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 ſiſter'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 taken notice 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 plexuſes 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 ſtocking-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 conteſted the honour of the invention of the ſtocking-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 and ſurpriſing machine; and who, finding ſome 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 ſtocking-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 recompenſed 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 Aſton, 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

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 them 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 ſtocking-frame, and exhibited ſeveral figures of this machine, and of the numerous parts of which it conſiſts.

The frame-work knitters or ſtocking-weavers hall is ſituated in Red-Croſs 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 ſtockings, (but being deſpiſed went 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. 605.

Yet Dr. Howell, in his Hiſtory of the World (vol. ii. p. 222.), makes this invention eleven years later, *viz.* anno 1600; 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 ſtockings by wires and needles; it has proved a very conſiderable benefit to the ſtocking manufacture, by enabling England to export vaſt quantities of ſilk ſtockings to Italy, &c. where, it ſeems, ſays Anderſon (Hiſt. Com. vol. i. p. 435.) by ſir Joſhua Child's excellent Diſcourſes on Trade, firſt publiſhed in 1670, they had not then got the uſe of the ſtocking-frame, though not much leſs than one hundred years after its invention.

A late writer in the Bibliotheca Topographia Britannica, N° 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 become famous in this country. This account of the invention, he adds, is moſt generally received, though it has alſo been attributed to a Mr. Robinſon, curate of Thurcaſton, in Leiceſterſhire. The firſt frame, we are told, was brought into Hinckley, in Leiceſterſhire, before the year 1640, by William Iliffe; and now the manufacture of this town is ſo extenſive, that a larger quantity of hoſe, 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 Leiceſter, Loughborough, Nottingham, and Derby, with the villages in their dependencies, are the principal ſeats of the ſtocking manufacture in England.

About the year 1756, Meſſrs. Jedidiah Strut and William Woollatt, of Derby, invented a machine, by which, when annexed to the ſtocking-frame, the turned ribbed ſtockings are made the ſame with thoſe made upon the common knitting-pins: this is known by the name of the Derby rib. Theſe, together with the manner of making the open-work mills, in imitation of the French mills, a curious ſort 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 ſtocking-trade.

STOCKING-*Frame*, a moſt ingenious machine for weaving or knitting of ſtockings. 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 diſtinct 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 ſtocking-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 ſhewn 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 faſtening of the firſt 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 ſtocking 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 faſtening the end. It ſhould be obſerved, that there are many different fabrics of ſtocking-ſtitch for various kinds of ornamental hoſiery, 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 ſtocking-ſtitch uſed for plain hoſiery, and is formed by the machine called the common ſtocking-frame, which is the ground-work of all the others.

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

To give motion to this machine, the workman ſeats 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 ſlur-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 preſſer-bar, 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 preſſer-bows. The connection with the treadle E is by a ſtring or wire *e*, which aſcends behind the machine, and is attached to the croſs-bar H, which is extended from one of the preſſer-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 preſſer and middle treadle, E, is produced by the re-action of the wooden ſpring I, which draws it up with two ſtrings; but in ſome frames a counter-weight is uſed inſtead of the ſpring.

The weaver produces all the other movements 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 ſinkers, or ſimply the frame, becauſe it contains the principal works of the machine. The thread of which the ſtocking 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 ſtocking piece by the action of the needles and ſinkers, the piece hangs down at S, and is received upon a ſmall roller fixed in an iron frame *p*, called the web, which is made ſufficiently 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 meſhes. Theſe parts are the needles, the frame of ſinkers, and the preſſer-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 barbs being made very delicate. There is a ſmall cavity or groove punched or ſunk in the ſtem of the needle, immediately beneath the barb, of ſufficient depth to receive the point, when an adequate preſſure 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 ſhewn at R. This circumſtance muſt be particularly attended to, as the principal action of the machine depends upon it. The depreſſion of the barbs of the needles is produced by the edge of the preſſer-bar F, which is extended horizontally over the whole length of the needles, and actuated by preſſing 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 ſinkers; they are formed to a particular ſhape (as ſhewn in *fig.* 4.), and are capable of being elevated or depreſſed, and alſo of being drawn backwards or forwards between the needles. Theſe motions are given by the hands of the weaver, as the hand-bar K, which he holds, is part of the frame containing the jacks and ſinkers. The ſinker-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 upright ſides of the frame; and the upper bar P, which is called the ſinker-bar, becauſe the ſinkers are fixed to it, being united ſeveral together in pieces of lead each an inch wide, which are caſt round the ends of the ſinkers, and faſtened by ſcrews to the bar P.

To allow the frame of ſinkers 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. By the motion of the ſpindle-bar upon its centres, the frame of ſinkers can riſe and fall, and the quantity of this motion is limited by ſtop-ſcrews applied to the vertical ſtandards W. To draw the ſinkers forward between the needles, the ſinker-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, Y, called the main-ſpring: this is ſupported by a piece which projects from the fixed croſs-bar of the frame, and is of ſufficient force to bear the frame of ſinkers 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 ſinkers, are for the purpoſe of forming loops in the thread between the needles. To effect this, the nips, *f*, of the jacks and ſinkers are raiſed above the level of the needles, as in *fig.* 4, and the thread is extended acroſs all the needles, immediately beneath the nips. If then the jacks and ſinkers are all preſſed down between the needles, it is evident that the nips of the ſinkers muſt carry the thread down before them, and form it into loops hanging down between each needle, as ſhewn at X. This, then, is the principal office of the ſinkers: but to perform the operation of ſinking in the manner now deſcribed, 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 between 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 ingenious. The row of ſinkers ſhewn in *fig.* 4. is compoſed of two kinds, called jack-ſinkers and lead-ſinkers, which are very different in their movements, although we have hitherto ſpoken of them as one. The lead-ſinkers are all thoſe of which we have ſpoken as being faſtened to one bar P, called the ſinker-bar, which is part of the ſinker-frame, and which the workman moves by his hands: on this account, the lead-ſinkers 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-ſinker has two needles in it. The jack-ſinkers are made of the ſame form as the lead-ſinkers, one being placed between each of the two needles contained between every lead-ſinker; therefore the lead-ſinkers and jack-ſinkers are diſpoſed alternately to form a row, and a needle is placed in every ſpace in the whole row. Each jack-ſinker is ſupported by a ſmall lever, *h i*, (*fig.* 3.) called a jack, freely movable on a centre-pin: the oppoſite end *i*, or tail of each jack, is preſſed by a ſpring *k*, which has a notch or indentation at a particular place; and when the jack-ſinker is elevated, ſo that its nip, *f*, is above the level of the needles 1, ready to receive the thread, the end of the tail, *i*, is received in the notch of the ſpring *k*, which retains it in that poſition; but at the ſame time a ſlight force applied beneath the tail, *i*, of the jack to lift it up will depreſs the nip, *f*, of the jack-ſinker, 3, between the needles. It is to be underſtood, that all the jacks, *i h*, are arranged in a row, and move upon one wire, which is a common centre of motion;

motion; but the motion is 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 *l*, called the ſlur-bar, is extended beneath all the jacks, and upon this a piece of metal, *m*, called the ſlur, travels, with rollers to reduce the friction: it is drawn by a line extended from each ſide, and conducted over a pulley *n*, at each end of the bar *l*, to be carried round the ſlur-wheel D, *fig.* 2. We have before explained how an alternate motion is given to this wheel, by the action of the two feet upon the two treadles B, C: it is plain by this connection, that the ſlur, *m*, can be made to travel from one end of the ſlur-bar, *l*, to the other, and in ſo doing, that it will elevate the tails, *i*, of all the jacks, *i*, *h*, beneath which it paſſes, and produce a correſponding depreſſion of the jack-ſinkers, 3, between the needles. After the ſlur has paſſed, the jacks retain the poſition given to them by the preſſure of the ſprings *k*.

The operation of ſinking or forming the loops between the needles is thus conducted: the nips of all the ſinkers are raiſed above the needles, as in *fig.* 4; the thread is then extended lightly acroſs the ſtems of the needles, beneath the nips *f*. By preſſing on one of the treadles, B or C, the ſlur-wheel D is made to turn round, and this, by the ſlur-line, draws the ſlur, *m*, from one end of the ſlur-bar, *l*, to the other. In its paſſage it encounters the tails, *i*, of the jack, and lifts them up one by one, which at the ſame time depreſſes the correſponding jack-ſinker 3; and its nip, *f*, ſinks 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-ſinkers are depreſſed, a loop of the thread will be formed between every other pair of needles. The workman then depreſſes the lead-ſinkers, 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 cauſes the jack-ſinkers, 4, to riſe up, as much as he depreſſes the lead-ſinkers 3; becauſe it ſhould have been mentioned before, that the firſt loops formed by the jack-ſinkers 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-ſinkers 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 ſame 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 ſinker-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, preſſes back the two thumb-plates L, at the ſame time that he depreſſes the hand-bar, K, of the frame containing the lead-ſinkers; by which means he produces the aſcent of the jack-ſinkers, in an equal degree to the deſcent of the lead-ſinkers, until the nips of the two arrange exactly in one line, which poſition is determined by proper ſtops attached to the ſinker-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, *s*, of the ſinkers, which open part is made purpoſely to admit the loops laſt made to remain upon the ſtems of the needles, quite detached from the action of the ſinkers, which are at liberty to form a new courſe of loops by the nips, *f*, of their points *t*.

If we ſuppoſe the frame has been before at work, the loops laſt formed, which hang upon the ſtems 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 deſcribed.

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 ſinkers riſe above the needles: the hand-bar is then drawn forwards a little, to advance the ſinkers 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 inſert 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 ſtems of the needles, ſo that it will be ſituated in the arch, or opening, *s*, of the ſinkers.

When the ſinkers advance or recede, they muſt all move together both the lead-ſinkers and jack-ſinkers, as if they were one. It is clear that there is no impediment to the moving forwards of the lead-ſinkers, becauſe they are at liberty to incline or ſwing forwards upon the joints at the tops of the hanging-cheeks, O, O, which ſuſpend the frame containing them: but for the jack-ſinkers to advance at the ſame time, it is neceſſary to bring forward the jacks, and their centre of motion, together with the ſprings and ſlur-bar. To admit of this motion, all thoſe parts are framed upon a ſtrong bar called the camel; and upon this is placed four wheels, which run upon the ſole-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.* 2 or 4, which is ſcrewed to the ſinker-bar P, 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-ſinkers 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 all its appendages, *viz.* the jacks, with their ſprings and the ſlur-bar, are drawn forwards at the ſame time that the ſinker-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 ſtems, as ſhewn at S, *fig.* 1, ſo as to be in the arch, *s*, of the ſinkers, as before deſcribed.

The firſt row of loops being thus diſpoſed of, the frame of ſinkers is reſtored to its former poſition, and a ſecond row is formed upon the ſtems of the needles by a repetition of the ſame proceſs, *viz.* extending the thread acroſs the needles beneath the nips, *f*, of the ſinkers; moving the ſlur by the two outſide treadles B, C, which depreſſes all the jack-ſinkers, and makes a loop of double depth between every other pair of needles: this is called drawing the jacks: next preſſing on the thumb-plates L, and depreſſing the hand-bar, K, at the ſame time, which elevates the jack-ſinkers, and depreſſes the lead-ſinkers by one movement, and produces a loop of thread between every two adjacent needles. Another complete row of loops is now formed upon the ſtems 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,

which advances all the ſinkers 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 ſinkers 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 treadle E, to bring down the preſſing-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 ſtems of the needles, in the arch, *s*, of the ſinkers, are next brought forward upon the needles, by drawing forwards the frame of ſinkers; but in advancing theſe loops, draw over the cloſed beards of the needles, and conſequently over the laſt-formed hoops, which remain under the beards, in the poſition ſhewn at R, *fig.* 1; or, in other words, the loops laſt formed, and reſting under the beards at R, *fig.* 1, are drawn through the loops of the upper or laſt courſe of the finiſhed work which remained upon the ſtems of the needles, as repreſented at S. By this means, the loops of what was the upper or laſt courſe of the finiſhed work, become ſecured from opening or unravelling, and the loops under the beards now become the laſt or upper courſe of the work, and are preſerved from unravelling by the needles, one of which paſſes through each loop; and theſe loops will not be drawn off from the needles until there is another row of loops prepared, and reſerved 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 laſt 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 ſinkers, which produces the advance of the ſinkers towards the points of the needles, or their receſſion towards the ſtem, takes place upon the centres, called the top joints *o 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-cheeks O, O, of the frame of ſinkers deſcends 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 ſinkers will be beneath the level of the needles, and then the frame of ſinkers 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 ſinkers cannot be depreſſed till they are moved. When the thread is firſt extended acroſs the needles, in order to be ſunk 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 ſinkers 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 ſinker-frame will be at its loweſt poſition, and the top arms, Q, will reſt upon the lower ſtop-ſcrew of the ſtandards W. When the ſinkers are brought forwards, to draw the loops from the ſtems 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 ſinkers 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 ſinkers are then brought forwards upon their centre of motion, while the preſſer 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 ſame being unneceſſary, becauſe the elevation of the ſinkers is determined by the upper ſtop, againſt which the frame riſes by the action of its main-ſpring; and the proper degree for the advance of the ſinkers 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 ſinkers, in order to put back the work upon the ſtems of the needles, ſo as to be out of the way while a new row of loops is made, the hook, 9, muſt be carried back beneath the arch, which will keep down the points of the ſinkers, 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 laſt courſe of the work, and by which the work is ſuſpended from the needles, muſt be puſhed back upon the ſtems of the needles to the poſition S, *fig.* 1, ſo as to come into the arched or open part *s*, *fig.* 4, of the ſinkers: this is done by depreſſing the ſinkers low enough for their point, *t*, to enter between the needles, and then puſhing back the hand-bar and frame of the ſinkers to carry back the work upon the ſtems 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, *f*, of the ſinkers; and by preſſing the ſlur-treadle B C, the jack-ſinkers are depreſſed one by one, ſo as to form double loops. This is called drawing the jacks.

The ſecond movement is ſinking. This is done by drawing down the hand-bar K, and bearing upon the thumb-plates, L, at the ſame time: the whole row of lead-ſinkers is thus depreſſed, whilſt the jack-ſinkers 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 ſtem of the needles. To do this, the ſinker-frame is lifted up, by elevating the hand-bar K, ſo that the point, *t*, of the ſinkers will be quite drawn out above the needles; and in this ſituation, the hand-bar and ſinker-frame being brought forwards, the breaſt or curved part of the arch, *s*, of the ſinker will bring forwards the piece of work which hangs upon the ſtems 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 preſſer-treadle E, being borne upon at the ſame moment, will bring down the preſſer, 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 ſtems of the needles into the ſituation of S, *fig.* 1. This is the ſixth and laſt movement. To put back work, the frame is pulled down to bring the points of the ſinkers below the level of the needles; and in this poſition, by preſſing back the hand-bar, and all the ſinkers together, the points, *t*, will enter between the ends of the needles, and carry back the loops of the work upon the ſtems of the needles, where it will remain in the arches of the ſinkers, 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 ſinkers; 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 depreſſing it into large loops between every two needles, by the motion of the ſlur; 2d, ſinking, to make the loops between all the needles; 3d, bringing the thread under the beards of the needles; 4th, bringing the work forwards from the ſtems of the needles towards the beards; 5th, cloſing the beards by the preſſure of the preſſer-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 to 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 ſinkers 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 ſtockings. 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 ſlight 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 ſinkers 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 ſlight 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 ſtar, and the notches nicks: one is marked 9, in *figs.* 2 and 3.

The motion allowed to the frame of ſinkers is limited, as before-mentioned, by ſtops projecting from the two upright ſtandards, W; and through theſe ſtops, ſtop-ſcrews, *x*, 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 ſinkers, and make them always riſe up as high as the upper ſtop-ſcrews will permit.

The manner of making different parts of the ſtocking-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 beard: this is done by a ſimple ſcrew-preſs. 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 ſtems. 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-ſinkers 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 ſtocking-frame has undergone very few alterations ſince its firſt invention, a circumſtance highly creditable to the genius of the inventor. A ſtocking-frame for weaving the tartan plaid hoſe 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.

STOCKING FRAME

Fig. 1.

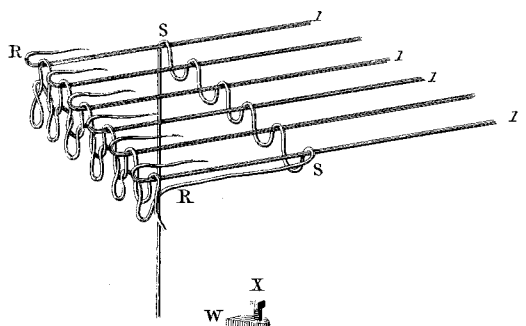


Fig. 7.

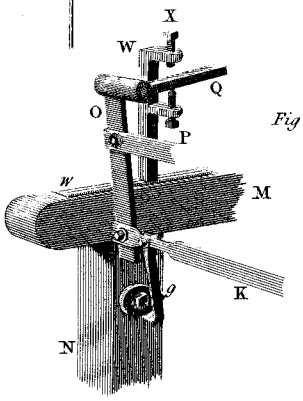


Fig. 3.

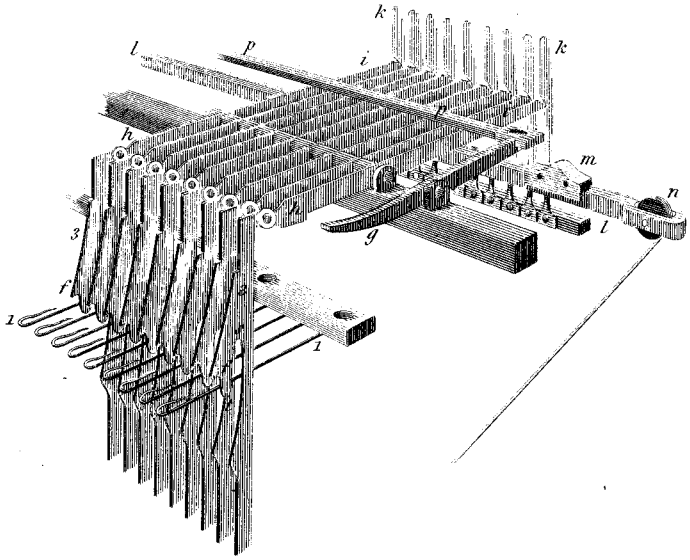


Fig. 4.

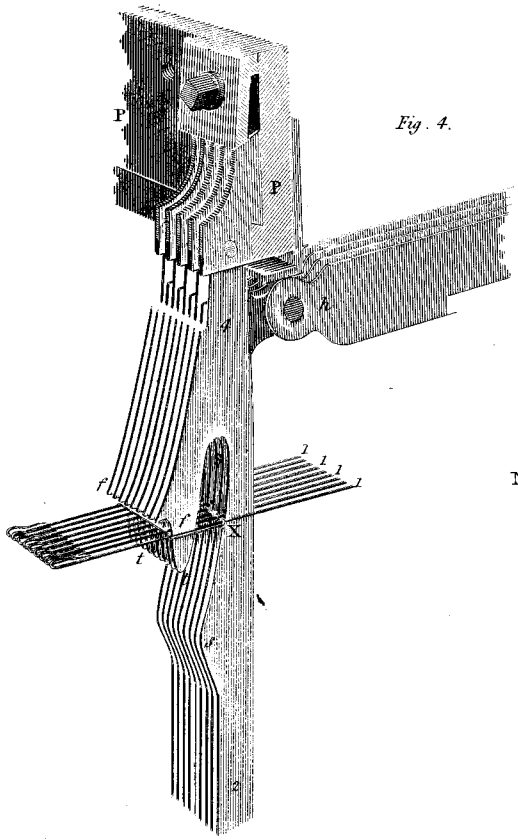
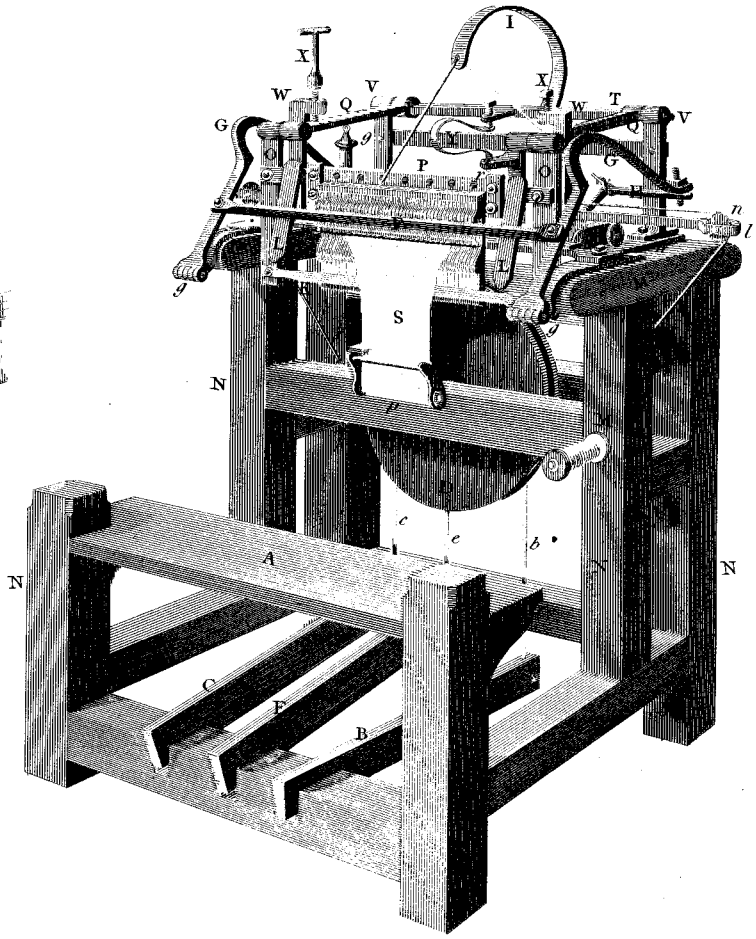


Fig. 2.



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