A TREATISE

ON THE

ART OF WEAVING,

WITH

Calculations and Tables

FOR

THE USE OF MANUFACTURERS.

BY JOHN MURPHY,

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AND OTHER ARTICLES IN THE ENCYCLOPEDIA EDINENSIS.

ILLUSTRATED BY ENGRAVINGS.

SEVENTH EDITION, REVISED AND ENLARGED.

PREFACE.

It were vain to search for the origin of Weaving amidst the darkness of remote ages, although there can be no doubt of its having an equal claim to antiquity with any of the other arts, which contribute either to the necessaries, the comforts, or the luxuries of the human race. In the state of nature, the wants of man are comparatively few, and are usually supplied by the most simple and obvious means; yet there is scarcely a nation or tribe to be found in the savage state, however rude or uncultivated, who have not some notions of interweaving fibrous substances into cloth, either for ornament or use; and many of the productions of these people display no common degree of ingenuity. It is not, however, till nations have emerged from a state of barbarism, advanced considerably in civilization, and begun to indulge in the pleasures of luxury, that the useful and ornamental arts are cultivated with assiduity, and brought to their most refined state of perfection.

The Egyptians were the first civilized people of whom there are any authentic records, and to them the neighbouring nations were chiefly indebted for their knowledge in the arts and sciences: among which was the art of Weaving, especially of fine linen, for which they were widely famed. The Israelites, in particular, as appears from the book of Exodus, had acquired an extensive know-

ledge of the useful and ornamental arts, during their abode
in that land; for we find, not long after their departure
thence, the names of Aholiab and Bezaleel, the greatest
artists of their time, associated with the graver, the em-
broiderer, and the weaver, in preparing the ornaments for
the tabernacle. The Greeks were likewise greatly indebt-
ed to the Egyptians for their knowledge, both in the arts
and sciences; and of them they learned the culture of
flax and weaving of linen. The Romans, again, borrow-
ed many of the useful arts from the Greeks, and spread a
knowledge of them as far as they carried their victorious
arms.

With respect to the processes or manipulations of
Weaving as conducted by the ancients, nothing satisfac-
tory can be gathered from history, although it is highly
probable that they were either the same, or similar to
those at present practised by the natives of India. One
thing, however, is certain from their fables and sculp-
tures, that the Egyptians, Greeks and Romans, spun
their yarns with the distaff and spindle: and it has been
remarked that these simple implements have been used for
spinning in all the countries which have been discovered
by navigators for the last three centuries. They are still
employed by the natives in the East Indies; and they
were common in Scotland in the middle of the last cen-
tury.

That the art of Weaving was unknown in Britain be-
fore the Roman invasion, at least for the purposes of
clothing, will appear from the following curious picture of
its inhabitants at that period, drawn by the great poet
Milton. " At Cæsar's coming hither," says he, " such
likeliest were the Britons, as the writers of those times and
their actions represent them, in courage and warlike rea-
diness, to take advantage by ambush or sudden onset, not
inferior to the Romans, nor Casibelan to Cæsar, in wea-

pons, arms, and skill of encamping, embattling, fortifying, overmatched; their weapons were a short spear and light target, a sword also by the side; their fight sometimes in chariots, fanged at the axle with iron scythes, their bodies most part naked, only painted with woad in sundry figures, to seem terrible as they thought; but if pinched by enemies, not nice of their painting, to run into bogs up to their necks, and there stay many days, holding a certain morsel in their mouths no bigger than a bean, to suffice hunger: Their towns and strongholds were spaces of ground fenced about with a ditch, and green trees felled overthwart each other; their buildings within were thatched houses for themselves and their cattle: In peace the upland inhabitants, besides hunting, tended their flocks and herds, but with little skill of country affairs; the making of cheese they commonly knew not; wool and flax they spun not; gardenery and planting, many of them knew not; clothing they had none but what the skins of beasts afforded them, and that not always; yet gallantry they had, painting their own skins with several portraitures of beast, bird or flower."

After the Romans had obtained a footing in Britain, they established a woollen manufactory at Winchester for clothing their army, and also taught the natives the art of Weaving and the culture of flax. The Saxons afterwards introduced the manufacture of several kinds of cloth, chiefly for domestic purposes; among which is said to be the weaving of counterpanes.

Little farther is known of Weaving in Britain till early in the fourteenth century, when Jack of Newbury introduced the manufacture of broad woollen cloth, which was afterwards protected and encouraged by King Edward III., and which has ever since been the staple of England. The following extracts, however, from Anderson's Progress of the Arts and Sciences, and others, will exhibit the state of

the cloth manufacture in Europe from this period till the end of the seventeenth century, when a new era may be said to have commenced in the history of the arts in Britain.

ANNO.

1209. Venice gains the silk manufacture from Greece.

1248. A company of wool merchants settle in London.

1253. Some fine linen made in England.

The latter end of this century the better sort of people wore woollen shirts: the most considerable citizens gave not above one hundred livres for a daughter's portion. But now, says Lafflamma, we wear linen. The women wear silk gowns, some of which are embroidered with gold and silver.

Table linen was scarce in England.

1305. The city of Louvain in Flanders, with the adjacent villages, were said to contain above an hundred and fifty thousand journeymen weavers.

1327. The first broad cloth made in England by Jack of Newbury.

1331. King Edward III. resolves to promote a woollen manufactory in England, and to this end brings seventy families of Walloons into England.

1336. Two Brabant weavers settle at York with the king's protection; as it may prove, said the king, of great benefit to us and our subjects.

1337. Laws enacted for encouraging the woollen manufacture in England.

Holland gains part of said manufacture from Flanders and Brabant.

1339. Looms set up in Bristol for woollen cloth.

1348. Norwich eminent in the worsted manufacture.

French fashions introduced into England.

1351. Foreign weavers numerous in London.

B

ANNO.

1619. Tapestry work first introduced into England.

1620. Broad silk first manufactured.

1622. The woollen manufacture in a declining state.

1624. The Dutch make woollen cloth to the amount of £25,000 a-year.

1641. Ireland spins linen yarn for Manchester, who returns it to them made into cloth.

1643. Bow dye or scarlet first made.

1646. The French begin their manufacture of fine woollen cloth, under the patronage of Cardinal Mazarine at Sedan.

1650. The worsted manufacturers of Norwich incorporated.

1654. The fine broad cloth of England sent to Holland to be dyed.

1663. Forty thousand men, women and children employed in silk throwing, in and near London.

1666. Burying in woollen established by law.

1667. Dyeing and dressing woollen cloth perfected in England, by one Brewer from the Netherlands.

1668. The Scots send linen yarn to England.

1670. The wear of muslins first introduced.

The linen manufacture began to be encouraged in Ireland, where it is very considerable.

1685. Seventy thousand refugees came from France on the revocation of the edict of Nantz, (by which edict the protestants there enjoyed the public and free exercise of their religion) and settle in Great Britain and Ireland, bringing with them the blessings of industry, and an extensive knowledge in many manufactures yet unknown there; of these two thousand are supposed to have gone to Ireland. The whole number, who, for conscience' sake, quitted their native country, are said to have been 800,000; they distributed themselves in

Holland and Brandenburgh, where they erected the fabrics of cloth, serges, stuffs, druggets, crapes, stockings, hats, and all sorts of dyeing; and among them were goldsmiths, jewellers, watchmakers and carvers. Many settled in Spittalfields, London, where they erected the manufacture of silk, and helped to people the suburbs of Soho and St. Giles; by them was introduced the art of making crystal, which was entirely lost to France.

1696. A law to prevent the exportation of English wool, and the importation of Irish.

Hemp, flax, linen, thread and yarn from Ireland, admitted duty free. (This law gave rise to the now happy state of the linen manufacture in Ireland.)

From these extracts it will appear that Britain and Ireland were first indebted to the bigotry and persecuting spirit of the continental powers of Europe, in the sixteenth and seventeenth centuries, for many of the useful arts which they now enjoy, and which laid the foundation of some of our most extensive manufactures.

The cloth manufacture made little progress in Scotland till after the Union, when it was greatly promoted by the fostering care of the Board of Trustees, which was established by charter at Edinburgh, in the year 1727, for protecting and encouraging the Scotch manufactures and fisheries. The greater part of the goods manufactured in Scotland, however, were made of linen yarn, till about the year 1759, when a branch of the silk trade from Spittalfields, London, was established at Paisley, where it was brought to such perfection, especially in the more light and fanciful kinds, that in a short time, Paisley silks not only rivalled those of the south, but had a preference in all the

markets in Europe; and this laid the foundation of that extensive knowledge of fancy weaving, for which the trades-men of Paisley have since become so famous, and which is now spread over the west of Scotland.

About the same period, the increasing demand for cotton goods, induced several individuals to attempt a more ample supply of yarn, to meet an extension of this branch of manufacture; but all without success till the year 1767, when Richard Hargreaves, a weaver in Lancashire, invented the cotton jenny, which, though at first it contained only eight spindles, was afterwards enlarged, so as to contain 20, 30, and even 80. And about two years after this invention, Sir Richard Arkwright improved the spinning of cotton still farther, by the application of water for the moving power, &c.; together with the addition of rollers, and other modifications of the machinery. The extension of this rising manufacture now became so rapid, that it would soon have felt a serious check, had not the discoveries in chemistry which were made about the same time, come in to its aid, particularly in the processes of dyeing and bleaching; by the latter of which, the manufacturer was enabled, instead of a process of some months, to bring his goods to the market in the course of as many hours after they came from the loom. These inventions and discoveries, together with the improvements in calico printing, the discharging of colours, particularly of Turkey red for Bandanas, the application of steam for the moving power, and innumerable other discoveries in mechanics and chemistry, which would fill a volume to give in detail, have contributed, within the last forty years, to raise the cotton manufacture to a state of perfection and extent unknown in the history of commerce.

Having thus given a short account of the progress of weaving in Britain, from its first introduction to the present time, it may not be improper to add a few words with

respect to the subject itself, and the work which is now offered to the public. The art of Weaving naturally divides itself into a number of separate or distinct branches, differing so materially in principle, that an experienced tradesman in one branch, is often as much a stranger to some of the others, as any other mechanic; while at the same time, the constant demand for novelty and variety, to give life and vigour to our commerce, and to maintain a competition with foreign rivals, render a general knowledge of the art, in all its parts, of the utmost importance both to the manufacturer and operative tradesman. But as this great object is scarcely attainable by practical application, it can only be supplied through the medium of the press. From this consideration, therefore, the present work was first undertaken; how far it may be found to answer this important end, time, and an enlightened public, only can determine.

In the fancy weaving department of the work, the different branches of the art have been explained under their respective heads, and arranged in the most simple and natural order that presented itself after much study and reflection; and their general connexion and dependence on each other as a system, have been exhibited and illustrated in such a manner, that any person of moderate acquaintance with the art, may, with a little attention, easily comprehend the whole; and be able to apply the principle of any one branch, to the extension and improvement of another, so as to give the greatest diversity to his patterns.

In this new and improved edition of the work, every attention has been paid to the silk branches of weaving, which, since the reduction on the importation duty took place, has become an object of general interest among the manufacturers of fancy goods in this country. On revising the work, the fundamental branches of weaving, applicable to this manufacture, have been pointed out, and a considerable quantity of new matter introduced, chiefly to explain

the method of weaving those fabrics and textures which have
been brought into the trade since the publication of the
first edition. Among these will be found Canton crapes,
Turkey gauze and piquet stripes, Turkey gauze harness',
on the newest and most approved construction; likewise
Kamschatka or Chenille shawls, &c. And, in order to em-
brace every improvement in the draw loom department to the
present time, a description of Cross's machine, or counter-
poise harness, with illustrative engravings are given, and
also an engraving and description of the new French draw
loom for superseding the draw boy, which has been intro-
duced into this country since Cross's machine was made
public. And to render this work still more complete, an
elegant engraving of the power loom and dressing machine,
with a minute description, are added; together with a
beautiful engraving, representing an Indian family employed
in the different processes of the cotton manufacture.

The thirteenth Chapter, which may be bound by itself,
is more immediately intended for the use of the manufac-
turer. It contains a number of tables to facilitate calculation:
the rules, however, which are there laid down, will not only
explain the principles on which these calculations are
founded, but will be useful, if committed to memory, when
tables are not at hand. The prices of cotton yarn also,
in this edition, have been extended to embrace the general
trade. The years 1825 and 1826, have exhibited extremes
in the rise and fall of cotton yarn, which are not likely to
be exceeded in this country for a long time; and therefore,
these tables have been adapted to the present state of our
manufacture, with a sufficient allowance for any contingent
rise or fall in the prices.

The Author cannot close this preface without expressing
his warmest acknowledgments to the Honourable Board of
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CHAPTER I.

A

TREATISE

ON THE

ART OF WEAVING.

CHAP. I.

Construction of Loom Mountings.

SECT. I.   OF THE SEVERAL PARTS OF A MOUNTING.

THE art of Weaving, with respect to its elementary
principles, may be divided into the six following branches,
namely, plain texture, tweeling, double cloth, spotting,
flushing, and crossed warps; for, to one or other of these,
or to some of their combinations, may be referred every
variety of texture or ornament which is produced in the
loom.

All the diversity of which these fundamental branches
are susceptible, arise from the mode in which the threads of
warp are separated, or the sheds opened, to receive the woof.
The apparatus or mountings which, in ordinary cases,
are employed for this purpose, consist of heddles variously
arranged on shafts, and connected to an assemblage of
levers, which are put in motion by the weaver's feet.   Pat-
terns, however, which are too extensive to be conveni-
ently woven on this principle, are executed in the draw
loom, in which every diversity of ornament may be pro-
duced, and the range of the pattern carried to any prac-
ticable extent.

A   1

The heddles, which constitute the essential part of a
mounting, are of various constructions: some are clasped,
as represented at A, fig. 1, plate 1; others are made with
eyes as at B in the same fig. and those employed in cross
weaving have half heddles attached to certain parts, to
assist in crossing the threads of warp. The clasped hed-
dles are chiefly in use for plain fabrics, or where little
mounting is necessary. The thread of warp enters between
the clasps where the dot is placed in the fig.; and, should
the yarn be weak or soft in the undressed state, the clasps,
when drawn together, prevent it, in a considerable degree,
from being unequally strained behind the mounting. The
eyed heddles are chiefly appropriated to fancy mountings,
as the eye passes with more facility over any obstructions
that may remain on the warp after it is dressed.

When eyed heddles are intended for the lighter fabrics
of cloth, one single knot of the twine is sufficient to form
the eye as represented in the fig.; but for the stouter fa-
brics, such as the general run of customary weaving, the
eye requires two knots to prevent it from slipping.

Each leaf of heddles is fastened to two shafts, one above
and one below, by means of cords called the maitland
cords, or backings, on which they are knotted at the pro-
per distances for the given set of reed, though, for some
kinds of coarse cloth, they are made to shift along the
cords, to suit different sets of reed, or to produce a variety
of pattern by the same mounting. In fancy mountings, how-
ever, when adapted to any particular pattern, it is more
advantageous to have each portion of the heddles cast or
knotted on the cords opposite those spaces of the cloth
which they are respectively to weave.*

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* The twine of which heddles are constructed is made of linen yarn, cotton,
silk, or worsted, according to the species of work on which they are to be
employed. Twine made of linen yarn, which is now chiefly confined to warps

The levers which are employed for raising and sinking the leaves, in most of the branches of fancy weaving, are coupers, long marches, short marches, and treddles. In

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of the same material, or for the construction of harnesses, is made of three threads or ends laid together and well twisted. It is wound on a reel 90 inches in circumference, and tied in cuts which should contain 120 threads; but owing to waste and the diminution occasioned by twining, it seldom exceeds 110. Heddle makers usually make their calculations by the hank, which is four of these cuts, equal to the fourth part of a spyndle of single yarn.

Cotton twine, which is now in general use for cotton and linen warps, is composed of five ends twisted together, and made up into cuts and hanks of the same length as the linen twine: but as the cotton runs somewhat longer than the linen, the cut will contain about 120 threads.

Heddle twine made of silk is usually called liesh, and is for the most part employed for silk warps, or for the doups and bead-lams in cross weaving. Liesh, however, is now made of cotton yarn for the last purpose, and consists of 6, 9, 12, and sometimes even of 15 ends or plies. These ends are first made into strands of 2, 3, 4, or 5 threads each, and then three of these strands twisted together make the 6, 8, 12, and 15 ply liesh respectively. Worsted twine has been employed for the same purposes as the linen and cotton twine, though not to any great extent.

There is no precise rule for adapting the grists of heddle twine to the different grists of warp, for this in a great measure will depend on the fabric of the cloth, as well as the opinion of the weaver. Mr. Alexander Peddie, indeed, has given a table for this purpose in his book on weaving; but, as it is well known that the grists or fineness of warps, for the same fabric of cloth, vary as the squares of the reeds, and his grists of twine are computed simply as the number of the reed, it is evident that, when the grist of the twine is suitably adapted to one set of reed, the greater the difference between this and any other set, the more will the grists of the twine and warp be at variance. For example;—according to Mr. Peddie's table, if 8 oz. twine suit 600 heddles, 4 oz. will make heddles for 1200 of the same fabric. This proportion is simply as the number of the reed. But were the grist of the twine to vary as the grist of the warp, it would be as

$$6 \times 6 = 36 : 8 :: 12 \times 12 = 144 : 2,$$

reciprocally, that is, only half the weight Mr. Peddie makes it.

fig. 2, plate 1, which is a view of a four leafed tweel mounting, A are the coupers, B, the long marches, C, the short marches, and 1, 2, 3, 4, the ends of the treadles, as seen from the back of the loom. As the coupers A have the bolt or fulcrum i between the weight and power, they are termed, in mechanics, levers of the first order; and, as the centre of motion is generally from one-third to two-fifths of the whole coupers from the weight to be raised, or where they are connected to the leaves by the cords n n, the power will be increased in the same proportion. Again, as the power, which is the pressure of the foot on the treadles, acts on the long march B between the weight and prop or bolt m, this march is said to be a lever of the third order; but instead of giving an increase of power, this lever diminishes it in proportion as the treadle cord is tied towards the bolt. The long march therefore is applied merely for the purpose of changing the direction of the power, or raising the leaf to which it is connected by pressing down the treadle. When any treadle is connected to the short march C on the side of the cords a farthest from the bolt, the march becomes a lever of the second order; but when tied between these cords and the bolt, it is then a lever of the third order, and diminishes the power in the same manner as the long march. The short march, however, is neither intended to increase the power nor change its direction, but to afford the means of connecting a number of treadles to the same leaf, while the power is exerted constantly on its centre. The ends only of the treadles 1, 2, 3, 4, can appear in this view of the mounting. When their centre of motion, or heel bolt, is placed either below or behind the weaver's seat, they are levers of the third order; and, therefore, the farther back he works with his feet, the greater effort is necessary to open the sheds. In heavy mounted looms, however, it is found advantageous to re-

verse the position of the treadles; and then the weaver works upon the ends farthest from the bolt, which gives him a considerable increase of lever power, although attended with a deeper tread.

SECT. II. DRAUGHTS AND CORDINGS.

A draught and cording, draught and tie, or draught and tie-up, as it is termed in different manufacturing districts, is a small plan of the leaves and treadles of a mounting, on which are represented the order or succession in which the warp threads are drawn through the heddles, and the leaves pointed out which are to be raised and sunk by each treadle. The annexed figure is the draught and cording of a four leafed tweel, corresponding with the mounting at figure 2, plate 1.

No. 1.

d	*c*	*b*	*a*				
		0	0		1	1	A
	0	0			2	2	B
0	0				3	3	C
0			0		4	4	D
1	2	3	4				

In this plan the spaces marked A, B, C, D, represent the leaves, and those marked *a*, *b*, *c*, *d*, which cross them at right angles, the treadles. The figures 1, 2, 3, 4, on the leaves, show the succession of the draught, or denote that the first thread of warp is taken through a heddle on the leaf A, the second, on the leaf B, the third on C, and the fourth on D, and this is said to be one set

of the pattern, or once over the draught. The cyphers on the spaces *a, b, c, d,* show what leaves are raised by each treadle, respectively, while working over the pattern; the blank squares, at the same time, exhibiting such as are sunk. This distinction, however, is merely arbitrary, for in some instances it is more convenient to mark the sinking cords, and leave the raising ones blank, as is usually the case in cordings for jacks or stocks and pulleys. It is pretty generally understood, however, that the raising cords are marked on cordings for coupers and marches, and the sinking ones left blank, unless something to the contrary be mentioned. In the present example there are marks on the treadle *d*, where it crosses the leaves C and D, and blanks where it intersects A and B: the two former leaves, therefore, are raised, and the two latter sunk by this treadle, to open the first shed. The same is to be understood of the other treadles of this, or any other plan of cording which is not otherwise described. The figures on the treadles likewise show the order in which they are wrought over to produce this tweel.

When the succession in which the threads of warp are drawn through the leaves is exhibited by numbers, as is usually the case in complex draughts, it is evident that the highest number will show how many threads, or at least heddles, are in one set of the pattern. Sometimes, however, to save room, the threads are represented by small lines drawn across the leaves, as at N fig. 3, where each line denotes a single thread, or what is drawn into each heddle. In some branches of weaving, also, it is found convenient, for the same reason, to mark a whole draught over a certain portion of leaves, with one straight line, as at O in the same figure.

If we suppose the warp of any web to be divided into two equal parts, namely, those portions which are drawn,

respectively, on the back and front leaves of a plain mount-
ing; then, that half which belongs to the back leaf will
consist of the odd numbers 1, 3, 5, 7, &c. beginning with
number 1 on this leaf; and the even numbers 2, 4, 6, &c.
will, of course, be drawn on the front leaf. In whatever
manner, therefore, the draught of any pattern may be
diversified, be the number of leaves what it may, provided
an odd and an even number be not drawn on the same
leaf; if a raising cord for each leaf that contains the
even numbers, be put on one treadle, and the reverse of
this cording be put on another treadle; then, these two
treadles wrought alternately will convert all the warp in
the draught into plain cloth. This observation will be
found useful in many cases, especially where the draught
is much diversified, as will appear in many of the examples
given in the course of this work.

In the preceding, and all other plans of cording whose
draughts run straight over the leaves, and the order of
treading is in the same regular succession over the treadles,
the raising marks will form one complete set of the pattern
on the cording plan: for as, in the specimen already given,
the mounting produces a biassed stripe of flushing when
the treadles are wrought over in the order of the figures
1, 2, 3, 4, each shot of woof passing, alternately, over and
under two threads of warp, the raising marks will be found
to assume a similar form on the treadles *d*, *c*, and *b*; but
at the leaf A and treadle *a*, the run of the stripe appears
to be interrupted. As the same set of leaves, however,
must repeat the pattern, the raising mark which seems to
be wanting on the back part of the mounting is brought
forward by passing the two leaves B and C, their common
distance, to the leaf D, and forms a part of the succeeding
stripe. This will more obviously appear by repeating the
cording, as in the annexed figure.

No. 2.

			0	0			1	1
		0	0				2	2
	0	0					3	3
	0			0			4	4

m : : : 0 : 0 :
: : 0 : 0 : :
: 0 : 0 : : :
: 0 : : : 0 :
: 1 : 2 : 3 : 4 : n

The preceding remark requires particular attention, especially in making cording plans of considerable extent; for even in this small specimen it is obvious, that, wherever the run of the pattern breaks off at one side of the plan, it must be continued on the succeeding leaves and treadles at the opposite side. This will also be sufficiently exemplified in the plans given under fancy tweeling.

The form of the draught and cording here described is common in the manufacturing districts of Scotland and north of Ireland; but in England their construction is somewhat different, which it will be necessary here to explain. Instead of marking the order of the draught and cording on the spaces, as in the preceding example, the English weaver puts his marks on the lines, which thus become the representatives of the leaves and treadles. The following specimen, which is the draught and cording of the four leafed tweel already explained, will enable the reader to understand any draught and cording of this form that may occur.
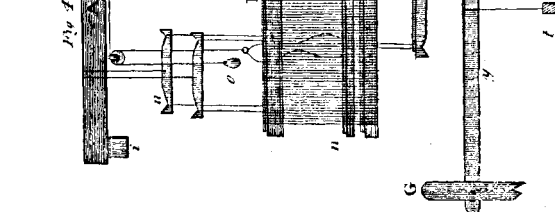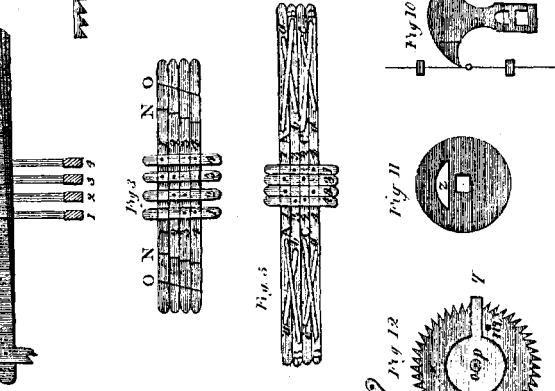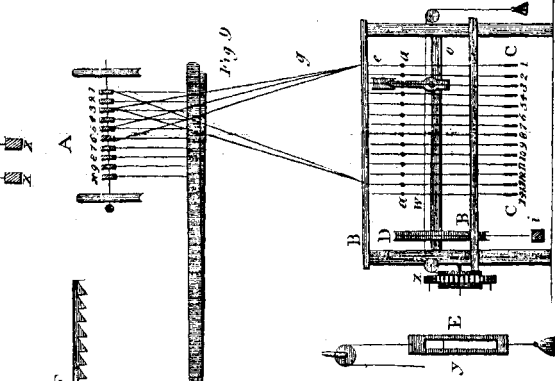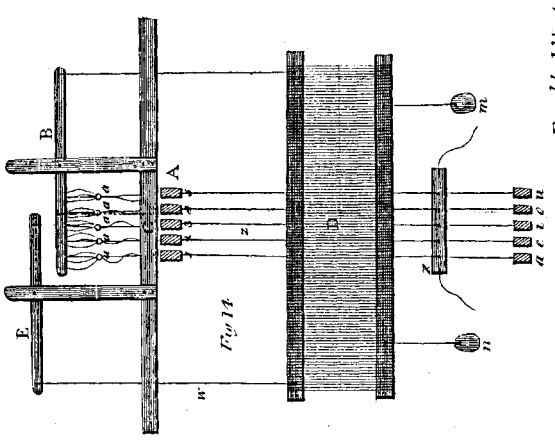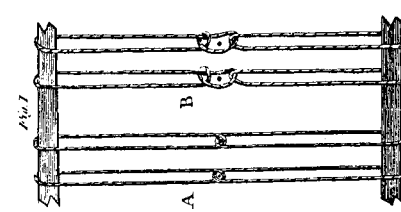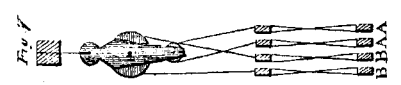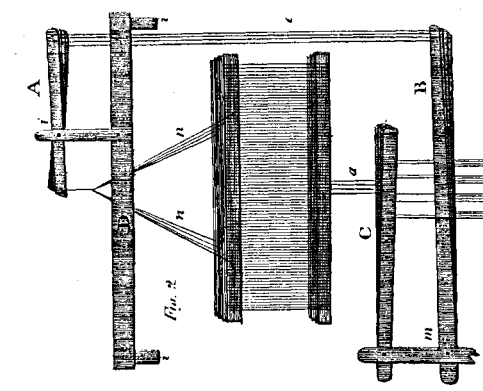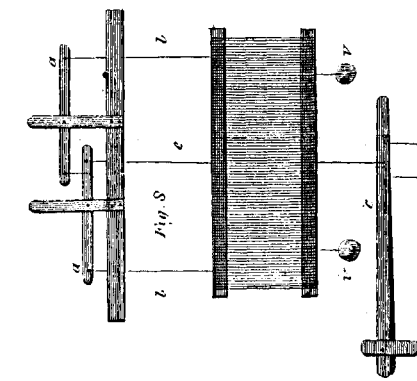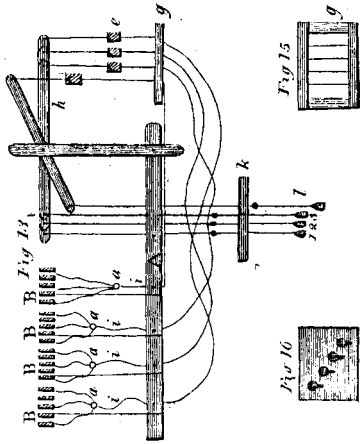
PLATE 1

CONSTRUCTION OF LOOM MOUNTINGS

No. 3.

Thus.   Or thus.
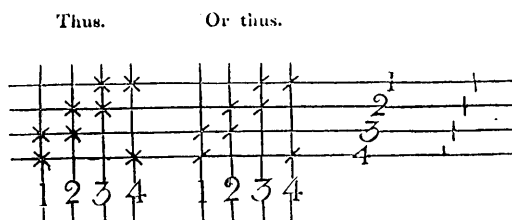
When two or more species of weaving are combined in the same web, the draught of each kind is drawn, in spaces, on its respective mounting, and the cords are placed on the treadles so as to open the compound sheds. But this part of the subject will be better understood after the fundamental branches of weaving have been explained.

SECT. III.   MOUNTING WITH COUPERS.   *Plate* 1.

In all looms mounted with coupers, except those for crossed warps, each leaf has its couper, and its long and short marches: in cross weaving, every upper shaft has its couper and long march, and every under shaft has its short march.

The coupers are placed in the frame D, fig. 2, called the top-castle, or heddle bearer, which rests on the side rails of the loom *i, i,* and are kept in a horizontal position, during the process of mounting, by means of another small frame, known by the name of the mounters or justers. The end of each couper, which is placed immediately over the centre of the loom, is connected to the upper shaft of its respective leaf by the bow-cords *n, n,* which, in general, are tied at the distance of about one-fourth of the breadth of the web from each side.   The other ends of the coupers

B   1

project over the web, towards the side of the loom, imme-
diately above the ends of the long marches, to which they
are respectively connected by the cords *e*. The long and
short marches are fixed on their centres by small bolts, into
the march frame *m*, at the opposite side of the loom. The
short marches are tied to the under shafts of their respec-
tive leaves, likewise in a horizontal position, equally dis-
tant from the leaves and long marches, and at a sufficient
distance from both, to prevent their coming in contact
when the sheds are opened.

When the weaver has arrived at this stage of his pro-
cess, which is invariably the same in all looms mounted
on this principle, he proceeds to tie up the treadles agree-
ably to the plan of the intended pattern. For this purpose
he places his cording before him, and observes which are
the raising, and which the sinking cords on each treadle.
He commences with the first treadle, to which he connects
all the leaves which have the raising marks, by their long
marches, and all the others, by their short marches.
Thus he proceeds with the other treadles, until the whole
are tied up. For example, in the plan of mounting already
described, there are raising marks on the treadle *d* where it
crosses the two leaves C and D; consequently the long
marches of these two leaves must be tied to this treadle.
But, as there are no marks on the squares where the leaves
A and B cross it, sinking cords, as formerly mentioned, are
understood; and therefore this treadle is connected, di-
rectly, to the short marches of these two leaves. In the
same manner the long marches of the leaves B and C,
and the short marches of A and D, are all connected to
the treadle *c ;* and so on with the remaining treadles. All
these connexions are formed by running knots, termed
snitches, known to every weaver, by which any part of
the mounting may be tempered to the artist's satisfaction.

SECT. IV.   MOUNTING WITH JACKS.

The method of mounting looms described in the last section is general, and may be applied to any number of leaves that can be practicably employed.   There are other methods, however, which, though more limited, are found more advantageous in some particular branches of weaving. The method of mounting with jacks, which is now to be explained, is of this description, and is generally adopted for weaving plain textures, and in some of the smaller, tweel mountings.

Fig. 4 is a front view of a loom mounted with jacks, adapted to a plain fabric.   A is the heddle bearer, which, as in the last mounting, is supported by the side rails or capes of the loom, which are seen in section at *i, i;* B, the two leaves of heddles; *u, v,* the two pairs of jacks, suspended from the heddle bearer by their centres; *n,* two small rods in the under doups or bows of the two leaves, respectively. When these rods are drawn up to the clasps of the heddles by the handle *o,* the clasps are opened, and the threads of warp are permitted to pass through them without obstruction.   At *x* are two spring shafts which form the connection between the under shafts of the heddles and their respective short marches *y.*   G is a part of the march frame, and *t, t,* are the ends of the treadles.

By examining the fig. it will appear, that each jack is connected by one end to one leaf, and by the other, to another; so that it would seem that one jack at each side of the loom would be sufficient for a plain fabric: but it is usual to employ two jacks at each side of these mountings, for steadiness, one crossing the other, which, when the loom is at work, move always in opposite directions.   There are other methods of mounting jacks, principally with a view to facilitate the shifting back of the heddles; one of which is very common, that is, by what are termed tum-

blers, for slackening the heddles above when requisite;
but the method given in the drawing is the most simple,
and at the same time equally convenient with any of the
others.

Fig. 5 shews the manner in which the jacks are, con-
nected to the leaves of a four leafed tweel. In this plan
the double lines A B and C D represent one set of jacks,
nected to the leaves of a four leafed tweel. In this plan
the double lines A B and C D represent one set of jacks,
which are connected to their respective leaves at the points
on which they terminate. The leaves *a b* and *c d* represent
another set of jacks, shorter than the former, which are
suspended from the heddle bearer, or tumbler, if employed,
a little farther down; but their connexions with the leaves
are reversed, so as to move in contrary directions, when at
work. The small jacks are added merely for the purpose
of keeping the leaves steady when they are raised and sunk,
as formerly noticed.

It has been already observed, that there are no raising
marks necessary in mounting with jacks, the blank
squares, only, pointing out the cords to be tied to the
treadles; but if a plan of cording be made on purpose for
jacks, the sinking cords are marked, and the blank squares,
of course, signify nothing. As the marks, therefore, on
Fig. 5 denote sinking cords, the sheds which each treadle
produces will stand as under,

Treadle 1 sinks the leaves B. and D. and raises A. and C.
———— 2 ———————— A. ——— D. ———————— B. ——— C.
———— 3 ———————— A. ——— C. ———————— B. ——— D.
and   4 ———————— B. ——— C. ———————— A. ——— D.

Jacks are also employed sometimes in the higher mount-
ed looms; but as it is necessary to have two jacks for each
leaf at both sides of the web, for the reason already stated,
so many jacks would render the mounting difficult to ad-
just in the event of the smallest derangement. Besides, by

the nature of this mounting, when any leaf is sunk, the leat connected to the other end of the jack must be raised ; and therefore, in the present form, jacks can only be applied when one of the leaves with which it is connected is raised and the other sunk, whereas, in the method of mounting with coupers, any one or more leaves may be raised or sunk, independently of all others, which renders this method of general application.

Jacks are, however, sometimes mounted in such a manner that any leaf may be raised or sunk without affecting any other, which is effected by fixing a small screw pulley into each end of the jack, and connecting the leaves over these pulleys; but it is seldom these contrivances are put in practice.

SECT. V.   MOUNTING WITH STOCKS AND PULLEYS.

This simple apparatus is chiefly employed by customary weavers for strong fabrics, to which it is better adapted than either of the preceding; not only on account of its being equally steady, but because it is capable of sustaining considerably more stress.   Like the jacks, however, it is very limited with respect to the power of raising and sinking the leaves, though some contrivances have likewise been introduced to obviate this objection.

At A, fig. 6, is exhibited a method of mounting a three leafed tweel on this principle.—*a* is a section of the heddle bearer, to which the cords *c* and *d* are fixed.   The upper shafts of the three leaves are seen at *b*; and these are connected by the pulleys in the manner represented in the fig. To the under shafts 1, 2, 3, of these leaves, are connected the three treadles, in the same manner as seen in fig. 4.

As each treadle sinks only one of these leaves in forming the sheds, while the other two rise, it will appear, that when the leaf No. 1 is sunk by the treadle, it will raise the

double pulley *e*, together with the two leaves 2 and 3. But as *i* is a fixed pulley, it will follow from mechanics that, when the leaf No. 1 sinks, for example, two inches, Nos. 2 and 3 will thereby be raised, with the pulley *e*, only one inch. Again, when No. 2 is sunk two inches, the double pulley *e* will be drawn down half an inch, by which No 1 is raised one inch, and No. 3 will, of course, rise one inch and half to be on a level with No. 1, so that when No. 2 sinks two inches, Nos. 1 and 3 actually rise only one inch as in the first shed. As the leaf 3 has the very same connexion with No. 1. that No. 2 has, it is evident, that when it is sunk two inches, the others will, as in the former cases, be raised one; and therefore these three sheds will be equal, although the sinking leaf passes through double the space of the risers. In some species of weaving, however, this inequality in the two parts of the shed would be a very material objection; but as it is necessary, in stout fabrics, to have the upper part of the shed slacker than the under part, to allow the woof to go on more easily, and for which the yarn beam is commonly raised higher than the cloth beam, this becomes rather an advantage.

Fig. 7 is a stock with two pulleys, mounted for a four leafed tweel. Its draught and cording, with the manner in which the leaves are connected, are marked in the following plan.

No. 4.

0			0	A	1	A
	0	0		A	3	A
		0	0	B	2	B
0	0			B	4	B
4	3	2	1			

Here the two back leaves A, A, are connected by a cord passing over the undermost pulley, and B, B, by another over the upper pulley. Now, it is evident, that when the treadle 1 is pressed down, it will sink the threads 1 and 2 of the draught; when the treadle 2 is pressed down it will sink 2 and 3; treadle 3 sinks 3 and 1; and 4, 4 and 1, which is one set of the tweel. Had the draught been straight over the leaves as in No 1, it would only be necessary to exchange the pulley cords of the two centre leaves.

A tweel damboard may be woven by a stock and four pulleys, as in the following scheme.

No. 5.

									A	B
0				0	0	0			4	1 1 1
	0			0	0		0		3 .	2 2 2
		0		0		0	0		2 . .	3 3 3
			0		0	0	0		1 . . .	4 4 4
0	0	0		0					1 . . .	1 1 1
0	0		0		0				2 . .	2 2 2
0		0	0			0			3 .	3 3 3
	0	0	0				0		4	4 4 4
1	2	3	4	1	2	3	4			

In this plan the figures at B are the draught, and those at A refer to the number of the pulleys: that is, the two centre leaves marked 1, 1, are connected together over the first pulley, 2 and 2, over the second, 3 and 3, over the third, and 4 and 4, over the fourth. The ciphers on the treadles may denote either raising or sinking cords; but this plan will be better understood after tweeling has been explained.

It has been already observed, that eyed heddles move back over the warp, when requisite, without any obstruc-

tion. Clasped heddles, however, must be slackened when
set back, either from above or below, to relieve the threads
between them. This is effected when the mounting will
permit, by pressing down the upper shafts; but when the
leaves are fixed above, as in the case of stocks and pulleys,
the under shafts are raised for this purpose.

Fig. 8 is another method of mounting looms on a simple
principle, which, though it does not come with propriety
under stocks and pulleys, may be noticed here, as it is
chiefly employed by customary weavers for extending the
variety of sheds. It consists of two sets of coupers a, a,
for each leaf, one connected to the other as represented in
the fig. These coupers are connected to their respective
leaves by the cords b : and the cord e, passes from the cou-
per through the centre of the warp to the short march c,
to which it is tied. The treadle x is also tied to the short
march; so that when the treadle is pressed down, it raises
the outward ends of the coupers, and consequently the leaf
to which they are attached. V v are two weights sus-
pended from the other shafts, for sinking the leaves after
being raised. As there are no sinking connexions in this
mounting, the sheds are formed merely by raising the
leaves. It is therefore necessary that the eyes of the hed-
dles should be situated so low, that when the lay is put
back to the proper position for throwing the shuttle, the
warp may be all close to the race-rod.

SECT. VI.   ARRANGEMENT OF TREADLES.

In many branches of fancy weaving, the raising marks
on the treadles of the cording plan, form either the whole,
or part, of the pattern to be produced, when the treadles
are placed in their natural or progressive order, as in the
preceding examples. This position of the treadles is some-
times very convenient for exhibiting the relation between

the cording plan and the sketch of the figure on design paper; for the former very often conveys a pretty correct idea of the latter. But were the weaver to adopt this arrangement in practice, he would either be under the necessity of working over the treadles with one foot, or his legs would be often crossing in a very awkward manner, while shifting from one treadle to another, by which his operations would be greatly obstructed.

Different methods of placing the treadles of a mounting have, therefore, been adopted in the various branches of weaving, to obviate this inconvenience. In spot mountings, and such other varieties as have portions of their grounds woven plain, the plain treadles are usually placed in the centre, and those which are destined for the figured part, at each side, as nearly as possible, in equal portions. In tweels, and all the varieties in which the order of treading is straight over the treadles; if the treadles are numbered as in the foregoing examples, it is plain, that the right foot, when it commences the tread, will work on all the odd numbers, and the left, on the even ones. Suppose, therefore, all the odd numbers to be placed together at the right side, and the even ones at the left; then, the treadles may be corded so that the treading may either commence at the centre and proceed outward, or at the outsides, and work toward the centre; or, which is frequently the case, that one foot may commence at the outside and the other at the centre, and both work towards one side. For example, if we take the treadles of an eight leafed tweel whose progressive order would be 1, 2, 3, 4, 5, 6, 7, 8; then, in order to work them with both feet without crossing, they may be arranged in any of the following orders:

8, 6, 4, 2, 1, 3, 5, 7.
2, 4, 6, 8, 7, 5, 3, 1.
8, 6, 4, 2, 7, 5, 3, 1.

c

These arrangements are further exemplified under fancy tweeling.

In some of the other kinds of weaving, such as victories, crapes, &c. where one treadle works against a number, the left foot usually rests on that treadle, and the right works over the others in all their variations. In other cases, when only part of the treadles can be wrought alternately, as in velveteens, &c. two or more successive treadles are placed together, either for the right or left foot, at pleasure, and the weaver treads these in succession with one foot, and then works the others alternately. In some cases however, additional treadles are employed, to make the treading equal. In other instances, such as tweels with an odd number of leaves, all the treadles are placed in their natural order, and the weaver works over them all with one foot; or, when the treading returns in the same regular order, as in lined work, he works over the treadles from one side with one foot, and from the other side with the other. It frequently occurs, likewise, that one or more leaves are to be raised, occasionally, along with some of the leaves which form the principal sheds of the ground. In such cases, the treadles of these occasional sheds may be omitted, by screwing a small piece of wood, such as a piece cut off the end of an old shaft, to the point of the principal treadle, and applying to it the treadle cords of these additional leaves. These attached pieces are called tongues; and while the weaver continues to work the ground, he keeps his foot on the principal treadle only; but when the additional leaves are to be raised, he slips his foot forward on the tongue, and presses it down along with the treadle.

SECT. VII.   SUBSTITUTES FOR TREADLES.

In all the preceding methods of mounting looms, it will be observed, that every shed must have its particular treadle; although the same shed may frequently occur in the course of weaving a pattern. There are, however, many kinds of fancy goods woven with leaves, in preference to the draw-loom, the patterns of which are so extensive, that, to employ the full complement of treadles, would not only embarrass the weaver, but, in many cases, be utterly impracticable. So far, indeed, has the predilection for leaves prevailed in some branches of weaving, that, in order to comprise as many as possible in a small compass, the heddles are made of different depths, and their respective shafts raised, one tier above another, to a sufficient height to prevent them from touching when the sheds are opened. Thus, for example, were a mounting to consist of ninety leaves, which is not uncommon for some of the finer kinds of silk patterns woven in England, and the shafts made about one eighth part of an inch thick, the whole, by arranging them in three tiers of thirty shafts each, might be comprised in about the space of five inches.

Before the invention of machines for opening the sheds of large mountings, the place of greater part of the treadles was usually supplied by a draw-boy. If the loom was mounted with coupers, the ends of all the coupers of those leaves which were to be raised to form each shed, were connected to a cord which descended at the side of the loom, and passing through a hole in a horizontal board, which regulated the distance of these cords, had a weight appended to keep it straight, and sink it after being raised. Each shed of the pattern, therefore, had its respective side-cord; and the whole were arranged in a straight line in the hole-board, in the same order as the sheds of the pat-

tern occurred; so that the draw-boy had only to pull them
in succession, along the board, as the sheds were required
by the weaver. If, to save room, pulleys had been em-
ployed instead of coupers, then, it is evident that the cords
passing over the pulleys must have been selected, and tied
to the side-cords; though, in this case, a small tail would
be necessary, as in the common draw-loom.

This simple mode of arranging the cords, which thus
opened the numerous sheds of the most extensive patterns
woven with leaves, is inserted, merely, to convey to the
reader a distinct idea of the general principle on which a
great variety of machines have been constructed, to super-
sede the use of a draw-boy in the different branches of
weaving: for, however much these machines may vary in
their forms, or to whatever species of weaving they may be
peculiarly adapted, still it must be kept in view, that all
the leaves which would have been raised by any particular
treadle, must be here selected, and raised by the moving
part of the machinery. It will only be necessary in this
place, however, to illustrate the preceding observations by
a description of one of these machines of the most approv-
ed construction; reserving the farther consideration of this
subject till those branches of weaving shall have been
treated of to which this species of machinery is usually ap-
plied.

Fig. 9, plate 1, is the front view of a machine called the
parrot, from the pecking motion of that part which pulls
the side or knot cords. The ends of the coupers are seen
at A, and are numbered from 1 to 10 inclusive. The
knots, or more frequently beads, which are catched by the
parrot *e*, appear on the cords at *a a*; which cords are ar-
ranged in a straight line, and kept at equal distances by
the two hole-boards B, B. At CC are the leads or weights
appended to the knot-cords, which are, in the present ex-
ample, thirteen in number. The parrot *e* is moveable

along the square axle o, and is turned round by pressing
down the treadle i, which is attached to the wheel D by a
cord round its rim. The cord w is fastened to the parrot;
and, after passing through a hole in the wheel D, it is
wound about the inner part of the wheel x, which is turned
by the hammer E working in its teeth. Whenever, there-
fore, the weaver has occasion to shift the parrot from one
knot-cord to another, the hammer E is raised by a treadle,
and, falling by the weight attached to it, the cross wire y
catches one of the teeth and moves it one tooth round.
Thus the length of each tooth must be such that the fork
of the parrot will move exactly the distance of one bead
from another. Fig. 10 is a side view of the parrot, as it is
mounted for a double row of knot-cords, which are neces-
sary when the sheds of a pattern are numerous. Fig. 11
is a view of the wheel D, with the hole z, through which
the cord w runs. Fig. 12 is a front view of the wheel x.
p is another wheel on the same axle, but moveable on its
axis. m and n are two studs which regulate the number
of sheds in the pattern: for, when the wheel x, which is
fixed on the axle o, brings the index or handle q, by means
of the stud m, round to the catch s, which takes place al-
ways at the end of the pattern, the catch s is raised out of
the teeth, and the weight t, fig. 9, draws back the parrot
until the stud n comes round to the handle q, which it dis-
places, and allows the catch s to fall again into the teeth of
the wheel where the pattern is to recommence. From an
attentive view of fig. 9 it is easy to perceive how the cou-
pers and knot-cords are connected for each shed. For
example, were the 3d, 5th, and 6th leaves to be raised for
the first shed, each of these coupers would be connected to
the knot-cord No. 1, at g; and so for every other shade of
the pattern.

CHAP. II.

Tweeling.

COULD any advantage have been proposed, either to the manufacturer or operative tradesman, by entering into a detail of the processes of weaving plain cloth, this branch of the art, both on account of its simplicity and extensive use, is the first in order which ought to have claimed our attention. Since, however, it is not the manual processes of weaving, but the textures and ornamental decorations of cloth produced in the loom which are to be investigated in this work, it is unnecessary to take any farther notice of the plain texture in this place, than as it stands in relation to the other branches of weaving.

In the texture of plain cloth, each thread of woof passes over and under a thread of warp, alternately; and two leaves of heddles, only, are requisite to produce this effect. Tweeling, however, takes a greater range with respect to the intervals at which the threads of warp and weft are interwoven; and these intervals increase and vary in proportion to the number of leaves employed, and the order in which they are raised and sunk. Next to plain texture, tweeling is the most extensive in its application to every branch of the cloth manufacture: it not only serves as a ground on which other decorations are woven, but it forms, purely on its own principles, some of the most beautiful patterns which can be produced in the art of weaving. The number of tweels, which may be woven by varying the succession of the draught, plan of cording, or order of treading, is very extensive; but they may, for the sake of distinction, be treated of under the following heads, namely, biassed or regular tweels, broken or satin tweels, and fancy tweels.

SECT. I. REGULAR BIASSED TWEELS.

In the biassed tweels, the small stripes of flushing, form-ed by the intervals at which the warp and woof are inter-woven, run obliquely across the cloth; which is effected by drawing the warp threads in regular succession over the leaves, as formerly explained, and working over the treadles in the same order, one leaf only being raised or sunk by each treadle; although it is understood in this, as well as the other branches of weaving, that the smallest number of leaves is raised, and the greatest sunk, when practicable.

The first variation or change from plain cloth is the three leafed tweel, in which every third thread is raised in suc-cession, the weft passing over the other two. This is some-times termed the blanket tweel, and sometimes the fustian tweel, from being frequently employed in weaving these fabrics.

The four leafed tweel flushes the weft over three threads of warp, and is only interwoven at the fourth. The five leafed tweel flushes the weft over four warp threads, and sinks it under the fifth; and so of any higher number of leaves; for here the leaves only extend the range of flush-ing, by which the resistance that the warp naturally op-poses to the weft is proportionally diminished. For this reason tweels frequently take their designation from the number of leaves employed in weaving them; though sometimes, from the name of particular kinds of cloth to which they are most commonly adapted.

The following plans, and their corresponding figures on design paper, will sufficiently explain this species of tweel-ing, as the number of leaves in the mountings rise pro-gressively from that of the plain texture to the six leafed tweel; and, as the order of drawing in the warp, tying up the treadles, and working over them, are uniformly the same, whatever number of leaves may be employed, the principle may be extended to any higher mounting.

No. 1. Fig. 1.   No. 2. Fig. 2.   No. 3. Fig. 3.

	0	1 1			0	1 1				0	1 1 A
0		2 2			0	2 2				0	2 2 B
2	1			0		3'3			0		3 3 C
_	.			3	2	1		0			4 4 D
								4	3	2	1

No. 4. Fig. 4.   No. 5. Fig. 5.

			0	1 1		.		0	1 1 A
		0		2 2			0		2 2 B
	0			3 3			0		3 3 G
0				4 4		0			4 4 D
0				5 5	0				5 5 E
5	4	3	2	1	0				6 6 F
					6	5	4	3	2	1

In the plan No. 1, the two leaves A and B are for plain texture, and the additional leaves C, D, E, F, form, respectively, the plans of the three, four, five, and six leafed tweels. The corresponding figures 1, 2, 3, 4, 5, plate II. show the intervals of these textures, and the relation which they have to each other.

Notwithstanding the general directions given in the preceding chapter relative to the arrangement of treadles, there are some particular cases to which these instructions will not apply. These will be occasionally taken notice of as they occur in the course of the work. In the three leafed tweel, for instance, when woven with three treadles, the weaver must work them all with one foot, to avoid crossing his legs in an awkward manner; but when five treadles are employed, he can use his feet alternately without embarrassment, as will appear by the annexed plan

No. 6.

	0			0			1	1	1
		0					2	2	2
0			0				3	3	3
6	4	2 5	3	1					

The following is a plan of the same tweel woven with six leaves, which is employed in some species of English manufacture.

No. 7.

	0			0		1			1
	0			0		4		4	
		0					2		2
		0				5		5	
0			0				3		3
0			0			6		6	
0	4	2 5	3	1					

The five leafed tweel is sometimes woven with one leaf, and sometimes with both, though only five treadles are employed; but to make the treading of the feet alternate without interruption, eight treadles are necessary, as under.

No. 8.   No. 9.

				0	1			0				0	1
			0		2				0				2
	0				3		0				0		3
		0			4			0					4
0					5	0					0		5
5	3	4	2	1		10	8	6	4 9	2 7	5	3	1

D   1

In working No. 8, the weaver presses down the treadle
1 with his right foot; and, as it rises, he shifts the toe of
the same foot upon the treadle 2, which he next presses
down: then he works treadle 3 with his left foot, treadle
4 with his right, and treadle 5 with his left; consequently,
he is ready to place his right foot again on treadle 1 with-
out crossing his legs. This method of treading is frequent
in working velveteen patterns; and the weaver is said to
hop with his right or left foot, according to the side on
which the two successive treadles are placed. With eight
treadles, however, the weaver can employ his feet alt_rnate-
ly without interruption, as marked in No. 9.

Regular tweels are chiefly employed when a variety of
colours are to be displayed, and in such fanciful patterns
as are formed by the tweel reversed.

<center>SECT. II.   BROKEN OR SATIN TWEELS.</center>

In the regular tweels, the flushing has the appearance of
a series of small diagonal or oblique stripes on the cloth;
but when the succession of treading or plan of cording is
changed, so as to raise the leaves at intervals of one, two,
or more from each other, the tweel is said to be broken;
and the flushing no longer runs obliquely, but is variously
chequered, according to the disposition of the raising
cords, or the order of treading.

It is to be observed of satin tweels, that some are per-
fect in respect to the intervals at which the leaves can be
raised, and others are imperfect. When the leaves can
be raised regularly, at intervals of one, two, or more from
each other, the tweel is said to be perfect; but imperfect,
when the number of leaves does not admit of this arrange-
ment. This will be illustrated by the following plans and
observations. The lowest tweel that can be broken is that
of four leaves, which is usually called the

SATINET TWEEL.

No. 10. Fig. 6.

Straight. Draught.   Alternate.

		0		1				0		1
	0			2			0			3
		0		3		0				2
0				4		0				4
4	3	2	1			4	3	2	1	

FIVE LEAFED SATIN TWEELS.

Fig. 7.

No. 11.   No. 12.

	0				1				0		1
			0		2			0			2
0					3	0					3
		0			4				0		4
0					5	0					5
5	4	3	2	1		5	4	3	2	1	

No. 13.

	0				1
			0		2
		0			3
0					4
			0		5
5	4	3	2	1	

SIX AND SEVEN LEAFED TWEELS.

No. 14. Fig. 8.   No. 15. Fig. 9.

				0		1					0		1
	0					2		0					2
			0			3				0			3
0						4	0						4
		0				5				0			5
0						6	0						6
6	5	4	3	2	1				0				7
							7	6	5	4	3	2	1

EIGHT AND NINE LEAFED TWEELS.

Fig. 10.   No. 16.

8	7	6	5	4	3	2	1	
	0							1
						0		2
			0					3
0								4
					0			5
		0						6
							0	7
				0				8

No. 17.

9	8	7	6	5	4	3	2	1	
0									1
				0					2
								0	3
			0						4
							0		5
		0							6
						0			7
	0								8
					0				9

SIXTEEN LEAFED SATIN TWEEL.

No. 18.

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
														0		1
	0															2
				0												3
							0									4
										0						5
													0			6
0																7
			0													8
						0										9
									0							10
												0				11
															0	12
		0														13
					0											14
								0								15
											0					16

In these plans the treadles are arranged in their natural
or progressive order, to point out more distinctly, by the
raising marks, the intervals at which the leaves are raised.
In the satinet straight draught, for instance, the raising
cord for the first treadle is on the back leaf 1. The leaf
2 is passed, and another raising mark is placed on the leaf
3. The leaves 4 and 1 are next passed, and the third rais-
ing mark is placed on the leaf 2. The leaf 3 is now pas-
sed, and the fourth raising mark is placed on the fourth
leaf. It now appears that, in course of tying up these
treadles there must be two leaves passed over between
cording the treadles 2 and 3, and that none can be sunk
between 4 and 1: consequently, in this mounting, the
leaves cannot be raised at equal intervals; and, therefore,
it is one of the imperfect tweels. Among the five leafed
tweels No. 11 will be found to raise each alternate leaf
throughout the whole pattern; and that Nos. 12 and 13
pass two and raise the third without interruption; conse-
quently, the five leafed tweel is perfect by each of these
methods of cording. The six leafed tweel is subject to
imperfections similar to that of four leaves; but the seven
leafed tweel is perfect, either by passing one or two leaves,
as in the five leafed tweel. Eight leaves make the tweel
perfect by passing two, and raising the third; and this is
the lowest perfect tweel that can be woven with an even
number of leaves. The nine leafed tweel is perfect by
raising each alternate leaf. Ten and eleven leaves admit
of every third leaf being raised without interruption; and
also, the eleven leafed tweel may be broken, by raising
every second leaf; but twelve leaves make an imperfect
tweel. Thirteen leaves make the tweel perfect, by raising
either every second or every third leaf: fourteen perfect,
by raising every third. In the fifteen leafed tweel, either
one or three leaves may be passed; and, in that of sixteen,
which is frequently employed in weaving some kinds of

fine silks, either two or four may be passed, and the third
or fifth raised.

From this general view of the regular and broken tweels,
it may be observed, that any odd number of leaves above
five will require an inconvenient number of treadles to al-
low the weaver to work them with both feet; they are,
therefore, usually wrought with one. The three leafed
tweel is extensively employed in weaving stout fabrics, such
as blankets, fustians, &c. The four leafed biassed tweel is
usually appropriated to the imitation harness work, diaper,
and several species of silk. The four leafed broken tweel,
beside the purpose already mentioned, is much used in the
coarser kinds of diaper, called dornick. The five leafed
satin tweels, of which No. 13 is usually selected, is applied
to diaper and the coarser setts of damask; and the eight
leafed broken tweel is appropriated to the finer kinds of
damask and Canton crapes. It may be farther remarked,
that all tweel mountings of an odd number of leaves, except
that of three, which does not admit of being broken, will
produce perfect tweels, it being among the even numbers
that imperfections are found. The effect of a few of these
tweels on design paper, will be seen by referring to the
figures in the plate.

SECT. III.   FANCY TWEELS.

In all the preceding tweels, whether regular or broken,
only one leaf is raised by each treadle, all the others being
sunk; by which means the greater part of the weft is
thrown to one side of the cloth, and of the warp to the
other. Of what are here denominated fancy tweels any
number of leaves may be raised at pleasure, and a variety
of flushing interspersed with plain texture, produced, in
proportion to the extent of the mounting, and the order
in which the leaves are raised.

The lowest of these tweels that occurs is that of four leaves, or double jean, formerly noticed. This mounting admits of no more than three varieties in tweeling, namely, the regular or biassed tweel, the broken or satinet tweel, and the double jean or serge tweel, in which two leaves are raised and two sunk by each treadle: for, were any other arrangement made of the cording, it would only change one or other of these tweels to the opposite side of the cloth. As this mounting, however, is very much employed, as well for plain as for tweeled fabrics, it may be of use to subjoin plans of the cordings which produce these textures, both when the draught is straight over the leaves, and when it is alternate.

No. 19.   Fig. 11.

	0				0		0		1
0					0	0			2
	0			0		0			3
0				0			0		4
2	1			4	2	3	1		

Plain   Tweel.

No. 20.

	0			0		0		1
	0		0		0			3
0				0	0			2
0			0			0	4	
2	1		4	2	3	1		

Plain   Tweel.

In No. 19, the warp is drawn in regular succession over
the leaves, and the cording of the tweel is adapted to prac-
tice. As plain fabrics are generally woven with four leaves
instead of two, to prevent the heddles from being too much
crowded together, the warp is commonly drawn on alter-
nate leaves, as in No. 20. The following examples will
show how an endless variety of pattern may be produced
in fancy tweeling, the number of leaves is increased, and
the plan of cording varied. As the eight and ten leafed
tweels are in frequent use, both in the cotton and silk manu-
factures, some of their principal varieties are subjoined. In
those of eight leaves both the pattern and treading plans of
cording are given, which will serve to illustrate the observa-
tions formerly made on the subject. Under the word
pattern the cording exhibits one complete set of the tweel,
and under treading will be found different methods of ar-
ranging the treadles. To show the effect of any of these
plans on design paper, it is only necessary to fill a corre-
spondent number of squares, equal to the number of
squares in the cording plan; and by repeating the plan on
each side, both the run of the pattern, and the joinings
will be exhibited. This will be obvious, by comparing
the few examples on design paper with their respective
cordings. It may further be observed, that varieties may
be produced as long as the raising marks are fewest in
number on the treadles; but when they exceed the sink-
ing ones, the pattern resulting has every chance to be the
same as some of the preceding ones thrown to the opposite
side of the cloth.

FIVE LEAFED FANCY TWEELS.

No. 21. Fig. 12.

5	4	3	2	1	
		0	0		1
	0	0			2
0	0				3
0	0				4
0			0		5

No. 22. Fig. 13.

5	4	3	2	1	
0			0		1
		0		0	2
	0		0		3
0		0			4
	0		0		5

SIX LEAFED FANCY TWEELS.

No. 23. Fig. 14.

6	5	4	3	2	1	
0			0	0		1
		0	0	0		2
	0	0	0			3
0	0	0				4
0	0	0				5
0	0				0	6

No. 24. Fig. 15.

6	5	4	3	2	1	
0				0		1
			0		0	2
		0		0		3
	0		0			4
0		0				5
	0				0	6

No. 25.

6	5	4	3	2	1	
			0	0		1
		0	0			2
	0	0				3
0	0					4
0					0	5
0				0		6

No. 26. Fig. 16.

6	5	4	3	2	1	
	0			0	0	1
0			0	0		2
		0	0		0	3
	0	0		0		4
0	0		0			5
0		0			0	6

SEVEN LEAFED FANCY TWEELS.

No. 27.

7	6	5	4	3	2	1	
0				0	0		1
			0	0	0		2
		0	0	0			3
	0	0	0				4
0	0	0					5
0	0						6
0	0					0	7

No. 28.

7	6	5	4	3	2	1	
0					0		1
				0		0	2
			0		0		3
		0		0			4
	0		0				5
0		0					6
	0					0	7

No. 29.   No. 30.

No. 29

7	6	5	4	3	2	1	
	0				0	0	1
0				0	0		2
		0	0			0	3
	0	0		0			4
	0	0		0			5
0	0		0				6
0		0			0		7
7	6	5	4	3	2	1	

No. 30

7	6	5	4	3	2	1	
	0				0	0	
0		0			0	0	
0			0	0			
		0	0				0
	0	0				0	
0	0				0		
0		0					0
7	6	5	4	3	2	1	

EIGHT LEAFED FANCY TWEELS.

No. 31. Fig. 17.

PATTERN.   TREADING.

PATTERN

8	7	6	5	4	3	2	1	
0			0			0	0	1
		0			0	0	0	2
	0			0	0	0		3
0			0	0	0			4
	0	0	0				0	5
	0	0	0			0		6
0	0	0			0			7
0	0			0			0	8
8	7	6	5	4	3	2	1	

TREADING

8	6	4	2	1	3	5	7	
0			0	0		0		1
	0		0	0	0			2
		0	0		0		0	3
0		0			0	0		4
	0	0		0		0		5
	0		0			0	0	6
0	0				0		0	7
0		0		0			0	8
8	6	4	2	1	3	5	7	

No. 32. Fig. 18.

PATTERN

8	7	6	5	4	3	2	1	
	0			0	0	0		1
0			0	0	0			2
		0	0	0		0		3
	0	0	0		0			4
0	0	0		0				5
0	0	0		0				6
0	0	0			0			7
0		0			0	0		8
8	7	6	5	4	3	2	1	

TREADING

8	6	4	2	1	3	5	7	
			0	0	0		0	1
0		0	0		0			2
		0		0	0	0		3
	0	0	0			0		4
	0				0	0	0	5
0	0	0					0	6
0			0			0	0	7
0	0		0	0			0	8
8	6	4	2	1	3	5	7	

No. 33.

8	7	6	5	4	3	2	1	#	8	6	4	2	7	5	3	1
0					0			1	0			0				
				0		0		2							0	0
			0		0			3				0	0			
		0		0				4						0	0	
	0		0					5			0	0				
0		0						6					0	0		
0	0							7	0	0						
	0					0		8						0		0

No. 34.

8	7	6	5	4	3	2	1	#	8	6	4	2	7	5	3	1
	0			0		0		1					0		0	0
0			0		0			2	0		0	0				
		0		0		0		3						0	0	0
	0		0		0			4			0	0	0			
	0		0					5					0	0	0	
0		0						6	0	0	0					
	0		0			0		7					0	0		0
0		0				0		8	0	0		0				

No. 35.

8	7	6	5	4	3	2	1	#	8	6	4	2	7	5	3	1
	0				0	0		1	0				0			0
0				0	0			2	0			0			0	
			0	0		0		3		0					0	0
		0	0		0			4	0	0				0		
	0	0	0					5			0			0	0	
	0	0			0			6			0	0		0		
0	0		0					7				0	0	0		
0		0				0		8			0	0				0

(bottom headers, right grid: 2 4 6 8 7 5 3 1)

No. 36.

8	7	6	5	4	3	2	1	#	2	4	6	8	7	5	3	1
0		0				0		1			0		0			0
	0				0	0		2	0		0					0
	0			0	0			3	0				0		0	
0			0	0				4		0		0		0		
		0	0			0		5		0				0		0
	0	0			0			6	0	0			0			
	0	0		0				7		0		0		0		
0	0		0					8		0		0	0			

(bottom headers, right grid: 2 4 6 8 7 5 3 1)

TEN LEAFED FANCY TWEELS.

No. 37. Fig. 19.

10	9	8	7	6	5	4	3	2	1	
	0				0		0	0		1
0				0		0	0			2
			0		0	0			0	3
		0		0	0			0		4
	0		0	0			0			5
0		0	0			0				6
	0	0			0				0	7
0	0			0				0		8
0			0				0		0	9
		0				0		0	0	10
10	9	8	7	6	5	4	3	2	1	

No. 38. Fig. 20.

10	9	8	7	6	5	4	3	2	1	
	0					0		0		1
0					0		0			2
				0		0			0	3
			0		0			0		4
		0		0			0			5
	0		0			0				6
0		0			0					7
	0			0					0	8
0			0					0		9
		0					0		0	10
10	9	8	7	6	5	4	3	2	1	

No. 39. Fig. 21.

10	9	8	7	6	5	4	3	2	1	
				0		0		0		1
			0		0		0	0		2
		0		0		0	0	0		3
	0		0		0	0	0	0		4
0		0		0	0	0	0	0		5
0		0		0						6
	0			0	0			0		7
0			0	0				0		8
	0	0	0		0			0		9
0	0	0	0	0		0				10
10	9	8	7	6	5	4	3	2	1	

No. 40.

10	9	8	7	6	5	4	3	2	1	
0							0			1
						0		0		2
					0		0			3
				0		0				4
			0		0					5
		0		0						6
	0		0							7
	0	0								8
0	0									9
	0							0		10

No. 41.

10	9	8	7	6	5	4	3	2	1	
0						0	0			1
					0	0		0		2
				0	0		0			3
			0	0		0				4
		0	0		0					5
	0	0		0						6
0	0		0							7
0	0		0							8
0		0						0		9
	0						0	0		10

No. 42.

10	9	8	7	6	5	4	3	2	1	
0		0					0	0		1
	0					0	0	0		2
0					0	0	0			3
				0	0	0		0		4
			0	0	0		0			5
		0	0	0		0				6
	0	0	0		0					7
0	0	0		0						8
0	0	0		0						9
0	0		0					0		10

No. 43.

10	9	8	7	6	5	4	3	2	1	
	0				0	0	0	0		1
0				0	0	0	0			2
			0	0	0	0		0		3
		0	0	0	0		0			4
	0	0	0	0		0				5
0	0	0	0		0					6
0	0	0	0		0					7
0	0	0		0					0	8
0	0		0					0	0	9
0		0					0	0	0	10

No. 44.

10	9	8	7	6	5	4	3	2	1	
0		0				0		0	0	1
	0				0		0	0	0	2
0				0		0	0	0		3
		0		0	0	0		0		4
	0		0	0	0		0			5
0		0	0	0		0				6
0		0	0	0		0				7
	0	0	0		0				0	8
0	0	0		0				0		9
0	0		0				0		0	10

No. 45.

10	9	8	7	6	5	4	3	2	1	
0	0						0	0		1
0					0	0		0		2
				0	0		0	0		3
			0	0		0	0			4
		0	0		0	0				5
	0	0		0	0					6
0	0		0	0						7
0	0		0	0						8
0		0	0					0		9
	0	0					0	0		10

No. 46.

10	9	8	7	6	5	4	3	2	1	
0				0			0			1
		0				0		0		2
	0				0		0			3
	0			0		0				4
0					0	0				5
		0		0				0		6
	0		0				0			7
	0		0			0				8
0		0			0					9
	0			0				0		10

TWELVE LEAFED FANCY TWEELS.

No. 47. Fig. 22.

12	11	10	9	8	7	6	5	4	3	2	1	
0				0			0	0	0			1
0			0				0	0		0		2
0		0				0		0	0			3
0		0		0	0	0	0	0	0	0		4
	0			0	0	0		0				5
0				0	0		0	0				6
				0		0	0	0		0		7
0	0	0	0		0	0	0	0		0		8
0	0	0		0				0				9
0	0		0	0			0					10
0		0	0	0			0					11
	0	0	0	0		0		0	0	0	0	12

No. 48.

12	11	10	9	8	7	6	5	4	3	2	1	
				0		0	0		0			1
			0		0	0		0	0			2
		0		0	0		0	0	0			3
	0		0	0		0	0	0	0			4
	0		0	0		0						5
0		0	0		0	0						6
0		0	0		0	0	0					7
0	0		0	0	0	0				0		8
0	0		0						0			9
0		0	0				0			0		10
	0	0	0			0		0	0			11
0	0	0	0			0		0	0			12

All the running tweels may be converted into waved patterns, merely by working over the treadles from side to side, alternately, or in a zig-zag manner, and the waved stripes thus formed will run by the length of the cloth. Diamond draughts, which will be explained in the next chapter, will produce waved patterns, running across the cloth, by working the treadles straight over in one direction, as in the running tweels. Other varieties will be had, by making a little variation in the draughts, as in the pillow tweel, which will be found among the following examples.

WAVE.	STOCKINET.
No. 49. Fig. 23.	No. 50. Fig. 24.

			0		1			0		1
		0			2			0		2
	0				3		0	0		3
0					4		0		0	4
4	3 5 9	2 6 8	1 7				1 3	2	4	

WAVE.

No. 51. Fig. 25.

0		0			0			0	0		1
	0			0			0	0	0		2
0			0			0	0	0			3
	0			0	0	0		0			4
	0			0	0	0		0			5
0			0	0	0		0				6
		0	0	0		0			0		7
	0	0	0		0			0			8
0	0	0		0			0				9
0	0		0			0			0		10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17 &c.	2 18 20	1 19		

TWEEL FOR PILLOW CASES OR BED TICK.

Fig. 26.

No. 52   No. 53.

		0		1				0	10	5	1
	0			2			0		9	6	2
	0			3		0			12	8	3
0				4	0				11	7	4
4	3	2	1		4	3	2	1			
		6	5								
1	2	3	4								
5	6										

HERRING BONE.

No. 54. Fig. 27.

0			0		10	5	1
	0		0		9	6	2
	0	0			12	8	3
0		0			11	7	4
4	2	3	1				

Fig. 28.

No. 55.   No. 56.

		0		1				0		5		1
	0			2			0		7		3	
	0			3		0			8	6		
0				4	0					4		2
4	3	2	1		4	2	3	1				
			5									
6	7	8	9									
10												

No. 57. Figs. 29 and 30.

		0	0	0		11		5	
	0	0	0			12	10	6 4	
	0	0	0			15 13	9 7	3 1	
0	0	0				14	8	2	
6	5	4	3	2	1	*Treading of Fig. 29.*			
4	5	6	3	2	1	*Treading of Fig. 30.*			

SECT. IV.   TURNED OR REVERSED TWEELING.

In all the regular and broken tweels, the greatest pro-
portion of the weft is thrown to one side of the cloth, and
of the warp to the other. In a five leafed tweel, for ex-
ample, if the warp were one colour and the weft another,
and as there is always one leaf raised and four sunk, it will
follow, that four-fifths of the weft will appear on the upper
side of the cloth, and of the warp, below. But were the
plan of this cording reversed, four-fifths of the warp would
be thrown to the upper side, and of the weft below. Chang-
ing the appearance by the weft from one side of the cloth
to the other in this manner, is called *turning or reversing*
the tweel, and is of very extensive application in different
branches of weaving, particularly dimities, diaper, and
damask, which will be explained in their proper places.

Suppose, therefore, that a piece of cloth were to be wo-
ven in tweeled stripes, one stripe the reverse of the other,
two setts of tweeling leaves would be necessary; and the
plans of cording, on the treadles, would also be the reverse
of each other. The first of these tweels, in respect to the
number of leaves, is the dimity cord, which is merely the
three leafed tweel turned, a plan of which is subjoined, both
for cording and treading.

DIMITY CORD.

No. 58.

Cording.									Treading.						
		0			1 1 1		0			0		
	0			2 2 2				0				
0				3 3 3	0			0				
	0	0	1 1 1		0	0		0				
0		0	2 2 2	0	0		0	0			
0	0		3 3 3	0		0	0			
3	2	1		6	4	2 5	3	1		

In the above plan the first nine threads of warp are drawn on the back set of leaves, and the other nine on the front set. Under the word cording, the raising marks are so placed on the back leaves as to flush the weft on the upper side of the cloth, and on the front leaves, to throw up the warp. In the right hand plan, the cording is adapted to practice, which, as formerly observed, requires five treadles to make the treading alternate. The patterns, in these fabrics, are formed and regulated entirely by the quantity of warp drawn on each set of the leaves.

PLANS OF THE REGULAR AND BROKEN TWEELS, REVERSED.

No. 59.

Regular.   Satinet or Broken Tweel

			0		1 1 1				0
		0			2 2 2		0		
	0				3 3 3			0	
0					4 4 4	0			
	0	0	0	0	1 1 1		0	0	0
0		0	0		2 2 2	0	0		0
0	0		0		3 3 3	0		0	0
0	0	0			4 4 4	0	0	0	
4	3	2	1			4	3	2	1

FIVE LEAFED REGULAR AND BROKEN TWEEL STRIPES.

No. 60.

Regular.   Broken.

				0	1 1 1		0		
			0		2 2 2				0
		0			3 3 3			0	
	0				4 4 4	0			
0					5 5 5				0
0	0	0	0	0	1 1 1	0	0	0	0
0		0	0	0	2 2 2		0	0	0 0
0	0		0	0	3 3 3	0	0		0 0
0	0	0		0	4 4 4	0	0	0	0
0	0	0	0		5 5 5	0		0 0 0
5	4	3	2	1		5	4	3	2	1

These examples will sufficiently show the nature of turned tweel stripes: and the varieties may be increased at pleasure, by additional leaves, and by varying the size of one or both stripes.

But to convert tweeled stripes into checkers, or alternate squares, another set of treadles is necessary, in order to throw the flushing of each stripe from one side of the cloth to the other. The following plans will show, by inspection, how this is effected.

FOUR LEAFED TWEEL DAMBOARD.

No. 61.   Fig. 1.   *Plate 4.*

```
  | 0 | 0 | 0 ||   |   |   | 0 |        1 1 1 1 1
0 |   | 0 | 0 ||   |   | 0 |            2 2 2 2 2
0 | 0 |   | 0 || 0 |   |   |            3 3 3 3 3
0 | 0 | 0 |   | 0 |   |   |             4 4 4 4 4
  |   |   | 0 || 0 | 0 | 0 | 0 |        1 1 1 1 1
  |   | 0 |   | 0 |   | 0 | 0 |         2 2 2 2 2
  | 0 |   |   | 0 | 0 |   | 0 |         3 3 3 3 3
0 |   |   |   | 0 | 0 | 0 |   |         4 4 4 4 4
  |   |   |   | 4 | 3 | 2 | 1 |
4 | 3 | 2 | 1 ||   |   |   |   |
          B                A
```

Here it will be observed, that if the treadles at A be wrought four times over, or equal . to the number of draughts in each space or stripe; and again, the treadles at B, as often, it will be obvious that two rows of squares will be produced, one row the reverse of, and bosoming with the other; and by repeating this operation, the pattern will assume the appearance of a checker board, or, as it is commonly termed, a tweel damboard.

DICED SATINET.

No. 62.

	0	0	0					0		1		1	1	1
0	0			0		0					2	2	2	2
0			0	0			0				3	3	3	3
0	0	0			0						4	4	4	4
			0		0	0	0			1	1	1	1	
	0			0	0		0			2	2	2	2	
		0		0		0	0			3	3	3	3	
0				0	0	0				4	4	4	4	
				4	3	2	1							
4	3	2	1											

FIVE LEAFED REGULAR TWEEL DAMBOARD.

No. 63.

	0	0	0	0					0		1		1		1
0		0	0	0				0				2		2	2
0	0		0	0			0					3		3	3
0	0	0		0		0						4		4	4
0	0	0	0		0							5		5	5
			0		0	0	0	0	0		1		1		1
		0		0	0	0	0	0			2		2		2
	0			0	0		0	0			3		3		3
0				0	0	0		0			4		4		4
0				0	0	0	0				5		5		5
				5	4	3	2	1							
5	4	3	2	1											

FIVE LEAFED BROKEN TWEEL DAMBOARD.

No. 64.

0	0	0		0		0				1		1		1
	0	0	0	0				0		2		2		2
0	0		0	0		0				3		3		3
0	0	0	0		0					4		4		4
0		0	0	0			0			5		5		5
	0			0	0	0		0		1		1		1
			0	0	0	0	0	0		2		2		2
	0			0	0		0	0		3		3		3
0				0	0	0	0			4		4		4
		0		0		0	0	0		5		5		5
				5	4	3	2	1						
5	4	3	2	1										

In making plans of cording for reversed tweeling, of which considerable variety may be produced, particular care must be taken to avoid placing the raising marks of the different sets or divisions close together at the joinings: for, were this not attended to, part of the flushing of one division might be extended over another; by which the lines that divide the parts would not be distinctly defined; or, in the language of diaper weavers, the divisions would not *cut*. This will be better understood by comparing the following plan, with No. 61 above, in which it will be observed, that there is a raising mark on treadle 1, right hand set, for the back leaf of the front mounting, placed immediately contiguous to the raising marks on the back set, which continues the flushing of the back division into the front one, making an unevenly side similar to the teething of paper spots. And if the same figure be inspected with attention, it will be found that there is no possible way in which these divisions can be joined, but the flushing of one division will run into the other, both by the warp and weft. The most simple rule to find if these cordings be correct, is to fold one division over the other in both directions; and if the raising marks in one compartment or division, fall exactly on the sinking marks of the other, this imperfection will be avoided.

No. 65.

			0	0	0	0			1	1	1
		0		0	0		0		2	2	2
	0			0		0	0		3	3	3
0					0	0	0		4	4	4
0	0	0						0	1	1	1
0	0		0			0			2	2	2
0		0	0		0				3	3	3
	0	0	0	0					4	4	4
4	3	2	1	4	3	2	1				

CHAP. III.

LINED WORK.

SECT. I.

From the preceding examples of fancy tweeling, the transition to lined work is short and easy. Instead of the straight, or over and over draughts of the former, lined work patterns are usually woven with what is termed a diamond draught: that is, a draught which runs straight over the leaves from the back to the front, but returns, in the same order, to the back leaf again for one sett of the pattern; forming a zig-zag figure on the upper edges of the shafts. Sometimes, however, patterns of this kind are woven in more complex draughts, which will be explained in the sequel. The treadles, also, when placed in their natural or progressive order, are wrought from side to side alternately, in the very same order of succession as the draught.

Whatever variety, therefore, is adopted in the cording plan, one sett of the pattern will, by the preceding arrangement, be nearly double the extent by the warp, of that produced by a single draught; but the additional part will be inverted. And as the treadles are also twice wrought over, the figure will again be nearly doubled by the weft; the latter part, which is formed by returning back over the treadles, being likewise inverted: so that a square or diamond figure is commonly produced, each side of which is equal to the plan of the raising marks on the treadles. These patterns would be exactly four times the dimensions of those arising from the single draught, were two threads of warp drawn upon each leaf throughout the pattern; but,

in general, those patterns turn upon a single thread at the points, both in the warp and weft; so that there is only one thread drawn on the back leaf, and one on the front leaf, while there are two on each of the intermediate ones. The same is to be observed of the treading, which will be obvious from the following examples.

The smaller mountings of this kind produce but a very limited variety of patterns, commonly a small diamond or lozenge figure, with a dot or speck in the centre, which gives it the resemblance of an eye : hence these figures are generally denominated bird-eye patterns. When the mountings, however, extend to eight leaves and upwards, they admit of considerable diversity in flushing, tweeling, and plain texture, deviating from the formal figures of the bird-eye, and which now assume the appearance of what is called lined work. No. 26, fig. 8, is an example on which the blank squares represent raising cords.

BIRD-EYE PATTERNS.

No. 1.   No. 2.

Plate 2.

Fig. 31.   Fig. 32.

0			0					1		1				0	0
		0				6		2	6	2			0	0	
	0					5	3	6	3			0	0		
0							4		4			0			0

4	3	2	1		4	3	2	1
	5	6				5	6	

No. 3.   No. 4.

Fig. 33.   Fig. 34.

0	0			0				1		1				0	
0			0			8		2	8	2			0		0
		0				7	3	7	3		0		0		
	0			0	6	4	6	4		0		0			
0			0	0		5		5			0				

5	4	3	2	1		5	4	3	2	1
	6	7	8				6	7	8	

PRINCIPLES OF TWEELING & LINED WORK.

PLATE 2.

Figs 1
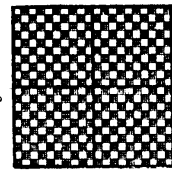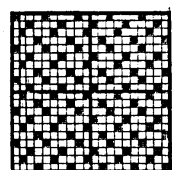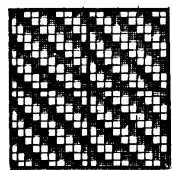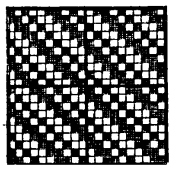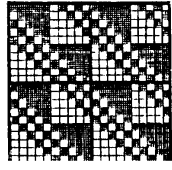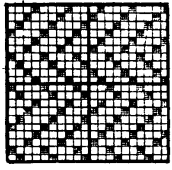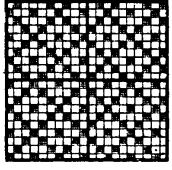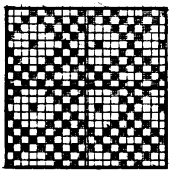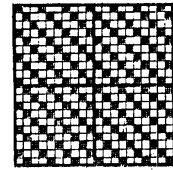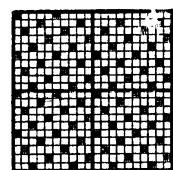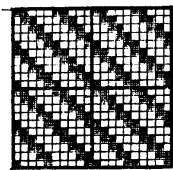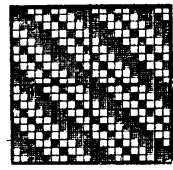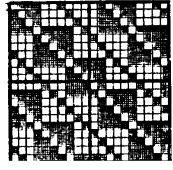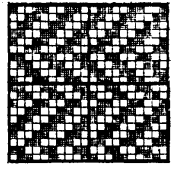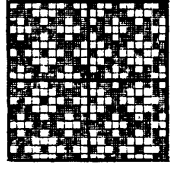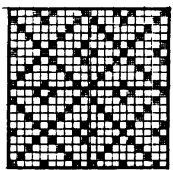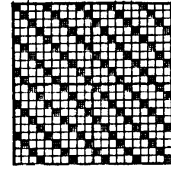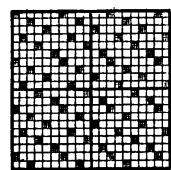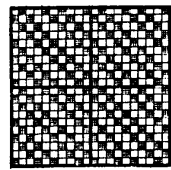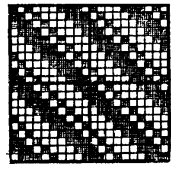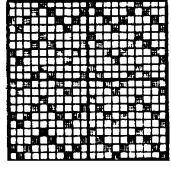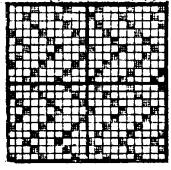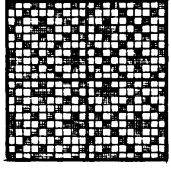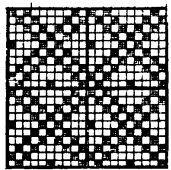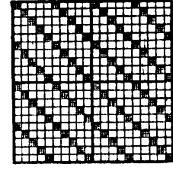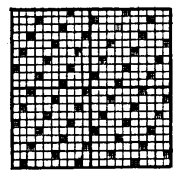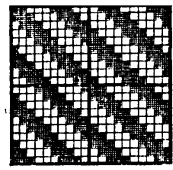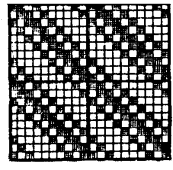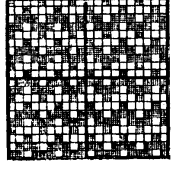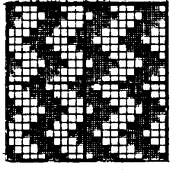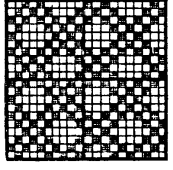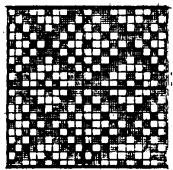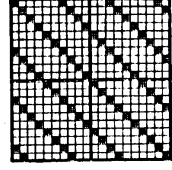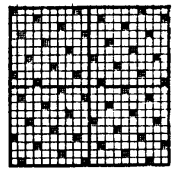
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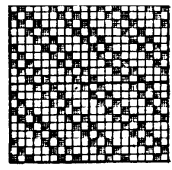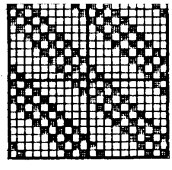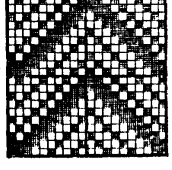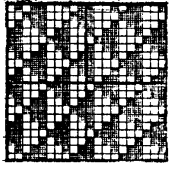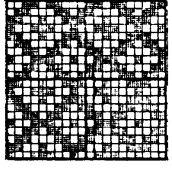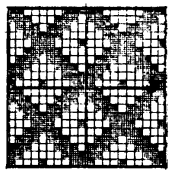
No. 5. No. 6.

Fig. 35. Fig. 36.

0	0			0			1	0				0
0			0	0	8		2				0	
		0	0		7		3			0		0
	0	0			6	4			0		0	
0	0			0		5		0		0		
5	4	3	2	1				5	4	3	2	1
	6	7	8						6	7	8	

No. 7. No. 8.

Fig. 37. Fig. 38.

	0			0		1	0				0	
0			0		10	2				0		0
		0			9	3			0		0	
	0				8	4		0		0		
0				0	7 5		0		0			
0			0		6			0				
6	5	4	3	2	1			6	5	4	3	2	1
	7	8	9	10					7	8	9	10	

No. 9. No. 10.

Fig. 39. Fig. 40.

	0			0	0		1	0				0	0
0			0	0		10	2				0	0	0
		0	0		0	9	3			0	0	0	
	0	0		0		8	4		0	0	0		
0	0		0			7 5		0	0	0			
0		0			0	6		0	0			0	
6	5	4	3	2	1			6	5	4	3	2	1
	7	8	9	10					7	8	9	10	

No. 11. No. 12.

0	0			0			1	0		0		0	0
0			0		0	10	2		0		0	0	0
	0		0			9	3	0		0	0	0	
	0		0			8	4		0	0	0		0
0		0			0	7 5	0	0	0		0		
	0		0	0		6	0	0			0		0
6	5	4	3	2	1			6	5	4	3	2	1
	7	8	9	10					7	8	9	10	

G

LINED WORK PATTERNS.

No. 13.   No. 14.

Plate 3.

Fig. 1.   Fig. 2.

	0		0			0	0			1	0			0			0	0
0		0			0	0	0	14		2		0				0	0	0
	0			0	0	0		13		3			0		0	0	0	
0			0	0	0			12		4	0			0	0	0		
	0	0	0			0		11		5		0	0	0			0	
0	0	0			0	0		10		6		0	0	0		0		
0	0	0		0	0	0		9		7	0	0	0			0		
0	0		0	0	0				8		0	0	0		0			0
8	7 9	6 10	5 11	4 12	3 13	2 14	1				8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 15.   No. 16.

Fig. 3.   Fig. 4.

0					0	0	0		1	0				0	0		
	0				0	0	14		2		0				0	0	
		0	0	0	0		13		3			0				0	0
		0	0	0			12		4			0	0	0	0	0	0
		0	0			0	11		5	0			0	0	0		
0	0	0			0	0	10		6	0	0		0	0	0		
0	0			0	0	0	9		7		0	0	0			0	
0			0	0	0			8			0	0					0
8	7 9	6 10	5 11	4 12	3 13	2 14	1			8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 17.   No. 18.

0	0				0		0		1	0	0	0				0	0
0				0		0		14		2	0	0				0	0	
		0		0		0	13		3	0				0	0		0
	0		0		0		12		4			0	0		0	0
0		0		0			11		5		0	0		0	0
0		0		0			10		6	0	0		0	0	
0		0				0	9		7	0	0		0	0		0
0		0			0		8		0		0	0			0
8	7 9	6 10	5 11	4 12	3 13	2 14	1			8	7 9	6 10	5 11	4 12	3 13	2 14	1

PLATE 3.

PRINCIPLES OF LINED WORK

Fig.ˢ 1.

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No. 19.   No. 20.

0			0			0			1	0					0	0	
	0				0		0	14	2		0			0	0		0
		0		0		0		13	3			0	0	0		0	0
0			0		0			12	4			0	0		0	0	
	0		0					11	5		0	0		0	0		
	0		0		0	0	0	10	6	0	0		0	0			
0		0			0	0	0	9 7		0		0	0			0	0
	0				0	0		8			0	0			0	0	
8	7 9	6 10	5 11	4 12	3 13	2 14	1			8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 21.   No. 22.

0	0	0			0	0		1	0	0		0			0	0
0	0	0		0	0	0	14	2	0		0			0	0	
0	0	0	0	0	0		13	3	0		0		0	0		
		0	0	0			12	4	0			0	0			
	0	0	0		0		11	5		0	0		0	0	0	
0	0	0		0	0		10	6	0	0		0		0	0	0
0	0	0		0	0	0	9 7		0	0		0	0			0
0	0		0	0	0		8		0			0	0	0		
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 23. Fig. 5.

0					0	0		1
	0			0	0		0	18 2
	0	0	0	0	0		0 0	17 3
	0	0	0	0		0 0		16 4
	0	0	0		0 0			15 5
	0	0		0 0			0	14 6
0	0		0 0			0 0		13 7
0	0		0 0		0 0			12 8
0		0 0			0 0			11 9
	0 0		0 0			0		10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1

No. 24. Fig. 6.

10	9/11	8/12	7/13	6/14	5/15	4/16	3/17	2/18	1		
0		0	0	0			0	0			1
	0		0			0	0			18	2
		0			0	0				17	3
0		0		0	0		0			16	4
0	0		0	0		0				15	5
0		0	0			0				14	6
	0	0				0	0			13	7
	0	0	0			0	0			12	8
0	0			0	0	0				11 9
0		0		0		0				10	

No. 25. Fig. 7.

10	9/11	8/12	7/13	6/14	5/15	4/16	3/17	2/18	1		
	0	0	0				0		0		1
0	0	0				0		0	0	18	2
0	0				0		0	0	0	17	3
0				0		0	0	0	0	16	4
		0		0	0	0	0	0		15	5
	0		0							14	6
0		0	0		0					13	7
0		0	0	0			0			12	8
0	0	0	0					0		11 9
0	0	0	0	0					0	10	

No. 26. Fig. 8.

10	9/11	8/12	7/13	6/14	5/15	4/16	3/17	2/18	1		
0			0	0			0				1
	0			0	0		0	0		18	2
		0			0	0	0	0		17	3
			0	0	0	0	0	0		16	4
0			0	0	0	0	0	0		15	5
0	0		0	0	0	0	0			14	6
	0	0	0	0	0	0			0	13	7
	0	0	0	0				0	0	12	8
	0	0	0	0			0	0		11 9
0	0	0	0			0	0			10	

No. 27.

10	9	8	7	6	5	4	3	2	1		
0		0		0				0	0		**1**
	0		0				0	0		18	**2**
0		0				0	0			17	**3**
	0				0	0				16	**4**
0				0	0				0	15	**5**
		0	0					0	0	14	**6**
	0	0		·		0	0			13	**7**
	0	0				0	0			12	**8**
0	0			0	0		0			11	**9**
0			0	0				0		10	
10	9	8	7	6	5	4	3	2	1		
11	12	13	14	15	16	17	18				

No. 28

	0	0			0	0					**1**
	0	0			0	0				18	**2**
0	0							0		17	**3**
0	0						0			16	**4**
			0	0				0		15	**5**
			0	0			0			14	**6**
0	0					0		0		13	**7**
0	0				0		0			12	**8**
		0		0		0		0		11	**9**
	0		0		0		0			10	
10	9	8	7	6	5	4	3	2	1		
11	12	13	14	15	16	17	18				

No. 29.

0						0	0	0			**1**
	0						0	0		18	**2**
		0	0	0	0	0	0			17	**3**
		0	0	0	0	0			0	16	**4**
		0	0	0	0			0	0	15	**5**
		0	0	0			0	0		14	**6**
		0	0			0	0		0	13	**7**
	0	0			0	0		0		12	**8**
0	0			0	0		0		0	11	**9**
0			0	0		0		0		10	
10	9	8	7	6	5	4	3	2	1		
11	12	13	14	15	16	17	18				

No. 30.

	0		0		0		0						0		0				1
0			0		0		0					0			0		18		2
0		0			0		0			0						17		3	
0		0		0			0		0						0		16		4
0		0		0		0		0						0			15		5
				0			0			0			0			14		6	
		0					0			0			0			13		7	
0					0			0			0			12		8			
0				0			0			0			11	9					
0		0			0			0			0			0		10			
10	9	8	7	6	5	4	3	2	1										
	11	12	13	14	15	16	17	18											

TWELVE LEAFED PATTERNS.

No. 31. Fig. 9.

			0		0		0						0		0				1
			0		0							0		0		0	22		2
			0			0		0		0		0		0		0	21		3
0		0		0			0		0		0		0		0		20		4
0		0				0		0		0		0				0	19		5
0			0		0		0		0			0			0		18		6
		0		0		0		0		0					0		17		7
		0		0		0		0			0				0		16		8
		0		0		0						0					15		9
	0		0		0			0					0			14		10	
0		0		0									0			13	11		
0		0			0			0				0			12				
12	11	10	9	8	7	6	5	4	3	2	1								
	13	14	15	16	17	18	19	20	21	22									

No. 32. Fig. 10.

	0		0		0			0		0		0					1
0		0		0			0		0		0				22		2
0		0			0		0		0				0		21		3
0				0		0		0			0		0		20		4
	0		0		0		0			0		0			19		5
0		0		0						0		0			18		6
0		0		0							0			17		7	
0		0					0	0						16		8	
0		0					0	0					15		9		
0			0								0		14		10		
0			0	0	0					0	0		13	11			
	0	0		0	0			0	0				12				
12	11	10	9	8	7	6	5	4	3	2	1						
	13	14	15	16	17	18	19	20	21	22							

No. 33. Fig. 11.

0			0	0	0	0	0				0				1
	0			0	0	0				0			0	22	2
		0			0				0		0			21	3
0			0				0		0					20	4
0	0			0		0		0				0		19	5
0	0	0			0		0				0	0		18	6
0	0			0		0				0	0	0		17	7
0			0		0				0	0	0			16	8
	0		0				0		0	0	0			15	9
	0		0			0	0	0		0	0			14	10
0		0			0	0	0	0	0		0			13 11	
	0			0	0	0		0	0	0				12	

| 12 | 11 13 | 10 14 | 9 15 | 8 16 | 7 17 | 6 18 | 5 19 | 4 20 | 3 21 | 2 22 | 1 |

No. 34. Fig. 12.

0				0		0				0		1
0		0			0				0	0	22	2
	0		0					0	0	0	21	3
		0		0			0	0	0	0	20	4
		0		0		0	0	0	0	0	19	5
0			0		0	0	0				18	6
0				0	0	0	0				17	7
0		0	0	0	0	0					16	8
	0	0	0	0	0	0					15	9
	0	0	0				0	0	0		14	10
0	0	0	0				0	0	0		13 11	
0	0	0	0	0			0	0	0		12	

| 12 | 11 13 | 10 13 | 9 15 | 8 16 | 7 17 | 6 18 | 5 19 | 4 20 | 3 21 | 2 22 | 1 |

FOURTEEN LEAFED PATTERNS.
No. 35. Fig. 13.

0	0			0	0	0	0		0			0		1
0	0			0	0	0		0	0		0		26	2
0			0	0	0			0	0		0		25	3
	0	0	0			0		0	0		0		24	4
	0	0	0	0	0	0	0			0	0		23	5
0	0	0		0			0		0	0		0	22	6
0	0			0		0		0	0		0		21	7
0			0	0	0	0	0	0		0		0	20	8
0	0		0			0	0		0		0	0	19	9
	0	0			0	0		0		0	0		18	10
0		0	0		0	0		0	0	0			17 11	
	0		0	0	0		0	0	0	0			16 12	
	0		0		0		0	0			0		15 13	
0			0		0	0	0				0		14	

| 14 | 13 15 | 12 16 | 11 17 | 10 18 | 9 19 | 8 20 | 7 21 | 6 22 | 5 23 | 4 24 | 3 25 | 2 26 | 1 |

No. 36. Fig. 14.

0						0	0	0		0		0	0			1
	0						0	0	0		0	0	0	26		2
		0					0	0	0	0	0			25		3
			0					0	0	0		0		24		4
				0	0	0	0	0	0	0		0		23		5
				0	0	0	0	0	0		0		0	22		6
0				0	0	0	0	0		0		0		21		7
0	0			0	0	0	0		0		0		0	20		8
0	0	0		0	0	0		0		0		0	0	19		9
	0	0	0	0	0		0		0		0	0	0	18	10
0		0	0	0		0		0		0	0	0	0	17	11
	0	0	0		0		0		0	0	0	0	0	16	12
0	0	0		0		0		0	0	0	0	0		15	13
0	0		0		0		0	0	0	0	0		0	14	
14	13 15	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1		

No. 37.

0			0	0	0			0		0	0			1
	0		0	0	0			0		0	0	0	26	2
		0	0	0			0		0	0	0		25	3
	0	0	0			0		0	0	0			24	4
0	0	0		0		0		0	0	0		0	23	5
0	0		0		0	0	0			0		22	6
0		0		0	0	0		0		0	21	7
	0	0	0		0		0	20	8
0	0	0	0		0	0		0	19	9
0		0	0	0	0	0		18	10
0	0	0	0		0		0		0	17	11
0	0	0		0		0		0		0	16	12
0	0		0	0		0		0	0	15	13
0	0		0		0		0		0	0	14	
1 5	13 16	12 17	11 18	10 19	9 20	8 21	7 22	6 23	5 24	4 25	3 26	2	1	

No. 38.

	0	0	0			0	0			0			0 ‖			1
0	0	0			0	0		0			0		‖	26		2
0	0			0	0			0		0		0	‖	25		3
0			0	0				0		0	0	0	‖	24		4
	0	0	0		0			0		0	0	0	‖	23		5
	0	0			0		0		0	0	0		‖	22		6
0	0			0		0	0		0	0	0		‖	21		7
0					0		0	0	0		0		‖	20		8
	0			0		0	0	0		0			‖	19		9
	0		0		0	0	0		0				‖	18	10	
0		0		0	0	0		0				0	‖	17	11	
	0		0	0	0		0				0	0	‖	16	12	
0		0	0	0		0				0	0	0	‖	15 13		
0		0	0	0		0			0	0	0	0	‖	14		
14	13 15	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1 ‖			

No. 39. Fig. 15.

0	0	0				0	0		0	0	0		0	0	‖			1
0	0	0			0	0			0	0		0	0		‖	30	2	
0	0	0		0	0				0		0	0			‖	29	3	
			0	0		0	0	0		0	0				‖	28	4	
	0	0			0	0		0	0						‖	27	5	
0	0				0		0	0							‖	26	6	
0	0		0	0	0		0	0							‖	25	7	
0			0	0		0	0		0	0	0	0	0	0	0 ‖	24	8	
		0		0	0		0		0	0	0	0	0	0	0 ‖	23	9	
0	0	0		0	0		0		0		0	0	0	0	0 ‖	22	10	
0	0		0	0		0	0		0		0	0	0	0	0 ‖	21	11	
0		0	0			0	0	0		0		0	0	0	0 ‖	20	12	
	0	0				0	0	0	0		0		0	0	0 ‖	19	13	
0	0					0	0	0	0	0		0		0	0 ‖	18	14	
0						0	0	0	0	0	0		0		‖	17	15	
						0	0	0	0	0	0	0		0	‖	16		
16	15 17	14 18	13 19	12 20	11 21	10 22	9 23	8 24	7 25	6 26	5 27	4 28	3 29	2 30	1 ‖			

No. 40.

			0		0		0	0	0		0	0			‖		1
		0		0		0		0	0		0	0			‖	30	2
	0		0			0			0	0		0	0		‖	29	3
0		0		0					0	0		0	0	‖		28	4
	0		0		0					0	0		0	‖		27	5
0			0		0				0	0		0	0	‖		26	6
	0			0		0	0		0	0		0	0		‖	25	7
0				0		0	0	0		0	0			‖		24	8
0				0	0	0	0		0	0				‖		23	9
0	0				0	0		0	0					‖		22	10
	0	0			0	0		0	0				0	‖		21	11
0		0	0		0	0		0	0		0				‖	20	12
0	0		0	0	0		0	0		0				‖		19	13
	0	0		0		0	0				0			‖		18	14
	0	0		0	0							0		‖		17	15
		0	0	0					0				0	‖		16

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	‖
	17	18	19	20	21	22	23	24	25	26	27	28	29	30		‖

No. 41. Fig. 16.

			0		0		0	0		0			0				0	‖		1
		0		0		0		0	0		0	0		0				‖	38	2
	0	0					0	0		0	0		0			‖	37	3
0	0		0					0	0		0	0		0		‖	36	4
0		0		0				0	0		0	0	0	0	‖	35	5
0		0		0				0	0	0	0		0	0	‖	34	6
0			0		0				0	0		0	0		‖	33	7
0				0		0	0		0		0	0		0	0	‖	32	8
0				0		0	0		0	0		0	0		‖	31	9
0	0				0	0		0	0	0		0	0		‖	30	10
	0	0				0	0	0	0	0		0	0		0	‖	29	11
0		0	0			0		0	0	0		0	0		0	‖	28	12
	0		0	0		0	0		0	0				0	‖	27	13
	0	0		0	0		0	0		0	0		0		‖	26	14
0		0	0		0	0	0		0	0			0		0	‖	25	15
0		0	0	0	0		0	0			0		0	‖	24	16
	0		0	0		0	0			0			0	‖	23	17
	0	0		0	0			0		0			0	0	‖	22	18
	0	0	0				0			0		0	0	0	‖	21	19
0			0			0				0	0	0	‖		20

20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	‖
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		‖

No. 42.

				0				0	0	0	0	0					0	0		0	‖		1
0																					‖		1
	0							0	0	0	0					0	0		0		‖	38	2
		0					0	0	0	0				0	0		0		0		‖	37	3
			0		0	0	0	0					0	0		0		0	0		‖	36	4
0				0	0	0	0				0	0		0		0	0				‖	35	5
		0	0	0	0					0	0		0		0	0					‖	34	6
	0	0	0	0				0	0		0		0	0							‖	33	7
0	0	0	0				0	0		0		0	0		0	0	0				‖	32	8
0	0	0	0			0	0		0		0	0			0	0	0				‖	31	9
0	0	0			0	0		0		0	0			0	0	0					‖	29	10
0	0			0	0		0		0	0			0	0	0						‖	29	11
0			0	0		0		0	0			0	0	0							‖	28	12
		0	0		0		0	0		0	0	0	0	0							‖	27	13
	0	0		0		0	0		0	0	0	0	0								‖	26	14
0	0		0		0	0		0	0	0	0	0									‖	25	15
0	0		0		0	0		0	0	0	0	0	0								‖	24	16
0	0		0		0	0		0	0	0	0	0	0								‖	23	17
0		0		0	0		0	0	0	0	0					0	0	0			‖	22	18
	0		0	0		0	0	0	0	0						0	0	0			‖	21	19
0		0	0		0	0	0	0	0							0	0	0			‖		20

20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	‖
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		‖

No. 43.

0						0	0	0	0		0			0		0	0		‖		1
	0						0	0	0		0		0		0	0		‖	38	2
		0					0	0	0		0			0		0	‖	37	3
			0				0	0	0	0		0			0	‖	36	4
				0			0	0	0	0	0		0		0	‖	35	5
					0			0	0	0	0		0	‖	34	6
						0			0	0		0	‖	33	7
0						0			0	0		0	‖	32	8
0					0	0	0	0	0		0			0	‖	31	9
0	0				0	0	0	0		0			0	0	‖	30	10
0	0	0			0	0	0		0			0	0	‖	29	11
0	0	0			0	0		0			0	0	‖	28	12
0	0	0	0		0	0			0	0	‖	27	13
0	0	0	0	0	0	0	0		0	0	‖	26	14
0	0	0	0	0	0		0	0	0	‖	25	15
0		0		0		0	0		0	‖	24	16
0		0		0		0	0		0	‖	23	17
0		0		0		0	0		0	‖	22	18
0	0		0			0	0		0		0	0	‖	21	19
0	0	0			0	0		0		0	0	‖		20

20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	‖
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		‖

SECT. II.   DOUBLE, TRIPLE, &C. DRAUGHTS.

THESE examples will be sufficient to apprise the reader, of the great variety of figures that can be woven on lined work, especially by the larger mountings. All these figures, however, are produced by the diamond draught; and, like those in fancy tweeling, arise, solely, from different arrangements of the raising cords upon the treadles. But, as the resources of fancy weaving are inexhaustible, various other changes will be effected in these figures, merely by diversifying the order or succession of the draught, independently of the position of the raising cords. As every extension of the draught in this manner, however, enlarges the figure in a duplicate proportion, that is, as the square of the number of threads in one set of the draught, such patterns, when the leaves are numerous, will occupy a considerable space on design paper; and therefore, to save room in the plate, only a few specimens, upon a small scale, can be added. These specimens, however, will sufficiently unfold the principle on which these varieties are produced, and which may be extended to the larger mountings, at pleasure.

The following figure is a plan of what is usually called a double draught, and which is only the diamond draught inverted.

DOUBLE DRAUGHT.

No. 44. Fig. 17.

			0		5	1	11	5		1
		0			6	2 14	10	6	2	
	0				7	3 13	9 7	3		
0					8	4	12	8	4	
1	2	3	4							
5	6	7	8							
11	10	9	8							
15	14	13	2							
	16	17	8							

The double draught, whatever plan of cording is adopted, always produces two square or diamond figures, one within the other, which are again imbosomed by others of the same kind, formed by the inverted part of the draught. The following is a plan of the double draught upon six leaves, the cording of which is the same as No. 26, in fancy tweeling, and No. 9, among the bird-eye patterns.

No. 45.

	0			0	0	17	11	1	23
0			0	0		18 16	10	2	24
		0	0		0	19 15	9	3	25
	0	0		0		20	14	8 4	26
0	0		0			21	13	7 5	27
0		0			0	22	12	6	28

6	5	4	3	2	1
	7	8	9	10	11
12	13	14	15	16	17
22	21	20	19	18	
28	27	26	25	24	23

A triple draught enlarges the dimensions of these patterns still farther; producing, in general, three similar concentric figures, which are all imbosomed by others of the same kind, where the draught is inverted, as represented in fig. 18. The following is a plan of this draught on a scale of four leaves, with one leaf raised and three sunk; but it is evident from the preceding examples of lined work, that much diversity will arise here also, by varying the arrangement of the raising cords on the treadles.

TRIPLE DRAUGHT.

No. 46. Fig. 18.

		0	1	19	15	9	5	1
	0		2 22	18	14 10	6	2	
0			3 21	17	13 11	7	3	
0			4	20	16	12	8	4

1	2	3	4
5	6	7	8
9	10	11	12
15	14	13	16
19	18	17	16
	22	21	20

From this example it will appear, that any number of concentric figures may be formed, by repeating the draught any number of times over the leaves in one direction, and returning in the contrary direction as often : so that, should the draught diverge from the centre of the cloth toward each selvage, and the treading continued to the same extent, the pattern would be one great figure, composed of concentric squares, whose dimensions and variety would depend on the number of leaves, and the arrangement of the raising cords.

Another method of diversifying the draughts of lined work patterns, is, by dividing the leaves into two equal portions, and drawing a few sets of the diamond draught on each portion, alternately. This arrangement throws the group of small figures produced by each set of leaves, into alternate squares, somewhat resembling the damboard pattern. It is customary, however, to introduce an odd leaf into these mountings, immediately between the two divisions, which serves as a point leaf to both sets. The following plans will illustrate these remarks.

ALTERNATE DIAMOND DRAUGHTS.

No. 47. Fig. 19.
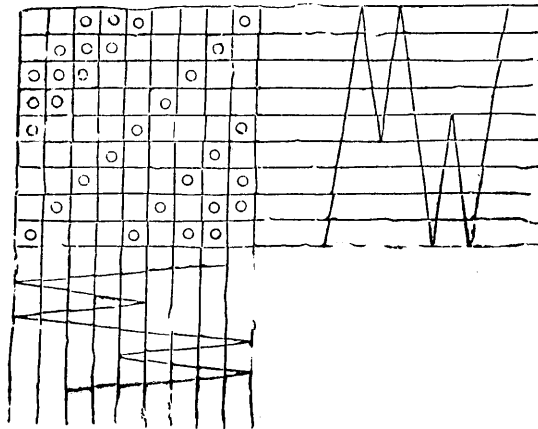
The lines drawn over the leaves and treadles of the preceding plan and two following draughts, show the succession of the draught and treading, as described in page 6.

No. 48.
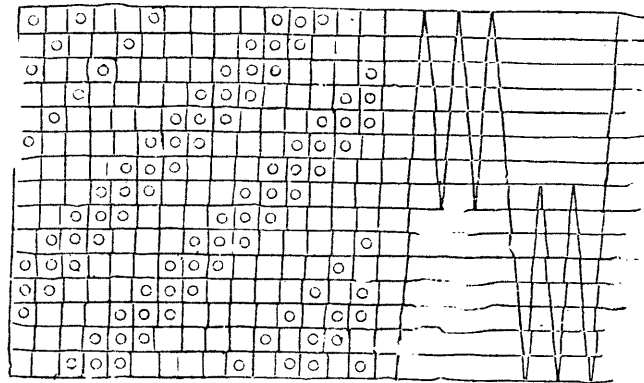
No. 49. DRAUGHT.
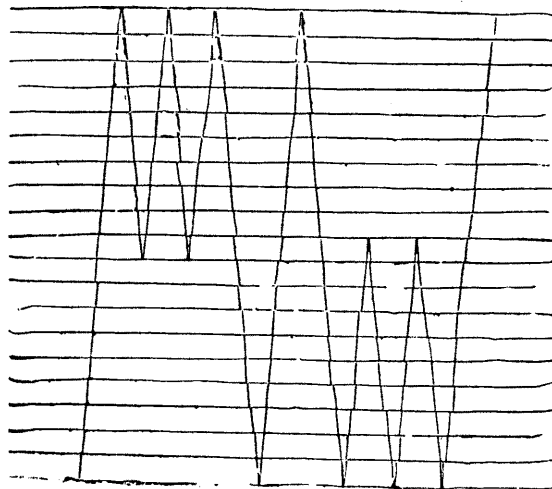
CORDING OF No. 57.

0	0	0	0					0						0	0	0	0				
0	0	0					0					0	0	0	0						
0	0					0					0	0	0	0					0		
0					0					0	0	0	0					0	0		
				0					0	0	0	0					0	0	0		
		0					0	0	0	0				0	0	0	0				
	0					0	0	0	0				0	0	0	0					
0					0	0	0	0				0	0	0	0						
0				0	0	0	0				0	0	0	0							
			0	0	0	0				0	0	0	0								
		0	0	0	0				0	0	0	0					0				
	0	0	0	0				0	0	0	0					0					
0	0	0	0				0	0	0	0					0						
0	0	0	0				0	0	0	0				0							
0	0	0				0	0	0	0				0								
0	0				0	0	0	0				0					0				
0				0	0	0	0				0					0	0				
			0	0	0	0				0					0	0	0				
		0	0	0	0				0					0	0	0	0				

In all the preceding patterns, the order of the treading is the same as the draught, which, indeed, is the common practice in this branch of weaving. The treadles, however, might be wrought over in various other successions, which would give a proportionate effect to the patterns.

To find the number of leaves requisite for any lined work pattern from the cloth or design paper, count the threads or spaces from the centre of one figure to the centre of the imbosoming one, including the two points; and this will be equal to the number of leaves: and if a square be formed of which this is the diagonal, it will give a representation of the cording on the treadles, the raising marks corresponding with the black squares on the design paper.

But if a draught and cording be given to represent the pattern on design paper; first make a figure on the paper exactly the same as that formed on the treadles by the raising marks; and, this repeated four times, but inverted, so

that any one corner of the cording plan may be the common centre, and allowing only one thread for each of the points, both by the warp and weft, it will give one complete set of the pattern, which will be evident by comparing any of the preceding plans with their respective Figures in the plate.

In the more complex patterns, however, if the threads of warp be numbered as in the draught, each thread will have its corresponding space on the design paper, counting from right to left. The numbers also, which point out the order of treading, will correspond with the threads of weft, which are to be counted from the bottom of the paper, upwards. Then observe what threads of warp are raised by each treadle, beginning with number one of the treading, and taking the others in their order; and these marked on the corresponding squares of the design paper, will give one set of the pattern.

Lined work patterns have hitherto been chiefly confined to table linen; but, from the great diversity of which they are susceptible, they might be also employed, with considerable advantage, in some of the branches of the cotton and silk manufactures. For instance, were the warp one colour and the weft another, they might be made into shawls, &c. in great variety.

CHAP. IV.

DORNIC AND DIAPER.

SECT. I.

Having explained, in the second chapter, the method of turning or reversing the tweel, both when the run of the flushing is regular and when it is broken, we come now to apply this principle to the production of an extensive variety of fanciful patterns, which are partly known by the name of dornic, and partly, by that of diaper.

This branch of weaving was chiefly confined to the manufacture of table linens, till of late, that it has been applied to a certain species of shawls, in the cotton manufacture, the warp and woof of which are, in general, of different colours. The coarser sets of table linens, and which require the least mounting, having only a four leafed tweel, were manufactured in considerable quantities, some time ago, at Dornock, in the north of Scotland; whence the name dornic: but the finer kinds, which are usually woven by a more extensive apparatus, and, in general, with a tweel of five leaves, are called diaper. As these patterns, however, are all woven on the same principle, namely, reversing the tweel, this distinction merits no farther regard, than that the smaller mountings be first explained, and the others, in order, as they become more complex.

The most simple pattern of this kind is the damboard or checker, Fig. 1, plate 4, which has been already explained: but such draughts, instead of forming squares, may be broken into an indefinite number of parts, of various dimensions; and, when the whole of this variety contained in one
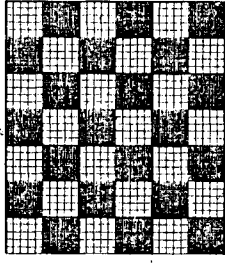
PLATE 4.

PRINCIPLES OF DIAPER.
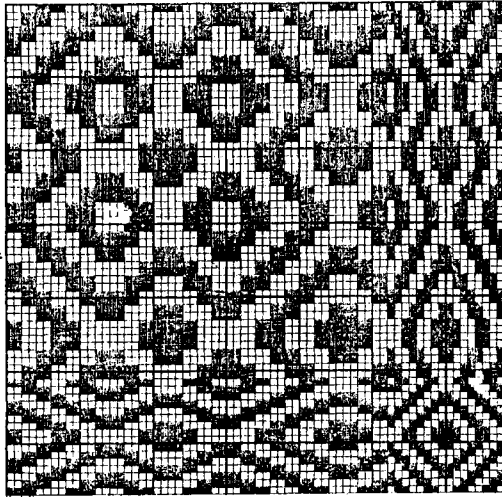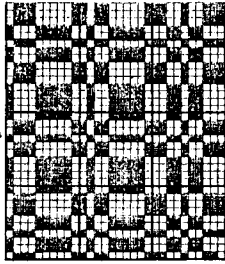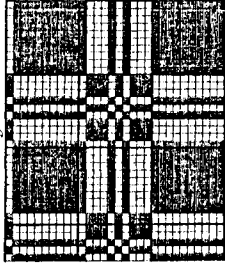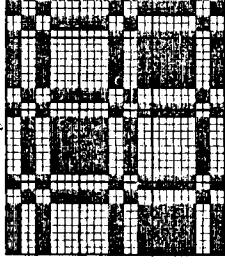
Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

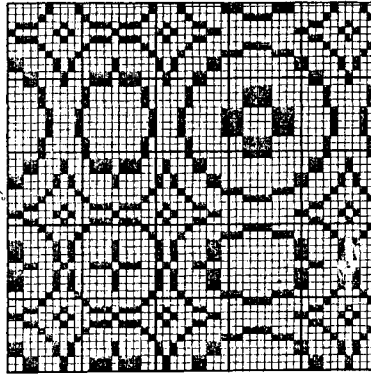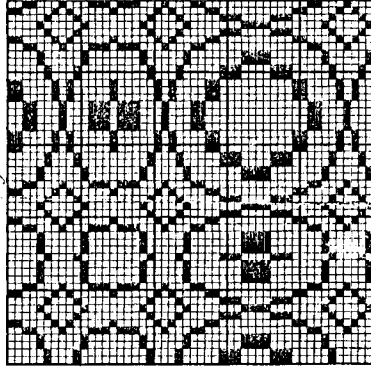Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.
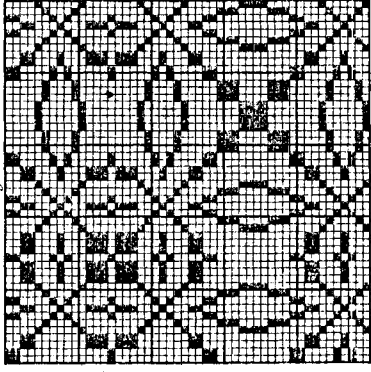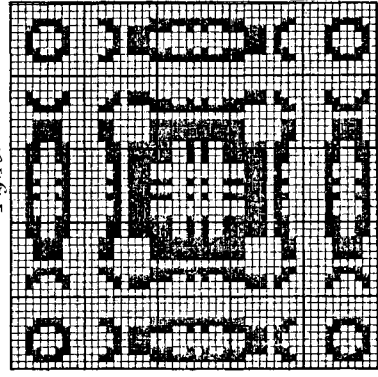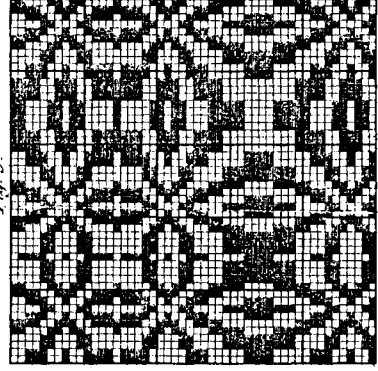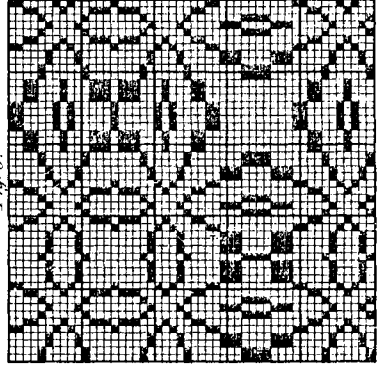
Fig. 12.
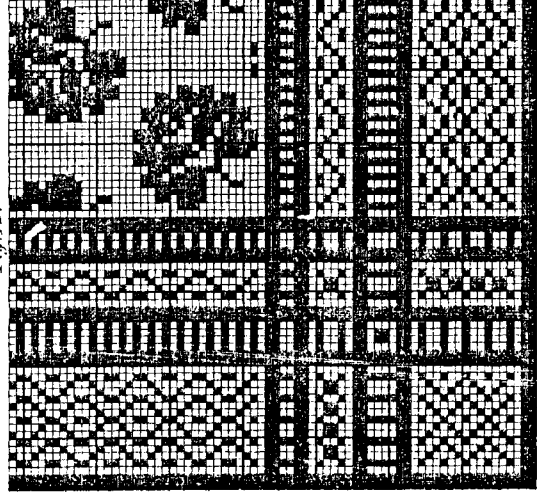
set of the pattern is woven square, which is effected by following the same order of succession in treading as is observed in the draught, or any other succession which fancy may suggest, an endless diversity of figures may be produced, merely by two sets of tweeling leaves.

The following plan, which may be taken for an example, is the draught and cording of a very common pattern in this branch of weaving; and the figure which it produces is represented on design paper in Fig. 2.

No. 1.   Fig. 2.   Plate 4.

This draught and plan of cording are adapted to the four-leafed biassed tweel, the cording being the very same as that of the checker; but, it will be obvious from the examples given under the article, reversed tweeling, that the same figure may be produced by a tweel of any other number of leaves, and woven either by the regular or broken method of treading.

When two or more sets of tweeling leaves are thus employed, the mounting is said to consist of two or more *divisions,* and the draughts and cordings of such mountings

are usually marked on one leaf and treadle for each set or division, which are sufficient to exhibit all the design. This is called the *binding plan*; because it binds, as it were, the several divisions together, which are at any time to be raised, and brings all that is essential in the pattern, into a small compass: so that the weaver has only to substitute one set of tweeling leaves and treadles, whatever number may be employed, for each leaf and treadle in this plan.

This will be apparent by comparing the preceding draught and cording with the corresponding draught, marked *m*, in which it will be observed, that, on the back set of leaves A, there are two draughts, which are marked 2 on the back leaf of *m*; then 2 over the fore set B, which are marked, in the same manner, on the front leaf of *m*. These are succeeded by eight draughts on the set A, two on the set B, two on the set A, and eight on the set B; all of which are set down in figures, respectively, on the binding plan *m*.

Where the four treadles A cross the leaves or divisions marked A, the greatest portion of raising marks is placed; or, that division is said to be raised, in order to reverse the tweel: a raising mark is therefore placed in the corresponding square of the binding plan, on the treadle marked *a*. The same is to be observed with respect to the leaves and treadles marked B; and this takes place in all those plans which are given in the contracted form, whatever number of divisions they may contain.

In weaving this pattern, the weaver works twice over the treadles A, because these reverse the tweel in such parts of the pattern as are drawn on the back division: and, by following the succession of the draught, he goes twice over the treadles B, eight times over the treadles A; and so on till the figure be square; after which, the same succession is repeated.

When dornic or diaper patterns are drawn on design paper, which is usually 10 by 10, each unit in the binding

plan denotes one space by the warp: so that each of these spaces may contain sometimes four and sometimes five threads, according as it is intended for dornic or diaper, or fineness of the reed, and these are generally drawn through one interval of the reed. The spaces by the weft, likewise contain a corresponding number of shots, or once over the set of heddles.

Keeping still in mind the general rule, that all patterns formed by the warp are produced by the raising cords; let the warp, in this example, be supposed blue, and the weft white; then the dark shaded spaces in the figure will represent the pattern as formed by flushing the warp above, and the white spaces, those parts of the pattern where the warp is below. Hence, the two spaces at the bottom of the design, Fig. 2, will represent those parts of the figure which are produced by working twice over the treadles A; the next two spaces, those which are produced by the treadles B. The treadles A, again being wrought eight times over, form the large squares of eight spaces each way; and so on, with any other variety that may occur, without any regard being paid to the number of tweeling leaves in the division.

It must be observed, however, that this pattern, as well as all those given in this chapter, is drawn upon a comparatively small scale; and thus, in applying them to practice, they may be enlarged in any given proportion, either to expand their dimension, or to suit them to any desirable sett of reed. Thus, were all the figures on the binding plan of the preceding pattern multiplied by 3, it would stand as below, and afford an example, in which it will appear that all the members of the draught are still in the same proportion as at first: and so of any other pattern of this kind.

	6	24	6	
24		6		6

When a still greater variety of pattern is required, the number of divisions must be increased, as in the other branches of weaving. As these mountings, however, can only be augmented by adding complete sets of the tweel, the varieties arising from an increase of leaves in this, must be more limited than in almost any other branch. This disadvantage, however, is in a great measure compensated by the ingenious diversity which is usually observed in the succession of the draught; by means of which, a style of pattern peculiar to diaper weaving is produced. The same draught also will weave a variety of patterns, agreeably to the different arrangements of the raising cords upon the binding plan, and the succession of working over the treadles: and, that diaper mountings may not always be confined to their original draughts, the heddles are not, in general spaced, as in the finer kinds of fancy mountings, but are cast separately, so as to run on the backing or maitland cord; by which the weaver can adapt them, at pleasure, to any pattern he may have occasion to weave. The following plans, which are on a scale of four divisions, and only a four-leafed tweel for saving room, will give the reader an idea of the manner in which a variety of patterns may be obtained from the same draught and succession of treading, merely by a different position of the raising cords upon the treadles.

No. 2. Fig. 5.

0					1	2		2	1	3	3	1	2		d
	0				1	1	2		2	1	1	1	1	1	2	c
		0			1	1	3	3	1	1	1	1	1	3	b
			0	1		1	4	1		1	1		1	4	a

1	1	1	1
	1	1	1
2	2	3	4
2	2	3	
	1	1	1
1	1	1	1
3		3	
&c.	1		1
d	c	b	a

Binding Plan and Treading.

No. 2.

THE FULL MOUNTING.

```
| 0| 0| 0‖  |  |  | 0‖ |  |  | 0‖ |  |  | 0‖ | ‖ |    ‖ | ‖‖ ‖ | ‖|
0|  | 0| 0‖ |  | 0| ‖ |  | 0| | ‖ |  | 0| ‖ |  ‖ |   ‖ | ‖‖‖ ‖ ‖|      D
0|0|  | 0‖ | 0| |  ‖ | 0| |  ‖ |0| | ‖ |  ‖ |   ‖ | ‖‖ ‖‖ | ‖|
0|0|0| ‖0| |  |  ‖0| |  | ‖0| |  |  ‖ |  ‖ |   ‖ | ‖‖ ‖‖ | ‖|
 |  | 0‖ | 0|0|0|0‖ |  |  | 0‖ |  |  | 0‖ | ‖ | ‖ |  ‖ |  |  | ‖ | 11
 | 0| ‖0| | 0|0‖ |  | 0| ‖ |  | 0| ‖ | ‖ | ‖ |  ‖ |  |  | ‖ | 22   C
 | 0| | ‖0|0|  | 0‖ | 0| |  ‖ |0| | ‖ | ‖ | ‖ |  ‖ |  |  | ‖ | 33
0| |  | ‖0|0|0| ‖0| |  | ‖0| |  | ‖ | ‖ | ‖ |  ‖ |  |  | ‖ | 44
 |  | 0‖ |  |  | 0‖ | 0|0|0‖ |  |  | 0‖ | ‖ | ‖ | ‖ |  |  |  |
 | 0| ‖ |  | 0| ‖0| | 0|0‖ |  | 0| ‖ | ‖ | ‖ |  |  |  |
0| |  ‖ | 0| | ‖0|0| | 0‖ |0| | ‖ | ‖ | ‖ |  |  |  |      B
0| |  | ‖0| |  | ‖0|0|0|0‖|0| |  ‖ | ‖ | ‖ |  |  |  |
 |  | 0‖ |  |  | 0‖ |  |  | 0‖ |0|0|0|0‖ |  | ‖‖ |  |  |  |
 | 0| ‖ |  | 0| ‖ |  | 0| ‖0| |0|0|0‖ |  | ‖‖ |  |  |
0| |  ‖ | 0| | ‖ | 0| | ‖0|0| | 0‖ |  | ‖‖ |  |  |      A
0| |  | ‖0| |  | ‖0| |  | ‖0|0|0| ‖ |  | ‖‖ |  |  |
4 | 3 | 2 | 1‖ 4 | 3 | 2 | 1‖ 4 | 3 | 2 | 1‖ 4 | 3 | 2 | 1 ‖
      D            C            B            A
```

In this example, the straight lines which are drawn across the several divisions, denote the draughts over the leaves; that is, each line shows that one thread is to be drawn on each leaf of that set on which it is placed: and this method is commonly adopted when the draughts and cordings are thus extended, in preference to that of marking the succession of drawing by figures, on account of taking less room. Thus, the drawing commences on the back leaf of the division C, and is continued until it has gone twice over these leaves, as pointed out by the figures. Then there are two similar draughts on the leaves D, one on A, one on B, one on C, one on D, and so forth, agreeably to the units in the figures in the binding plan, the draught commencing always on the back leaf of each division.

By following the order of treading, which is here the same as the draught, and which is marked on the treadles of the binding plan at *a*, *b*, *c*, and *d*, the weaver observes,