STOCKINGS, the clothing of the leg and foot, which immediately cover and screen them from the rigour of the cold.

Anciently, the only stockings in use were made of cloth, or of milled stuffs sewed together; but since the invention of knitting and weaving stockings of silk, wool, cotton, thread, &c. the use of cloth stockings is quite discontinued.

Mezerai says that Henry II. of France was the first who wore silk stockings at his father's wedding to the duke of Savoy, in 1559.

Dr. Howell, in his History of the World (vol. ii. p. 222.) relates, that queen Elizabeth, in 1561, was presented with a pair of black knit silk stockings, by her silk-woman, Mrs. Montague, and thenceforth she never wore cloth ones any more. The same author adds, that king Henry VIII. ordinarily wore cloth hose, except there came from Spain, by great chance, a pair of silk stockings. His son, king Edward VI., was presented with a pair of long Spanish silk stockings by Sir Thomas Gresham, and the present was then much noticed of. Hence it should seem, that the invention of knit silk stockings originally came from Spain.

How early the invention of knitting was taken up in Spain does not appear; but though it existed there in the time of Henry VIII., who died in 1547, yet it was not practised in England till the third year of queen Elizabeth, viz. 1561.

Others relate, that one William Rider, an apprentice on London bridge, seeing at the house of an Italian merchant a pair of knit worsted stockings, from Mantua, took the hint, and made a pair exactly like them, which he presented to William, earl of Pembroke, and that they were the first of that kind wore in England, anno 1564. Anderson's Hist. Com. vol. i. p. 400.

The modern stockings, whether woven or knit, are a kind of plexus of formed of an infinite number of little knots, called stitches, loops, or meshes, intermingled in one another.

Stockings, Knit, are wrought with needles made of polished iron, or brass-wire, which interweave the threads, and form the meshes of which the stocking consists.

This operation is called knitting, the invention of which it is difficult to fix precisely, though it has been usually attributed to the Scots, on this ground, that the first works of this kind came from Scotland. It is added, that it was on this account, that the company of flocking-knitters, established at Paris in 1527, took for their patron St. Fiacre, who is said to have been the son of a king of Scotland: however, it is most probable that the method of knitting stockings by wires, or needles, was first brought from Spain.

Stockings, Woven, are ordinarily very fine; they are manufactured by the frame or machine, made chiefly of iron, the structure of which is exceedingly ingenious, but also exceedingly complex; so that it is very difficult to describe it well, by reason of the diversity and number of its parts; nor is it even conceived, without much difficulty, when working before the face.

The English and French have greatly contended for the honour of the invention of the flocking-loom; but the matter of fact, says Mr. Chambers, after M. Savary, in his Dictionary of Commerce, waving all national prejudices, seems to be this, that it was a Frenchman who first invented this useful, finding machine; and who, by the difficulties in procuring an exclusive privilege, which he required, to settle himself at Paris, went over into England, where his machine was admired, and the workman rewarded according to his merit.

The invention thus imparted to the English, they became so jealous of it, that for a long time it was forbidden, under pain of death, to carry any of the machines out of the island, or communicate a model of them to foreigners. But as it was a Frenchman who first enriched our nation with it, so a Frenchman first carried it abroad; and, by an extraordinary effort of memory and imagination, made a loom at Paris, on the idea he had formed of it in a voyage he had made to England. This loom, first set up in the year 1656, has served for the model of all those since made in France, Holland, &c.

But this account of the original inventor of the flocking-frame seems to be erroneous, as it is now generally acknowledged, that it was invented in the reign of queen Elizabeth, in 1589, by William Lee, M. A. of St. John's college, in Cambridge, a native of Woodborough, near Nottingham.

It is said that this gentleman was expelled the university for marrying contrary to the statutes of the college. Being thus rejected, and ignorant of any other means of subsistence, he was reduced to the necessity of living upon what his wife could earn by knitting of stockings, which gave a spur to his invention; and by curiously observing the working of the needles in knitting, he formed in his mind the model of the frame which has proved of such singular advantage to that branch of our manufactures. See London Magazine, vol. iv. p. 337.

Soon after Mr. Lee had completed the frame, he applied to queen Elizabeth for protection and encouragement, but his petition was rejected. Despairing of success at home, he went to France, under a promise of being patronized and rewarded by Henry IV. and, with nine of his servants, settled at Roan in Normandy. But by the sudden murder of the French monarch, Mr. Lee was disappointed of the reward which he had reason to expect, and died of a broken heart at Paris. After his death, seven of his workmen returned with their frames to England, and in conjunction with one Alton, who had been apprenticed to Mr. Lee, and who had made some improvements in his master's invention, laid the foundation of this manufacture in England.

In the space of fifty years the art was so improved, and
the number of workmen so much increased, that they petitioned the Protector to constitute them a body corporate, but their request was refused. King Charles II. in 1663, granted a charter, extending their jurisdiction to ten miles round London. See COMPANY.

Such is the account given of this invention by Dr. Deering in his Hist. of Nottingham, p. 100, who has also described the flocking-frame, and exhibited several figures of this machine, and of the numerous parts of which it consists.

The frame-work knitters or flocking-weavers hall is situated in Red-Crofs street. They were incorporated 19th August, 1663.

In this hall is the portrait of the author of this ingenious art, pointing to one of the iron frames, and discoursing with a woman who is knitting with needles and her fingers. These words are on the picture: "In the year 1589, the ingenious William Lee, A.M. of St. John's College, Cambridge, devised this profitable art for flockings, (but being deipect to France,) yet of iron to himself, but to us and to others of gold, in memory of whom this is here painted." Hatton's View of London, vol. ii. 695.

Yet Dr. Howell, in his History of the World (vol. i. p. 222.), makes this invention eleven years later, viz. anno 1660; and adds, that Mr. Lee not only taught this art in England and France, but his servants did the same in Spain, Venice, and in Ireland.

Mr. Lee's invention was made about twenty-eight years after we had first learned from Spain the method of knitting flockings by wires and needles; it has proved a very considerable benefit to the flocking manufacture, by enabling England to export vast quantities of silk flockings to Italy, &c. where, it seems, says Anderson (Hist. Comm. vol. i. p. 435.) by Sir John Child's excellent Difcources on Trade, first published in 1670, they had not then got the use of the flocking-frame, though not much less than one hundred years after its invention.

A late writer in the Bibliotheca Topographia Britannica, No. 7, says that Mr. Lee, after some years' residence in France, received an invitation to return to England, which he accepted, and that thus the art of frame-work knitting became famous in this country. This account of the invention, he adds, is more generally received, though it has also been attributed to a Mr. Robinson, curate of Thurctalton, in Leicestershire. The first frame, we are told, was brought into Hinckley, in Leicestershire, before the year 1640, by William Lulle and now the manufacture of this town is so extensive, that a larger quantity of hoo, of low price, in cotton, thread, and worsted, is supposed to be made there than in any town in England. The manufacture has since employed about two thousand five hundred and eighty-five working people; the number of frames has been computed at about one thousand, and there have been also about two hundred in the neighbouring villages. The towns of Leicelcr, Loughborough, Nottingham, and Derby, with the villages in their dependencies, are the principal seats of the flocking manufacture in England.

About the year 1756, Meffris Jeddiah Strut and William Woollatt, of Derby, invented a machine, by which, when annexed to the flocking-frame, the turned ribbed flockings are made the same in those made upon the common knitting-pins; this is known by the name of the Derby machine. These, together with the manner of making the open-work mills, in imitation of the French mills, a curious fort of lace for caps, aprons, and handkerchiefs, as well as a great variety of figured goods for waistcoats, &c. have sprung from the same machine, and form a considerable additional branch of the flocking-trade.

STOCKING-Frame, a most ingenious machine for weaving or knitting of flockings. To comprehend the action of this machine, which is extremely complicated, it is first necessary to have a perfect idea of the nature of the fabric which is produced by it; this is totally different from cloth woven by a loom, as the slightest inspection will shew; for instead of having two distinct systems of threads, like the warp and the weft, which are woven together, by crossing each other at right angles, the whole piece is composed of a single thread, united or looped together in a peculiar manner, which is called flocking-stitch, and sometimes chain-work.

This is best explained by the view in fig. 1. Plate Stocking-frame. A single thread is formed into a number of loops or waves, by arranging it over a number of parallel needles, as shown at R; these are retained or kept in the form of loops or waves, by being drawn or looped through similar loops or waves formed by the thread of the preceding course of the work, S. The fabric thus formed by the union of a number of loops is easily unravelled, because the stability of the whole piece depends upon the ultimate falling off of the part of the end of the thread; and if this is undone, the loops formed by that end will open, and release the subsequent loops one at a time, until the whole is unravelled, and drawn out into the single thread from which it was made. In the same manner, if the thread in a flocking piece fails or breaks at any part, or drops a stitch, as it is called, it immediately produces a hole, and the extension of the hole can only be prevented by falling off the end. It should be observed, that there are many different fabrics of flocking-stitch for various kinds of ornamental holings, and as each requires a different kind of frame or machine to produce it, we should greatly exceed our limits to enter into a detailed description of them all. That species which we have represented in fig. 1. is the common flocking-stitch used for plain holings, and is formed by the machine called the common flocking-frame, which is the ground-work of all the others.

Fig. 2. is a perspective view of a common flocking-frame, exhibiting as many of its parts as can be seen in a general view. The basis is a wooden frame, confining of four pillars N, and various crofs-pieces, called rafters; the two uppermost M, are called caps; upon the top of these the small parts of the machine are situated, being fastened in a frame of wrought iron. The pieces which compose the iron frame are two sole-bars wu, which are screwed down upon the wooden caps M, and at the ends have joints, g, to support the prefier-bows G, G, of which we shall soon have occasion to speak. At the back are two vertical standard V, called the back standards, which support the axis T. These standards are united by back crofs-bars, which are clearly seen in the figure near V. There are likewise two front standards W, erected from the sole-bars wu, wu.

To give motion to this machine, the workman feats himself before it, upon a board or seat A, and puts the different parts of the machine in motion by his hands and feet: he applies his feet upon two treadles B, C, which have cords, b, c, ascending from them, and passing in opposite directions round a barrel or wheel, upon the axis of which is a large wheel, D, called the sliver-wheel. By alternately pressing down one treadle, and allowing the other to rise, he can turn this wheel round in either direction at pleasure. The object of this movement will be described hereafter. There is likewise a third treadle, E, upon which he presses his foot, when he wishes to bring down what is called the prefier-bars, marked F, the use of which will be afterwards explained. This bar is attached to two arms or levers G, which are moveable round the fixed centre pins or joints g. The ends of the levers are of a curved form; hence the pieces G are called the
the preffer-bows. The connection with the treadle E is by a
spring or wire, which ascends behind the machine, and is
attached to the crofs-bar H, which is extended from one of
the preffer-bows to the other, and is cranked down, to avoid
such parts of the machine as it would otherwise intercept in
its motion. The return of the preffer and middle treadle, E,
is produced by the reaction of the wooden spring I, which
draws it up with two flings; but in some frames a counter-
weight is used instead of the spring.

The weaver produces all the other motions by his hands:
for this purpose, he applies them to the ends K, K, of the hand-bar, and he can then very conveniently press his thumbs upon the thumb-plates L, L. By drawing forward or lifting up the hand-bar K, and at the same time pressing upon the thumb-plates L, or relieving them, he gives the requisite motions to what is called the frame of finkers, or simply the frame, because it contains the principal works of
the machine. The thread of which the fockling is to be
made is kept upon a bobbin M, stuck upon a pin in the
front upright, N, of the frame, and the thread from this is
carried upon the needles; and when it is woven into the
flocking piece by the action of the needles and finkers, the
criss hangs down at S, and is received upon a small roller
fixed in an iron frame P, called the web, which is made suf-
ficiently heavy to stretch the piece to a moderate tension.

As an introduction to a description of the whole machine, it
will be proper to give the reader an idea of those parts which
operate upon the thread, and of the motions which are
given to them to produce the loops or melches. These parts
are the needles, the frame of finkers, and the preffer-bar: the
needles are stationary, the rest moveable.

Fig. 1. represents what are called the needles: these are
made of iron-wire, of the shape represented, and are hooked
or barbed at the ends, the returned points of the hooks or
bars being made very delicate. There is a small cavity or
groove punched or sunk in the stem of the needle, imme-
diately beneath the barb, of sufficient depth to receive the
point, when an adequate prefltre is applied upon the
hook to bend the barb down. The barb then becomes a
closed eye; and if a thread is looped over the wire or stem
of the needle, and drawn forwards while the barb is thus
closed, it will draw over the barb of the needle, and come
off at the end of it: but if the thread is drawn forwards
whilst the barb is open, it will be caught under the hook,
and be thus detained, as shown at R. This circumstance
must be particularly attended to, as the principal action
of the machine depends upon it. The depression of the
bars of the needles is produced by the edge of the preffer-bar P, which is extended horizontally over the whole
length of the needles, and actuated by preflfing the foot on
the middle treadle, as before explained.

Between every two adjacent needles, 1, 1, a thin plate of
steel, 2, 3, is placed: these plates are called finkers; they
are formed to a particular shape (as shown in fig. 4), and
are capable of being elevated or depressed, and also of
being drawn backwards or forwards between the needles.
The motions are given by the hands of the weaver, as the
hand-bar K, which he holds, is part of the frame containing
the finkers and finkers. The finker-frame consists of the hand-
bar K K (fig. 2 or 4), extending across it at the bottom; the
hanging cheeks O, O, which form the upper sides of the frame; and the upper bar P, which is called the finker-
bar, because the finkers are fixed to it, being united cere-
bral together in pieces of lead each an inch wide, which are
cast round the ends of the finkers, and fastened by screws to the bar P.

To allow the frame of finkers to have the motions of
which we have spoken, it is suspended by joints at the top
of the hanging-cheeks, called the top joints: these joints
are formed at the ends of the top arms, Q, Q, which are
two horizontal levers fixed to an axis T, called the spindle-
bar; the extremities of this turn on pivots, supported by the
upper ends of iron uprights V, called the back standards.
Both the motions of the spindle-bar upon its centre and the
frame of finkers can rise and fall, and the quantity of this
motion is limited by stop-screws applied to the vertical
standards W. To draw the finkers forward between the
needles, the finker-frame can be inclined upon the top
joints of the hanging-cheeks, by drawing forwards the hand-
bar K. From the middle of the spindle-bar, T, a short
lever projects, which is borne upwards by a spring, X,
called the main-spring; this is supported by a piece which
projects from the fixed crofs-bar of the frame, and is of
sufficient force to bear the frame of finkers upward, and
give the top arms, Q, Q, a tendency to rest always against
the upper stop-screws, X, of the standards W.

The hooked part or nips f (fig. 4.) of the finkers, are
for the purpose of forming loops in the thread between the
needles. To effect this, the nips, f, of the jacks and finkers
are depressed above the level of the needles, as in fig. 4.-5,
and the thread is extended across all the needles, immedi-
ately beneath the nips. If then the jacks and finkers are all
depressed down between the needles, it is evident that the nips of the finkers must carry the thread down before them, and form it into loops hanging down between each needle, as shown
at X. This, then, is the principal office of the finkers: but
to perform the operation of sinking in the manner now de-
scribed, by depressing the whole number at once, would not
be practicable; because, as a greater length of thread is
required when it is depressed into loops, than when it lies
straight across the needles, it would require to draw the
thread all at once from the bobbin M (fig. 2.), in sufficient
quantity to make up the difference; to do which, the thread
must slide or draw beneath the nips and the needles,
which it could not do, on account of the friction.

The contrivance to render this depression or looping down
of the thread between each needle practicable is very in-
genious. The row of finkers shown in fig. 4., is com-
pounded of two kinds, called jack-finkers and lead-finkers, which
are very different in their movements, although we have hitherto spoken of them as one. The lead-finkers are all those of which we have spoken as being fastened to one bar
P, called the finker-bar, which is part of the finker-frame,
and which the workman moves by his hands; on this account, the lead-finkers all move together: they are one half of the
whole number, and are disposed between every other needle,
so that the space between each lead-finker has two needles
in it. The jack-finkers are made of the same form as the
lead-finkers, one being placed between each of the two
needles contained between every lead-finker; therefore the
lead-finkers and jack-finkers are disposed alternately to form
a row, and a needle is placed in every space in the whole
row. Each jack-finker is supported by a small lever, b, b,
(fig. 3.) called a jack, freely movable on a centre-pin:
the opposite end c, or tail of each jack, is preflf by a
spring k, which has a notch or indentation at a particular
place; and when the jack-finker is elevated, so that its nip, f,
is above the level of the needles r, ready to receive the thread,
the end of the tail, c, is received in the notch of the spring k,
which retains it in that position; but at the same time a light
force applied beneath the tail, c, of the jack to lift it up will
cause the nip, f, of the jack-finker, g, between the needles.
It is to be understood, that all the jacks, j b, are arranged in
a row, and move upon one wire, which is a common centre
of motion;
STOCKING-FRAME.

motion; but the motion it given to them one at a time, beginning at one end of the row, and proceeding one by one to the other. To effect this, a straight iron bar, or ruler, called the flur-bar, is extended beneath all the jacks, and upon this a piece of metal, m, called the flur, travels, with rollers to reduce the friction: it is drawn by a line extended from each fide, and conducted over a pulley n, at each end of the flur-wheel D, 2, to be carried round the flur-wheel D, 2.

We have before explained how an alternate motion is given to this wheel, by the action of the two feet upon the two treadsles B, C: it is plain by this connection, that the flur, m, can be made to travel from one end of the flur-bar, l, to the other, and in so doing, that it will elevate the tails, t, of all the jacks, i, b, beneath which it passes, and produce a corresponding depression of the jack-finkers, z, between the needles. After the flur has palied, the jacks retain the position given to them by the pressure of the springs k.

The operation of finkering or forming the loops between the needles is thus conducted: the nips of all the finkers are raised above the needles, as in fig. 4; the thread is then extended lightly across the items of the needles, beneath the nips f. By pre-filling on one of the treadsles, B or C, the flur-wheel D is made to turn round, and this, by the flur-line, draws the flur, m, from one end of the flur-bar, l, to the other. In its passage it encounters the tails, t, of the jack, and lifts them up one by one, which at the same time depresses the corresponding jack-finker, z; and its nip, f, finkes the thread between the needles, and forms a loop. As these loops are formed successively, the thread draws easily beneath the nip to produce each single loop, and the workman allows the threads to draw off from the bobbin, M, through his fingers, as fast as it is required. When all the jack-finkers are depressed, a loop of the thread will be formed between every other pair of needles. The workman then depresses the lead-finkers, 4, by pulling down the hand-bar K, and their nips carry down the thread between the remaining needles in loops, in the intermediate spaces between the former loops: in doing this, he cau tof the jack-finkers, 4, to rise up, as much as he depresses the lead-finkers 3; because it should have been mentioned before, that the first loops formed by the jack-finkers were double the depth intended, although only half the number: by this means they contained the proper quantity of thread to form the whole number of loops; viz. one between every two adjacent needles.

The jack-finkers are caused to rise up by means of the locker-bar, p, extending over all their tails i. Each end of this bar is screwed to a lever, g, called a locker, which moves upon the fame centre as the jacks, and the front ends of these levers are made with inclined ends, so as to be lifted up by wedges fixed at the back of the thumb-plates, L, which move on joints fixed to the finker-bar, and hang down in a convenient situation to be acted upon by the thumbs of each hand, when holding the ends of the hand-bar K. The weaver, therefore, preffes back the two thumb-plates L, at the same time that he depresses the hand-bar, K, of the frame containing the lead-finkers; by which means he produces the afcent of the jack-finkers, in an equal degree to the descent of the lead-finkers, until the nips of the two arrange exactly in one line across the point of the frame, by proper loops attached to the finker-frame. By this means, a complete row of loops is formed, one loop between each needle.

These loops are now to be carried backwards upon the needles, into the position of S, fig. 1, so as to occupy the arch or opening, o, of the finkers, which open part is made purposely to admit the loops last made to remain upon the items of the needles, quite detached from the action of the finkers, which are at liberty to form a new course of loops by the nips, f, of their points o.

If we suppose the frame has been before at work, the loops last formed, which hang upon the items of the needles, will not be a single thread, but the loops at the upper part of the work S, fig. 1; it is only when the frame first begins to work that the loops will be a detached thread, as we have just describ'd.

But it remains to shew how the loops are put back upon the needles; this is done by merely lifting up the hand-bar K, till the points, t, of the finkers rise above the needles: the hand-bar is then drawn forwards a little, to advance the finkers so much, that the points t, which were behind the loops of thread upon the needles, will now come before them, and then the hands are depressed, to inflect the points, t, between the needles again before the threads; and by pushing back the hand-bar, the points, t, carry back the work upon the items of the needles, so that it will be situated in the arch, or opening, o, of the finkers.

When the finkers advance or recede, they must all move together both the lead-finkers and jack-finkers, as if they were one. It is clear that there is no impediment to the moving forwards of the lead-finkers, because they are at liberty to incline or swing forwards upon the joints at the tops of the hanging-checks, O, O, which fullfed the frame containing them: but for the jack-finkers to advance at the same time, it is necessary to bring forward the jacks, and their centre of motion, together with the springs and flur-bar. To admit of this motion, all these parts are framed upon a strong bar called the camel; and upon this is placed four wheels, which run upon the folle-bars, so as to become a carriage. To communicate motion to this carriage, a link is jointed to a piece at each end, marked r, fig. 3 or 4, which is screwed to the finker-bar F, just within the thumb-plates L. These links are jointed at the other ends to the common centre of motion of the jacks. The joints of the pieces, r, are so adjusted, that they will exactly line with the joints which unite the jacks and jack-finkers together; and the links are the same length between the centres as the jacks, for which reason they are called half-jacks.

By means of this connection, the carriage, with its appendages, viz. the jacks, with their springs and the flur-bar, are drawn forwards at the fame time that the finker-frame is drawn forwards, by pulling the hand-bar K K; or, by a contrary movement, the loops of threads which were last formed upon the needles, will be carried back from the hooks or beards of the needles upon their items, as shewn at S, fig. 1, so as to be in the arch, o, of the finkers, as before described.

The first row of loops being thus disposed of, the frame of finkers is restored to its former position, and a second row is formed upon the items of the needles by a repetition of the fame process, viz. extending the thread across the needles beneath the nips, f, of the finkers; moving the flur by the two outide treadsles B, C, which depresses all the jack-finkers, and makes a loop of double depth between every other pair of needles; this is called drawing the jacks: next prefilling on the thumb-plates L, and depressing the hand-bar K, at the same time, which elevates the jack-finkers, and depresses the lead-finkers by one movement, and produces a loop of thread between every two adjacent needles. Another complete row of loops is now formed upon the items of the needles; and this row is to be brought forwards, so as to be under the beards or hooks of the needles, in the manner shewn by R, fig. 1. This is produced by simply drawing forwards the hand-bar K, F, which
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which advances all the finkers together, and their points, \( t \), push forwards the thread till it comes into the beards, and these prevent it from coming off the needles.

The next operation is lifting up the hand-bar and frame of finkers as much as will raise their points, \( t \), quite clear up above the needles between which they were situated, and applying the foot on the upper tredle \( E \), to bring down the preffing-bar \( F \), upon the beards of the needles, to close them up, and while so closed, they hold the loops of thread at \( R \), as if they were looped through the eyes of as many needles. The upper loops of the works which are at \( S \), fig. 1., upon the items of the needles, in the arch, \( s \), of the finkers, are next brought forward upon the needles, by drawing forwards the frame of finkers; but in advancing these loops, draw over the closed beards of the needles, and consequently over the laft-formed loops, which remain under the beards, in the position shown at \( R \), fig. 1.; or, in other words, the loops last formed, and refting under the beards at \( R \), fig. 1., are drawn through the loops of the upper or laft course of the finished work which remained upon the items of the needles, as represented at \( S \). By this means, the loops of what was the upper or laft course of the finished work, become secured from opening or unravelling, and the loops under the beards now become the laft or upper course of the work, and are preferred from unravelling by the needles, one of which pales through each loop; and these loops will not be drawn off from the needles until there is another row of loops prepared, and refted under the beards of the needles, ready to be drawn through them. When the piece of work is finished, and taken off from the frame, the laft made row of loops must be secured by running a thread through them, or other means, or they would draw through the preceding loops, and release them, which in like manner would release their predecessors, and so the whole piece would unravel.

The motion of the frame of finkers, which produces the advance of the finkers towards the points of the needles, or their reception towards the item, takes place upon the centres, called the top joints \( o \), and the wheels of the carriage, as before mentioned. The quantity of motion is limited by a piece, fig. 7., called the arch, which is fixed fast against the inside of the wood-frame \( N \), fig. 2.; a part of the hanging-cheks \( Q_{1}, Q_{2} \), of the frame of finkers depends with a projecting part to act round this arch, which, at the same time that it limits the quantity of motion, prevents the motion being made, except in a proper succession, to produce the effects before described. Thus, when the hook is beneath the arch, the points, \( t \), of the finkers will be beneath the level of the needles, and then the frame of finkers cannot be raised up without first moving the lower part of the frame either forwards or backwards. In the same manner, when the hook is above the arch, the finkers cannot be depressed till they are moved. When the thread is first extended across the needles, in order to be funk into loops, the frame is said to be over the arch, that is, the hook is at the back, or on the farther side of the arch, and by applying thereto, the finkers are guided in their sinking, that is, when they descend, they depress the thread to form the loop. When this sinking has taken place, the finker-frame will be at its lowest position, and the top arms, \( O_{1} \), are reft upon the lower frame of the standards \( W \). When the finkers are brought forwards, to draw the loops from the items of the needles into their beards or points, the hook of the frame moves along the under side of the arch, and this prevents the points lifting up, while the lower stop prevents them from sinking down; but when the finkers are brought sufficiently forwards, the frame is lifted or thrown up by the main-spring, the hook following the curvature of the arch, until the points are completely above the needles, or the frame has reached the upper stop. The finkers are then brought forwards upon their centre of motion, while the preffer is drawn down to close the beards of the needles and draw the loops over them; in doing which, the hook quits the arch, and the frame comes forwards without any guide, the frame being unnecessary, because the elevation of the finkers is determined by the upper stop, against which the frame rests by the action of its main-spring; and the proper degree for the advance of the finkers is determined by the drawing forwards of the frame with sufficient force to draw the loops of the work tight; this force the workman must regulate by habit, so as make his work close.

In returning the frame of finkers, in order to put back the work upon the items of the needles, so as to be out of the way while a new row of loops is made, the hook, \( g \), must be carried back beneath the arch, which will keep down the points of the finkers, so as to prevent them from rising above the needles, as they would then quit the work they are intended to drive back upon the needles.

By the operation which we have described, one course of the work is formed; but, to render it more clear, we will continue the description in a few words, of the working of another course. Preparatory to working it, the loops of the laft course of the work, and by which the work is suspended from the needles, must be pushed back upon the items of the needles to the position \( S \), fig. 1., so as to come into the arched or open part \( s \), fig. 4., of the finkers; this is done by depreffing the finkers low enough for their point, \( t \), to enter between the needles, and then pushing back the hand-bar and frame of the finkers to carry back the work upon the items of the needles. This is the situation in which we suppose the frame, when the operation commences; and the frame is over the arch.

The first movement is the gathering of thread. The thread laid over is lightly extended across the needles, beneath the nips, \( j_{1} \), of the finkers; and by preffing the slurf-treadle \( B \), the jack-finkers are depressed one by one, so as to form double loops. This is called drawing the jacks.

The second movement is finking. This is done by drawing down the hand-bar \( K \), and bearing upon the thumbplates, \( L \), at the same time; the whole row of lead-finkers is thus depressed, whilft the jack-finkers rise, and the thread is carried down into a loop between every two needles.

The third movement is to bring the frame forwards under the arch. This is done by drawing the hand-bar forwards, and the row of loops just made is brought under the beards of the needles.

The fourth movement is to bring the work forwards from the item of the needles. To do this, the finker-frame is lifted up, by elevating the hand-bar \( K \), so that the point, \( t \), of the finkers will be quite drawn out above the needles; and in this situation, the hand-bar and finker-frame being brought forwards, the breast or curved part of the arch, \( r \), of the finker will bring forwards the piece of work which hangs upon the items of the needles, by its loops last made.

The fifth movement is closing the work, or drawing the loops last made, through the finished loops of the work. The preffing-treadle \( E \), being borne upon at the same moment, will bring down the preffer, and it will bear upon the beards, and close them, while the loops are drawn forwards; consequently the loops of the old work will be drawn over the beards, and quite off from the needles; this draws the loops thereof over the loops last made, which re-
main in the beards of the needles. To draw the work tight, the hand-bar, K, is drawn forwards two or three times with a slight jerk, so as to extend all the loops to their fullest quantity, and make the loops of the work unite closely.

The course is now finished; but as a preparation for making another course, the work must be carried back upon the items of the needles into the situation of S, fig. 1. This is the fifth and last movement. To put back the work, the frame is pulled down to bring the points of the finkers below the level of the needles; and in this position, by preffing back the hand-bar, and all the finkers together, the points, 1, will enter between the ends of the needles, and carry back the loops of the work upon the items of the needles, where it will remain in the arches of the finkers, so as to be detached from them, and out of the way, while a new set of loops is formed by the nips of the points of the finkers; and then the loops of the old work are to be drawn over those last made.

The movements are then repeated: 1st, gathering the thread upon the needles, and deprefling it into large loops between every two needles, by the motion of the flur; 2nd, finking, to make the loops between all the needles; 3rd, bringing the thread under the beards of the needles; 4th, bringing the work forwards from the items of the needles towards the beards; 5th, closing the beards by the preffure of the preffer-bar, and drawing the work over the beards; and, 6th, putting the work back on the needles, ready for working another course.

The operation of the machine proceeds in the manner described; and as fast as the courses are completed, the work descends lower, and hangs down in a web from the needles. When the piece is of a considerable length, it is rolled upon a roller, in an iron frame p, called the web, and the weight of the frame is sufficient to keep the piece in a proper tension. The roller in the web can be turned round occasionally to wind up the piece, and is retained by a ratchet-wheel and click.

Having given an idea of the manner of the operation of this curious machine, it only remains to explain the adjustments with which it is provided, in order to make it work correctly.

The fineness of the work depends on the number of loops which the thread will make in any given length, and this will be equal to the number of needles and finkers in the same space. The number of needles in an inch is called the gauge of the frame, and they vary from 15 to 40, which latter are used for the finest flockings. The gauge of a frame cannot be altered when it is once made, and the work which it will produce must always be of the same degree of fineness, although it may be made a little more dense or more flight by drawing the loops very close, or by allowing a greater quantity of thread, and making the loops longer. This circumstance will evidently depend upon the depth to which the nips of the finkers descend between the needles, when they carry down the thread into loops. To regulate this depth, the needle-bar, or that piece which sustains the leads containing the row of needles, is made to rise or fall a flight quantity, by means of two long adjusting screws, the heads of which are made with notches, and springs fall into them to keep the screws from turning back; these heads are called the flur, and the notches nicks: one is marked 9, in figs. 2 and 3.

The motion allowed to the frame of finkers is limited, as before-mentioned, by fops projecting from the two upright standards, W; and through these fops, stop-screws, s, are fitted, to regulate the degree of ascent and descent. The main-spring, y, is made of sufficient strength to lift the weight of the frame of finkers, and make them always rise up as high as the upper stop-screws will permit.

The manner of making different parts of the flocking-frame is worthy of notice. The needles are made of iron-wire, of a proper degree of fineness; it must be of good quality, as that which is liable to split or splinter, either in filing, punching, or bending, is totally unfit for the purpose. The wire is cut to lengths, and annealed or softened in a box of charcoal, in which they are heated to redness, and suffered to cool gradually. The needles are next punched with the small cavity which is necessary to receive the point of the bevvel: this is done by a simple screw-prest. The point of the needle is next formed by the file and burnisher, and the hooks are then bent to form the barb; next the needles are flattened, each with a blow of the hammer. To fasten these needles together, and fix them in the machine, they are placed parallel to each other in a mould or frame, and tin or pewter poured into the mould, round the flattened ends of the items. The piece of lead or pewter is just an inch in width, and the number of needles which it will contain, gives the denomination to the gauge of the frame. These leads of needles are fastened to the needle-bar by a screw through each. The lead-finkers are made of steel plates, which are put together by casting lead round them at the upper ends, in the same manner as the needles. The rack or piece, which contains the centre of the jacks, is called the comb, because it is composed of a number of small plates, fixed into a bar by casting them with lead or tin.

The flocking-frame has undergone very few alterations since its first invention, a circumstance highly creditable to the genius of the inventor. A flocking-frame for weaving the tartan plaid hole which is worn in Scotland, is described in the Society of Arts Transactions, vol. xxix. p. 84: it contains some additions invented by Mr. John Robertson.