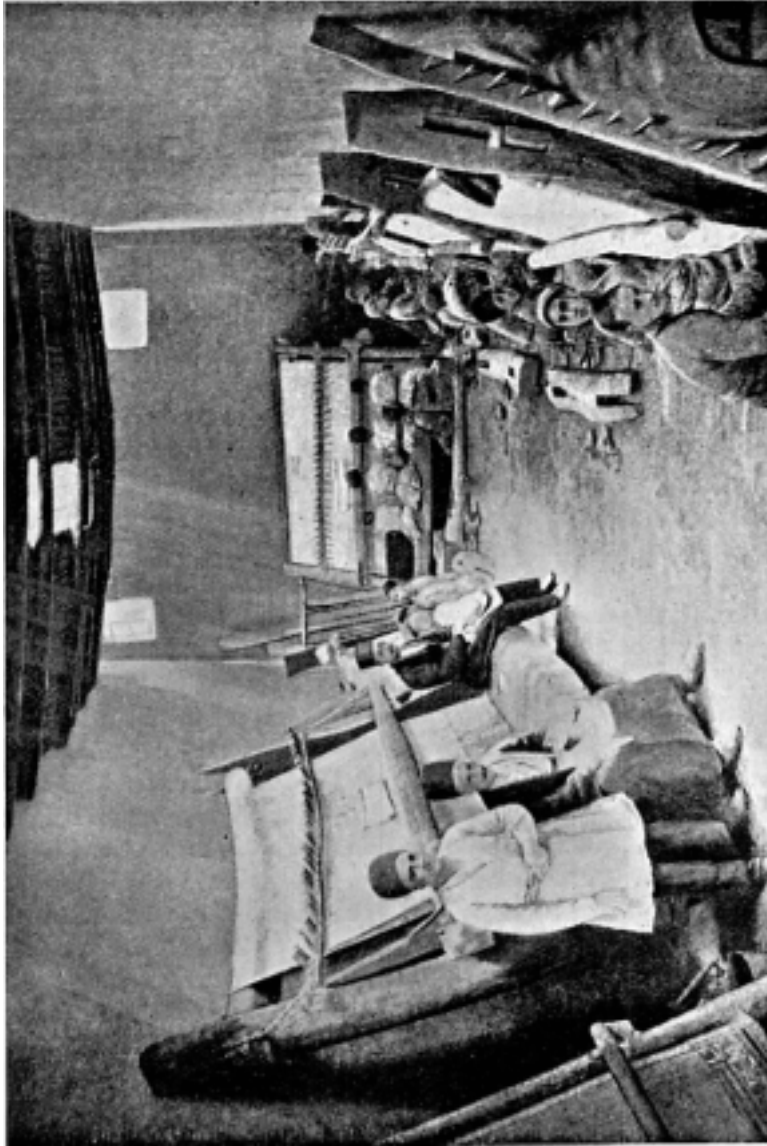


FIG. 3A.—TABRIZ CARPET WEAVING.

rank amongst the best styles of Persian loomwork. The carpets, whether of historic or modern design, are produced in fine structures, and in choice materials and colouring. In the city of Ispahan the number of looms in 1913 was not more than 100, employing about 300 weavers, but Ispahan carpets are also made in different parts of the province. A traditional style of Ispahan rug is woven in deep red tones on a blue ground. Tabriz rugs are pure Persian in design and texture, the ornament consisting of minute details clearly delineated in pile yarn. Cotton and wool are used as the warp yarn and also silk in fine-set rugs. By knotting with one series of the warp threads in advance of the alternating series, the back of the carpet has a ribbed appearance. The average make of rug has 160 or more knots per square inch and the finest make as many as 400. Vegetable dyes are mainly employed. Tabriz weavers are competent reproducers of both classic and Western styles of design. Teheran carpets are of a similar manufacture to those of Ispahan, but differ in design and tinted composition, which, in some examples, is based on the pine figuring seen in Cashmere shawls. The figures are arranged in rectangular spaces or diagonally. Kirman or Sirjan rugs are from the city and province of this name. The city is famous for its shawl and carpet manufactures. The latter are the production of the descendants of the ancient Parsee race, and are known for their excellent structure and colouring.

The pile yarn in Sehna, Feraghan, Khorassan, Sarak, and Saraband carpets are secured to the warp yarns by what is termed the Sehna method of knotting. Both this and the Ghiordes form of knotting, employed in the Tabriz, Hamadan, Herez, Sarakhs, and certain other varieties of rugs, are explained in Chapter II. At Sehna, in the province of Ardelan on the north-west border of Persia, narrow-web rugs are produced which equal in fineness and workmanship those of Tabriz. Cotton, linen, and silk threads are selected for warp, woollen yarns made of short-stapled wool for pile, and cotton, woollen, or linen yarns for binding weft. The knotting varies from 100 to over 300 knots per square inch. Diaper patterns are favoured in which the detail effects are ingeniously woven with all parts of the centre or field of the rug. Feraghan (province of Irak) manufactures closely resemble those of Sehna, but are not so fine in the weaving as the latter. Though rarely exceeding 160 knots per square inch, they are, on account of their true decorations and technical qualities, esteemed by Persian carpet connoisseurs. Khorassans

are a type of narrow-web rug of sound structure and materials produced by hill-country weavers. Sarak rugs are made with a cotton warp and cotton ground weft, and with fine-wool yarns for pile. A feature in the Saraband, which is similarly constructed, is the multiplicity of the bands in the border of the rug. The Selvile rug is a species of Saraband.

Other Persian carpet weavings which should be noted are those of Sarakhs, Herez, Shiraz, Kurdistan, Hamadan, Kermanshah, Meshed, and Sultanabad. Sarakhs or Birjar rugs include the correct make of Lulé or heavy class of carpet. The colourings of the ordinary varieties of Sarakhs are of an elementary order, with red hues predominating, those of nomad construction being rather garish in tone. The warp, ground weft, and pile yarns of these rugs are made of wool. Formerly Herez (province of Azerbaijan), including Bakhshis, Görevan and Serapi carpets were known as an inferior description of Hamadan; but rugs of an excellent quality and style with a cotton or linen foundation have been produced by the village weavers in the Herez district. Shiraz, the capital of Faristan, is an ancient seat of woollen and silk weaving. Here, as at Kermanshah, carpet weaving was at one time conducted in the governor's palace. The warp of Shiraz rugs is spun from goat's-hair, and the weft and pile yarns from wool. The rugs are of an intermediate grade with 6 to 12 tufts per inch across the web, and 7 to 14 tufts per inch lengthways of the web. Camel's-hair and *filik* (straight goat's-hair, reddish in tone), in the natural colour, are used in the pile yarns of certain classes of Hamadan rugs, while in other classes the prevailing colours are red, blue, and yellow, with the foundation cloth woven in cotton for warp and in wool for weft. Persian Kurdistan carpets are made by the Kurds, who produce a sound variety of rug woven in white or grey woollen warp yarns, and in pile yarns consisting of a medium fineness of wool. Such pile yarns are dyed by the weavers with natural dyestuffs.

Within the region of Kurdistan a number of the thinnest and best makes of Persian rugs are manufactured, in addition to rugs of a heavy description. Two thicknesses of weft yarn are applied in the weaving of many of these rugs, one a finer thread for binding the warp interlacings, and the other a thicker thread for "filling" and imparting firmness and durability of structure. Kurd productions may be distinguished by the line of coloured woollen yarn inserted into both ends of the rug. Meshed, the capital of Khorassan, is a considerable market for carpets. The



FIG. 3B.—TURKEY CARPET WEAVING.

rugs of this name are well set in the loom, having some 72 to 140 knots per inch, and being especially rich in colour quality and decorative character. They are mostly narrow-web fabrics composed of cotton or woollen warp, and of woollen pile yarns. At Sultanabad rugs and carpets of various grades, in both Eastern and Western styles of ornament, are produced, European designers being employed in the weaving establishments.

Turkish carpet designing is not, in the sense of Persian and Indian textile art, an outgrowth of native genius in designing and colouring. It is rather a combination of decorative types acquired from Persia and Arabia and incorporated into Turkish-made fabrics. In weaving, as implied in the selection and use of materials for a given class of carpet, the preparation and dyeing of the yarns of a special structure, and in the actual method of knotting, some inventive effort is displayed. With an indigenous supply of long-stapled material like mohair, the yarns, if hand spun, require to be, on an average, of a thicker quality than those spun from medium and fine wools. This factor may have determined the use of thicker yarns—though made of admixtures of wool and mohair or of wool simply—than the yarns employed in the weaving of Tabriz, Sehna, Kirman, and other fine varieties of Persian productions.

The thicker the yarn unit in the pile, the fewer the number of knots in a prescribed area of carpet, which accounts for Turkish carpets being of a less-knotted density than in weavings in which smaller woollen yarns are applied. It does not necessitate a pile of inferior wearing durability nor yet one lacking in filament compactness, but a pile consisting of strong fibre, and of high resistance property. The drawback in the employment of thick pile yarns is in the expression of design detail. Each knot has a specific effect, for it gives two ends of threads, and these, in a structure of 20 knots per inch in the width and length of the web, would cover one-twentieth of a square inch of carpet. Such ends, when the yarns are correctly spun relative to the space they are intended to cover, may be as efficient in filament filling as two or more knots having the same function, but in one instance each pile unit is the result of one thread and in the other of several threads all separately knotted. For fine work close-knotting and the use of small yarns are desiderata, but Turkish weavers have not, as a rule, this class of work in view. They employ the Ghiordes knot, which is of Turkish origin, possibly devised by the weavers of the carpets made

at the town of this name, which is an ancient place of carpet fabrication.

Turkish carpets include those designated Smyrna, Konieh, Oushak, Kir-Sheha, Bergama, Ak-Hissar, Yuruk, Ghiordes, Kulah, Anatolian, etc.

Smyrna is not so much a carpet-weaving centre as a centre for carpet dealing. Such carpets as are produced by Smyrna weavers are frequently of large proportions, loose in texture, simple in colouring, and ordinary in design. From the looms of Konieh carpets of a better character are obtained, though usually of the heavy variety. Antique Koniehs are found to be made of fine sorts of wool, but the modern Koniehs of coarse and parti-coloured wools.

Oushak is an important rug-weaving town. In the Yaprack and "Kirman" qualities of Oushaks the warp yarns are dyed in strong colours and in the wool; and a binding weft yarn is used of the same size as that of the yarn forming the pile. Yapracks are one of the coarsest classes of carpet. They are woven in two colours, such as red and green, and red and blue. The Oushak-Kirman is a closer make of fabric with from 25 to 56 tufts of pile per square inch, while the Gulistan and Enile Oushaks are finer still, and the Demirdjii productions of a sounder quality than the standard types of Oushak.

The carpets woven at Kir-Sheha, in the province of Angora, are noted for their brilliant red and green colours. Bergama and "Ladik" (Aidin) weavings are grouped with the better varieties of carpets, being strongly constructed and fresh in colouring—red, crimson, yellow and blue. The foundation threads are dyed in a similar shade to the principal colour in the pile yarns; and wool is the material of each part of the carpet structures. Ak-Hissar, the ancient Thyatira, has a reputation for cotton goods, dyestuffs, and carpets. The carpets made here consist of both mohair and woollen yarns, and resemble, in general appearance and construction, those known as Oushaks. Yuruk rugs are a shepherd production, coarse in texture, dark in colour, and warm and soft in the wear.

Ghiordes carpets form one of the best styles of Turkish weaving. Some of the antique specimens are comparable with Persian loomwork, but the commercial manufactures are less creditable in design and pile features. Kulah rugs are produced by men weavers. They are woven in mohair and coarse woollen yarns with some 16 to 48 knots per square inch of pile. A common

characteristic of Anatolian mats, made in various parts of Asia Minor, is their soft, full pile, due to the quality of the long-stapled wool selected. Sparta-Anatolian stair lengths are woven in diversified types of pattern and colouring.

The rough rugs and carpets known as Mosul and Genghis may be mentioned here though they are sometimes classed as Caucasian. Both are weavings of the Turkoman or Ottoman. The former are made in Mosul, in Asiatic Turkey, with camel's-hair and flik pile yarn, and with wool or cotton warp yarns interlaced with woollen weft yarns. Genghis rugs (named after the Mongol conqueror, Genghis-Kan, 1162-1227) are the manufacture of nomad tribes dwelling in tents on the sandy plains between Mosul and Persia. Goat's-hair is the material used for warp, and natural-coloured wools for weft, with finer grades of wool for pile. Some six knots per inch in both the warp and weft lines of the rug are common. Kurdish Mosuls are similarly constructed.

The use in most Turkish carpets of animal fibre—wool, mohair, or both—in the yarns for warp, weft, and pile, adds to the treading and wearing properties of these manufactures. Exceptions to this rule may obtain in Ghiordes, Kulah, and Meles fabrics, in the making of which cotton or wool is selected as the material of the yarn for the binding weft.

Caucasian and Transcaucasian weavings form a specific class of commercial carpets and rugs. The first are acquired from the Russian carpet-making districts of Daghestan, Kuba, and Circassia, and the second from the region between the rivers Kur and Arras, including the districts of Erivan, Baku, and Shirvan.

Daghestan rugs are geometrical and mosaic in pattern type, moderately close in the knotting, and made in a sound quality of short wool. Derbends are coarse in the make, with the warp yarns consisting of brownish goat's-hair, and the pile yarns of medium wool, and produced in designs of a mixed character. Kabistans or Kubistans from Kuba looms are well-woven, smooth-trimmed rugs, with a cotton warp and a cotton ground weft, and with a compact pile. Tchetchen or "Tzitzi" manufactures are a pure-wool type of weaving, the warp yarn consisting of white wool, and the ground and pile yarns of a stronger-fibred wool: the rugs average 6 to 10 knots per inch in the line of the web. The structure and material of Teherken or Circassian rugs correspond with those made by Tchetchen weavers.

Transcaucasian rugs follow in design and colouring the models

of Daghestan, though woven in districts on the southern slopes of the Caucasus, in which it might have been anticipated the influence of Persian textile art would have been paramount. As the older varieties of these rugs were made irrespective of marketable value, they are even and firm in structure and excellent in design and colour blending; but in the production intended for export, the original ideals have been more or less disregarded. Rugs in almost all sizes and somewhat nondescript in style are now made.

Soumaks, to which the name of "Kashmir" has been applied, are woven in Shemaka, a town sixty-three miles north-west of Baku. "Soumak" is a corrupted form of Shemaka, which, in addition to being a weaving centre, is the market place of Daghestan, Kubistan, "Tzitzzi," and Shirvan rugs. The Soumak is an ordinary class of woollen pile rug, with part loose fibre drawn on to the under surface, from which characteristic its trade name of "Kashmir" has been derived; but the rug is not of the Cashmere quality of material. Soumaks used to be confined to small and medium sizes, but they are now made in larger dimensions, and with coarse, greyish-brown warp in place of white wool, and with a heavy quality of pile yarn, loosely knotted. In the process of construction, the knotting is done slantwise of the warp threads, with alternate rows in reverse directions, causing the under side of the rugs to present a herring-bone effect. Two rows of pile tufts are knotted for the insertion of two ground shots of weft. The old method was to insert a foundation pick after each row of knots, and to insert 10 or 12 knots per inch perpendicularly, whereas in modern work of the coarser grades not more than 6 knots per inch in the warp line are frequent, with the weft yarns thrown across the web for each three rows of knotting. Generally Shirvan and Kazak rugs are a degree more compact in the pile than Soumaks, and of a fair quality of wool throughout. In certain makes of Kazaks four ground shots are woven into the warp for each series of pile tufts.

Carpet loomwork is practised by the Turkoman in Bokhara (Independent Tartary), Samarcand (Western Turkestan), in Kasgar and Yarkland (Eastern—formerly Chinese—Turkistan), and in the territory bordering the east side of the Caspian Sea. Carpet weaving is also done by the Baluchi, Brahui, and Tartar inhabitants of Baluchistan, bounded on the north by Afghanistan and on the west by the Persian province of Kirman.

Kashgar is noted for silk fabrics, cotton goods, and carpets,



and produces a good class of rug made in woollen or silk yarns for the pile structure. Samarcand rugs are likewise woven in wool or silk for pile and in cotton, wool or silk for warp, crossed with

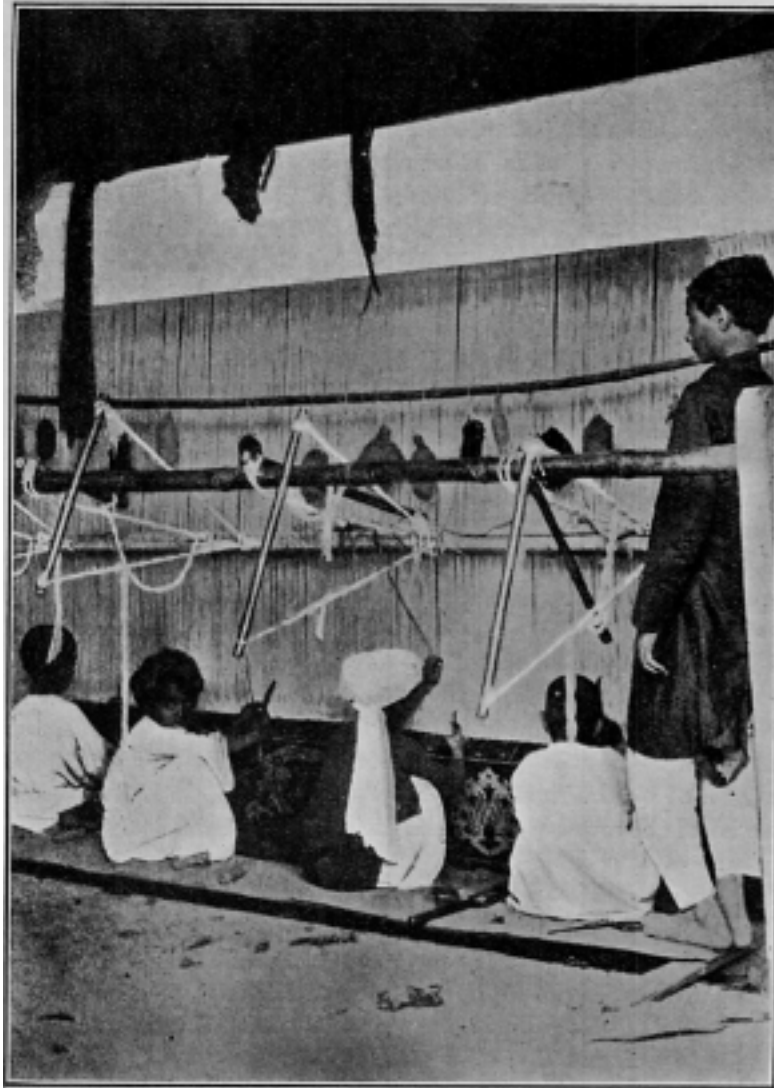


FIG. 3C.—INDIAN CARPET WEAVING.

cotton or woollen weft. Bokhara or Tekke carpets are recognised by their severe geometric forms of design and clear colour toning. They are made in satisfactory qualities of wool and goat's-hair,

and woven with up to 20 knots per inch in the warp and weft lines of the fabric; but the lower grades of Tekkes do not average more than 56 to 60 knots per square inch of surface.

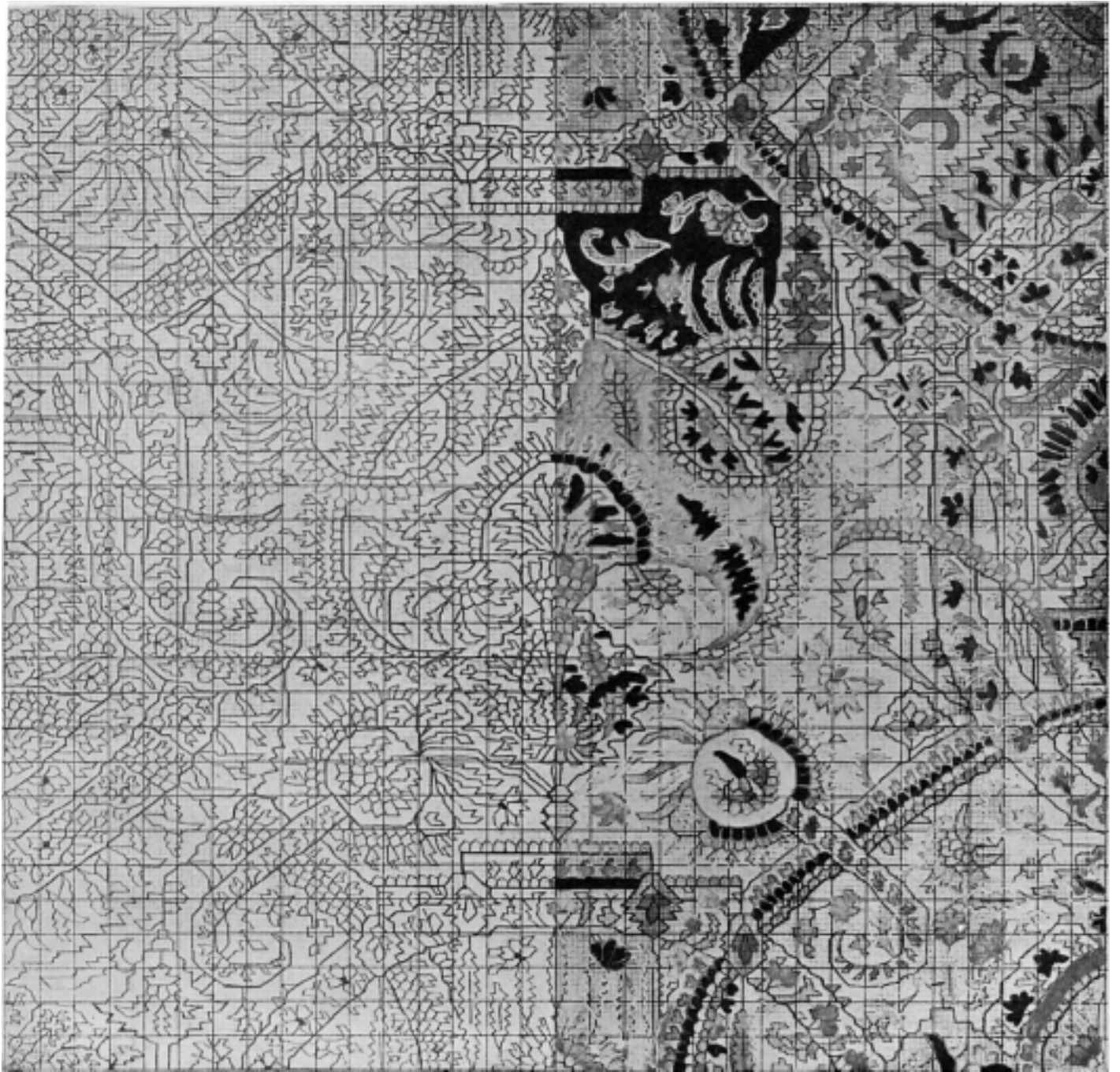
Each Turkoman family had formerly its particular design and colour type of rug, and this fostered trueness in weaving and originality in pattern style within certain traditional notions of textural ornament and tinting. The commercial factor, which is now paramount, has had its effect in acquiring quantity to the detriment of quality of production.

Turkoman Yomuds are made largely of goat's-hair; Afghan-Bokharas, coarse in texture, are woven in natural-coloured wools—brown and black, and thick in fibre; and the yarns in Baluchistans consist of medium wools, the rugs averaging from 5 to 10 knots per inch across and lengthways of the web.<sup>1</sup>

In Kabul and Herat (Afghanistan) carpets, camel-hair cloth, silk stuffs, and skin (*postin*) mats and rugs are specialities of manufacture. Antique Kabul carpets are varied and rich in decorative elements and colour blending. The ornament is of a Cashmere structure and composition, presenting many of the conventional floral and leaf forms distinctive of Kashmirien shawl designing, as exemplified in Fig. 4 (Folding Plate), a reproduction of a Kabul carpet made early in the eighteenth century. In decorative types and in the interchange and blending of brilliant red, green, and blue tints, with touches of black for emphasising the pattern scheme, this and similar Kabul weavings are suggestive of a close study of, and adherence to, Cashmere examples of textile surface decoration. Herati rugs are distinguished by the richness of the border design, formed of several bands of decorative detail developed in contrasting ground colours—a type of border ornament adopted in the production of the principal varieties of Persian carpets, such as Ispahan, Feraghan, Khorassan, etc. Purity and fastness of colour are obtained in both Kabul and Herati manufactures by the use of vegetable dyes, more particularly such as are procurable from the leaves of the *pistacia* or *pistachia* trees, of which there are forests in different districts of Afghanistan.

Indian carpet weaving, Fig. 3c, as exhibited in the older types of loomwork, consists of Persian principles of design. Later, as in the instance of Kabul carpets and rugs, it derived inspiration from the artistic products of Kashmir looms. In modern times it has been retarded by the introduction into

<sup>1</sup> *L'Art de l'Asie Centrale*, N. Simakoff.



*Carpets and Rugs.*]

FIG. 4.—Kabul Carpet Design.

[To face page 34.

India of European industrial practices. With the encouragement of cotton, jute, vegetable-dye, tea, etc., growing, and the expansion of the country by mechanical industries, new and improved fields of employment have been opened up, and these have lessened the native interest in handicraft production. The Indian carpets now offered for sale in Western and American markets are produced in such weaving centres as Kashmir, Lahore, Mirzapore, Malabar, Masulipatam, Amritsar, Ellore, and Calcutta. The weaving work of Kashmir is still of superior merit both in technique and design. It excels in the execution of all-over styles of ornament, rich in decorative detail, developed in bright colours harmoniously blended. The better grades of carpets produced in other centres are also of approved fineness and structure; but the industry generally suffers from the causes defined.

## CHAPTER II

### HAND-TUFTED STRUCTURES

Western Carpet Weaving based on Eastern Systems of Loomwork—Classification of Carpet Structures—Looped-Weft and Looped-Warp Pile Weaving—Single-Make Pile Fabrics—Tufted Pile, a Weft Principle of Carpet Construction—Vertical-Warp Loom for Pile and Tapestry Weaving—Tufted-Weaving Operation—Methods of Yarn Knotting—Ispahan Design Example—Practice of Tuft-insertion and of Wefting—Sehna and Ghiordes Types of Knot—Style in Carpet Designing—Tinted Composition of Eastern Examples—Latitude in Design and Colour—Decorative and Constructive Effects—Pine Variety of Figuring—Detail Work in Persian and Indian Ornament—Sectional Looming Plans—Colour Blending and Toning—Colouring of Design Features—Eastern Colouring and Theoretical Principles—Colour Values, Hues, Tones, and Tints—Nomad, Ghiordes, and Persian Colour Schemes—Function and Suggestiveness of Colour Tones—Purity of Hue—Colour Plan adapted to Character of Decorative Forms—Examples in Colour Transposition in the Pile Surface—Diversifying the Ground Shade of the Carpet—Detail Structure of Indian Styles of Design—Arabic and Persian Decorative Types—Early History of British Carpet Industry—Flemish and French Weavers—Invention of Wilton Pile—“Real Axminster”—British Makers of Hand-tufted Carpets—Royal Wilton Factory—Carpets with Solid Colouring in the Field and Decorative Border—Shaped Carpets—Example in Tree-of-Life Design—“Savona” Specimen Based on Eastern Model—“Ladoga” Specimen, Western Design Principle—Morris Movement in Decorative Reform—Hammersmith Rugs—The Morton Works, Co. Donegal—Yarns and Settings for Irish-woven Carpets—Thick-pile Example—Egyptian Symbolic Scheme of Ornament in Modern Cairo Rug—Sectional Looming Plan—Colour Gamut—Tufted Closeness in Oriental Carpets, Rugs, and Mats—Time Occupied in Weaving—Fineness of Manufacture determined by Tufted Density—Knotting Comparisons—Factors affecting Wearing Value.

THE modern carpet and rug industry presents both manual and mechanical methods of manufacture. The historic and technical data analysed, in reference to Eastern methods of production, have illustrated the schemes of textile work by which, from time immemorial, carpets of excellent quality, design and colour have been made in (a) felted materials, and in (b) woven structures. Closer and fuller investigation reveals Western practice as primarily formulated and established on these primitive systems of carpet construction. It has, as a result of inventive progress and of development in mechanical efficiency, introduced routine operations automatically controlled. Though industrial growth, on certain lines, was followed, the ancient and basic forms of fabrication have remained.

The range of productivity has been augmented and also that

of constructive accuracy, but, with the use of mechanism, in the place of the nimble fingers of the weaver, design and colour limitations have been imposed unknown to the hand craftsman. Moreover, the standard and style of the work wrought have not in all instances been improved. For example, it will be shown, in subsequent parts of this treatise, that in pile carpets woven in Western looms the most advanced schemes of weaving have not resulted in grades of manufacture superior in richness and density of fibrous pile, and in diversity of ornament and tinting, to those producible in the vertical loom; or by the simple but tedious process of securing, by hand knotting, tufts of yarn to the foundation or structural warp and weft yarns of the carpet.

In "felts" a higher degree of manufactured success, as estimated by the intrinsic merit of the product, has been achieved, but here also the facilities for design and colour treatment have been somewhat curtailed. The chief advantages the carpet industry has derived from inventive effort consist in economy of manufacture and in range of textural construction. In these technicalities the historic practices have been effectively superseded by modern machine operations. Thus, by their application in producing felt carpeting, the fibrous materials may, in the first place, be better prepared, that is, opened and disentangled, and re-mixed and levelled, than by the most skilful hand carding; and, in the second place, increased and more perfect means are afforded, by the use of mechanism, for the formation of a compactly felted layer of fibres, than those obtaining in the tools and devices employed in manipulative routine. Further, in all classes of decorative carpets—plain or pile surface—the powerloom has greatly extended the possibilities of industrial output, and also the schemes of practice in textile manufacture, which now include the following varieties of carpet construction :

## TABLE II

### CLASSIFICATION OF CARPET STRUCTURES

- (i) EASTERN OR HAND-TUFTED TYPE : woven in the high-warp loom, and now made in Donegal, some parts of England and Scotland, and on the Continent, as well as in Persia, Turkey, India, China, Japan, etc.
- (ii) FELT CARPETING :
  - (a) Eastern and Hand-made.
  - (b) Western and Machine-made.
  - (c) Woven Felts, in which the operations of the loom determine the decorative features and the structure of the carpet, and felting or fulling produces compactness and strength of carpet surface.

## (iii) COMPOUND PLAIN-WOVEN STRUCTURES :

- (a) Kidderminster, Scotch, and Ingrain Productions.
- (b) Unions, comprising several types of manufacture, all of which are, however, made in a lower quality of warp, *e.g.* cotton or jute, than weft yarn, the latter consisting of wool, wool substitutes, and other animal fibres, and also of jute.

## (iv) PILE CARPETS :

- (a) Loop-Pile, *e.g.* Brussels and Tapestry.
- (b) Cut or Velvet Pile, *e.g.* Wilton and Axminster, with the pile of the carpet formed in weaving by the insertion of wires into the sheddings of the pile-yarn warp.
- (c) "Chenille" Axminster in which the pile is developed by using a "chenille" or "fur" yarn, that is, a specially woven yarn composed of warp and weft threads, with the latter classified in the order of the colouring of the design in the carpet, and with the shots of weft in each chenille strand cut to give the pile effect. Chenille rugs are producible with the pile characteristic on one or both sides, the latter being classed as double-pile or "reversibles."
- (d) Royal or Machine-Wefted Axminster in which the pile is the result of inserting the pile yarns in lengths into prescribed warp sheds in the weaving of the carpet, such yarn being arranged on spools in the order of the colour units in the transverse lines of the figuring. Each spool, with its full complement of pile yarn, is equivalent to the formation of a particular row of pile effect in the design. The yarns delivered through tubes or guides from the spools, after being inserted into the carpet ground-work, are automatically cut to give an even length of nap.
- (e) Compound Types of Rugs in which the pile is "cut" and "loop" in the centre and back respectively; or formed of ordinary yarn, mohair or lustrous worsted in one section of the rug, and in curled, crimped or frisé yarns in the border section.

## (v) INFERIOR VARIETIES OF CARPETING :

- (a) Jute Manufactures.
- (b) Union Manufactures.

The pile in each variety of carpet—classes (i) and (iv)—with the exception of Eastern and Axminster carpets, is a product of the warp yarns. In ordinary makes of fabric, however, a pile or plush surface is also obtainable in the weft yarns and may be either looped, as in astrakhans and curls, or cut, as in velveteens and corduroys.<sup>1</sup> On both the *warp* and *weft* principles of pile construction the pile effect, in the common styles of manufacture, may be developed on a plain, sateen or twilled ground; but, in carpets, the pile entirely covers the surface, with the figuring or ornament developed in the pile yarns, and formed of one length and density of pile throughout the carpet structure.

The *weft* pile arrangement, as originated in ancient Egypt, consists, as explained, in looping the weft yarns in the process of interlacing them with the warp threads. The "looped" or

<sup>1</sup> *Dress, Blouse, and Costume Cloths*, Beaumont and Hill.

cut shots were, during insertion, pulled or drawn, at fixed distances apart, across the web, until they protruded from the surface of the texture, either with the fingers of the weaver or by a hooked instrument. The practice is ingenious and needed the exercise of some dexterity in determining the length of the loops or buckles in the shots of weft thus treated. It admitted of more diversity of pile production than might at first be considered feasible, for the scheme of distributing the loops in the weaving of the fabric, and of apportioning their length could be modified indefinitely or as desired. Moreover, in mummy cloths of this structure dissected, yarns of different thicknesses occur in selected series of loops, while in others they are multi-fold or variegated in colour. Further, by cutting certain loops and leaving certain loops uncut, according to a simple plan, not only was a fringed or shaggy pile obtained in combination with a "terry" or looped pile, but also a form of pattern or figured shape outlined, in two effects, on the face of the fabric.

This primitive description of "looped-weft" weaving is the precursor of terry or Turkish-towel weaving, whether the fabrics are made of cotton or linen, or by a union of cotton and linen threads. In the weaving of the towel manufacture the looping, or pile, is acquired by automatically releasing the tension on the pile warp ends so that the binding shot of weft with which they are interlaced, in being beaten into contact with the preceding shot, draws up the slack in the yarns and forces them into a looped or pile formation. It is, of course, a *warp* and not a *weft* product, and consists of yarns distinct from those used in making the ground texture, whereas the Egyptian fabric is a looped *weft* pile, and the yarn used in the looping is also common to the whole woven structure. But the looping idea, so far as it consists in extending specific yarns, either warp or weft, beyond their normal length in the width or length of the piece, is identical in both productions. Mechanical operations, in making the towel, eliminate the "random" unevenness of pile quality distinguishing the ancient texture, but this is more in contrast with, than a detraction from, the structural merit of the latter, inasmuch as the Egyptian craftsman manually controlled the warp, threw the shuttle, and selected and looped the weft yarns, while in the production of the towel all these technicalities are automatically performed. Apart from the historic interest of this original principle of pile weaving, it constitutes a species of loomwork



which, in the making of decorative fabrics, should find a modern application, for it enables, in hand-loom weaving, any particular feature in the pattern to be developed in a suitable variety of pile effect—looped or cut.

All the ordinary classes of modern pile goods are compound in formation, that is, they result from the use of two or more series of warp or weft yarns; but, as in the ancient specimens in Figs. 1, 1A, the yarns employed in the weaving of the fabric structure may, for specific styles of textural effect, be also used in producing a type of pile or plush. If this should be done in the weft, the plush characteristic may be developed by floating

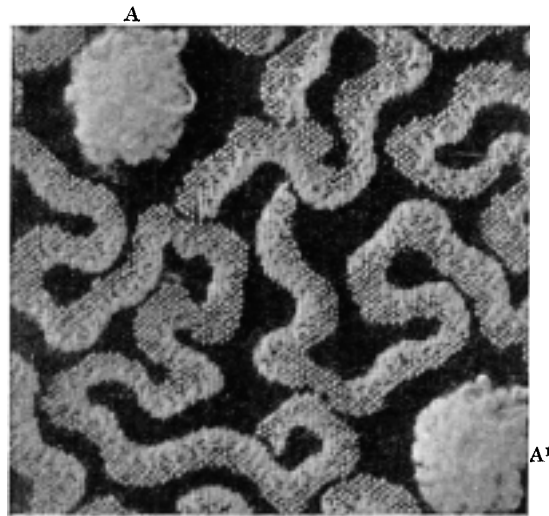


FIG. 5.

certain picks, in a regular interlacing order, on the surface of the fabric as in parts A, A<sup>1</sup> of the example in Fig. 5. Here the pile spottings are obtained by floating the white picks—the shuttling is one shot black and one shot white—5-and-1 round the edges of the spottings and 7-and-1 in the centre, then by cutting, inserting the knife blades up the race of the floats. To even or level the pile quality of the cloth, the pieces are “topped” or run through the cutting or cropping machine in finishing. The use of the ordinary weft for such features restricts the quality of the pile to the fibrous composition and structure of this yarn. But by applying a specific assortment of picks or “extra” shots—Fig. 5A—the pile may be developed in mohair or lustrous yarn,

and the ground of the fabric woven in carded or worsted yarn, as is the practice in the construction of astrakhans and similar manufactures. When these lustrous yarns are applied, whether they be cut or remain in loose floats, they form a curled effect, as observed in the example. This may be caused in two ways, first, by curling the yarn before winding for the shuttle, and, second, by shrinking the pieces in the scouring and milling operations. Fig. 5A is a single-make structure, the weave being 3-and-1 broken twill, the warp cotton, and the foundation weft soft-spun carded yarn. The spotting picks intersect plain in the sections of the fabric in which they show on the surface, and then float from one section to another, the intermediate lengths of yarn being

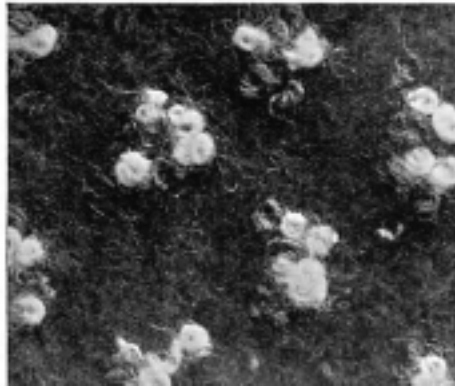


FIG. 5A.

removed in the work of cutting. The differences between this system of loomwork and that of drawing the filling yarn into loops will be at once evident.

The invention of mechanism has provided the means of locating the pile elements, but it has not materially contributed to the variety of loop and cut effects, nor to the length and colour of the pile producible. It will be understood that, in warp-pile textures, the methods here illustrated of acquiring the pile in the yarns of the ground of the fabric are inapplicable. A pile product is only weavable in the warp by utilising yarns separately tensioned, or delivered off a separate beam, from the yarns assigned to the groundwork of the cloth. It is, therefore, essentially a supplementary factor, but one firmly knitted into the foundation structure.

The tufted or Eastern carpet, as made in the vertical-warp

loom, is strictly a weft-pile production, in which feature it differs from all other classes of pile carpets but the chenille Axminster. The operation implied does not correspond to weaving as under-



FIG. 6.

stood in the ordinary sense of the term. There are no divisions made in the warp threads by a lifting and lowering movement for the passage of the shuttle. As in all Oriental craft work—*e.g.* the Cashmere shawl and the decorative silks of China and

Japan—the weaving is done with an infinitesimal amount of mechanical contrivance, but with a maximum degree of manual skill, aptitude and practice. Only one set of warp yarns is used, and these yarns are arranged as shown in the sketch of the model of the loom at Fig. 6, in which A is the warp or chain beam; B, the warp rail or rest; E, the divider, raddle, or sley; C, the tension stay or guide; D, the carpet roller; W, the warp ends; and W<sup>1</sup>, the foundation weft yarn. In employing this loom or frame in the weaving of plain pieces, cords, corresponding to the healds of the shafts in the horizontal loom, could be passed round the warp ends and attached in alternate order to a pair of rods, which could thus be made to bring either the odd or the even ends in the warp into a front position for the crossing of the weft. Operating the rods successively would make a plain intertexture, or operating them for two picks in one division of the warp and for one pick in the following division would give a rep or ribbed fabric. Or, further, by attaching the cords to groups of, say, three threads on one rod and to single threads on the second rod from side to side of the warp, would enable a weft cord plan to be woven; showing that by varying the system of cording or drafting, and the method of shedding or of actuating the rods, the several effects weavable in a two-heddle arrangement would also be practicable in this mounting.

But in producing pattern or design as a result of colour application, and also in the weaving of carpets, the threads W are “leased” for plain intersection, and in such a way as to be divided either sectionally or across the whole warp for the insertion of the ground picks. This is made necessary by the different weavers—see Figs. 7 and 7A—working at the same time on the production of one carpet. Thus each is engaged on a portion of the design, covering a limited number of warp ends or width and length area of the carpet. Each section is a part of the whole design scheme, and the work of one weaver correctly agrees in pattern formation with that of her neighbour from edge to edge of the warp, and from the commencement to the completion of the carpet length. Her duties consist in knotting the prepared tufts of yarn for forming the pile, to the threads W and in the exact order in which they are represented on point paper P, Fig. 6. Weaving proceeds, first, by looping the two ends of the tufted yarn to alternate pairs of warp threads, equal to a weft line of the point-paper pattern, or to a wire in automatic looming; and, second, in fastening the series of tufts firmly

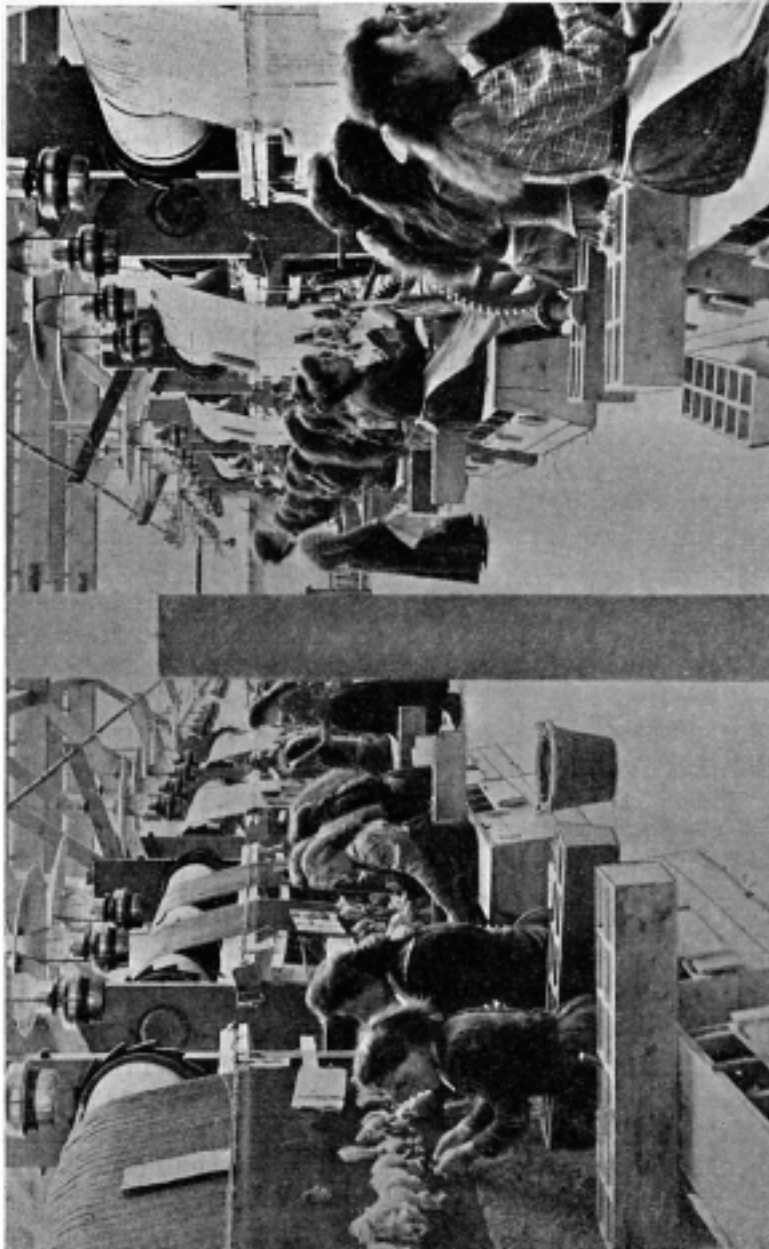


FIG. 7.



FIG. 7A.

in position by following their knotting with the insertion of two plain picks. In doing this, the weaver employs a hand metal comb by which she beats the tufts of pile and the foundation shots into compact contact with each other, and also with the preceding line of knotted tufts and the interlacing picks by which they are bound together.

Every simple or multi-strand thread which forms a unit of pile in the carpet, is knotted separately to two warp threads. This, as stated, is accomplished by the weaver or weavers in the precise sequence of the design, the scheme of colouring and of the pattern composition being adhered to in the minutest detail, or to the exactitude of a single thread of warp, each having its function in the carpet structure and place in the grouping of the pile tufts for producing the decorative plan.

Pile carpets, rugs, mats or other pile fabrics produced on these principles of loomwork are illustrative of textile-design construction in its most simplified form of weaving. As now understood, each quality of rug or carpet is ordinarily made of one thickness and quality of yarn for the pile, a second kind of yarn, untufted, for the foundation weft, and of a third variety of strong folded yarn—woollen, worsted, cotton or linen—for the warp. The surface is not texturally diversified, being of a uniform pile consistency—unless a bordered design, when the centre and border may differ in fineness—in all parts of the carpet. Neither various weave elements, nor various yarn structures, are combined or employed in outlining and developing the figured sections of the pattern. The carpet structure is plain in the foundation with an unvaried tufted-pile surface, design, construction and ornamentation being solely acquired by the system followed in attaching the coloured tufts, made of a corresponding length and thickness of carded or combed yarn, to the warp ends. Each tuft is a possible pattern unit; for, according to its shade and position in the carpet, it forms either a ground or a figuring factor, and this is the technicality now to be explained.

For this purpose reference will be made to Figs. 8 and 9. The former is a photographic reproduction of a section of Persian carpet made at Ispahan, and sketched in colour from the original. It is a border example, the ground space in the centre being ivory white, and in the border a brilliant red. Colour richness and contrast, as will be emphasised later, constitute one of the most meritorious qualities of these productions, while design, unity and beauty of style composition are largely the result of

softness of colour tone, due to the effects being produced in pile tufts. Accuracy in draughtsmanship is less remarkable than harmony in colour grouping and arrangement. Though this is admitted, it should be observed that the irregular detail types

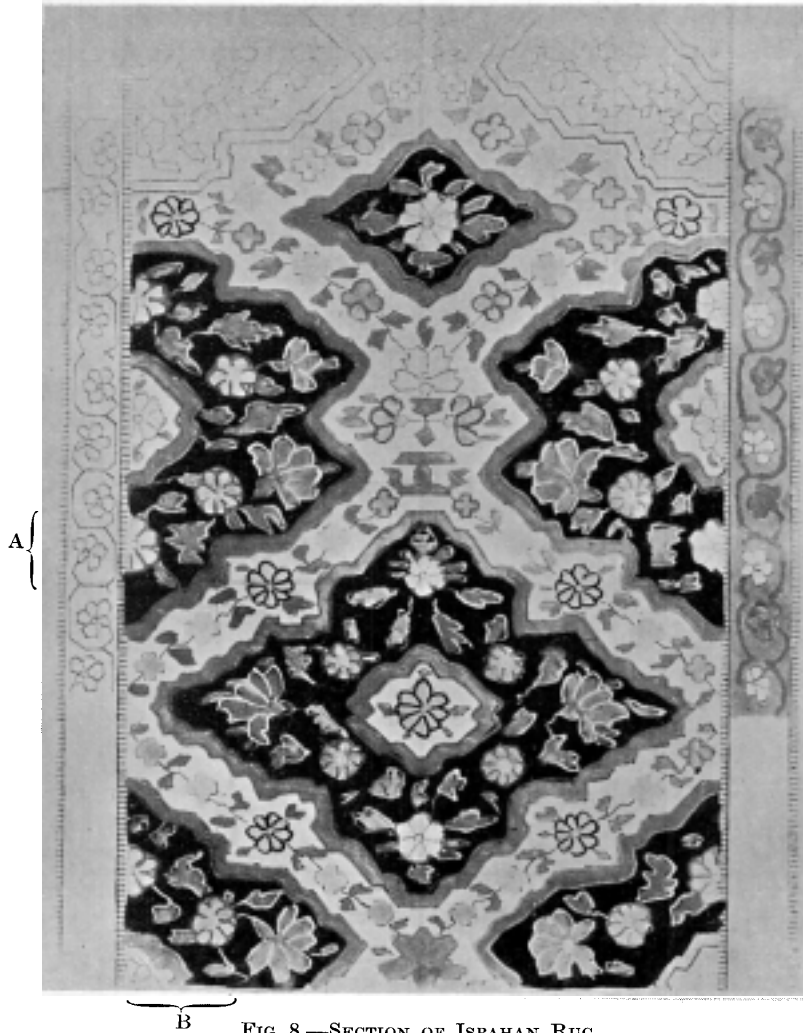


FIG. 8.—SECTION OF ISPAHAN RUG.

selected—comprising leaf, sprig, bud, stem, broken floral and geometric forms—when worked into a pattern scheme are peculiarly adapted to the decorative surface of this description.

A complete repeat of the design is shown in Fig. 8, but the upper portion and the border on the left side have been pur-



posely left uncoloured, enabling the rough and slender outlines of the figuring to be more distinctly seen. With the application of colour they assume their relative proportions and value as decorative units in the pattern as a whole. The ground of the principal parts of the ornament is a blue black with the leaves in green edged with gold, and the floral effects in red edged with white. The outer band of the diamond and rosette figures is

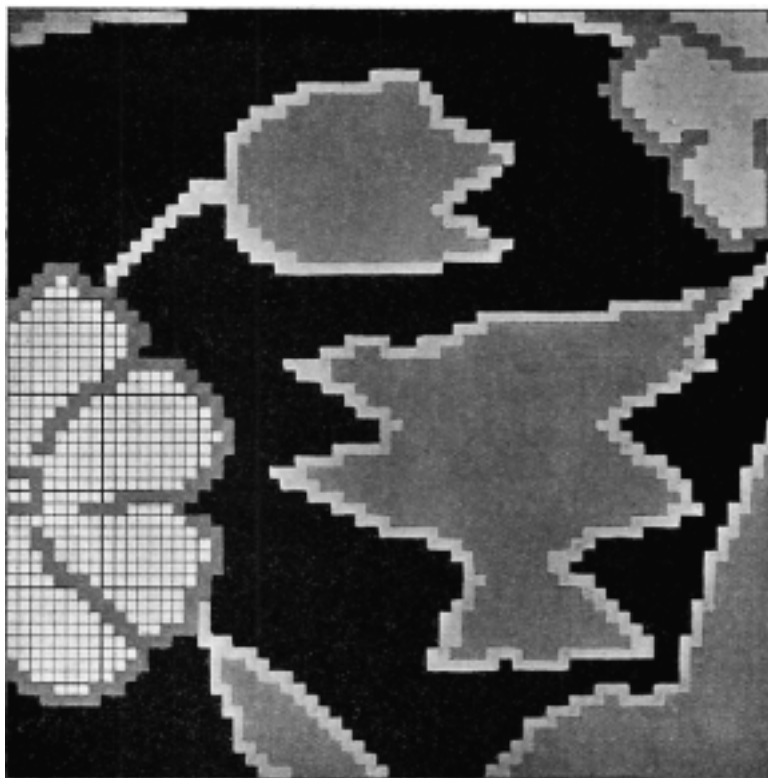


FIG. 9.—SECTION OF LOOMING DESIGN FOR ISPAHAN RUG.

green lined with red, as a strong demarcation colour both in contiguity with the white and the indigo black sections. In the running sprig pattern in the white and surrounding the large decorative features, patches of blue, heliotrope, yellow and pale blue colouring are introduced. The portion of the sketch prepared for the weaver and illustrated in Fig. 9 is that within the brackets A and B. Analysing this sectional plan, the practice in weaving on lines *a*, *b* and *c* would be as follows :

*Shot or line a* : Knot with black yarn tufts (= indigo in carpet) on threads 1 to 21; with light grey tuft (= gold) on threads 22, 23 and 24; with medium grey tufts (= green) on threads 25 to 30; and with light grey tufts on threads 31 and 32; etc.

Insert two foundation shots.

*Shot or line b* : Knot with black tufts on threads 1 to 20; with light grey tufts on threads 21 and 22; with medium grey tufts on threads 23 to 29; with light grey tufts on threads 30 and 31; etc.

Insert two foundation shots.

*Shot or line c* : Knot with black tufts on threads 1 to 19; with light grey tufts on threads 20 and 21; with medium grey tufts on threads 22 to 28; with light grey tufts on threads 29 and 30, etc.

Insert two foundation shots.

The carpet structure and methods of knotting are shown in Figs. 10 and 11. In both sketches, A, A<sup>1</sup> are the warp ends,

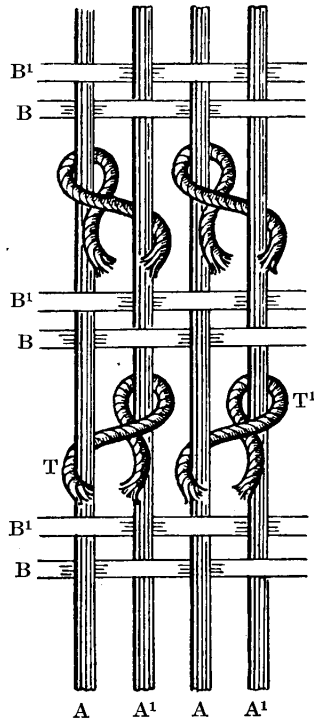


FIG. 10.

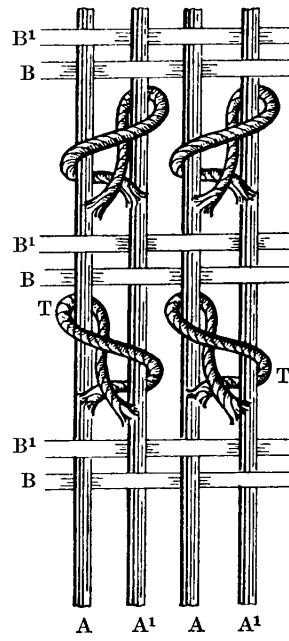


FIG. 11.

B, B<sup>1</sup> the shots of foundation weft, and T, T<sup>1</sup> the tufts of pile weft. Fig. 10 is the Persian (Sehna) knot, in which the two ends of each tuft are separated by being passed round threads A, A<sup>1</sup>; but in the Turkish (Ghiordes) knot, Fig. 11, the two ends cross

between each pair of ends A, A<sup>1</sup>. The former is the more convenient in making a close pile. Both the Sehna and Ghiordes knots are shown as made in knotting to the right, upper pair in Fig. 10 and the lower pair in Fig. 11, and as made in knotting to the left, lower pair of knots in Fig. 10 and the upper pair in Fig. 11. After the knotting of each series of tufts in a line of the carpet, two ground shots B, B<sup>1</sup> are usually woven, and forced into close contact with the looped portions of the pile yarns.

With the derivation of ornament from familiar nature types—the vine, the palm, the lotus, the lily—some overlapping in the design composition of the several varieties of Oriental carpets is evident. Certain simple geometric arrangements of prehistoric origin, and the influence of symbolism in woven art on the imagination of the craft artist, assimilate the styles of different periods and schools of practice. Colour and pattern had a cult meaning and significance to the textile worker of ancient Babylonia, being fostered and stimulated by the exclusive craft guilds with which he was associated. The proverbial conservatism of the East rigorously preserved the idealism in carpet design and in colour treatment, handing it down from one generation of weavers to another.

Carpet decoration became a distinctive, specialised branch of art. A scheme of technique and of ornament was originated and evolved in keeping with a prescribed code of teaching. The inventive faculty was not fettered, but observed approved tenets in the relation and grouping of pattern features and in the tinted elements applied. Two primary facts were borne in mind: First, that the embellished surface was a woven pile structure; and, second, that the ornamentative scheme as a whole was intended to pre-figure harmony and beauty of line, form, and colour in flat representation, and to suggest and interpret definite ideas and teaching. Concentration on these principles is justified in the carpet product—unique in constructive adaptability, and in decorative conception, facility, and style.

The Eastern weaver in thus working in an accredited cycle of design theory and practice, formed and developed a fabric structure in all points suitable for the objective in view. It provided the means, by the simple interlacing of warp and weft and of knotting tufts of yarn to the series of threads vertically disposed, for an unlimited range in pattern origination and colour toning and assortment. Employing the simplest mechanical device, an upright frame in which the warp ends were sustained

and tensioned, each warp line of the carpet was capable of being variegated in tinting throughout its length by the arrangement of pile tufts thereon. Every tuft so applied is a mosaic unit of the design plan, so that in a carpet surface composed of millions of tufts, each tuft, in the weaving process, is rendered an integral element of the ornamental whole and of the carpet as a woven manufacture. By this system the warp offers to the weaver the same freedom for the exercise of imaginative gift and technical skill in execution as the canvas presents to the artist. Literally in vertical-warp weaving, as shown in Chap. I, no restrictions are imposed beyond the materials employed and that the surface embellished is pile made, lending softness and depth of tone to the colours combined. Pattern structure and tinting may be diversified at will, with the genius and resource of the craft designer. Mechanical difficulties and restraint are unrealised, nor do they exist. As the work proceeds, the decorative form may be modified, and mellowed or emphasised, in colour quality and expression.

This latitude in the exercise of artistic ingenuity is the principal source of the wealth of ornament observed in this class of carpet production, whether of Persian, Indian, Turkish or Chinese origin. Each has, however, a distinctive character. The Indian loom work comprises the more minute, involved, and suggestive design units, while mathematical bases of formation are more common in carpets of the Smyrna and Yurak variety. The Persian, in a general sense, forms an intermediate species of ornament between the Indian and the Turkish. Geometric plans, rare in the purer Indian schemes of design, are illustrated in the free combination of figuring arranged in diamond, rectangular, and rhomboidal spaces, as exemplified in the Ispahan specimens reproduced in monotone in Figs. 8 and 9. The arabesque principles of line grouping and intersection appear repeatedly, but in a number of interesting and varied compositions, in Turkoman patterns, both in rugs and carpets.

In all Eastern carpet decoration the ornament reflects designing faculty as a result of local environment, national cult, custom, and historic influence. There is always an obvious union betwixt decorative and constructive effect. The two principles are rarely dissociated. The infusion of foreign art temperament, and of ideas of economy in labour and materials into the Eastern system, has not so far succeeded in obscuring the dominant conception of textile art as concerted with, and as a part of carpet

weaving and design. This conception obtains in the older or so-called antique carpets, and also in the finer Eastern makes of modern manufacture. In the intermediate and lower grades of work, adulterated styles of ornament are seen and loose weaving is practised, mainly as a result of competitive effort and the production of carpets of certain dimensions at a price.

Some varieties of Persian and Indian carpet designing are unique in detail ornament of a purely native origin. The methods of developing such detail in the pile surface will be explained by referring to the pine pattern in Fig. 12, and to the sectional point-paper examples in Figs. 13, 14, 15, and 16. The pine is employed as a detached figure and in the field of the rug or carpet. It lends itself to divisional decoration and colouring. The specimen is typical of the types of ornament combined in its elaboration. In the original, the ground colour—white in Fig. 12—is a deep tone of green, and the ground of the rug a bluish-green tint. The figure comprises four varieties of decorative elements: the leaf style at the base; the ornamental band or surround composed of the tip of leaves with intermediate bud forms; the interior band in wavy lines and bud and leaf details; and the central floral features. The vandyked leaf edging is developed by having the alternate leaves woven in green and orange, spotting each with details in yellow, red, and blue, and by using demarcation lines in black. For the interior band, the effects consist of curved lines in yellow naturally strewn with bud-like forms, in strong contrast, both in ornament and tinting, with the decorative composition of the outer band and also of that of the central section of the figure. In producing the floral quality of the latter, carmine red is used in the outer row of petals of the larger flower, and deep blue, Indian red, green and orange for the successive rows; then follow two flowers in green, red, blue, and yellow, one in carmine, yellow, and blue, and one in green, Indian red, and yellow. Blue and carmine form the principal colours in four of the remaining five floral forms, the last of the group, at the apex of the interior of the figure, being in blue, red, and yellow.

A striking characteristic in this example is the diversity of design feature due to colour tone, colour grouping, and colour adjustment. The forms blended, while in strict harmony with each other, are not particularly effective. They are somewhat slenderly drafted. This deficiency is, however, more apparent than real. It disappears with the production of the details of the



FIG. 12.—PINE TYPE OF FIGURING.

style in the pile of the carpet, by which process indefiniteness of line structure is transformed into a qualitative factor. Contrast in decorative types, as seen in the respective parts of the figure, is enforced and enriched by the colour tones applied to each. Surface decoration is sought and acquired without strength of line. Ornamental elegance and balance, as distinct from ornament drawn in bold rectilinear and curvilinear lines, form the ideal to be attained.

The pile carpet is treated by the Eastern designer as a textural surface to be richly tinted and relevantly decorated with form elements which neither clash in type nor produce a set variety of figuring. In acquiring this resultant, when the frail or sketchy outlines of the design have been made, he relies upon colour toning and expression. As the operation of carpet weaving progresses, he, at will, introduces touches of colour or fresh types of effect. If the design is not primarily originated in the loom, it is developed and elaborated therein. It is not necessarily in a completed state at the outset of weaving as when prepared for the harness loom, but is more in the nature of a rough draft of the design in the mind of the craft artist. Whether a new or old form of pattern, the expert weaver is at liberty to vary the colour arrangement. With the carpet in view as it is being woven, it is subject to modification in detail and in colour composition, to bring the whole scheme of its ornament in harmony with the designer's feeling for colour and decorative style. Thus, in a rug in which the pine pattern in Fig. 12 is used as the *motif* for the centre, each alternate figure in the production of the rug is weavable with the colour tones interchanged, but the ground shade is not alterable. It links the colour units with each other however varied they may be in application. Without increasing the number of colours employed, this practice of colour transference from one sort of detail to another in weaving the carpet provides scope for ingenuity in design embellishment.

Monotony in style construction, in the simpler as in the more elaborate forms of pattern, is in this manner rendered a rare occurrence. In mechanical weaving the repetition of elementary pattern types develops ornament of a stereotyped character. But with the play on colour grouping feasible in the making of the Eastern carpet, the most ordinary class of design, due to form blending, may be so diversified in colour structure as to possess a distinctive ornate value.

The extent to which detail effects are applied by the Oriental

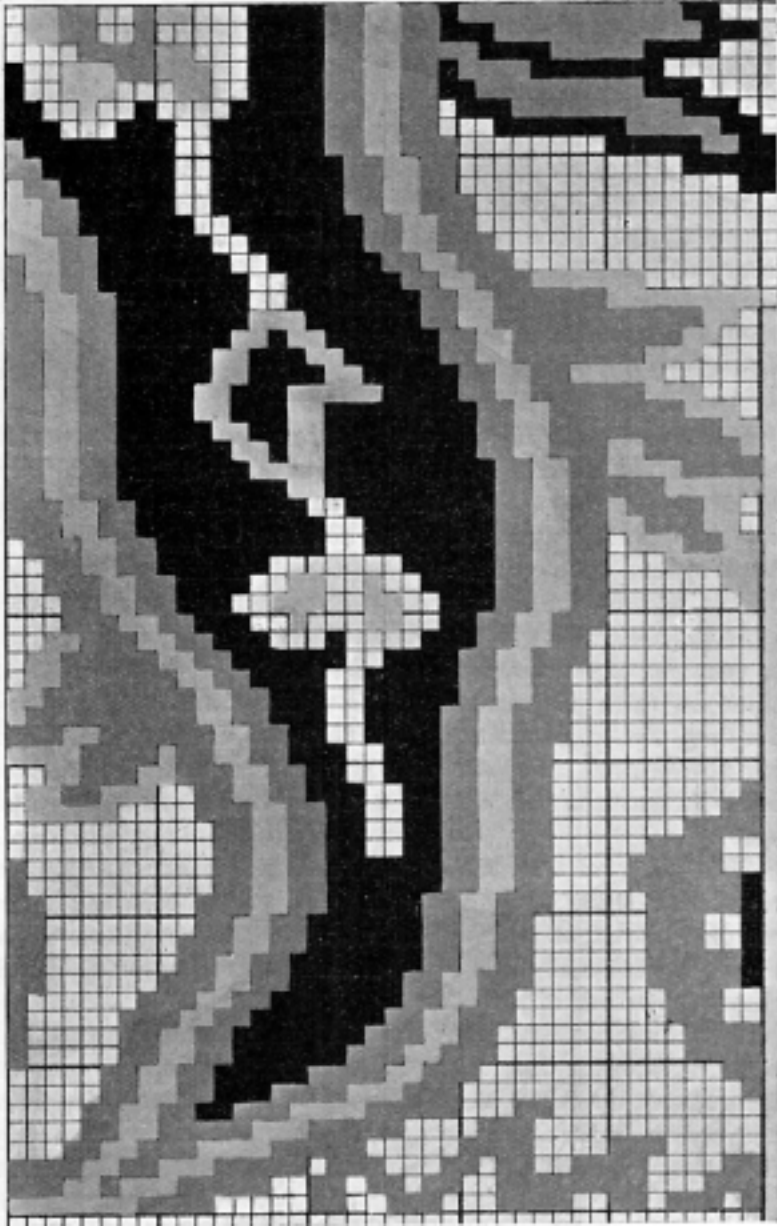


FIG. 13.



weaver is exemplified in the sectional looming plans in Figs. 13 to 16. Each arrangement is suggestive of a principle of technique and of design structure. The pile quality of hand-tufted carpets is peculiarly adapted for this kind of pattern work when it is unified in formation. The design plan is required to suggest, as well as to depict, stem, leaf, petal, bud, and floral types. In the first instance Nature has supplied the ornate type, which the weaver has not attempted to copy but rather to adapt to the carpet surface. Figs. 13 and 14 are derived from the elongated variety of leaf, Fig. 15 from stem, twig, and branch forms, and Fig. 16 from floral and plant forms. All are so fully conventionalised as to reveal only dimly the source from which they have been taken, but in conventionalisation they have been rendered appropriate for rug and carpet ornament.

Each variety of effect is clearly delineated, but not more so than would be the case in the carpet, as the sections are drawn to the approximate scale of the woven structure. In producing these and similar styles of ornate features in pile-yarn and in colour instead of in neutral shades, they gain in beauty of form and toning. Severe lines and details and harsh contrasts are, in the process, mellowed and enhanced in design quality. With the changing of the white point-paper ground to one of a suitable colour and of a pile character, of the effects in black to effects in a deep rich colour, and of the elements in grey and tinted grey to elements in colour of a proper hue and depth, these species of patternwork assume a different decorative tone and aspect.

This phase of the subject is illustrated in the practice of transferring these design examples into carpet colourings. It comprises the apportioning of colour tones to the several shades in which the sectional plans are sketched and as suggested in the following methods of procedure :

Fig. 13.—Substitute red for white, green for black, fawn for grey, and blue for tinted grey, which would produce the ground of the carpet in red pile, the black sections of the figuring in green, the grey outlines of the leaf form in fawn, and the tinted grey effects in blue, with the central floral elements in red, blue, and fawn. More closely examined, the leaf outlines are by this arrangement developed in fawn and blue, with the lateral appendages woven in the same colours and in green and fawn. In the leaf delineation fawn comes in contact with the red ground, but in the upper fringed details, outlined in black in the sketch, the

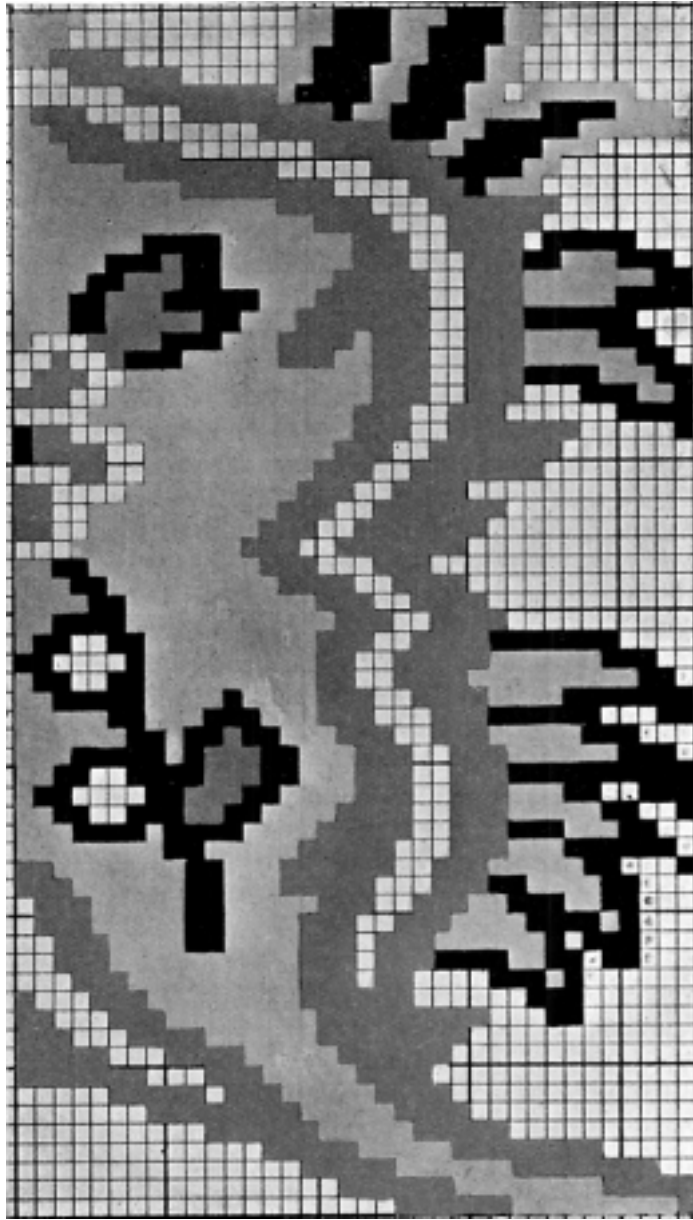


FIG. 14.

blue and red tones are in juxtaposition, and in certain parts of the interior of the leaf ornament, red and green.

Fig. 14.—Substitute blue for white, red for grey, green for tinted grey, and orange for black, which would yield a rug or carpet with a blue ground. The leaf form would, in this colour grouping, be delineated in red and blue, with the protruding leaf tips in orange and green, and with the outlines in given groups of detail in green, and the outlines in other groups in orange. This interchange in the relation of these, and other colour tones adds to the quality of the woven design. The central part of the leaf, consisting of various types of ornament, would be developed in green and blue, green and orange, and in blue, red, and green.

Fig. 15.—Substitute green for white, tan for black, deep red for grey, and blue for tinted grey, giving the ground of the carpet in green. This would result in the stem forms being outlined in red with their central elements in tan, and with the tan colour in contact with the green ground. The serrated features, in black and tinted grey in the example, would be woven in tan and blue, and the trifoliate leaflet, in the upper part of the design, in blue and red.

Fig. 16.—Substitute a crimson tone of brown for white, gold colour for black, green for grey, and blue for tinted grey, resulting in the ground of the carpet being woven in crimson or chestnut brown. The brightest colour, gold, is applied to the details in black. For developing the lobes of the leaf form effectively, the ground of the lower one is produced, in this colouring, in blue, with the ornate effects in brown, gold, and green, and the ground of the upper lobe in green with the decorative details in blue, gold colour, and brown.

Four varieties of carpet colouring are here represented, having red, blue, green, and brown ground shades respectively. The colours selected for each example harmonise either in juxtaposition or in other relations, as determined by the structure of the design, with each other. Their allocation and arrangement in the weaving of the different features are therefore variable without destroying or interfering with the colour harmony of the carpet. This being so, in the repetition of any particular type of effect its colour units may be transposed, the colour forming the outline features taking the place of the colour forming the interior features of the ornament, and *vice versa*.

Eastern colouring is true to definite theoretical principles. A

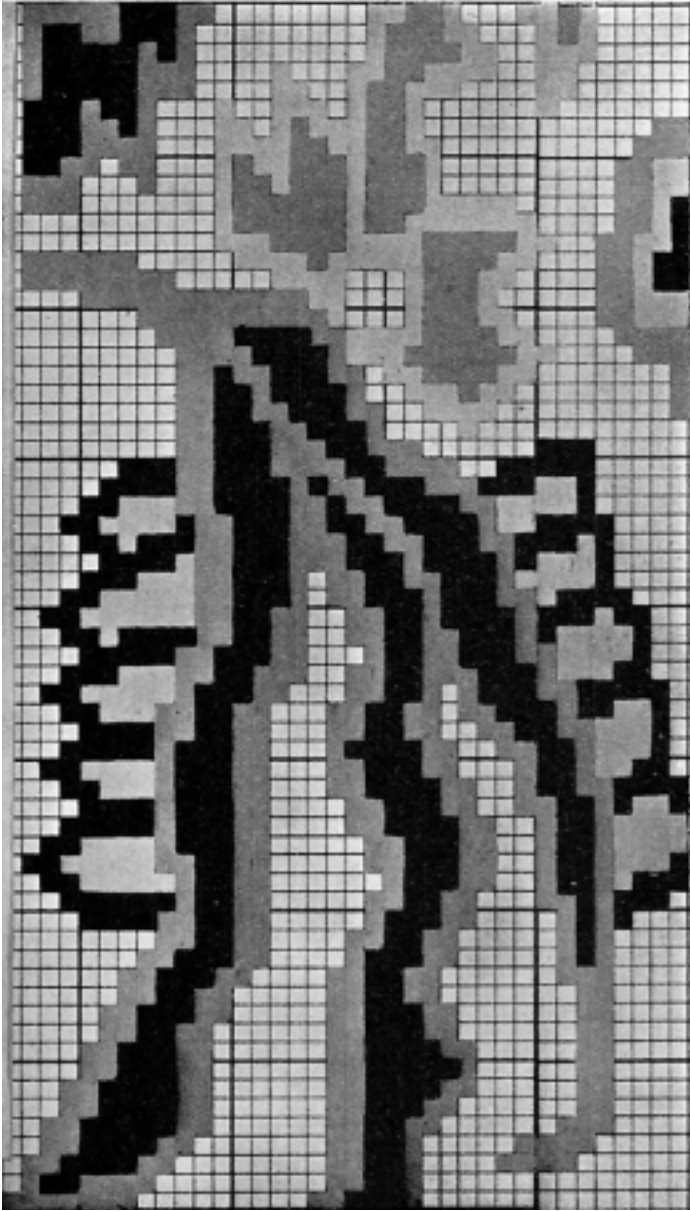


FIG. 15.



FIG. 16.

suitable gamut of hues, or colour scale, has been formulated as a result of instinctive appreciation of natural colour tones, tints, and contrasts; and these tinted units have been largely drawn upon in the origination of rug and carpet schemes of colouring. The colour scale includes the primary, secondary, and tertiary hues—red, blue, and yellow; orange, green, and purple; and russet, citron, and olive. But it should be observed that each dyed colour selected, however defined in chromatic nomenclature, possesses certain qualities, namely, softness, mellowness and restfulness of tone, and purity of hue. It follows that to specify the colour units employed only affords an incomplete idea of their æsthetic value. They need to be studied in their carpet setting, and also in comparison with colours of a like designation, and dyed by modern methods, to be correctly understood. If this fact is borne in mind, the rich field of colouring in carpet designing which the following colour tones—compiled from Persian, Indian, and Turkish productions—offer, will be better apprehended.

TABLE III

## EASTERN COLOUR VALUES

- RED.—*Tones and hues* : Turkish and Indian-red, maroon, russet, and crimson (small quantities). *Tints and hues* : Carnation, scarlet, rose, and pink (small quantities).
- BLUE.—*Tones and hues* : Indigo, purple and deep turquoise. *Tints and hues* : Lavender, azure-, cerulean-, and sky-blue.
- YELLOW.—*Tones and hues* : Ochre, olive, and citron. *Tints and hues* : Buff, fawn, saffron, straw, and deep flax colour.
- GREEN.—*Tones and hues* : Sea-green, yellow-green, blue-green, *vert des feuilles*, myrtle and sap-green. *Tints and hues* : Apple-, crocus-, emerald-, and pea-green.
- ORANGE.—*Tones and hues* : Yellowish brown, deep tones of fawn, and buff. *Tints and hues* : Gold, flame, and apricot colour.
- PURPLE.—*Tones and hues* : Crimson and bluish hues. *Tints and hues* : Lilac and heliotrope (in small quantities).
- BLACK.—Jet, ivory, and indigo blue black.
- WHITE.—Cream, straw, and pearly white.

The attributes, inference, and suggestiveness of colour are recognised in pattern structure and composition. This recognition runs through Eastern loomwork. Three rug and carpet colourings may be taken in exemplification of the principle followed. First, that of a nomad design with the field consisting of two medallion devices, the upper developed on a deep blue ground, with the figuring in pale ochre, light red, fawn, and lavender; and the lower device, which possesses a sage-green surround, woven on a red surface, with the detail ornament in

light yellow, pale orange, and greenish blue. Second, a Ghiordes prayer rug, having a citron-green centre, decorated in the upper space with small patches of toned red, light fawn, and indigo blue; a broad intermediate border with green, blue, red, and orange features on a pale fawn ground; and a narrow external border with the decorative effects in two tones of red, sage-green, light fawn, and lavender, on a dark blue surface. Third, a pure Persian style, in which the field is in three divisions: (1) a variety of pattern ornament, produced on a soft green pile, in blue, red, and fawn; (2) a dome-shaped space woven in deep crimson red; and (3) a rectangular space with a lighter crimson red ground, having its ornate features expressed in yellowish ochre, pale fawn, sage-green, and indigo blue. In this example a narrow strip, in lightish orange and pale blue dotted effects, divides the field from an intermediate band of a flat tone of red in the ground, with the figuring composed of corresponding hues to those combined in section (3) of the centre of the rug. This intermediate band is also divided from the main border—with the ground in indigo blue and the decorative devices in red, lavender, light fawn, green, and toned orange—by a strip in gold and red.

Each specimen suggests the colour feeling and technique of a proficient craft artist. However varied the tinted surface, unity of colour value is presented. Colour is made to evoke a sense of rest, warmth, harmony, and spaciousness. A change in the key of the colour scheme gives a fresh symphony of tone, without a strident or jarring tinted unit being perceptible. In the first specimen, the ground colours in the medallion motives are in complementary relation, as also in the border colouring, with that of the field, yielding a *mélange* of tones typical of colour balance and sufficiency. From the citron-green field in the Ghiordes prayer rug, a sense of the indefiniteness of space is induced which is not arrested but sustained by the profusion of coloured elements—all in perfect unison with the green tone of the field—appearing in the border. The Persian style is an interesting translation of the value of red in imparting warmth and wealth of colour tone. These qualities are enhanced by the deep indigo blue ground in the border of the rug, producing a strong colour contrast between the centre and border toning.

Two additional equations in colour phenomena are illustrated in these specimens, that of the value of purity of hue in positive as in toned and tinted colours, in acquiring harmony of colour

composition; and that of the utility, for the same purpose, of tone-upon-tone contrasts, as well as contrasts in distinctive hues of colour. The Eastern colourist exhibits a preference for the combination of pure hues as distinguished from the admixture of dulled and adulterated chromatic units. His work suggests that the hue of the colour may be appropriately softened in intensity or brilliancy, or deepened in tone, without diffusing the colour quality of the compound, whereas, with a variation in the hue, colour balance is likely to be sacrificed. Tone-upon-tone colouring, when practised in the use of pure hues, results in clear colour contrasts, and in the precise definition of the pattern elements in the style. They are more effective in these respects than contrasts in tones and tints of modified hues. Both species of colour arrangement and location are utilised, but the former, as giving the fresher, richer and fuller tone value, more extensively than the latter.

In general, the colouring proceeds on lines and by methods adapted to the character and variety of the decorative design. Indian carpets are peculiarly suggestive in red and green contrasts, mellowed by deep purplish blue. For giving qualities of brightness and cleanness, white and gold are employed. Blues of a lavender cast are useful in subduing the warm vividness of the red—scarlet, vermilion, carmine, rose, and crimson. The gamut of hues is somewhat less restricted than in the Persian patterns, but the ingenuity shown in colour assortment and in colour interchange results in a clear rendering of every feature in the decorative plan. Taking, for example, a simple type of figure, and producing it successively with a black, white, red, blue, and green ground, and developing the design details in red and blue, red and green, green and white, red and white, and blue and white, a well-diversified scheme of tinting is formed though restricted in composition to three colour units and black and white.

By the elaboration of this system of colour transposition in the weaving process, as shown in reference to Figs. 13 to 16, an extensive range of colour expression, contrast, and decoration is made to characterise Indian and Persian carpet and rug productions. Two specimens will be analysed, namely, those reproduced in neutral shades in Figs. 17 and 18. The colour schemes applied are as follows :

Fig. 17.—Indigo blue-black ground, larger floral forms in carmine red with petals lined and spotted with cream white; bud-like elements in orange edged with deeper orange, and smaller



buds in carmine edged with a deeper hue of the same colour; larger leaf formations in carmine and pink having the surface of the leaves in green edged with yellow; irregular and running devices in yellow with minute features in white, and other details developed in a yellow centre lined in carmine or green.

Fig. 18.—*Centre Octagonal Ornament*.—Green ground with floral and bud forms in red edged with white; smaller buds in

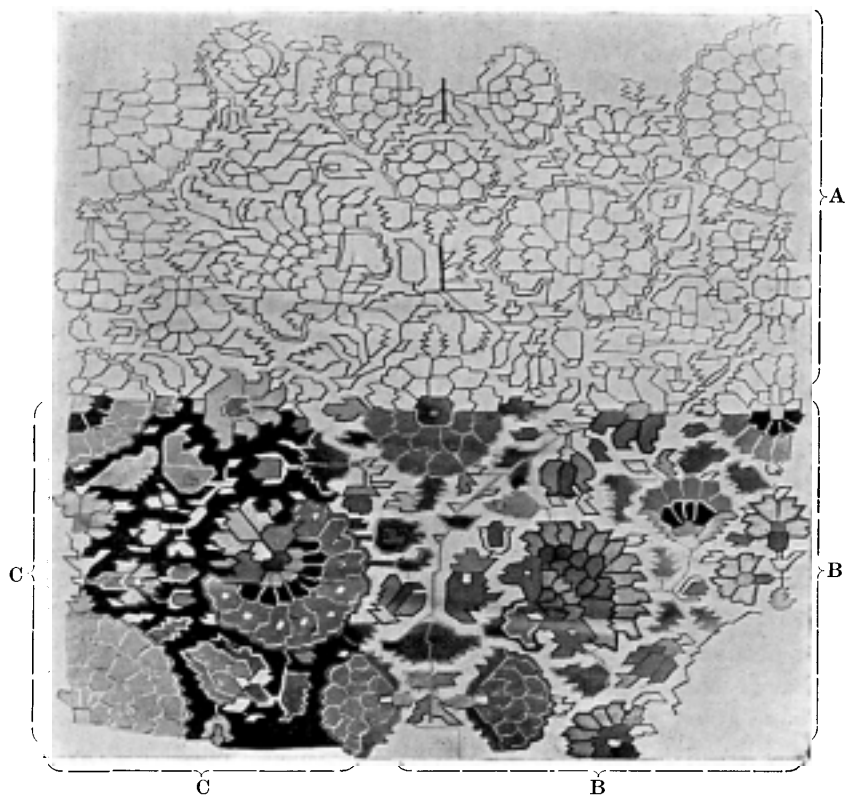


FIG. 17.

yellow edged with red, and the stems and leaves in blue-black; medallion device—black ground with waved border in red, outer edge in white, and inner edge in green; diamond figure—white ground with red and green flowers and buds, black stems and leaflets; and centre *motif* in red with blue border lined in black, and interior spot in white.

*Octagonal Ornament A*.—Exterior space—white ground with lozenge-shaped figures in yellow edged with red; flowers in yellow

and red subdivided with black; and elliptical rosettes in red and black. Centre medallion—green vandyked border edged with black and spottings in yellow; intermediate section in red with projecting leaves alternating in green and black edged with white; and centre figuring in yellow, black, and green.

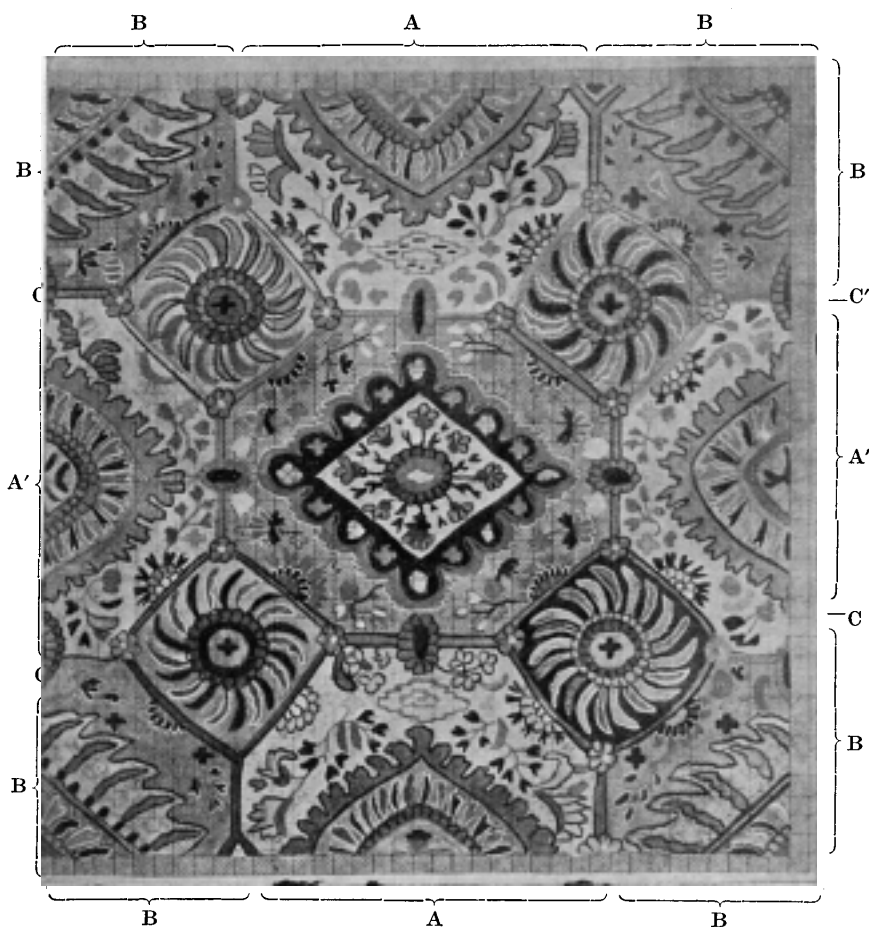


FIG. 18.

*Octagonal Ornament A<sup>1</sup>.*—Also white ground in the outer space, decorated with flowers and buds in red and yellow, leaves in green and stems in red; medallion device—red border with pale green ground and leaf forms woven successively in black and red, edged with white and yellow; centre figuring—yellow ground with bands of green and red and decorative details in red and black.

*Octagonal Ornament B.*—Ground space in red with floral effects in black edged with yellow, leaves in green edged with white and stems in the same colour; broad leaf decoration—pale yellow ground, green leaves edged with black, red buds, and oval ornament in red and black elements; border of centre figuring green, with red and black leaf forms lined with yellow and white; and centre rosette in blue, ornamented with bud surround in red and black.

*Diamond Devices.*—On line C, ground colours red and black respectively. In the former, leaf details in green, edged with yellow and black; rosette, outer band in blue and inside rim in black, with centre in red and cross in black; in the latter, leaf details in green and red, edged with white; rosette, red and blue bands with centre in red.

On line C<sup>1</sup>, ground colours pale yellow and pale green, with the leaves in green and red, edged with black; rosette, with blue and red bands and blue centre, on the pale yellow ground; and black and red leaves edged with white, with rosette in red and blue bands and red centre, on the pale green ground.

By the use of a blue-black ground in Fig. 17, an equal degree of colour emphasis is given to the component parts of the design, though this is not as apparent in the monotone specimen as in the carpet production. The scheme of colouring applied is in tones of duplicated hues, gaining diversity of tinting by the insertion of elements partially composed of yellowish and emerald green and partially of white. The hue of the green is alike complementary to each of the tints of red—vermilion, carmine, and Indian red. As a series of contrasts due to the employment of bright and deep tones in red, orange, yellow and green, with the red hue predominating, it is particularly instructive. Thus, the orange and deep orange, the carmine and crimson, the light red and deep red, each yield tone balance, or the two hues in each colour couplet form the same quality of colour contrast. White is applied to soften the hue of the carmine when this colour is used in a fairly broad surface, and also in accentuating the outlines or edges of the ornamentation generally.

The practice in Fig. 18 is, on the other hand, suggestive of colour contrasts in dissimilar but complementary hues. It also illustrates the system of diversifying the ground shade of the carpet for the purpose of developing the geometric base on which the design is constructed. The change from a dark to a light or to a medium colour tone has involved the modification of the

colour plan in sections A and A<sup>1</sup> and also in the centre octagonal ornament. On the white ground the yellow features are edged with red, and the rosette features with black; on the red ground the decorative elements in black are edged with yellow and those in green with yellow or white; and on the black ground the red features are lined with cream white and the green features with yellow. Throughout this decorative style, the value and the function of white, black and yellow as divisional shades are punctuated, as also the use of primary and secondary colours, and of their derivative hues and tones, in producing a rich but mellowed quality of pile-woven ornament.

Fig. 17, as sketched, suggests the fine, delicate nature of Indian designing. Section A is a portion of the pattern in outline, section B a portion with the colour shades applied to the figuring, and section C shows the altered character of the design as completed, with both the decorative forms and the ground worked out in colour. In outline, such pattern types are varied in form composition and in detail features. The broader effects, as developed in the floral forms of this specimen, pleasingly contrast with the more minute leaf and bud elements. It is a species of fretwork designing almost gossamer-like in structure. The decorative details require to be expressed in vivid colours in order to accentuate their individualistic character and influence in the ornate scheme. The application of subdued colour hues and tints would blur the ornamental details, whereas the object of the Eastern carpet weaver is to render them distinctive in tone.

Fig. 18 is reproduced from the design as drafted on ruled or looming paper. The ornament is a compound of Arabic and Persian ideas, with the latter prevailing in the colour scheme by which the decorative forms are modified in quality, especially when woven in the pile carpet in which the geometric plan of the style is preserved but the figuring softened and toned. This example strikingly illustrates the dependence of Eastern craft on the type of the woven surface of the carpet, and on colour admixture and harmony, for the artistic development of the design composition. These two factors—colour and pile structure—transform the pattern sketch into an aesthetic design, composed of ornate details decoratively grouped and planned.

The history of the British carpet industry dates from the time of Henry VIII. In the reign of Queen Elizabeth the industry was stimulated by the importation of hand-tufted or pile carpets from Continental and Eastern looms, and by the Flemish refugees

who brought their weaving craft into this country. Prior to this period, carpets of a coarse woollen character, probably of the drugget variety, had been produced, but pile weaving was neither understood nor practised. Following the revocation of the Edict of Nantes in 1685 by Louis XIV, considerable numbers of Huguenot weavers settled in London, Salisbury, and Wilton. Decorative silk weaving was established by these skilled craftsmen at Spitalfields and a carpet factory at Mortlake, Surrey. Wilton, famous for woollen-cloth manufacture, became, however, the historic centre of carpet weaving. Such was the progress made, and the status the community of Wilton carpet weavers assumed, that a Weavers Guild was incorporated by Royal charter in 1701 by William III. By virtue of this charter the Wilton weavers were invested with authority to prevent "any persons not licensed by them from carrying on a similar business within four miles of Wilton." The furtherance of carpet weaving at the Royal Factory, Wilton, was fostered and supported by Henry, the ninth Earl of Pembroke, and the sixth Earl of Montgomery, the enterprise having enjoyed Royal patronage from its inception down to modern times.

The invention of the "Wilton Pile," about the middle of the eighteenth century, brought trading prosperity for a number of years to the town from which it takes its name. The manufacture of this grade of carpet, as of other grades of a similar weave type, continued to form the staple fabric in Wilton till 1835, when the weaving of hand-tufted carpets was introduced from Axminster, Devonshire, at which place such weaving had been in existence for some eighty years.

The term "Real Axminster" is applied to these carpets to distinguish them commercially from machine-woven Axminsters, in which the pile and the carpet are acquired by the mechanical means described in other parts of this treatise. Though the expansion of the carpet industry is largely attributable to inventive effort and progress, and to the application of mechanism to manufacturing practices, the weaving of hand-tufted carpets, as done by English and Irish producers, is organised on such efficient lines as to impart artistic strength to the whole industrial organisation. Carpets woven in British and Irish factories, equipped with the primitive form of upright looms, vie in excellence and fineness of pile structure, in decorative style, and in richness of colour toning, with historic Eastern loomwork. Of the leading firms in the country specialising in this important

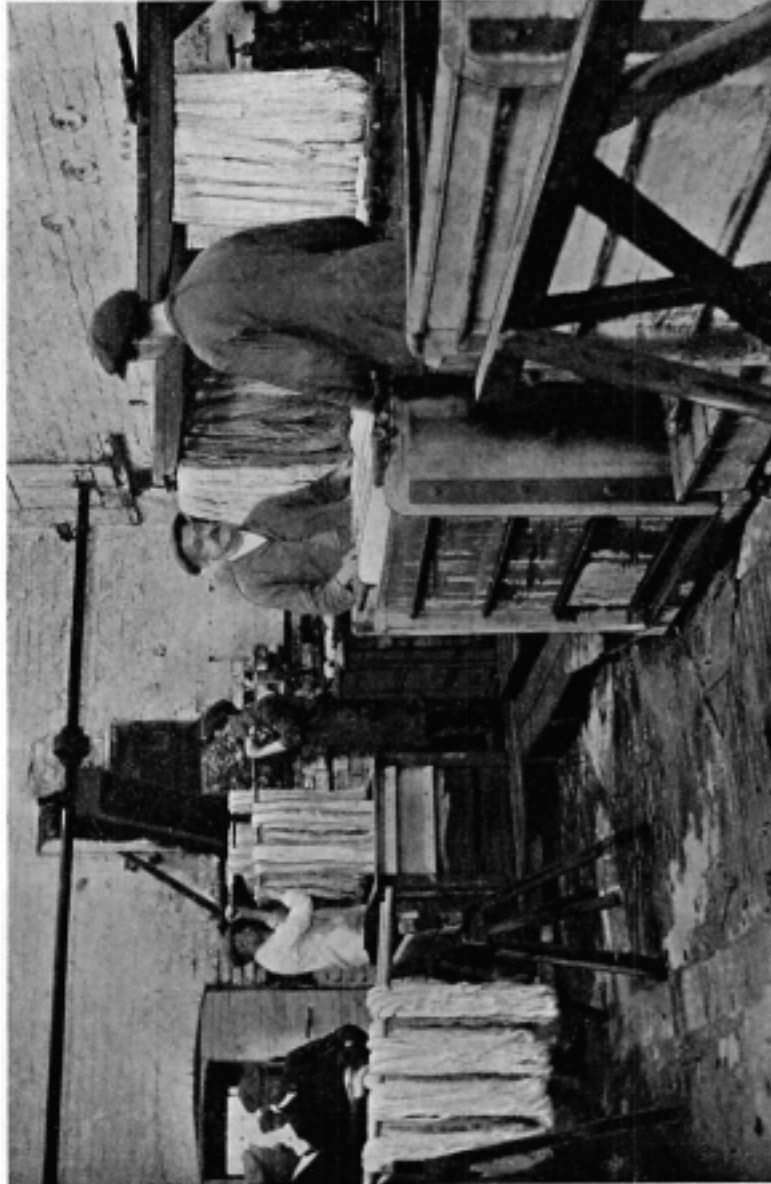


FIG 19.



FIG. 20.

department of the industry, reference will be made, in illustration of the modern status of British hand-tufted manufacture, to the productions of the Wilton Royal Carpet Factory Co., Ltd., Morris & Co., Ltd., and Alexander Morton, Sons & Co.

By each of these producers the work of every section of carpet construction—yarn preparation for looming, warping, dyeing and weaving—is performed on the manual system. The practices, as carried out at the Wilton Royal Factory, are shown in the views of the dyeing, winding, warping, and weaving sections in Figs. 19, 20, 21, and 22, with a view of the designing department in Fig. 23. While the whole routine of manufacture is thus manually accomplished, each branch of activity is under capable expert control. The analysis of the various styles and makes of carpets designed and produced by this craft organisation reveals the high standard of technical knowledge incorporated into the manufacturing procedure. The decorative and colour schemes of the designs applied give evidence of skilled draughting and competency in design practice as based on the study of historic and modern styles of flat ornament. The dyed qualities of the yarns in the carpets necessitate the utilisation of dyeing methods and processes which result in fast and mellow colour tones without deteriorating the natural properties of the wool of which they are spun.

Both carded and worsted yarns are used in the weaving of the pile, and both are made of selected wools of a good colour. The texture of the pile surface is soft, dense and flexible in filament composition. It ranges, with the variety of the carpet, from 16 to 144 knots or tufts per square inch, and from  $\frac{3}{8}$  of an inch to 1 inch in depth. Such is the quality of pile attained, as defined by tufted fulness and length and evenness of colour tinting, that carpets are weavable, perfect in structure and in shade, in which the centre is a solid delicate colour, and the border of a highly decorative character. Two specimens of this description are illustrated in Figs. 24 and 25. In the former, the body of the carpet is woven in a rich purple hue, in which the faintest inequality in yarn structure, in pile density, in dyeing, or in weaving, would be traceable in the pile surface. The ornate elements in band A of the border are produced in light fawn and cream on a purple blue ground, as also the spiral work in band C, these two types of pattern being woven in relief owing to the practice in applying the tufts of fawn and cream. The ribbon band in B, interlacing with the leaf forms, is neatly shaded in colour



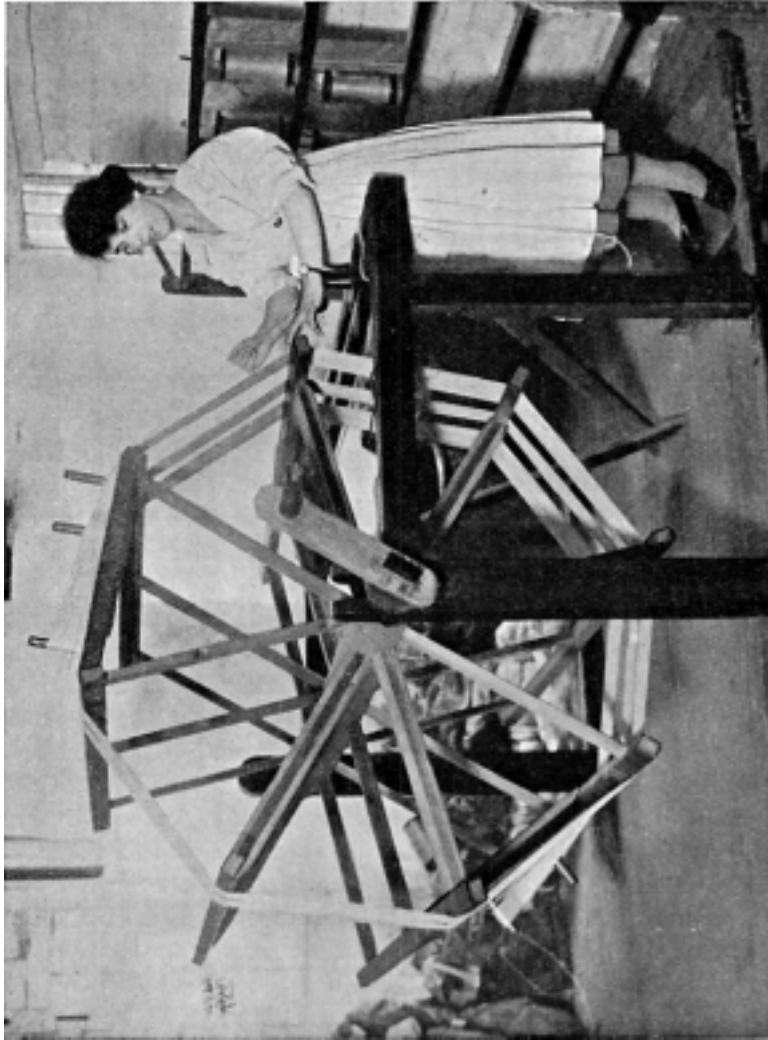


FIG. 21.



FIG. 22.



FIG. 23.

tones. As contrasting with the deep purple in the ribbon feature, the leaves are developed in natural green shades and the stems in warm brown or tan. The velvety quality of the pile is enhanced

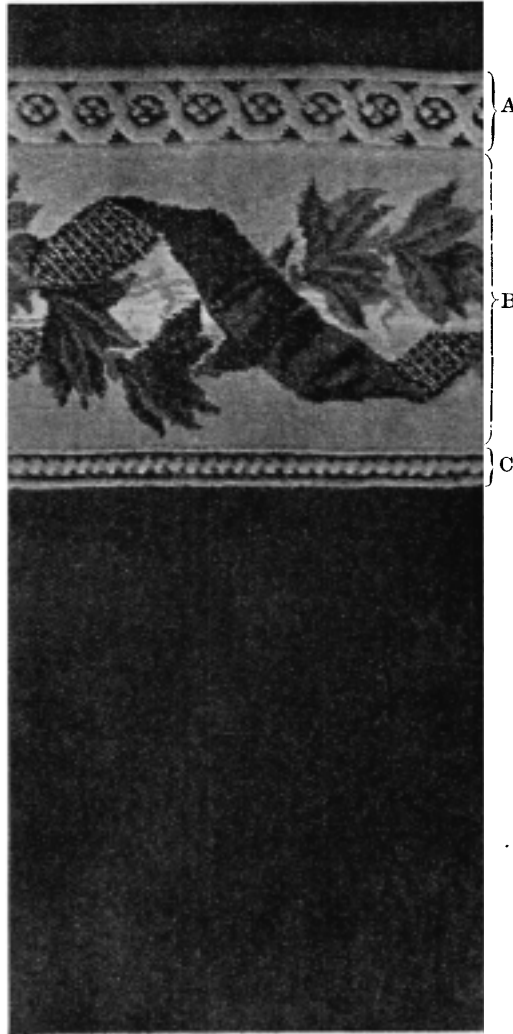


FIG. 24.

by its colour toning, the tinted yarns combined acquiring depth of hue in being formed into a pile fabric.

The Georgian example, Fig. 25, is equally suggestive of efficiency in hand-tufted weaving and design. The body of the carpet is woven in a soft tone of yellow brown. The border

is effective in arrangement, line proportion, and in colour units. The narrow line A is in light fawn, B in green, C in cream, E in yellow, F in green, and G in pale yellow. The tulip-shaped flowers in band D, in which the ground-shade is purple blue, are developed

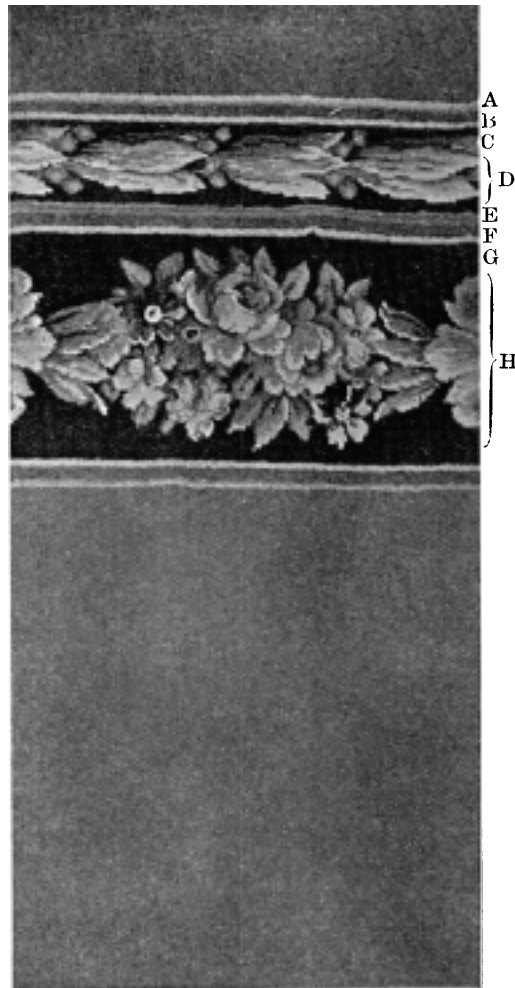


FIG. 25.

in green tones with the buds in pale tan and cream. The rose features in band H, which has also a purple shade ground, are delineated in natural rose tints, with the ox-eye blooms in clear tones of blue and their central details in pale pink and yellow. The flower forms alternating with the group of floral units are



PLATE I.  
SHAPED CARPET

developed in shades of olive, deep tan and yellow brown. Floral and leaf ornament of this description in a pile carpet surface, in which the design elements are so diversified in structure and in colour tinting and shading, is only possible by the exercise of craftsmanship akin to a fine technical art.

Other styles of design and colour practice are exemplified in the illustrations on Plate I, in Fig. 26, and on Plate II. Eastern principles of design are combined in the decoration of the two former, and Western principles in the decoration of the latter example.

The Shaped Carpet—Plate I—represents a weaving practice which does not obtain, unless performed with almost insuperable technical difficulty, in the horizontal-warp loom, whether operated by hand or power. Within the warp width of the vertical loom, any shape of carpet may be woven, so that the floor area of a room, or that of a corridor varying in width and form, can be fitted exactly with the carpet as woven. It is a system of tufted loomwork which simply involves the drafting of the design according to the size and shape of the carpet required, which the weavers are able to reproduce in the carpet as correctly as if the carpet were of uniform dimensions throughout its length.

The design of the specimen is framed in the Eastern tree-of-life scheme of ornament. Symbolic design is intended to reveal, in suggestive pattern forms and colouring, the meaning of the subject symbolised. It should not, either in plan or in component parts, be too problematical in character. The mystifying of the vision is to be avoided, but interest in the ornate types and their organic plan should be so far attracted and sustained as to evoke felicitous and speculative thought. Thus, in this example, these objects are attained. The figuring, in detail and as a whole, infers what it is intended to teach: the perennial quality of life, and the eventful transitions of which it is formulated. In no period or part of the decorative scheme is there a cessation or interruption of ornament or break in the colour composition.

Both form and colour units are constantly evolving, and, in the process, secure and maintain ornamental progression. The stem line of the basic ornament is woven in russet and tan, while from this ornament there radiate floral forms on the right and leaf forms on the left. Each group of forms develops and flourishes together, one group being the coefficient of the other, suggesting the complementary nature of the eventualities incident to human life. Linked with the central basic structure,

by branch and stem forms, are two dominant figures, produced in distinctive colour hues harmonising in tone. Intervening there are leaf details in lively tinting, which connect with a flat conventional leaf, from the upper part of which two branches emanate and form in outline a heart-shaped species of ornament.

The two descriptions of branch figuring below the diamond form and on the respective sides of the specimen, are woven in contrasting colour tones, and comprise leaf and floral features differentiating from each other in type. Similarly, such figuring above the diamond form is varied in colour and in ornate consistency on the respective sides of the carpet, while, immediately over it, two central-stem branches are developed, the lower one with tri-form leaves and the upper one with small flower blooms. The latter join up with the enclosed and bifurcated stems whose branches maintain decorative continuity. The vertebrae of the design consist of delicate, detail types of ornament, effectively distinguished from each other in ornate quality and in tinted tone. The vitality and contrasting properties of the pattern elements combined impose the idea of constant decorative unfolding and variation. The repeating character of the whole style is lessened in significance by the manner in which the units of effect are transposed in position and interchanged in colour development.

The design in the "Savona" Carpet—Fig. 26—is constructed on an Eastern original with a red ground. The reproduction is woven in what were known as "Cream Morris Colourings," in which it is applicable to carpets and rugs for landing, stair and room floor covering. The ornament is contrived on the centre or turn-over base, the units of pattern being repeated in reverse order from the central line of the figuring. Composed of pronounced decorative forms, with intermediate sections in varied types of detail, woven in cream, fawn, lavender, terra-cotta and green, with blue and black shades for edging and divisional lines, the specimen forms a choice example of carpet designing of well-defined character.

For separating the field from the border of the carpet fine clear lines in blue, terra-cotta and lavender are used. The border, in decorative style, is comparatively subdued in tone, its units of effect being of a geometric order, and developed on a fawn ground. The star and ornamental elongated figures are outlined in deep blue with their inner details woven in lavender, grey, cream, terra-cotta and green, the ornate line features being produced in the dark blue shade.



The ground of the central portion of the field is also fawn colour, with the demarcation lines of the figures in deep blue with cream middle. The central figuring is emphasised by having a cream-colour ground, on which the ornament is expressed in lavender, green and terra-cotta shades. The oval form at the base of the example is produced with a green ground, on which the ornate features are formed in fawn, olive and



FIG. 26.

lavender, including cream-tufted details. The segments consisting of branch, leaf and bud elements have a fawn ground, with the branches and leaves in dark blue outlines and green middle, and the buds in ochre with a deep blue edging.

In the long, full-filament pile, made of several-ply yarn, the colour toning of the design is mellow in quality. The figuring is clearly delineated in half-tone shades. These produce an *ensemble* of tinting which readily blends and harmonises

with the colour of the room in which the carpet forms a decorative quantity.

The "Ladoga" style—Plate II—belongs to the same design classification as the examples in Fig. 24 and 25, but the field of the carpet is woven in two tones of strawberry red instead of being developed in one solid colour. The structure of this specimen is analysed in Chapter X, on Pile Structure and Quality.

The Morris Movement, which had for its object decorative reform, dates from 1853. It is to this movement that the Morris Company owes its inception. Originally the firm was an association of artists, "all of whom had for many years been deeply attached to the study of the Decorative Arts of all times and countries, and felt more than most people the want of some place where they could obtain or get produced work of a genuine and beautiful character." The late William Morris was the inspiring genius and head of the enterprise. He had as colleagues Dante Gabriel Rossetti, Ford Madox Brown, Edward Burne-Jones, and Philip Webb, with P. P. Marshall as surveyor and engineer, and C. J. Faulkner as commercial expert. The artists themselves designed everything, and in some cases even executed the work; but from the beginning a clever all-round craftsman—George Campfield—was employed, and in course of time he was supplemented by groups of workers, including Albert and Harry Goodwin, Charles Holloway, Napier Henry, Frank Brangwyn and others, many of whom have since become painters of note.

The early productions of the firm comprised painted tiles, stained glass, furniture and tapestries. The tapestries were, in the first instance, embroidered woollen serge fabrics. The decorative textiles woven later by Morris and Company in their works at Merton Abbey—equipped with hand looms for vertical-warp and Jacquard or harness-weaving—included woollen tapestries of various widths and thickness, tapestries and damasks of mixed silk and wool, or silk and linen; and brocade or brocatelle, a type of silk material, with a rich shot effect, of Persian design. After perfecting the dyeing practice Morris added the weaving of thick hand-tufted ("Hammersmith") rugs in designs based on Eastern models. Other and cheaper forms of hand-woven carpeting of the Wilton and Axminster, Brussels, and Kidderminster structures were also introduced.

In 1898 Messrs. Alexander Morton and Company of Darvel, Ayrshire, and Carlisle, commenced vertical-loom carpet weaving at Killybegs, Co. Donegal. At first the work was quite experi-



PLATE II.

LADOGA

mental, being quite new to the country. It has been found that, by training and practice, the Irish village workers acquire skill and aptitude in the actual weaving operation, and in the system of knotting the pile yarns to the warp threads. Such has been the progress made that factories have been established at Kilcar, Crolly and Annagary, in which districts, including that of Killybegs, employment is given to all the girl operatives available; so that this class of hand-carpet production forms at the present time one of the staple industries of County Donegal. Carpets are woven in these works of a heavy or medium structure possessing a full nap or pile, and also of the Eastern quality of

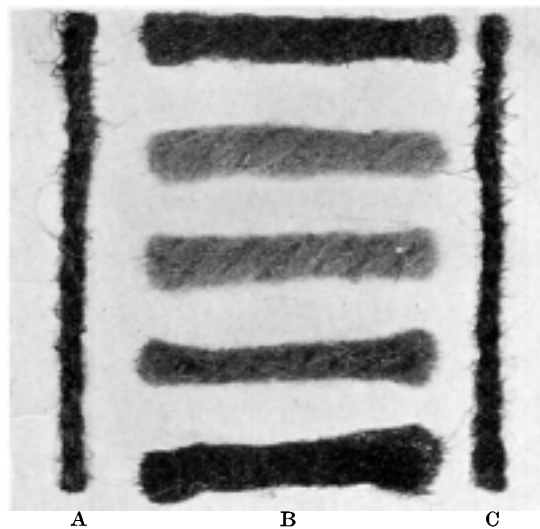


FIG. 27.

pile surface. With the facilities of manufacture the Company command, and the experts they employ, carpets are producible adapted to any floor space, rectangular, octangular or other shape, and historic, modern, heraldic or specialistic in ornament and colouring.

The carpets are made of strong-fibred wool yarns, of which specimens are shown for one variety of manufacture at A, B and C, Fig. 27. Here the warp yarns (A) consist of doubled 2-ply 8 skeins, with some eight threads per inch; the pile weft (B) of 3-ply 3 skeins, and the ground shots (C) of 2-ply 5 skeins. For the carpet sectionally illustrated on Plate III, the warp threads are made of doubled 2-ply 10 skein yarns, the pile weft of

worsted roving, 12–16 yds. per oz., and the foundation weft of doubled 2-ply 12 skeins, loosely twisted. In weaving, 16 to 18 feet of warp yield about four yards of carpet; and a weaver of average ability will produce some twelve square feet of carpet of 16 knots per square inch per week. The contraction in the width of the carpet from the web width is very slight, only amounting to 10 or 12 threads, or  $1\frac{1}{2}$  inches, in a carpet three yards wide. The method of weaving is purely Eastern in character, as indicated by the sectional drawings of the carpet structure in Fig. 27A, in which W,W, are the warp threads, G,G, the ground interlacing picks and P,P, the pile tufts.

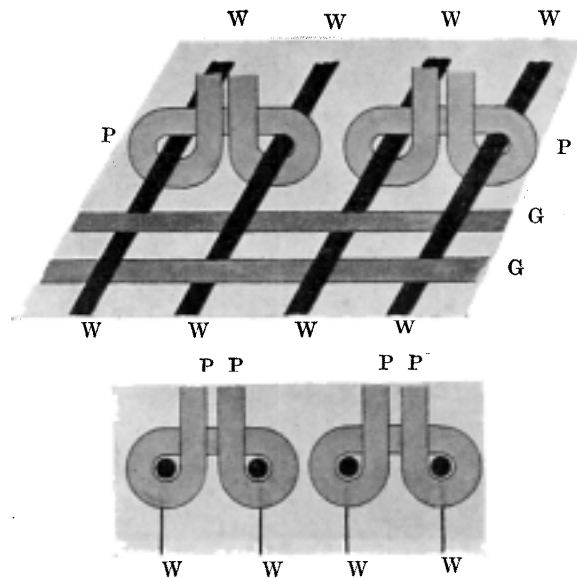


FIG. 27A.

Two examples of these carpets (manufactured by Messrs. Morton and Company) are shown at Figs. 28 and 29. The first is that of a carpet designed for floor decoration in the Houses of Parliament, Westminster. It is woven in three tones of green, using the deepest tone for ground, and the medium and lighter tones for the conventional forms in the centre and border designs. There is not that diversity of colour hue and tinting, or of detail pattern work, seen in Persian, Indian, and Turkish loomcraft, the ornament being of a Western quality in the basic plan and in the style of figuring, but the pile and build of the carpet are correctly made, and the whole design structure is adapted to the purpose for which the carpet is produced.



PLATE III.

FINE HAND-TUFTED DONEGAL

Fig. 29 is of a different description, being a closely-knotted carpet, rich in decorative types, and originated for the entrance hall of a residence in Cairo. It is Egyptian in design and colouring,



FIG. 28.

being illustrative of Egyptian symbolic art, as exemplified in the use of the lotus flower, the serpent, the phœnix, and in the ornate features forming the border design. In the central device the name of the owner is woven in hieroglyphics.

This rug measures 10 ft. 6 in. in width by 16 ft. in length.

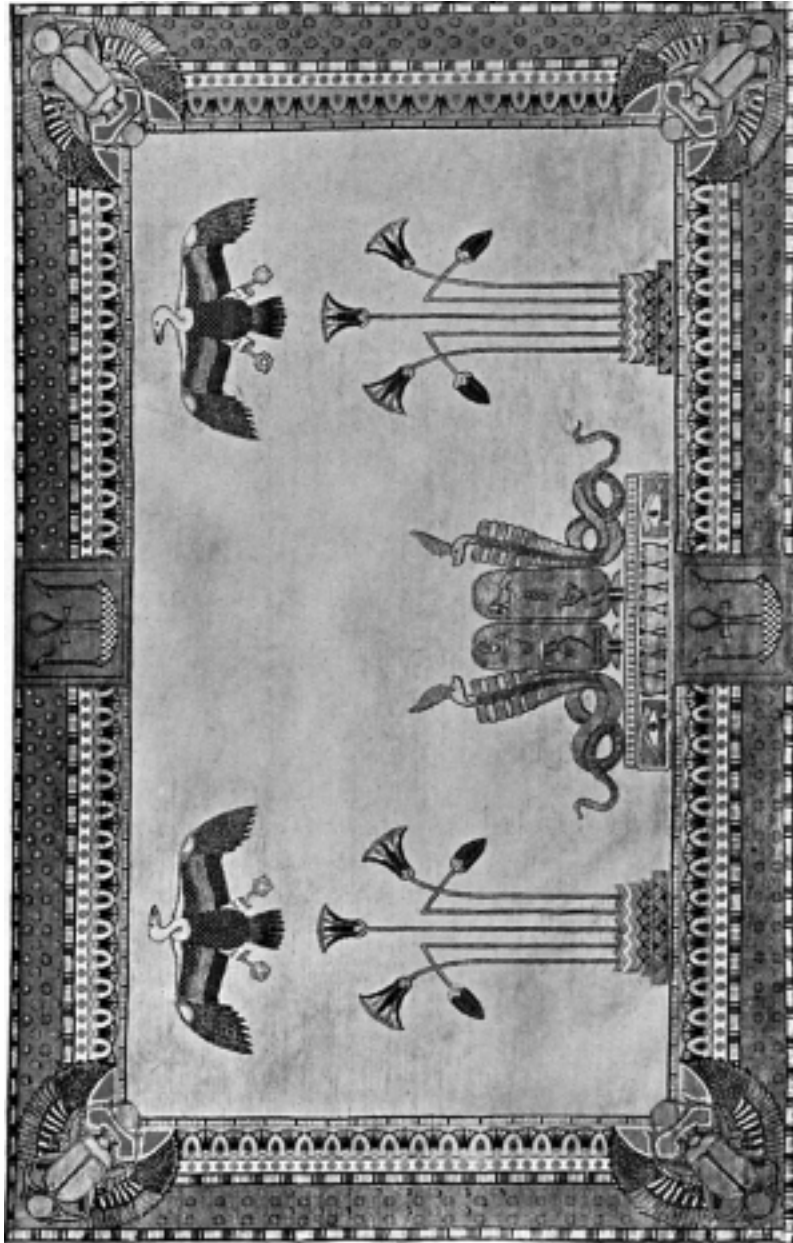


Fig. 20.



The pile surface is formed in a special quality of worsted yarn. Its closeness of structure is suggested by the number of pile tufts per square inch, namely 49 in the field of the rug, with all the outlines of the decorative types woven in yarns of half thickness, and giving a surface effect equal to 196 tufts per square inch.

As indicating the method of drafting the design on to point paper, a section is shown in Fig. 29A, but worked out in different tones and characters instead of in the colours applied in the weaving of the rug, which are requisite in the looming design for practical carpet production. This section coincides with the winged features in the corners of the border of the rug. In the portion of the colour gamut given on the right side of the example, the several symbols represent the following colours in the woven manufacture :

Squares marked in dots	= Peacock blue.
"    "    black	= Black.
"    "    diagonal lines	= Fawn.
"    "    dark grey	= Tan.

In addition the carpet contains decorative elements in ochre (= squares in crosses), in tinted grey (= squares ruled diagonally and dotted), in purple (= squares marked in triangles), in green (= squares marked in stars), in pale red (= squares in light grey) and in pale drab (= squares in white). From this sectional illustration and the various design types in which it is drafted it will be understood that the ornamental forms shown in dotted, black, grey, etc., squares are developed in the actual woven specimen in blue, black, tan, etc., with the ground of the centre of the rug (not shown in the sectional plan) in a fawn-coloured grey.

TABLE IV.

DIMENSIONS OF ORIENTAL CARPETS, RUGS, AND MATS.

<i>Carpets.</i>									
ft.	in.	ft.	in.	ft.	in.				
10	5 ×	8	6	Persian.	10	7 ×	7	11	Turkey.
10	9 ×	8	2	"	11	7 ×	8	1	"
13	9 ×	10	2	"	12	7 ×	8	0	"
16	0 ×	13	6	"	12	9 ×	9	8	"
17	5 ×	14	2	"	13	11 ×	10	11	"
17	10 ×	11	8	"	17	6 ×	12	10	"
19	0 ×	13	2	"	11	9 ×	8	10	Cashmere.
20	2 ×	15	8	"	12	4 ×	9	2	"
25	6 ×	13	2	"	20	4 ×	15	1	"
7	5 ×	6	0	Chinese.	9	0 ×	6	1	Mizapore.
9	0 ×	6	1	"	10	9 ×	9	2	"
9	9 ×	7	1	"	14	3 ×	11	4	"
11	9 ×	12	0	"	15	3 ×	12	6	"
15	0 ×	10	0	"	12	8 ×	8	11	Anatolian.
19	8 ×	13	2	"	25	0 ×	17	10	"

On the British, as on the Eastern, system of weaving practice any variety of ornament, design, or decorative style and colouring is producible. The system also admits of the manufacture of carpets of dimensions appropriate to floor decoration of rooms varied in area and in shape.

Eastern carpets and rugs are, however, made in such sizes as those stated in Table IV.

Such carpets are sold at so much per square foot, while those of British manufacture are sold at the price per square yard and the fractional parts thereof. Eastern rugs and mats are now produced in a considerable variety of sizes, of which the following are examples :

				<i>Rugs.</i>					
ft.	in.	ft.	in.	ft.	in.	ft.	in.		
5	6	×	3 11	Persian.	5	7	×	3 0	Mecca.
5	10	×	4 11	„	5	2	×	3 0	Sparta.
5	11	×	4 2	„	6	1	×	3 2	„
9	1	×	2 10	„	7	0	×	3 10	„
4	10	×	2 7	Mizapore.	6	6	×	4 6	Sarouk.
5	0	×	2 8	„	6	5	×	3 1	„
5	4	×	2 8	„	5	3	×	3 0	Broussa.
6	2	×	3 2	„	4	6	×	2 3	„
7	2	×	4 2	Indian.	5	2	×	3 5	Shiraz.
5	7	×	3 0	Chinese.	6	10	×	3 9	Cashmere.
7	0	×	3 0	„	7	2	×	4 7	Samarcand.

Though, as seen, many of the Eastern carpets and rugs are comparatively small, they are fine and close in the pile structure, and richly diversified in colour composition. With an average of 25 to 50 tufts or knottings per square inch in the ordinary and medium grades of production, and in the finer makes of 200 up to as many as 400, as in the best Tabriz, Sehna and Kirman weavings; and with the employment of several colours in each line of the carpet, the process of construction occupies a large amount of time even when a number of weavers operate at the same loom and across the same web, and with each weaver engaged in the weaving of an apportioned strip or sectional part of the work.

If, as now understood, the weaving durability of the tufted carpet is primarily dependent on the materials used in its manufacture combined with the manner in which the wool or other fibre is sorted, cleansed, dyed and made into yarn, the fineness of the carpet is strictly determined by the density or multiplicity of the pile tufts in a given area of surface. Eastern loomwork has been seen to vary in this particular with the centre in which it is practised, and also with the style of carpet and with the class

of yarns selected. In a silk pile rug 3 ft. by 4 ft. with 400 tufts per square inch, there would be no less than six hundred and ninety thousand knottings, or approaching three times as many tufts as in a carpet 3 yards by 4 yards with 16 knots per square inch. Or to take two rugs each 3 yards long and 2 yards wide, and one with 20 and the other with 200 knots per square inch, the former would contain some one hundred and fifty-five thousand and the

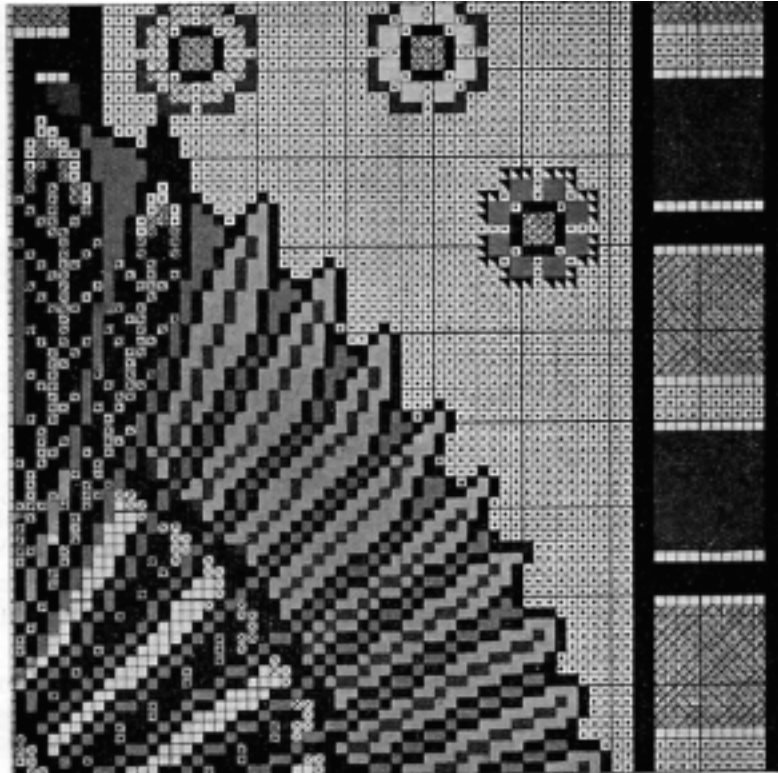


FIG. 29A.

latter over one million five hundred and fifty thousand separate knottings. From this remarkable difference in the total number of pile units in these respective productions two conclusions are to be drawn: First, that the pile density or fulness suffers in the ratio of the reduction in the number of the tufts, but the operation of weaving is thereby facilitated; and second, the more compacted the tufts in the carpet the greater and more skilful the task of construction, but the higher the carpet durability, softness, and flexibility.

Quality of product is, therefore, closely linked with efficiency and labour in the looming. It is directly connected with, and a result of, the craft faculty of the weaver. The formation, by looping, of 120 tufts per square inch in the carpet demands approximately eight times the amount of manual labour as the formation of some 16 tufts in the same space. But this is not all. In the closer-made structures fine yarns require to be selected, and these involve great care and dexterity in the application, or in the dividing of the warp threads, in passing the individual tufts round their respective ends in the warp, and in halsing each tuft in position. Misplaced tufts disturb the order of the pattern, and should they be incorrectly looped or assorted the pile is deteriorated in evenness and fastness. Here the system of technical performance coincides with that obtaining in the production of ordinary woven goods. Increasing the gauge of the fabric setting, and the counts of the yarns employed, renders weaving a more difficult operation—one in which a sound standard of proficiency becomes invaluable to the attainment of accuracy in the manufactured result. Hence in this class of carpet, the finer the set—*i.e.* the larger the number of pile tufts in a prescribed area of surface—the more intricate the weaving practice, the longer the time occupied in the work, and the greater the skill and aptitude involved. The weaver's ability is seen in the exactitude with which he follows the design draft, inserts and loops the coloured tufts, and forces the ground picks into contact with each other, binding in so doing the lines or series of tufts permanently together, and also acquiring a level, fast carpet foundation.

Other factors require to be taken into account in addition to the frequency of the pile knotting in determining the wearing value of the carpet, such as pile length, the materials of which the pile yarns are spun, and the yarns used in, and the make of, the carpet foundation. The ordinary warp and weft yarns in Eastern weavings have been shown to be made of wool, cotton, flax and hemp, differing with the class and quality of rug and also with the district of manufacture. Length of pile is governed by the thickness of the yarns selected and by the staple of the fibrous materials of which the pile yarns are composed. The pile varies from  $\frac{2}{16}$  to  $\frac{3}{16}$  in the finer carpets to  $\frac{8}{16}$  to  $\frac{10}{16}$  of an inch in depth in those of a thicker character. In the heavy Donegal carpets, as in the heavy Afghanistan Bokhara rugs, the yarn tufts average two inches in length and yield a pile more than half an inch

long. For the deeper grades of pile, medium stapled wools are used of a strong fibre varying in diameter from  $\frac{1}{300}$  to  $\frac{1}{520}$  of an inch, and for the short, dense pile of the best carpets, close-grown wools, fine in the fibre, averaging  $\frac{1}{1500}$  to  $\frac{1}{2400}$  of an inch in diameter.

## CHAPTER III

### FELT CARPETING

Persian Felts—Nūmūds—Pattern development in Eastern Felts—Methods of Production—Surface decoration—Insertion of Design Types in Fulling—Quality and Wearing Property—Fibrous Composition—Processes of Modern Manufacture—Carding—Lap and Batt Making—Carding for Quality—Blending—Carding for Mixture Shades—Principles of Blending applicable to Felt Carpeting—Felt Shades in Mixed Colours—Hardening—Treatment of Carded Batts—Machinery Employed—Bywater's Roller Hardener—Table Hardener—Felting Operation—Fulling Stocks—Combined Fulling and Milling Machine—Design in Felts—Character of Pattern Effects obtainable in Carding—Printing—Types of Border Design—Woven Felts—Reversibles—Weave Types and Structures—Plans for Weft Unions—Woollen-Yarn Felts in Double Weaves—Union Felts—Amount of Contraction in Milling—Application of Weave Structures—Design a Resultant of Plan Combination—Drafted Rug Designing—Loom Setting for Drafted Rug Styles—Practice in Design Construction—Dimensions of Woven Felted Rugs—Centre Types of Pattern—Motives for Drafted Designs—Transference of Unit Effects on to Point Paper—Jacquard Patterns in Felted Unions.

As stated in Chapter I, " felts " may be described as one of the earliest varieties of carpeting. They form a type of cloth producible independently of the operations of spinning and weaving. Yarns are not employed. It is solely a problem of effectually opening and separating the staple of the wool, followed by the re-blending of the filaments into compact, adhesive layers of a uniform thickness and density. Such layers are made, by hardening and fulling, into pieces of a definite length, consistency and firmness.

Persian felts are designated by the Eastern craftsman as " nūmūds " or " nammads," as distinct from " Kali," the tufted, hand-woven pile carpet. They are used in Persia for a partial surround of the latter, the Kali occupying the central and upper parts of the floor space. The nūmūd is not a solid coloured felt, like that made by machinery, but a decorative floor covering diversified both in colour and in ornament. For the purpose to which it is applied in the East, there is possibly no more suitable production. Soft, cosy and durable, it forms a kind of frame in which the rich pile carpet is set, and lends that *ensemble* of