

EIGHTEENTH ORDINARY MEETING.

WEDNESDAY, APRIL 6, 1859.

The Eighteenth Ordinary Meeting of the One Hundred and Fifth Session was held on Wednesday, the 6th inst., Peter Graham, Esq., Member of the Council, in the chair.

The following candidates were balloted for and duly elected members of the Society:—

Abinger, Lord | Nissen, Hilary Nicholas
Stevens, James John

The following Institution has been taken into Union since the last announcement:—

Rugby, Institute.

The Paper read was—

ON EMBROIDERY BY MACHINERY.

By GEORGE WALLIS.

The object of this paper is simply to give a popular description of the leading features of the embroidering machine, and to illustrate its practical use and capabilities by specimens of textile decoration produced by it. A full and complete description of this machine would involve either the presence of a machine in full work, or such a series of elaborate drawings, diagrams, or models, as would render the task of description neither pleasant nor profitable. No attempt, therefore, will be made to do more than simplify the principle upon which the machine is constructed, and give such illustrations of its action and capabilities as may serve to show its superiority over, or indicate its inferiority to, the human hand in the production of embroidered effects. The diagrams used will be such simplifications of construction as will be best calculated to render that construction intelligible, and are in no way intended as illustrations of the complete mechanical structure of the parts described, or of their full action.

As an interesting branch of art-industry, embroidery by machinery is more wondered at than understood, and it is no uncommon thing to find the mechanical agent used in its production confounded with the various sewing machines which have recently come so largely into use for a variety of purposes. Machine embroidery may, as it did some ten or twelve years ago, stimulate the productions of hand embroidery, and, to a certain extent, supplement them, but it is doubtful, to say the least, if it can ever supplant them. Excelling hand embroidery in accuracy of repetition, and in the production of the same design on both sides of the fabric decorated, it is limited in its range, alike as regards subject and the article to which it can be applied.

In variety of effect it can never compete with hand-embroidery, and, although, as in the dress embroidered for Her Majesty, by the late Mr. Louis Schwabe, of Manchester, the effects of the original drawing are given in all their variety, this has only been done at a great sacrifice of all the economic powers of the machine. When Mr. Schwabe first showed me this specimen in 1844, he said, "I was written to and asked if my machines would execute any design? I replied that any design which Her Majesty wished executed should be produced by them. When the drawing came I saw the mistake I had made, but resolved, cost what it might, that the work should be done, and there it is." As an illustration of what can be done by the embroidering machine, the example is interesting, but as an illustration of its economic use, or its superiority over hand embroidery, it is worthless.

Having said thus much as to the true purposes of machinery as applied to embroidery, it may be useful

to make a few introductory remarks on the subject of embroidery as an art of so ancient a character, that its origin is entirely lost.

The early history of embroidery is associated with the progress of civilisation and refinement as an elegant employment for females; and one which, from a remote antiquity, exercised a large and abiding influence on ornamental art. It is the most primitive mode of textile decoration, and ranges at once from the simplest figure to the most intricate elaborations of a variety of materials requiring the skill of the needlewoman, with the invention of the ornamentalist. It is practised in one form or another wherever man has made any advance beyond the rude art of ornamenting his body by tattooing. The wonderful embroidery of the Peruvians, which so astonished their Spanish invaders, displayed surprising effects of colour produced by the plumage of tropical birds, combined with threads of gold and silver. In all periods of the world's history, among the richest specimens of ornament dedicated to the service of ceremonial religion, we always find embroidery. In the Mosaic Tabernacle the embroidery of purple, blue, and scarlet was conspicuous, and the elaborate embroidery of sacerdotal vestments, especially those of the high priest, show how largely this sacrificial ornamental work was used in the early ceremonials of the Jews.

In the last chapter of the Proverbs of Solomon is an interesting picture of the virtuous wife, whose "Lamp goeth not out by night," and who "worketh beautiful vestments for herself,"—

Her clothing is fine linen and purple.
Her husband is known in the gates,
When he sitteth among the elders of the land.
She maketh him fine linen and selleth it;
And delivereth girdles unto the merchant.

Verses 22, 23, 24.

In the prophecy, by Ezekiel, embroidery is mentioned as the clothing of Jerusalem, represented under the figure of a woman.

"I clothed thee also with embroidered work."
Chap. 16, verse 10.

"Thou wast decked with gold and silver;
And thy raiment was of fine linen, and silk, and embroidered work."
Verse 13.

The Egyptians used embroidery to a very great extent. The sails of their boats were of embroidered linen, and the wrappings of their dead were frequently thus decorated.

The Greeks attributed the invention to Minerva. Homer describes two of his heroines as engaged in embroidery—Helen, as depicting the combats of the Trojan war, and Andromache,—

"In the chamber at the palace top,
A splendid texture wrought on either side,
All dazzling bright, with flowers of various hues."

The women of Sidon are said to have been noted for their skill in embroidery even before the period of the Trojan war. Pliny attributes its invention to the Phrygians, hence the Roman name for embroidered garments, — *Vestes Phrygionis*.

It should be understood, however, that the word signifying "embroidery" is used by ancient writers as a generic term for all kinds of decorative work done by the needle. In later periods, the sense was limited to peculiar effects produced by certain fixed methods, and in more modern times a still greater limit is understood.

The practice of embroidery in Europe was very largely extended during the mediæval periods, and was carried to great perfection for the personal adornment of royalty, the nobility, and especially in the service of the church. The vestments of the priesthood, hangings, veils, canopies, curtains, and other textile articles of use and decoration, were largely embroidered; indeed, the character of the work of this period was chiefly ecclesiastical, and the inmates of convents em-

ployed their time in this direction with remarkable results. Some of the most valuable illustrations of the manners and costumes of past ages have come down to us through the agency of the needle; and in proof of this it will be sufficient here to allude to those interesting records in embroidered work and tapestry, as coverings for the walls of rooms, and hangings for doors, windows, and corridors, in the execution of which the ladies of noble families beguiled their leisure hours. Family traditions, historical incidents, portraits, the sports of the field, and groups of natural objects, were all employed in the execution of textile ornaments for the decoration of apartments. In England this art was carried to a high degree of perfection, and in the execution of vestments, English work was so highly prized as to have been constantly sent out to Rome by command of the Pope. There can be little doubt that the skill in embroidered work displayed by our ancestors was the forerunner of several of our most common kinds of ornamentation. Paper hangings for instance, were originally professed imitations of tapestry, the patterns having been first printed on canvas.

Ancient embroidery is divisible into three heads:—"Low" embroidery, in which the threads are laid flat on the ground of the work; "Raised" embroidery, in which the figures are brought into relief, and rounded by means of wool, cotton, parchment, or paper placed beneath the needle-work; "Gimped" embroidery, in which the figures are formed by cords of gold, silver, or silk, and portions of velvet or satin, gold and silk.

Hand embroidery is still extensively practised in the East. The true Indian and Persian scarfs are embroidery work of floss, or untwisted silk, and exceedingly rich effects are thus produced, as will be remembered by those who examined the Indian productions of this class in the Great Exhibition of 1851.

In Turkey and Greece embroidery with gold and silver thread, or richly-coloured cottons, silks, and velvets, is much used for robes and decorations. The embroideries exhibited by Turkey, in the Great Exhibition of 1851, were of a marvellous character in execution, and deserved much more attention than it is to be feared they received. As Commissioner of one of the groups of Juries, I had to direct attention to them, and in the midst of so much that was excellent, the difficulty lay in selecting those most worthy of reward. The articles embroidered were all made up for use as clothing, and the jury for that class had therefore to undertake the work of adjudication. Such was the difficulty of selection, that the task was nearly abandoned in despair, and nothing but an urgent demand on my part that so remarkable a display should have full justice done to it, induced the jury to proceed. From the systems adopted by the Turkish authorities in collecting and registering the works, some of the best had to be passed over, and the jury finally reported:—"It is impossible to recognise, either by medal or honourable mention, many of those to whom such distinctions are justly due, as no names are given whereby the jury can take cognizance of the articles. Those cases which the jury have been enabled to recognise are selected as much for the facility for giving such recognition, as for the high merit displayed in the production, inasmuch as there are others deserving of the same consideration, could the jury have discriminated amid the vast collection of articles." The awards are curious, and all to women, except a prize medal to the Tailors' Association of Janina, for Albanian costumes. Whether the daughter of the Turkish gentleman with an unpronounceable name ever received the awarded medal, or the girls Bukudgy and Istche, or the wives of Carabet and Tezy got information of the "honourable mention" made of their embroideries, is a matter of speculation to this hour with those who desired to do them justice.

Probably the finest modern examples of pure embroidery in silk, unmingled with gold and silver thread,

pearls or precious stones, are executed by the Chinese. Not only in execution, but in design and the fitness of the forms of the ornament to the material and purpose, the embroideries of the Chinese generally exhibit a great superiority to the usual examples of European skill. The extreme care taken with the work, especially in the more costly specimens, renders them very instructive examples of textile decoration. From 700 to 750 stitches may be counted in the space of a square inch. Some years ago I took the trouble to dissect some of the best examples I could meet with, and the more closely they were examined the more marvellous the work appeared. Some diagrams now before you show the peculiarities of treatment, and illustrate in some degree the arrangement of the stitches.

Of course, the leading Continental nations are producers of embroidery, especially France, but the styles adopted are usually either a reproduction of the ancient methods or imitations of Eastern productions.

This brief sketch of the progress of embroidery by hand, must suffice to introduce the special subject before us,

EMBROIDERY BY MACHINERY.

This has been effected to a considerable extent by the Jacquard and Draw looms, or, rather, effects in imitation of embroidery have been produced. With this, however, we have nothing to do, as machine embroidery, by the legitimate means of the needle, is the point which it is desired to explain and illustrate.

The first idea of the embroidering machine originated with M. Josué Heilmann, of Mulhouse. His object was to combine accuracy of repetition over a large surface with economy of production. Selling it to Messrs. Koechlin, also of Mulhouse, he developed the principle of its construction in their establishment, where it was first practically applied to manufactures. The invention appears to have been first brought before the public in the National Exposition of the Products of Industry, at Paris, in 1834; but the machine was patented for England about 1829, and with all rights, &c., purchased from Messrs. Koechlin by Mr. Henry Houldsworth, of Manchester, by whom it was subsequently very greatly improved from time to time. The first successful use of the machines as improved was in the silk manufactory of the late Mr. Louis Schwabe, in the then Portland-street Mill, Manchester; Mr. Houldsworth having made an arrangement with Mr. Schwabe, as a manufacturer in whose trade their powers would find most development. Here they were employed in embroideries for upholsterers, but chiefly in the "sprigging" of waistcoatings, to which they were peculiarly adapted, as will be shown in the course of the illustrations of the construction and action of the machine.

The leading principle of the machine in the production of a pattern is that of the pantagraph, by which a given form is copied to a fixed scale, in this particular instance to one-sixth the size of the guiding pattern.

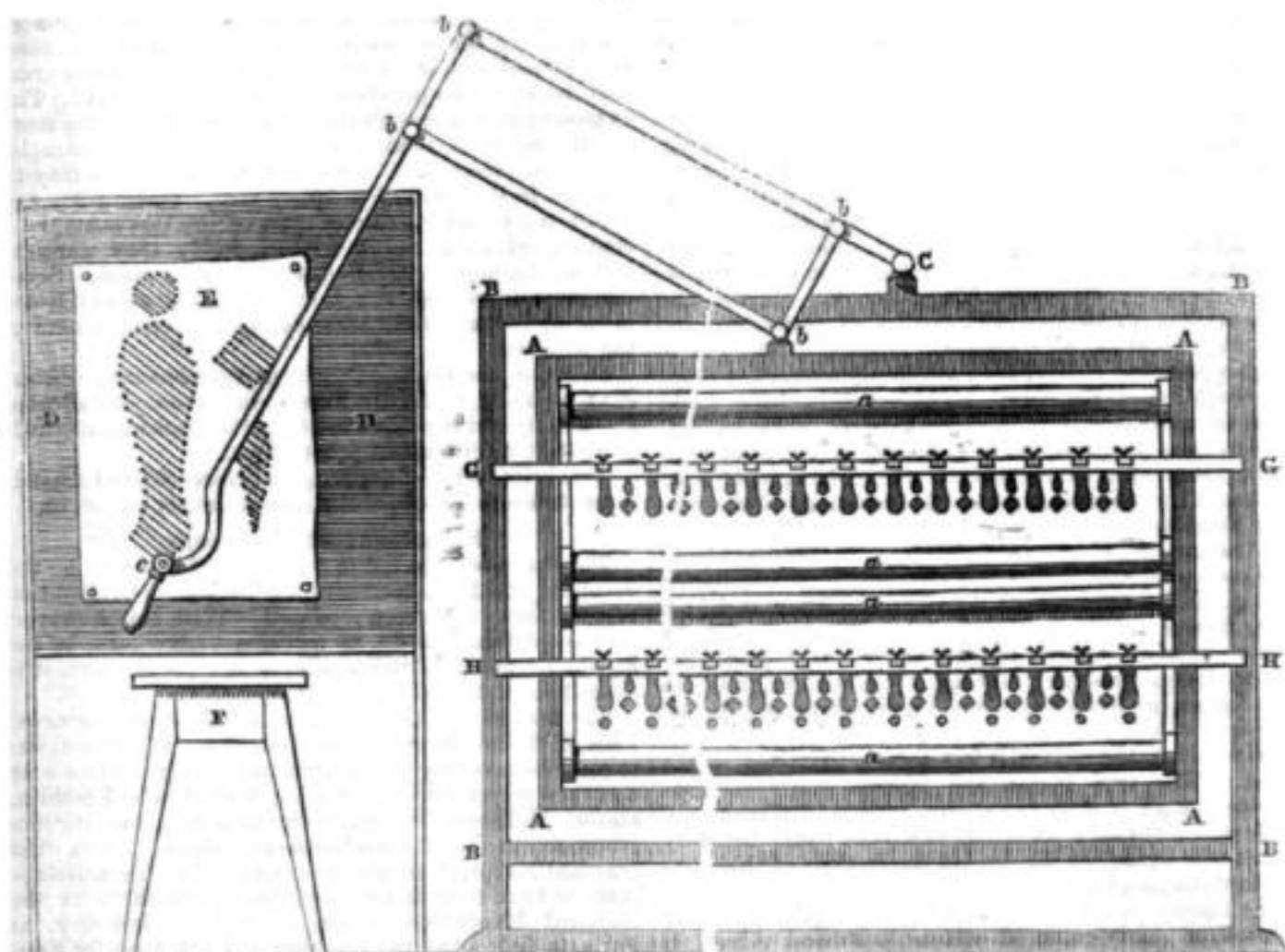
The machine may be divided into *three* parts:—

1. The pantagraph and the embroidery frame, attached upon which the fabric to be embroidered is stretched.
2. The arrangement of the needles and the pincers by which they act on the fabric.
3. The locomotive arrangement of the carriages by which the embroidering threads are carried through the fabric.

The diagrams by which the constructive principle of these several parts will be illustrated are not drawn to any scale or relative proportion, but are simply intended to convey, as far as possible, a distinct idea of the leading features of the machine and its operations, and they have been drawn and arranged with that view only.

In Fig. 1 we have an elevation of the leading features of the machine, divested of all detail, giving only its essential parts. A, A, A, is the embroidery frame, within which the fabric to be embroidered is stretched in

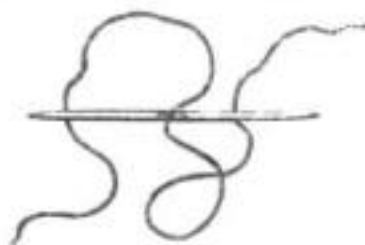
Fig. 1.



two divisions, an upper and lower one, upon rollers a, a, a, a . This swings from the outer frame B, B, B, B , at the pivot of the pantograph C . Every person who understands the action of an ordinary pantograph, will at once understand that if a figure of suitable design and size is fixed on the vertical plane D, D , as shown in the pattern E , all that will be required in order to copy this pattern to a fixed scale on the plane A, A, A, A , will be to move the pointer c of the lengthened side of the parallelogram b, b, b, b , by the handle attached to it. The angles of this parallelogram will become acute or obtuse, just according to the motion required to bring the frame A, A, A, A , into its proper relative position. To effect the copying of the pattern E by a series of stitches, a drawing generally six times the size of the pattern to be embroidered, is made upon a piece of stout paper, or a plate of tin. Each stitch is arranged to this scale, and a hole punched in the paper or plate at each end of every stitch. Into this hole the pointer of the pantograph is inserted before each stitch is taken. This point is moved backward and forward across the pattern, upon the system of stitches laid down by the embroiderer seated on the stool F ; and with each motion the needles are drawn backward and forward through the fabric by a corresponding action of the carriages, on the frames of which the pincers which hold the needles are fixed, as indicated; G to G in the upper tier thus embroidering the upper piece of cloth, and H to H in the lower tier, by which the fabric fixed upon the lower pair of rollers is embroidered. The pattern E is thus repeated one sixth the size, each needle in operation executing a repeat, and the pattern when finished extends the whole width of the fabric at one operation.

The arrangement of the needles, and the mode by which they are alternately held and released must now be noticed. The needle-holders or pincers act in a manner analogous to the human hands, working from each

side of a framework of cloth, placed in a vertical position, the needle being a double-pointed one, with an eye for threading the silk in the middle, thus:—

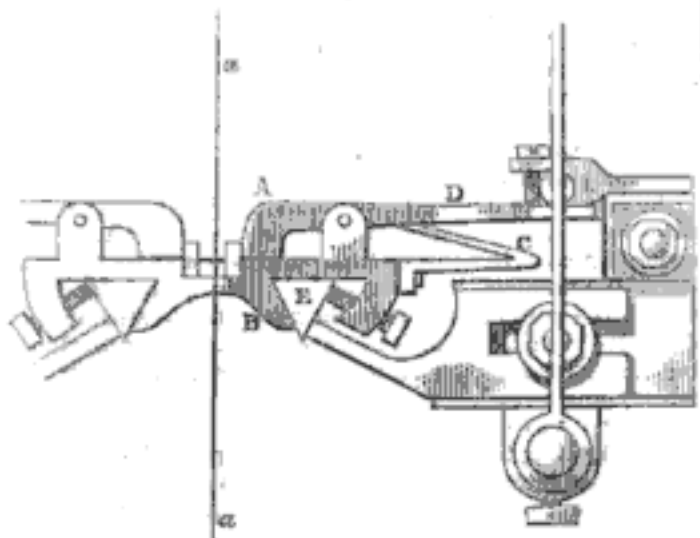


The pincers are arranged, as already stated, in a double row on two tiers across the frame work of the carriages on each side of the embroidery frame, and project over, so as to come in contact with the fabric when stretched upon it. (See Fig. 3, a, b, c, d .) They are placed at one inch and a half from each other, and the larger machines have as many as 75 in each row. The construction of these pincers may be illustrated in profile by Fig. 2.

A is the upper jaw of the pincers, which is kept down upon the needle by the action of a spring,— C . By this spring the upper jaw is brought back into its place after the end has been pressed down at D , to release the needle after it has pierced the fabric, (as shown in section at aa ,) and been received by the opposite pincer. B is the lower jaw, which is, of course, fixed to the frame. The prismatic rule E runs the whole length of each series or pincers, and sustains them in a perfectly true and corresponding position. The arrangement for the release of the needle after it has been driven through the fabric cannot be easily explained; it must, therefore, suffice to say, that the upper jaw of the pincer is pressed down at the proper time by the action of a rod on the lever end D , and the needle, thus released, after having passed

through the fabric, is held fast by the opposite pincer,

Fig. 2.

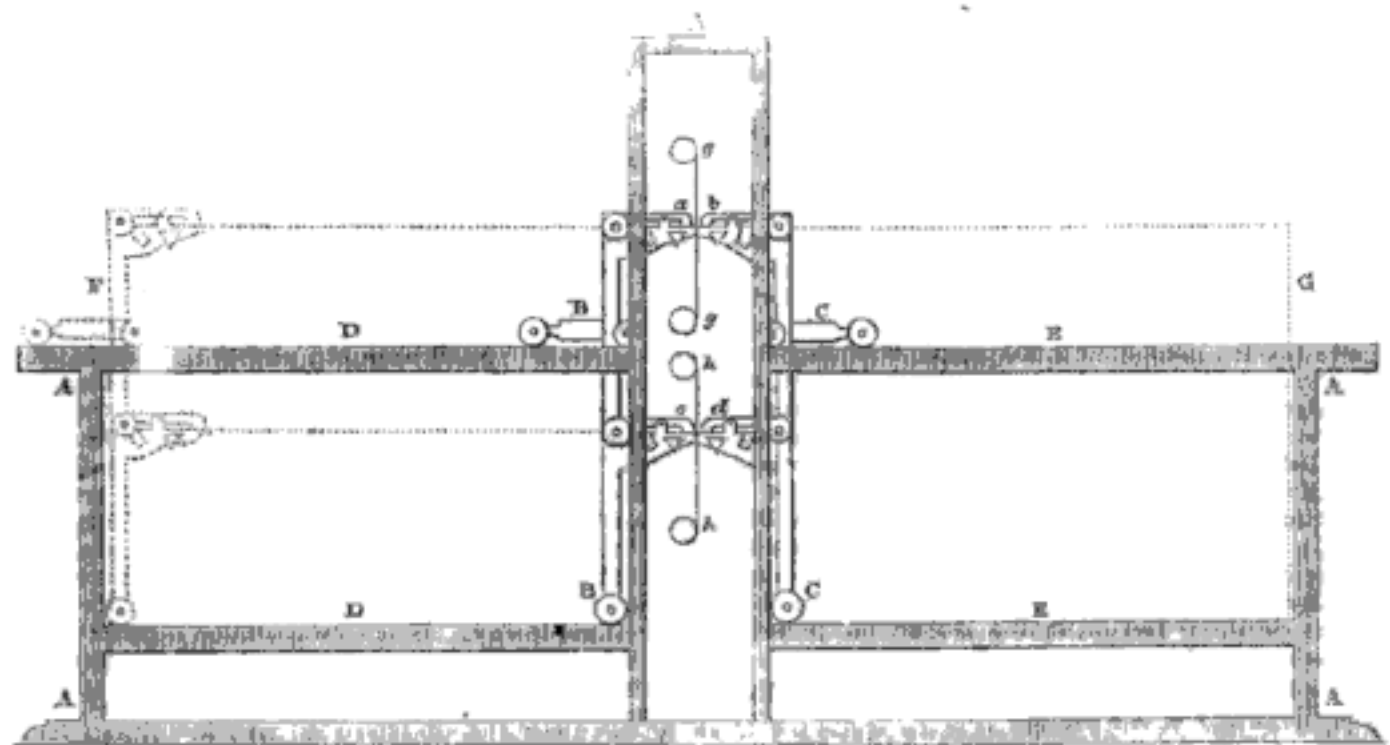


the thread being thus carried to its full tension, as shown in Fig. 3 at F, and then brought back again to the fabric to be taken up in the same manner by the pincer from which it had been released, again to return at each motion of the pantagraph handle indicating another stitch.

Originally this release of the needles depended upon the worker of the pantagraph, who had to use his or her feet upon treadles provided for the purpose, and attached to the releasing rod. One of the improvements effected by Mr. Henry Houldsworth was a mechanical arrangement by which these treadles were dispensed with, and the pantagraph worker, or embroiderer proper, released from the duty of attending to two movements. By this arrangement the releasing rod is acted upon by a clock motion, which is brought into play at the instant the carriage is driven against the frame work when the needle passes through the fabric.

The locomotive arrangement of that portion of the machine which carries the pincers and needles, may be understood in its elementary form by a reference to Fig. 3.

Fig. 3.



A, A, A, A, A, represents the structural framework of the machine, and is of iron; B B and C C the carriages acting on each side of the fabric; a b and c d indicate the position of the pincers carrying the needles. These carriages run on a species of railway along the horizontal lines D D and E E, and are required to be most accurately fitted. The section of the fabric stretched in a vertical position on the rollers g g and h h, and passing between the upper and lower tier of pincers, gives the centre line of the diagram.

We will now assume that the needles being threaded and fixed in the pincers b and d, are pushed through the fabric represented as stretched upon the rollers g g, h h. The needles are released from b and d, and seized by the pincers a and c. The carriage B B is then drawn backward to F, until the threads are all drawn equally through the fabric. The needles being threaded in pairs, that is to say, with a thread of double length, these threads are drawn up to their full tension at once. This supersedes the knotting of the thread to prevent its being drawn through the cloth. The embroiderer sitting at the pantagraph moves the point for the first stitch, as shown in Fig. 1 at E, the carriage B B is brought back to the fabric, and the needles forced through into the jaws of the pincers

b d, again they are released from a c, and being duly fastened upon by b d, the carriage C C is drawn along the frame until the thread is again at its full tension, when the carriage reaches G. Stitch the first is then complete.

The pantagraph pointer is again moved for another stitch on the enlarged pattern E, Fig. 1, and again the process of bringing up the needles to the fabric—their passing through—their release on one side and their seizure on the other is repeated, and so the work goes on until fresh needles and thread are required, when the same course is repeated in the putting in, and starting the work at the same point at which the last stitch of the former thread left the work incomplete.

Each machine is usually worked by three young women and three or four girls, the latter being employed to thread the needles and prepare them for the machine, that a supply may be always on hand. One young woman—who is generally the most experienced, and acts as the "captain" of the machine—attends to the pantagraph, criticises the work, and directs the motions of the workers of the carriages, who push backward and forward the rows of needles. With an intelligent "captain," quick and skilful workers, and rapid threaders, an elaborate pattern,

and a machine in good working order, I know nothing in manufactures more interesting than the embroidering machine. The pattern grows so rapidly under its action; every stitch tells toward the final effect; and the result is at once so satisfactory, that the operation appears to be the realisation of the thought of the workers direct from their minds, and with no more mechanism than is necessary to realise that thought.

The original machine, as devised by M. Heilmann, was worked by one person, but had this feature been retained the economic value of the invention would have been lessened. It was only by extending the size and capabilities, improving the structure of the parts, without in any way interfering with the principle, which has always been the same, that it could be brought into successful operation as a paying manufacturing agent. In Switzerland the original form is still retained for cotton embroidery, and found to answer for that class of work.

From the time of its first introduction into England, until within the last two or three years, the embroidering machine was employed only by Messrs. James Houldsworth, and Co., of Manchester, as the successors of Mr. Louis Schwabe. A few machines are now used by one or two other persons at Manchester, but the great mass of productions in machine embroidery still emanate from the original proprietors, who have some twenty machines, more or less actively employed.

After the death of Mr. Louis Schwabe, in 1845, these machines were gradually brought to bear upon ladies' dresses, and during 1847 and 1848, at which period I was actively engaged with my friends, the Messrs. Houldsworth, in the development of the capabilities of the machines in this direction, it is not too much to say that the productions of this house, by mechanical means only, did much to foster and keep up the demand for embroidery; and so far from interfering with the hand labour, it is a fact that, in 1849, there were in London alone some 2,000 persons obtaining their living by embroidery who had never done so before, and in Scotland and the north of Ireland some thousands of females were employed in this industry, not in large factories, but in their own houses. The patterns were printed in outline upon the merino or other fabric to be embroidered. These were distributed by travelling agents, and were afterwards collected by them from the workers after the embroidery was finished. As is now generally known, this is the method pursued in Scotland and the north of Ireland in the production of sewed muslins and tambour work.

The advantages of the embroidery machine over hand labour lie chiefly in two points.

1. The rapidity, accuracy, and excellence of work in the production of repetitions of the design in borders, sprigs, flounces, and trimmings for dresses.
2. The perfect embroidery of a pattern on each side of the fabric, as in the case of window curtains, table covers, and trimmings for upholstery purposes.

In the first of these it will be seen that, inasmuch as a needle can be worked at every inch and a half of a machine, and in a double row, there must be great economy in the execution of a pattern arranged so as to repeat at every inch and a half within the vertical range of the embroidering frame, that is to say, within the action of the pantagraph in its command over the rows of needles. The machine is therefore always worked at the greatest advantage when the full range of needles is brought into operation by small repeats, and at the greatest disadvantage when large repeats are worked, and thus a certain number of needles, or rather needle-holders or pincers are idle. Thus, in a pattern which is only repeated at every six inches, three pincers would be idle in every such space in the machine, and my own impression is, that with less than a dozen needles at work, the machine operates at a loss, or at least that there is no gain in the work, except in the matter of a double-sided pattern.

The usual calculation is that with less than eight needles the work is executed at a loss.

This is of course one of the disadvantages of the machine in certain classes of the work; and except under certain peculiar arrangements of the design, there was always great difficulty in competing with hand labour, in the execution of the "collonade" fronts of ladies dresses at the period these were in fashion. On the contrary, in bordered and flounced dresses, hand-labour had no chance with the machine.

As may be supposed, these machines presented an apparently insurmountable obstacle in the execution of a series of repeats in a curved line, which a few years ago was one of the problems yet to be solved. Mr. James Houldsworth, the present proprietor, however, has overcome this difficulty in suitable fabrics, by constructing an embroidering frame for insertion into the machine, on which the fabric being stretched upon elastic cross pieces, and screwed up to the desired curvature, the design is embroidered in a right line, but when the fabric regains its original position on removal from the frame, this line becomes a curve, the reverse of the direction in which it was stretched.

Embroidery for dresses being comparatively out of fashion, the machines are chiefly used at the present time for furniture fabrics, such as window curtains, table covers, valences, borderings, and goods for foreign markets, of which there are before you some admirable specimens, all produced by Messrs. James Houldsworth and Co., of Manchester.

Some of the capabilities of the embroidering machine are shown in these examples. The work is clear, fine, and, according to the character of the design, perfect in all its parts, whilst the advantage of having the pattern complete on both sides of the fabric must be apparent to every one, especially in table covers and window curtain borders. Here the peculiar action of the machine in driving the needles through at a perfect right angle, and returning it at the same angle, becomes of great value; not, after all, that the two sides are equally perfect, yet no unpractised eye would easily detect the difference. When, however, the hand embroiderer attempts this kind of effect, the amount of attention required to execute the work, with even a moderate degree of precision, renders the operation anything but an economical one.

An example of work, as applied to linen and cotton fabrics, not previously attempted in these machines, has reached me to-day. When the operation is perfected by the necessary experience, the result will no doubt be satisfactory, as the style of embroidery is well adapted to a great variety of articles in ladies' dress.

In the matter of design as applied to machine embroidery it must be evident that there are certain peculiarities about it which the artist, to be successful, must thoroughly understand.

The repeats of the pattern must all be either one inch and a half wide, or multiples of that width; that is to say, three, four and a half, or six inches, and so on. The vertical range may be said to be unlimited, except by economy of production; for, by means of the rollers on which the fabric is placed, the work can be carried even into stripes, as, indeed, has been done when necessary. In making a working design, the length of stitch has to be carefully kept in view, and the angle at which the thread will lie when the work is seen as a whole. In hand-embroidery this is also a condition, but in that great masses of these stitches may be brought together, which is a peculiarity of Eastern embroidery, and the effect produced by the contrasting angles at which the thread is inserted is often very remarkable, especially when different shades of the same tint or colour have been employed. In machine embroidery this kind of effect cannot be imitated successfully or economically, and it is usual to keep each form as much as possible to one, or, at most, two series of stitches. Shaded effects, however, are produced, as in the case of the dress embroidered for Her Majesty the

Queen, by dyeing the silk with a graduated tint or shade, by which the thread is dark at one end and gradually becomes light at the other end. Pleasing effects are thus produced in a very economical manner, even in what are called self-coloured embroideries—say, on dark green merino, embroidered with silk shaded from dark to light green. These irregular effects of light and shadow are not, however, very legitimate when viewed artistically; but for this the manufacturer cares quite as little as the consumer. If the thing sells with the one and “looks pretty” to the other, that is enough, according to the art-creed of both.

There is yet another point which in the smaller patterns it is of considerable importance for the designer to bear in mind. Silk at 40s. per lb. is too costly to be wasted, therefore it is desirable that each needleful should do its work, and that no fragments should remain to cut away at a loss. Hence patterns have to be designed to the needleful; and, if a pattern, however excellent in the abstract it may be, consumed one needleful and 36 inches out of two needlefuls of 42 inches each, it would be considered anything but sound economy in machine embroidery to execute it, as eight inches of silk would be lost in each needle employed—a waste upon any extent of production which would astonish those who are not in the habit of thinking about mere fragments in the materials of manufacture. It will at once be seen from this fact that the designs for machine embroidery must ever be somewhat peculiar, and, to a certain extent, limited in range of form, and that all the more successful—certainly the most economical—are made almost in the presence of the machine by which they are to be executed, and, for the most part, under no higher inspiration than that of a species of artistic measure table, such as:—

Two needlefuls make one flower.

Three flowers make one repeat.

Twenty repeats make one border.

Four borders make one table cover decoration.

One can thus tell almost to an inch—certainly to a yard—how much silk will be consumed in a given operation.

It will now be asked, “Do these machines begin and finish their work completely?” Not absolutely; but so perfect is the work in a well-arranged pattern that, with the exception of the cutting out of certain ends used for starting points, the occasional fastening of other ends, and the insertion here and there of a stitch by hand, the work is practically finished when it leaves the machine. Experienced hand embroiderers, acquainted with the peculiarities of machine work, are, however, employed to look it over.

As a branch of factory labour for females, none is so healthy, certainly none more interesting.

The workers are generally the most intelligent of their class, and their wages are fully remunerative when work is abundant; but there is one great drawback in the economical working of these machines, in contradistinction to that of most other manufacturing agents. The fashion for embroidery fluctuates very much. In times of increased demand there is great anxiety and much trouble in instructing even the generally intelligent girls who are desirous to get this kind of employment.

A sudden change of fashion throws the machines out of work, and with it the workers, and when a demand again occurs, fresh hands have to be instructed. Happily, there is less change in furniture fabrics than in dresses, and thus the best hands are retained ready for an emergency and the instruction of others; but the operative classes are now keenly alive to the disagreeable character of fluctuating employments, alike to employer and employed; and thus the difficulty is increased even to such a house as that of the proprietors of these machines, whose reputation as employers of factory hands has always stood so high.

In concluding this attempt to explain the mechanical

principle and economic application of one of the most interesting agents which, in the progress of modern invention, has been brought to bear upon textile decoration, it is only right to state that the imperfections of the exposition are inherent in the subject, and nothing but a very earnest desire to comply with the wishes of the managing officers of the Society of Arts, that a popular explanation of the construction and peculiarities of the embroidering machine should be given to the members, would have induced me to undertake the task, under the many disadvantages which must necessarily arise out of the fact that my connection with these machines, in a practical form, ceased ten years ago, and I doubt if I have seen them more than three times in the interval.

DISCUSSION.

Mr. FREDERICK LAWRENCE inquired whether different coloured silks or threads were worked in the machine at the same time.

Mr. WALLIS replied that in producing chintz effects, as many colours as might be necessary could be used in different needles, but in getting the shaded effects, as shown in some of the examples, the “trick,” for such it really was, of shading the silk in dyeing from light to dark had to be adopted; and thus a certain variety of effect was produced, although this was not always of a very artistic character.

Mr. WILLIAM HAWES said, looking at this paper, not with the eye of a manufacturer, because he had no knowledge to enable him to form an opinion upon the subject, but as being very interesting in a social point of view, he would offer a few remarks upon one or two matters connected with the subject. The first point which struck him, was that this invention afforded employment to women. It was that peculiar kind of occupation which, whilst stimulating taste, was capable of becoming a domestic manufacture, and was, therefore, of the greatest benefit to that class which stood most in need of employment. This machine appeared to effect the important end of the economical working of a costly material; for they understood from Mr. Wallis that they could measure, almost to the fractional part of an ounce, the quantity of silk necessary to produce a certain amount of embroidery; and, when that fact was known, all temptation to fraud on the part of the workpeople ceased; whereas, in times past, when the silk machines were employed in the houses of the workers, they became a source of constant collision between the employers and the employed, in accounting for the material entrusted to them for the purposes of manufacture. If this machine was capable of doing certain descriptions of embroidery, as well as, or better than, hand labour, and employed persons for whom employment was required, and at the same time allowed the manufacturer to entrust a valuable commodity in the hands of the work-people, without fear of fraud—on all those grounds it must be regarded as a valuable addition to our mechanical resources. They had been told that the machine was not, in all cases, capable of producing such perfect results as were obtained by hand labour; but they were likewise told that for some descriptions of goods it produced a better and cheaper article than hand labour could supply. These were points which he thought were especially deserving the attention of the Society; and he considered that they were very much indebted to Mr. Wallis for the clear manner in which he had put before them the benefits which manufacturers and the public might derive from machines of this kind.

Mr. DAVID CHADWICK said, although not connected with this branch of manufacture, he wished to call the attention of Mr. Wallis to an omission in his paper. He did not hear that any mention was made of a gentleman in Lancashire who had devoted a great deal of attention to embroidery—Mr. Gilbert French, of Bolton. He had visited the works of that gentleman, and had

noticed the large number of females who were employed upon this beautiful work, and he had seen specimens of embroidery which, to his eye, were more beautiful and elaborate than those exhibited that evening. Although, as a Manchester man, he felt proud of the honourable mention that had been made of Mr. Houldsworth, yet he thought it would have been well if Mr. Wallis had brought forward some specimens of hand labour in this branch of art, produced by first-class workers of the present day, so as to compare them with the best productions of machine embroidery. As one of the public he thought Mr. Wallis's paper was somewhat defective in some portion of its statistics. He had given them minute particulars of the process by which the work was effected, but he had not given any comparison of the cost of producing these beautiful articles by machinery as compared with that of hand labour. To the public generally it was a matter of little importance by what means a particular article was produced; they were only interested in the economy of the production. Those who purchased these fabrics were astonished at the price at which beautiful table covers could now be obtained, as compared with the cost of similar articles ten or fifteen years ago. He should be glad to hear from Mr. Wallis, if he was able to furnish it, a comparative statement of the cost of producing these articles by hand labour and by machinery. During his (Mr. Chadwick's) visit to Mr. French's establishment, he was informed that that gentleman supplied hand-worked patterns of embroidery of the most costly description, not only to every part of England, but almost to every part of Europe, and that he found, notwithstanding the increasing production of machinery, the demand for hand embroidery work had been constantly advancing.

Mr. WALLIS said he feared that Mr. Hawes had misunderstood his remarks as to the increase of domestic employment occasioned by the stimulated production of embroidery in 1847-8. The machines could never be brought into use in the houses of the workers like the sewing machines, as they were of too cumbersome and costly a character. All that was meant in this direction was to call attention to the fact that the demand for hand labour was increased by the action of the machines in cheapening production and thus stimulating demand.

Mr. HAWES said he had merely quoted from the paper itself, which stated, "so far from interfering with the hand labour, it is a fact that, in 1849, there were in London alone some 2,000 persons obtaining their living from embroidery who had never done so before, and in Scotland and the north of Ireland some thousands of females were employed in this industry, not in large factories, but in their own houses."

Mr. WALLIS continued—With respect to Mr. D. Chadwick's remarks, it happened that Mr. Chadwick was a statistician, and he (Mr. Wallis) an artist; both studied figures, but they were of a different kind. He had great respect for figures in arithmetic, and no doubt it would have added to any value there might be in his paper if some comparative statement could have been made as to the cost of production in certain classes of work by machine and hand embroidery. It happened, however, that one or two articles would be no test whatever for any other article, as each would have to be judged of by the quantity of work in each under the precise conditions of its production, for, as shown in the paper, economy in machine embroidery depended upon the greatest use of the needles, and adaptation of the pattern to length of thread, etc. With respect to the excellent productions of Mr. Gilbert French, of Bolton, he (Mr. Wallis) thought he had carefully guarded himself from misapprehension when he stated that his subject was commercial and not artistic embroidery; besides, he had illustrated by a reference to certain examples, the fact that the machine could not produce large and massive patterns of an exceptional character with the same economy as small repeats; nor did he believe that on the whole the larger works would pos-

sess the artistic qualities of good hand embroidery. His object had not been comparison, but a simple statement of what the embroidery machines could do.

Mr. G. F. WILSON, F.R.S., said there was one point of great interest mentioned in the paper, which had a particular bearing upon the matter which they were all so anxiously discussing—namely, the great Exhibition of 1861. It had been shown that this machine had been first brought out at the national exposition of products at Paris, which was another fact added to the many that had already appeared in the *Journal* of the Society in connection with exhibitions.

The CHAIRMAN remarked that it would be clear to all present that when Mr. Wallis undertook to read this paper he entered upon a difficulty. When he (the Chairman) first heard the announcement of this paper, he could not conceive how Mr. Wallis could make them comprehend the subject without a machine to illustrate it. But they must all admit that he had explained it well, and that they now really understood how embroidery by machine was accomplished. With regard to the statistics of economy by this process, which had been asked for by Mr. Chadwick, they would understand that in a certain class of goods the economy was twenty times as great as in others. Some of these machines would carry 100 of these needles in one length, and work two frames at the same time—working 200 needles in a simultaneous operation. It appeared that a machine of this description required the attendance of one person to work the pantograph point, four girls to move the frame, and three others to thread the needles. Thus, they had 200 needles at work with the labour of eight persons, which made a proportion of 25 needles to 1. In some cases there would be no economy at all in the use of the machines; but it was in such articles as table covers, and embroidered cloths that the economy of the machines was most apparent. In the embroidery of one of the table covers exhibited, they would probably have two rows of 96 needles each at work, and from the length of the frame they could work two covers at once; and at the same time the manufacturer had the satisfaction of knowing that he could not be robbed of his silk, as they could calculate almost to a drachm what quantity of silk was consumed in working a particular pattern. Mr. Wallis did not go quite far enough back in his history of the use of these machines. He (the Chairman) remembered that about the year 1834, Mr. Schwabe undertook a very large contract from a city house for embroidered merino dresses; he believed that was the occasion of the first introduction of machine embroidery for ladies' dresses. He might observe that since sewing machines were introduced they had heard very little about distressed needlewomen, and it was evident that the introduction of the embroidery machine had greatly increased the demand for that branch of labour. Machine labour and hand labour acted and reacted upon each other, the one creating a demand for the other. He had now to propose that which he was sure would be passed with acclamation, namely, a vote of thanks to Mr. Wallis for his interesting paper.

The vote of thanks having been passed,

Mr. WALLIS briefly acknowledged the compliment.

The Paper was illustrated by a large number of fine specimens of machine embroidery, lent by Messrs. Houldsworth and Co., of Manchester, as well as by several working diagrams prepared by Mr. Wallis. Messrs. Wilson and Newton exhibited their Boudoir Sewing Machine.

The Secretary called attention to an instrument, invented by the Rev. W. Taylor, for enabling the blind to work sums in arithmetic, and solve algebraical problems. A description of the instrument will be found at page 328 of the *Journal*.