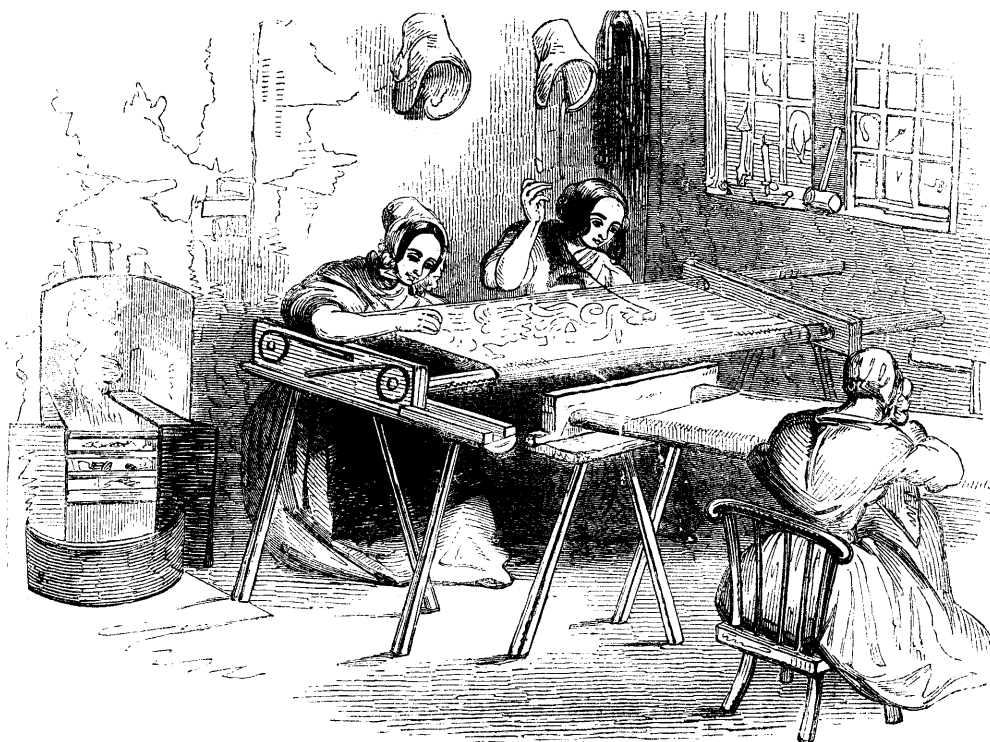


A DAY AT THE NOTTINGHAM LACE-MANUFACTORIES.



[Lace-runners or Embroiderers at Work.]

IF the fair ladies who wear veils, 'cardinal capes,' scarfs, collars, borders, quillings, and edgings of British lace, could know the vast amount of inventive skill, of complicated machinery, and of patient endurance involved in the production of these articles, they would see how largely the well-being of thousands depends on the fluctuations of 'fashion,' and would perhaps marvel how such fabrics could be sold at such a price as the modern market indicates.

We shall perhaps be correct in saying that those who, from their sex and the form of their attire, have most concern with lace as a material for ornamental dress, are seldom in a condition to decide whether lace is in our own day made by machinery or by hand; or how far the two are combined. And there is good reason why this may be the case; for almost every year presents some new adaptation of mechanism, some new order of processes, by which a pattern is produced that could before only result from the needle of the embroiderer. In some cases the imitation is so exact, that a close inspection is necessary to determine the mode of production; while in others the machine produces a new pattern altogether, rather than an imitation of an old one worked by hand.

But before we conduct the reader to the busy lace-making world of Nottingham, where bobbin-net lace may be said to form the staple product, it will be necessary to pay a little attention to that which was formerly called *lace*, when no such article as bobbin-net had yet been heard of. The connection between it and the modern manufacture is in every way remarkable.

The real lace, such as was worn by the dowagers of the last century, is formed principally of *flax* thread, and is wholly worked by hand, not only in the decorative parts, but in the mesh-work ground itself. The bobbin-net of modern times is made of *cotton* thread; the meshes being made wholly by machinery; and the figured device (if any) being effected sometimes by the same machine and at the same time as the ground, and sometimes by a kind of embroidery or tambour-work. The silk net, such as the material of which black veils are sometimes made, is, as its name imports, made of *silk* thread, and is formed by machinery very nearly on the same principle as bobbin-net.

At what period and in what country this elegant material was originally first wrought for dress cannot perhaps be easily determined. It has been supposed that Mary de' Medici was the first who brought lace into France from Venice, where, and in the neighbouring states of Italy, lace seems to have been long previously worn. It is recorded that lace-making was introduced into this country by some refugees from Flanders, who settled near Cranfield, now a village on the west side of Bedfordshire, and adjoining Buckinghamshire; and it has been supposed that the first kind so made in England was that which is called *Brussels point*, the net-work being made by bone bobbins on a pillow, and the pattern and sprigs being worked with the needle.

The working of hand-made or 'pillow lace' may be thus briefly described:—The lace-maker sits on a stool or chair, and places a hard cushion on her lap. The desired pattern is sketched upon a piece of parchment, which is then laid down upon the cushion; and she in-

ts a number of pins through the parchment into the shion, in places determined by the pattern. She is o provided with a number of small bobbins, on which reads are wound; fine thread being used for making meshes or net, and a coarser kind, called *gimp* or *mp*, for working the device. The work is begun at e upper part of the cushion by tying together the reads in pairs, and each pair is attached to one of e pins thrust through the cushion. The threads are en twisted one round another in various ways, ac- ording to the pattern, the bobbins serving as handles ; well as for a store of material, and the pins serving ; knots or fixed points, or centres, round which the reads may be twisted. The pins inserted in the ashion at the commencement are merely to hold the reads; but as each little mesh is made in the progress f the working, other pins are inserted, to prevent the reads from untwisting; and the device on the parch- ment shows where these insertions are to occur.

Such is the simple principle, modified according to he pattern about to be produced, on which 'pillow- lace' is made; and it is astonishing how many females ave been dependent for their subsistence on this occupa- tion. Throughout the midland counties, especially Jedford, Buckingham, and Northampton, almost every own and village exhibits this domestic branch of ma- nufacture; but so greatly has it suffered by the com- petition of the Nottingham lace, that it would perhaps e difficult now to say what is the number of persons thus employed. In a petition presented to Queen Adelaide in 1830, it was stated that a hundred and twenty thousand persons were dependent on the pillow- lace manufacture, and were reduced to an extremely low rate of earnings; but it is supposed that the num- ber has been since then greatly reduced. Mr. Slater (in M'Culloch's 'Commercial Dictionary'), after speak- ing of an improved pattern of pillow-lace introduced about the year 1800, says, "From that time to 1812, the improvement and consequent success were aston- ishing and unprecedented. At Honiton in Devon- shire, the manufacture had arrived at that perfection, was so tasteful in the design, and so delicate and beau- tiful in the workmanship, as not to be excelled even by the best specimens of Brussels lace. During the late war veils of this lace were sold in London at from twenty to a hundred guineas: they are now (1831) sold at from eight to fifteen guineas. The effects of the competition of machinery, however, were about this time felt; and in 1815 the broad laces began to be superseded by the new manufacture. The pillow-lace trade has since been gradually dwindling into insigni- ficance."

Here then we come to the point of connection be- tween pillow-lace and machine-lace: we see that the former thirty or forty years back from the present time was in its zenith; and we have now to watch the steps whereby that system was produced which has exhibited such wonderful results at Nottingham.

Nottingham is the centre of the cotton hosiery dis- trict, as Leicester is of the worsted hosiery, and Derby of the silk. In all three varieties, the weaving (if it may be so termed) of the stockings is effected through the instrumentality of the 'stocking-frame,' one of the most singular machines belonging to our textile manufac- tures; and it was through the medium of this frame that machinery first became applied to the making of a material which should imitate lace. A stocking, it would be seen by a little examination, is formed by a series of loops, in which a long and continuous thread is passed successively through loops or eyes into which it is temporarily thrown; whereas lace, whether made on the pillow or by machinery, results from a twisting of one thread round another.

It is said to have been about the year 1770 that one

Hammond, a frame-work knitter (which is the techni- cal name for a stocking-maker) at Nottingham, while looking at a piece of pillow-lace in his wife's cap, bethought him of trying whether he could imitate it by a modified action of his stocking-frame. With what degree of success the attempt was followed is not clearly stated; but in all probability it was more instrumental in spurring on the ingenuity of others than in effecting the immediate object desired. From that time Not- tingham and its vicinity became a scene of remarkable bustle and ingenuity; numerous frame-work knitters being led, by the hope of pecuniary advantage, to study and improve the capabilities of their hosiery- frames. By degrees the retail shops exhibited specim- ens of machine-made lace, so much cheaper than than made by hand, as to give rise to a progressively in- creased demand; and Nottingham became the nucleus of an entirely new branch of manufacture.

The great improvement, however, which gave to the new branch of industry its most extraordinary impulse resulted from the inventive ingenuity of Mr. Heathcoat. This gentleman constructed a machine, which, from cer- tain arrangements of its parts, was called a 'bobbin frame' or machine; and hence has resulted the term 'bobbin-net.' But Mr. Heathcoat, like many other in- genious men who have introduced improvements in manufactures (among whom Jacquard furnishes a nota- ble instance), was treated roughly for his pains by some of the workmen; and he transferred his capital and skill to Devonshire, where the bobbin-net manufacture soon attained a high degree of importance.

Mr. Heathcoat, having obtained a patent for his im- portant improvements about the year 1809, retained the use of it in a great measure in his own hands till about the year 1823; when, the patent expiring, the manu- facture was taken up with an extraordinary degree of activity by many persons at Nottingham. "A tempo- rary prosperity," says Mr. M'Culloch, "shone upon the trade; and numerous individuals—clergymen, lawyers, doctors, and others—readily embarked capital in so tempting a speculation. Prices fell in proportion as production increased; but the demand was immense; and the Nottingham lace-frame became the organ of general supply, rivaling and supplanting, in plain nets, the most finished productions of France and the Ne- therlands." The earnings of workmen were quite extra- ordinary. The inhabitants of Nottingham look back to that period as to a sort of golden age, never equalled before or since, when men could earn wages such as would startle those unacquainted with the matter. Dr. Ure remarks, that "it was no uncommon thing for an artisan to leave his usual calling, and, betaking himself to a lace-frame, of which he was part proprietor, realize by working upon it 20s., 30s., nay even 40s. per day. In consequence of such wonderful gains, Nottingham, the birthplace of this new art, with Loughborough, and the adjoining villages, became the scene of an epidemic mania. Many, though nearly devoid of mechanical genius or the constructive talent, tormented themselves night and day with projects of bobbins, pushers, lockers, point-bars, and needles of every various form, till their minds got permanently bewildered. Several lost their senses altogether; and some, after cherishing visions of wealth, as in the old time of alchemy, finding their schemes abortive, sank into despair, and committed suicide."

By degrees the furor subsided, and the bobbin-net manufacture took its place among those which are of national importance, but not pre-eminent for lucrative returns. Competition and superabundant supply, as usual, brought this about. Various manufacturers and machinists, among whom are Mr. Morley and Mr. Leavers, have from time to time introduced improve- ments and modifications of the machine; and steam-

power, which was first applied to this manufacture in 1816, became gradually adopted more and more, till the most extraordinary changes have resulted in the prices of the finished articles. It has been stated that lace, which was sold by Mr. Heathcoat for five guineas a yard soon after the taking out of his patent, can now be equalled at eighteenpence a yard; that quillings, as made by a newly-constructed machine in 1810, and sold at four shillings and sixpence a yard, can now be not only equalled but excelled for three halfpence a yard; and that a certain width of net, which brought seventeen pounds per piece twenty years ago, is now sold for seven shillings! There are but few other branches of our manufactures in which equal vicissitudes have occurred in the same space of time.

The reader will by this time have had ample means for judging how it is that machine-made lace has done so much towards extinguishing the old pillow-lace; and will be prepared to accompany us in a brief notice of the manufacture.

From the mode in which the lace-manufacture is subdivided at Nottingham, any notice of one single factory would fail to convey an idea of the general system pursued, because links would be wanting in the chain of processes. For this reason we have thought it better, instead of confining ourselves to the general arrangements of one large factory, to consider the whole town as a collective lace-manufacturing community, and to follow a piece of lace from house to house, and from factory to factory, till it is presented to us in a finished form. Several manufacturers, some of whose names we shall have to mention, have kindly furnished the facilities for this object.

In the first place, then, the cotton-thread is procured from the Manchester districts. There are probably a few cotton-mills at hand, but the main bulk of the material employed is furnished by the great Lancashire and Cheshire firms. We do not know whether flax-thread is ever now used for machine-made lace, but cotton forms the great staple, and to that we may confine our attention. The 'cotton-yarn agents' are perhaps the first parties in the chain of operations at Nottingham to whom it may be necessary to refer. They come between the Manchester spinner and the Nottingham manufacturer, effecting sales of cotton thread or yarn from the former to the latter. These agents are in some cases lace-agents also, and effect sales of the manufactured articles; indeed they occasionally receive a portion of the finished lace as payment for the thread supplied.

Then comes the 'manufacturer.' A bobbin-net machine is so complex and so costly, that, unlike a common loom, the actual workman can seldom possess one of his own; he must be indebted to another man who possesses capital, for his working implements. In some cases the capitalist has a large building, containing all the requirements and resources of a regular factory, and where the machines are generally worked by steam-power. In other cases he may have a large number of machines, but instead of working them on his own premises, he lets them out at so much a day to middle-men called 'machine-holders.' These machine-holders intervene between the machine-owners and the workmen, much in the same way as a householder supplies a link between the house-owner and the lodger; he pays rent to the owner, and receives it back, with a profit, from those who occupy a subordinate position to himself. In such cases as these the machines are worked by hand-power, since steam-power only becomes available in a tolerably large building.

Mr. Drinkwater, one of the Factory Commissioners, who visited Nottingham for the purposes of the Commission in 1833, after giving a list of the machine-owners, says:—"It will be seen by this list that a very

large proportion of them are proprietors of a *small* machine; in this case the owner generally works himself, and so far partakes of the character of master and journeyman. It is not uncommon to find one of these costly machines, which may have occasioned an outlay of 500*l.* to 1000*l.*, within a house but little removed above the degree of a cottage; but for the most part they are worked in the attics and upper stories of substantial houses, the lower parts of which are occupied as shops or lodging-houses. The centre of the town is not much filled with them; but in all approaches and in the back streets, as well as in the better houses of the lower town, the incessant thump of the machine is heard."

As an example of a factory on a considerable scale we may mention one which we visited in the vicinity of Nottingham, in the possession of a Mr. Burt. The lace-manufacture is carried on not only *in* Nottingham, but throughout a circle of wide radius, of which that town is the centre. About two miles north of town, on the road to Mansfield and Worksop, is a pretty little village called Carrington, many of the inhabitants of which are employed in this factory. The factory presents to view a double pile of buildings, exhibiting long ranges of windows, story after story, of considerable height, and surmounted by the upper pinnacle of a factory—viz. a chimney. The entrance and the staircases occupy a middle compartment between the two ranges of buildings.

On entering some of the stories of the factory, the effect to a stranger is most deafening, for the lace-making machine is anything but a silent worker. Some of the stories of the building are filled with the looms, making broad net several yards wide, or a narrower net for quillings. Some are occupied by winders winding the yarn on the very remarkable bobbins employed in the manufacture. Some are devoted to processes subsequent to the actual formation of the lace, but preparative to the sale of the commodity. In the lower part of the factory are smiths' and engine shops, where the machines are partially made, and wholly adjusted to working order. In a court-yard in front of the factory is an appendage which may at first seem rather remarkable, viz., a *gas-house*. The factory being a mile or two from Nottingham renders a supply of gas from thence a serious affair; while the system which the factory is conducted renders necessary a large amount of night-work. The machinery is kept working for twenty hours out of the twenty-four, two complete sets of workpeople being engaged; and the supply of artificial light is required for a great number of hours. It is to furnish this, and in sufficient quantity that the gas-works, with the necessary apparatus of retorts, purifiers, gasometer, &c., have been constructed within the establishment.

At the factory here described, various kinds of lace and net, both plain and figured, are made. At another establishment which we visited, in Nottingham, that of Mr. Beck, the machines are employed in the production of fancy net alone, that is, such as are intended to imitate the productions of hand-labour; but in the form of wide pieces, and in that of narrow quillings and borders. In a third establishment, the property of Mr. Cleaver, we found the machines wholly employed in making silk edgings; a great many yards being made at one time, and then separated by drawing out threads from between them; and some of the looms are able to produce ten thousand yards of silk edging per week.

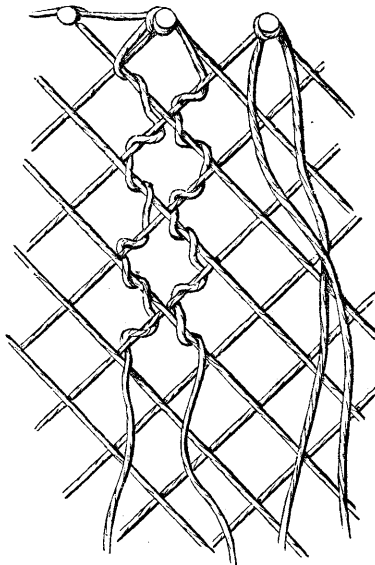
So it is throughout Nottingham and its vicinity. Some manufacturers undertake the fabrication of one kind of net or lace, and some another; but there is a general similarity of proceeding throughout, both in the mode in which the machines act, and in the

paratory and finishing processes to which the lace is subjected.

The reader may now very naturally be desirous of knowing what kind of a machine it is that produces such remarkable results. Here we have to state at once that a thorough comprehension of its action can scarcely by any possibility be acquired from a written description, unless accompanied by a large series of illustrative engravings, and studied closely by those who are accustomed to investigate the action of machinery. This is, of course, quite beyond our present purpose, which relates only to a slight exposition of the general principles involved.

Let us ask, then, what is it that the machine has to perform? It has to entwine threads one around another in such a way as to form meshes or holes, bounded by a circular, a square, a hexagonal, or an octagonal margin, according to the pattern. We may make the following supposition:—Let a number of strings be suspended from the ceiling of a room in pairs, so that when the two strings of each pair are twisted round each other by hand, they may form half as many ropes as there were strings. We will further suppose, that after two or three turns of one string round another, each string is twisted once round one string of an *adjoining* pair, and then returned again to its former companion. By this arrangement, each rope would become linked to the adjoining ropes on either side, and the whole would form a kind of net-work, presenting holes or meshes bearing some analogy to those of net-lace.

Or we may represent it pictorially, thus:—Here we



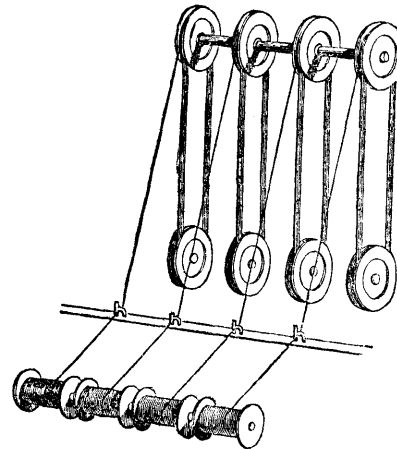
[Strings twisted in the manner of the bobbin-net.]

have a small number of strings, fixed at one end; and each string has to be passed diagonally round and between the others, so as to form knots, links, loops, or whatever fastenings they may seem most to resemble. The reader, perhaps, could hardly bring the matter home to his own mind more clearly than by selecting a few threads of different colours, fastening them at one end, and twisting them round one another in a certain definite and pre-arranged order: he would find that the meshes produced would bear some slight resemblance to different kinds of net, according to the manner and the order in which the successive threads were brought into the twist.

Now it is to effect such convolutions as these that the

machine is employed; and there is certainly much to call for admiration in the successful adaptation of parts to this end. In common weaving, it is well known that the cross threads pass at right angles over and under the long thread, passing over and under each thread alternately, if it be to form a plain material, or passing over several threads consecutively and under one, if it be to form a twill. But in the production of net this crossing is at the same time accompanied by a twist, so that one thread passes completely round another.

Annexed is a representation of part of a winding-engine; to which succeeds another cut portraying



[Winding-Engine.]

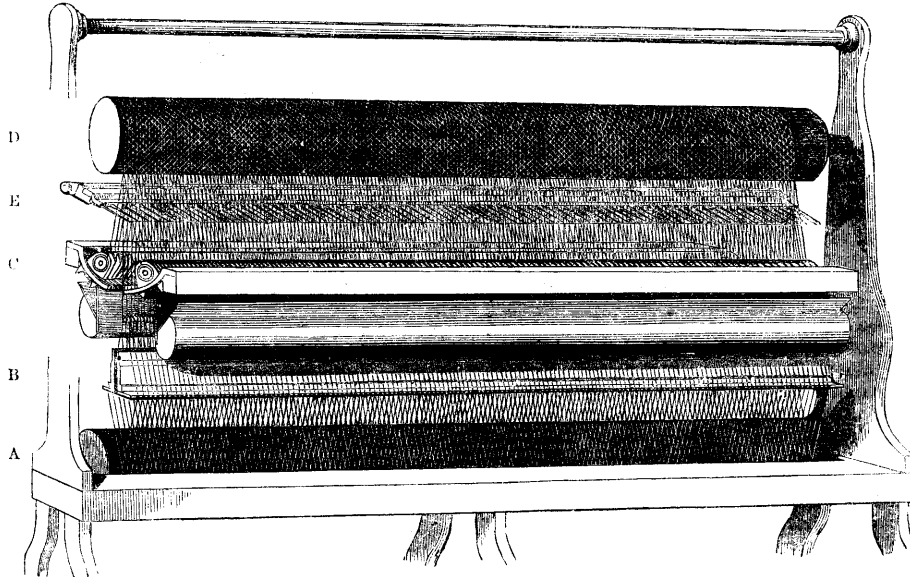
the essential parts of one kind of bobbin-net machine. The former winds the cotton for the latter, and is represented here to show how the cotton leaves the form of *skeins*, and is wound on a bobbin or reel.

The net-machines are infinitely more complex. There are several kinds employed by the Nottingham manufacturers, and known by the names of the 'circular-bolt machine,' the 'lever-machine,' &c., according to certain peculiarities in the mode of action; but one of these, viz. the 'circular bolt,' which is more used than any of the others, will be sufficient for our purpose. It so far bears an analogy to a common loom that there are warp-threads stretched in a parallel layer, and weft-threads wound on bobbins which pass between the warp-threads; but beyond this point the analogy is very slight indeed. In common weaving, the warp-threads lie horizontal; here they are vertical. In the former case, the bobbins are only few in number; in the latter they amount to hundreds, and even thousands. In the former the bobbin passes between and among the warp-threads in the direction of the plane in which the warp lies; in the latter it passes at right angles to that direction. In the former there is only one weft-thread, or one bobbin or shuttle, to many thousand warp-threads; in the latter, there are as many separate weft-threads and bobbins as there are warp-threads.

When we thus speak of 'bobbins' in reference to common weaving, we depart a little from common nomenclature; for the name of 'shuttle' is given to the little machine which carries the weft-thread: but the analogy of principle is observable, independent of the technical terms employed. The shuttle, in common weaving, is a kind of little boat, containing the weft-thread, wound upon a pirn or axis. But the bobbin of a net-machine is a most remarkable contrivance. The whole apparatus, including the bobbin on which the cotton weft-thread is wound, and the carriage or frame

in which it is placed, is not thicker than the diameter of the meshes in the net to be made. Very frequently the thickness is not more than one-thirtieth of an inch! The bobbin consists of two thin disks of brass, about an inch and a half in diameter, laid face to face with a

slight intervening space; and in this minute space the thread is wound, in quantity about fifty or sixty yards to each bobbin. The bobbin is then fitted into a kind of carriage, which conveys it between the threads of the warp, and at the same time allows the thread to be un-



Essential parts of the Bobbin-net Machine.]

(The warp, ascending from the beam A, passes through small holes in a guide-bar B, and thence to the point C, where the bobbins in their respective combs, driven by the ledges on the two bars beneath, traverse the warp to and fro, and interlace the threads as shown at D; the points E assisting to maintain the forms of the meshes.)

wound from the bobbin: in short, the carriage is to the bobbin what the little boat of a shuttle is to the pirn on which the weft-thread is wound.'

No less than three thousand six hundred of such bobbins as are here described are sometimes used in one machine! Many of the machines are twenty quarters wide—that is, fitted to the manufacture of net five yards in width; and have twenty of these bobbins to the inch. If the arrangements of the machine, as represented in the cut, be examined (the moving power being here wholly omitted), it will be seen that the warp-threads are wound on a beam in the lower part of the machine, from which they ascend to the upper part. The warp is divided into two parcels (somewhat in the same manner as the warp of a common loom by the action of the treadles), and each parcel is susceptible of a reciprocating motion, alternately to the right and left. The weft-threads, wound on the bobbins, are fastened each at one end to the upper part of the machine; and the bobbins are suspended so as to have a backward and forward motion between the warp-threads, like so many clock pendulums, being guided between the warp-threads by a very curious piece of apparatus called a 'comb.' The principle of action, then, is this:—After the bobbins have been driven between the respective warp-threads, the warp is shifted a little on one side, so that, when the bobbins return, they pass through openings different from those which they traversed in the first instance; and by this means the weft-thread, unwinding from each bobbin in the course of its movement, becomes twisted round one of the warp-threads. After this has been repeated two or three times, the comb which carries the bobbins is itself shifted to and fro laterally, by which the bobbins are brought opposite to openings between the warp-threads different from those to which they were before opposed. Herein lies the whole principle. According

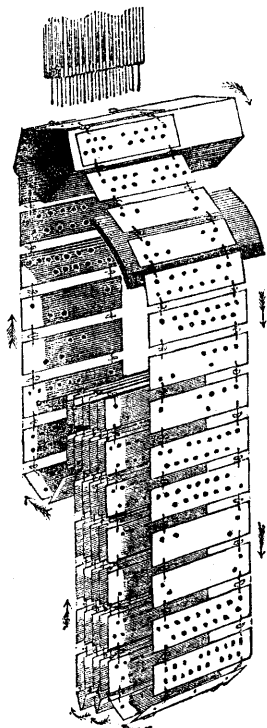
as the front layer of warp, or the hinder layer, or the comb carrying the bobbins, are shifted to and fro laterally, so does the weft-thread, as it becomes unwound from the bobbins, twist round the warp-threads during the passage of the bobbins across; a shifting, in one or other of several different ways, being effected immediately after each traverse of the bobbin. After a certain number of twistings have been effected, a series of points become inserted between the warp-threads, and temporarily hold up the knotted twists so as to form the meshes of the net.

It has been often said, and truly, that the bobbin-net machine is one of the most complicated which the ingenuity of man has ever devised; and it may therefore well be supposed that nothing more than the bare principle can be here exhibited. Perhaps it may assist the reader if we carry out our former supposition a little further. Let a series of strings be suspended from the ceiling in two rows, with their ends fastened to a horizontal bar; and let a number of small pendulums be suspended between the strings, and enabled to oscillate to and fro between them. Then, if after each traverse of the pendulums between the stretched threads, the rows, one or both, of threads be shifted a little on one side, so that the pendulums may return through openings different from those which they before traversed, we should have a system of movements somewhat analogous to those in the machine; and the strings by which the pendulums were suspended would be found to twist round the stretched vertical strings. If we further suppose that each row of strings is capable of being shifted independent of the other, and that the pendulum strings be fastened to a shifting bar near the ceiling, we might imitate in a rough way the series of movements by which net is made.

Not only is plain net made by these movements of the machine, but figured net also. In plain nets, all

the bobbins are moved similarly at one time; but in fancy nets, some are stationary, some pass between the warp-threads, some are shifted laterally to the distance of one mesh, some to the distance of two or three meshes; some move to the right, some to the left; the warp-threads, too, instead of being divided into two parcels only, are divided into several, each of which is susceptible of the lateral movement independent of the others. It is by modifications of these lateral movements that all the numerous varieties of machine-made lace or net are produced; and if this fact be borne in mind, the principle of the machine becomes to a certain degree explicable. It is known to those who have witnessed weaving, that figured weaving results from a multiplication or extension of the same kind of movements as those whereby plain weaving is effected; and the same may be said of lace-making. It results from this, that a great portion of the complexity of the machine is due to the mechanism by which these lateral movements are produced: if the warp is divided into several parcels, each of which can be moved, either to the right or to the left, independently of the other parcels; and if the bobbins are similarly classed in several parcels, each of which shifts without reference to the others; it follows that an almost infinite variety of movements may be brought about; and it is not difficult to see that these movements must affect the manner in which the bobbin-threads twist round the warp-threads, and consequently affect the pattern produced.

It is by means of levers that the various parcels of warp and bobbin threads are shifted laterally, after each traverse of the bobbins; and the annexed cut shows



[Jacquard Apparatus.]

one of the modern contrivances for governing the movements of the levers. This is an application of the Jacquard apparatus, which we saw at work in the establishment of Mr. Beck. Near the end of the bobbinet machine is fixed the pentagonal bar here represented, each side of which is pierced with as many holes as there are pins or levers above, seen at the top of the cut. A number of oblong pieces of card, from two to five hundred, are connected together in an endless chain, and so arranged as to size, that when one of the cards is laid on one side of the pentagon, and the latter made to revolve, the whole series will be brought successively in contact with the pentagon, each one lying temporarily on the flat upper side. Every card is pierced with holes, varying in number and disposition according to the pattern of the lace to be produced, but never more in number than the pins or levers above; and these holes are so cut as to coincide exactly with those in the pentagon. Suppose, then, the pentagon to have an up and down motion, so as to be brought in contact with the pins, what would result? Wherever a hole occurs in the card, it permits the pin

opposite to it to penetrate into the pentagon; but where a blank occurs, by the card not being perforated opposite to a particular pin, the pin cannot enter the pentagon, but is driven upwards. Now the warp and bobbin threads, and other apparatus of the machine, are so connected with these pins, that when one of the pins is driven upwards, some part of the thread-apparatus is shifted laterally; and it hence follows that the disposition of the holes in the cards determines the order and number of the shiftings of the threads. It bears a strong analogy to the action of a barrel-organ or a musical snuff-box, where the number and disposition of the pins on the barrel determine the pipes and the springs which shall be sounded. The number of cards employed depends on the number of successive movements requisite to form one complete specimen of the pattern.

Whether the article be plain broad net, fancy broad net, sprigged net, plait net, wire-ground net, quilling net, or edging, the movements of the machine by which it is made depend pretty much on the same principles, and may therefore all be alluded to in connection. But in noticing the subsequent processes, it will be desirable to take some one kind as a standard; and for this purpose it will be well to select a specimen of 'piece-goods,' such as a collar or a cape, in which all the figures are worked by hand on a piece of plain net.

After a piece of plain net has left the machine, it undergoes the process of 'gassing,' or singeing, for the removal of the hairy filaments from the cotton. There are some firms in Nottingham which confine their attention to this operation only. The gassing-machine is a very beautiful contrivance, in which the manufactured article is drawn between two rollers, and exposed, as it passes, to the action of a large number of minute blazes of gas, which remove the little adherent filaments without scorching or burning the net.

Supposing, as we do, the specimen to be a piece of plain net which is to be embroidered by hand, the net next receives a slight printing, with some coloured pigment, of the pattern which is to be worked upon it. There are in Nottingham a small number of artists (for so they are or ought to be) who design patterns for the lace-workers, and cut them out on wooden blocks, precisely as those for the floor-cloth manufacture. This is evidently an employment in which taste and a knowledge of the forms of natural objects are required; and it is satisfactory to find that a School of Design is about to be established at Nottingham, with the avowed object of elevating the taste and character of the lace-patterns produced. The lace is generally carried to the house of the 'designer and stamper,' who stamps the pattern very slightly on it. In the instance of a cape or collar, or any article of definite shape, the stamp gives the shape and size of the article, as well as the figures with which it is to be decorated.

When the stamper has imprinted on the net the outlines of the device, a 'pattern-setter' decides on the manner in which the pattern shall be filled up. For instance, if a leaf form part of the pattern, the stamper only gives the outline of the leaf, and it rests with the pattern-setter to determine how the needle of the embroideress shall fill up the device.

We next go to one of the humble homes of the numerous and lowly-paid 'lace-runners.' The term *embroidery* does not seem to be much used in connection with the Nottingham lace-trade, most of those who work on net with the needle being termed 'lace-runners.' Each workwoman has a frame, on which the net is stretched out horizontally, at a height of about three feet from the ground. She sits on a stool or chair, places her left hand under the stretched net, to keep it in a right position for working, and with her right hand

works the pattern with needle and thread in every part where the stamper has imprinted a device. The needle is inserted between and among the meshes of the net, and stitches of greater or less length taken, until there is a body of thread laid in sufficient to mark the device conspicuously. This working round of the outline is called 'running,' while the filling-up of the interior parts is termed either 'fining' or 'open-working,' according as the original meshes of the net are brought to a smaller or a larger size by the action of the needle. Now, by the work of the needle, the meshes of the net may be made larger or smaller, will be easily comprehended by the one sex, and must be taken for granted by the other.

It is sad work to see how continuously these poor females must labour before they can earn a small pittance. Little do those who see in the attractive shop-windows of London the beautiful veils and capes which Nottingham now produces, imagine how many aching fingers and eyes, and perhaps hearts, have been concerned in their production. We believe it to be pretty nearly correct to say that at the present time the earnings of the lace-runners do not, on an average, much exceed a half-penny an hour; for the weekly earnings for long days' work are not much above three hillings, and are frequently below it.

The mode in which this embroidery business is transacted is often thus:—A person takes from a manufacturer as much work as twenty, or perhaps fifty, females can embroider; and she devotes as many rooms as her house can afford to the reception of the workers, who pay to her a trifling sum (out of their trifling earnings) for the use of the room. Our frontispiece, for example, was taken in a garret or attic in a house in an humble neighbourhood, in which seven or eight young women were at work, in the same manner as the three represented in the cut. They all received their work from the woman who rented the house, who paid them for their labour, deducting a rent for the frame-room, and, we believe, a further trifle for some other item. To eke out their earnings, the women in one room often have their meals in common, making up, for a few pence, a hash or stew sufficient to dine seven or eight. There they sit, for twelve or fourteen hours a day, with the head stooping over their work, plying the needle, and driving off dull thoughts as well as they may by singing (for there is said to be much singing among the Nottingham work-people). It is not unfrequent for them to say—"If the great ladies of London knew how much work we have to do to their veils and capes for a shilling, they would pay better." But, poor things, these embroiderers do not know how complex, in such a country as England, are the circumstances which regulate the wages of labour: they would perhaps find that in reality the "great ladies of London" have but little influence on the rate of the seamstresses' earnings.

Some of the articles in lace are decorated by 'tam-bouring' instead of 'lace-running.' This is done in frames similar to the others, and by females in a similar rank of life; but a very small hook is used instead of a needle, by which a thread is wound as a kind of chain about and among the threads of the net.

After the lace-runners have worked the collar, cape, veil, or other net-lace article, it is taken back to the manufacturer, who then employs 'lace-menders' to examine every piece, and mend, with needle and thread, every defective mesh in the net, whether produced in the machine or by any subsequent accident. This is done so skilfully, and the form of the mesh so closely imitated, that the mended part can scarcely be detected except by a practised eye. The females engaged at 'lace-mending' earn much higher wages than the lace-runners, on account of the greater skill required.

The bleaching is an important part of the net manu-

facture, and is carried on by several firms in the neighbourhood of Nottingham. The net, after going through the greater part of the processes, has acquired a tint nearly as dark as brown holland; and it is the office of the bleacher to give it the snowy whiteness which adds so much to the beauty of the material. This bleaching is effected by a series of processes, such as scouring, exposure to the action of bleaching liquid, drying, &c. At one bleaching establishment near Nottingham, that of Messrs. Manlove and Alliot, we witnessed a most remarkable mode of drying the net after bleaching, recently patented, we believe, by these gentlemen. Usually the bleached article is wrung or pressed, and then hung up in a hot room to dry; but in this new mode the net is wrapped round in a kind of coil, between two concentric copper cylinders, the outer one of which is perforated with holes. The apparatus is then made to rotate with extraordinary velocity, so great even as a thousand times in a minute; and the centrifugal force thus engendered drives out the water from the damp net through the holes in the cylinder, thus leaving the material nearly dry. It is expected that this invention will introduce important improvements in bleaching and analogous processes.

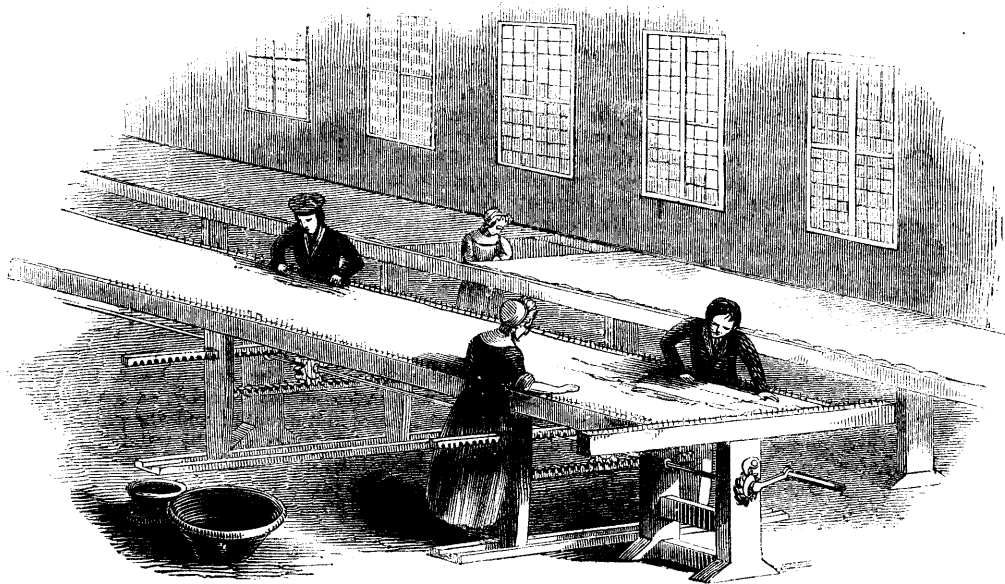
If the net or lace is to be black, instead of white, it is dyed instead of bleached.

After being again examined to see whether any further mending is required, the net next goes to be 'dressed,' and this takes us to the work-rooms of another class of persons. The 'lace-dressing rooms' of Nottingham are sometimes two hundred feet in length, and furnished as in the annexed cut. Long frames extend from end to end of the shop, capable of being adjusted to any width by a screw, and provided with a row of pins round the edge. The net or lace is first dipped in a mixture of gum, paste, and water, wrung out, and stretched upon the frame by means of the pins or studs. While on the frame it is rubbed well with flannels, to equalize the action of the stiffening material in different parts, and then left to dry in a warm room. It is to the nature of the solution used that the different kinds of net and lace owe their different degrees of stiffness.

If the manufactured article be a cape, a collar, or a veil, it is not till the present stage in the proceedings that it is cut from the piece. The stamping, the embroidering, the gassing, the bleaching, the dressing—all are done while the piece is yet whole, several yards in length; but when it approaches thus far towards completion, the material is cut up, according to the size and shape given by the stamp, and a 'pearl edge,' or something similar, is sewn on by hand round every edge.

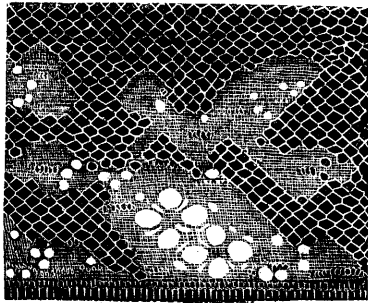
After a process of rolling, pressing, ticketing, &c., the article is finished.

The kind of article which we have selected as a specimen or standard comprises within the range of its manufacture nearly all the processes involved in the other branches of the lace-trade; and will therefore serve to give an idea of them all. As regards the question, to what degree hand-labour is employed upon the different varieties, the following will be a kind of summing-up. In a plain net the whole fabric is made at the machine. In sprigged net, the groundwork and a portion of every sprig are made at the machine, and the outline of every sprig is then worked by hand. In fancy broad-net the device as well as the groundwork are made at the machine. In plait-net the same thing is observable, and also in tating-net. In edging and lace for borders the device is now very generally worked by the machine, but in some varieties it is partly put in by hand. In 'piece-goods,' such as capes, collars, and veils, the device is almost wholly worked by hand, a very small proportion being effected



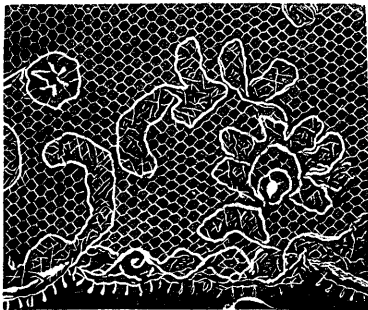
[View in a Lace-Dressing Room.]

by the Jacquard appendage to the lace-machine. As an exemplification of the manner in which the machine and the hand imitate each other's productions, we annex representations of two specimens, one of which (*a*) was



[Specimen of Machine Lace.]

wholly worked at the machine, and the other (*b*) wholly figured by hand on a machine-made net, excepting the



[Specimen of Run Lace.]

pearl edge,' which, after being made at the machine, was sewn on by hand.

We stated, in a former part of the article, that the machine-holder, whether owner or not, buys thread from the Manchester cotton-spinner, and then works it up into net or lace. He does not do anything further to

the material, but sells it at once, either to other manufacturers, or to agents and dealers. These other manufacturers carry the material through all the subsequent operations, employing and paying for the services of the gassers, the bleachers, the dyers, the dressers, the stampers, the menders, and the embroiderers. Some of these manufacturers only undertake the finishing of the plain goods, while others confine themselves to the fancy or embroidery department. One of these latter, Mr. Hickling, to whose kindness we have been much indebted, has been instrumental in the introduction of the Nottingham 'cardinal capes' of modern lady-couture; while other firms have taken up some other department in particular. Some are 'cap-manufacturers'; that is, they procure the lace from the machine-workers, dress and finish it, cut it up, and employ a number of women to make it into caps. Lastly, agents, sent by the great wholesale houses from London and elsewhere visit Nottingham periodically, and make their purchases in lace and net; for Nottingham is the market for this commodity, whether made there or elsewhere.

Such, then, is a very brief sketch of a manufacture which may be said to have had no existence in the beginning of the present century, and of which Mr. Felkin (the greatest authority in all matters relating to the bobbin-net trade) made the following estimate in 1831: he calculated that the capital employed in Manchester in spinning thread for the bobbin-net manufacturers amounted to nearly a million sterling; and that the capital employed by the latter in various ways exceeded two millions sterling; that the number of persons employed in spinning, making, winding, embroidering, mending, &c. for the bobbin-net work, amounted to more than two hundred thousand; that the raw material (cotton and silk) used was worth about 150,000*l.* annually, in the state as imported; that this value was increased to 540,000*l.* when spun into thread; and that the final value, when manufactured into net, and ready for sale, was nearly two millions sterling per annum, or, including the wages of the embroiderers employed in different parts of England, more than three millions sterling! These results are certainly extraordinary, and could have been but little anticipated by the inventors of the machine, sanguine as they might be.