accident, such as the breaking of a warp-yarn, so as to avoid any break in the pattern. The lines marked A, A repre­sent the chain of perforated cards.

There are many slight modifications of the Jacquard engine in use in this country, but in principle they all agree. Of late years, the operations of the loom and of the Jacquard engine have been made familiar to the public in consequence of the various galleries of practical science and art which have sprung up in London and other cities and towns. Seen without explanation, however, this beau­tiful machine appears complicated and unintelligible ; but with descriptive diagrams, its beauty and simplicity are readily appreciated.

In figure-weaving, every thing depends on the proper ar­rangement of thc warp-yarn. Whether the draw-loom or the Jacquard engine be employed, a single yarn misplaced must necessarily render the figure imperfect. The taking up of the proper warp-yarns, and drawing them through the appropriate *eye* or *mail,* is called drawing in or cording in. To facilitate the operation, the design or pattern is drawn upon paper, divided into squares similar to the patterns sold in the shops in all our large towns for German embroidery work. The annexed diagram will explain the nature of the design.

In cording in, two persons usually work together, one taking up the threads, and the other counting off the pattern. Thus, in the annexed figure, the direction given to the first arrangement of the warp-yarns could be, “ Take up one”—“ pass eight”—“ take up two”— “ pass eight’’—“ take up two”—“ pass eight”—“ take up one.” In this way he proceeds from shoot to shoot, until the draught is completed. It will be observed that the counting is facilitated by every ten spaces being divided by stronger lines.

To punch the holes in the cards for the Jacquard en­gine, an ingenious machine is employed. It is a sort of counterpart of the engine itself, being provided with lift­ing cords, wires, and needles, so arranged, that by pulling the cords, the needle-heads are protruded. Answering to the revolving bar, and in front of the needle-heads, is a perforated iron plate, about two inches thick, provided with a set of moveable punches, which are driven forward by the protrusion of the needle-heads, and deposited in another perforated plate temporarily placed to receive them.

In order to move the proper cords, and so deposit the proper punches destined to describe the pattern on the card, the operation of drawing in is performed on a frame provided with a number of vertical threads answering to the warp of the goods to be woven. These threads are taken up with a long needle by one man, another directing as before ; and when completed, the proper threads are at­tached to the corresponding cords of the punching ma­chine, and the proper punches are deposited in thc moveable plate. This being done, the blank card is placed against the face of the moveable plate, and against the cutting end of the punches. Both are then removed together, and placed upon another perforated plate, when the punches are driven through, and the card is cut at the requisite spot. Each card is numbered, so that there cannot be any mistake in attaching them together ; and as every part of the punch­

ing machine gauges with the corresponding part of the Jacquard engine, the precision throughout is perfect. Our space will not enable us to be more explicit, but we ap­prehend the ample explanations we have given of the Jacquard engine will render the operation of punching the cards intelligible.

We have already described the perfection which the art of automatic spinning has attained in this country ; but it must be obvious, that without the substitution of mecha­nical for manual power, these great inventions would have been comparatively inoperative. The idea of applying mechanical power to weaving was promulgated by M. de Gennes, and is mentioned in the Philosophical Transac­tions as early as 1768. In 1787, a rude loom, moved by mechanical power, was constructed by the Rev. Dr Cart­wright, who took out a patent for it in August of that year. The idea first obtained possession of his mind by convers­ing with some gentlemen of Manchester, when it was ob­served, that on the expiration of Arkwright’s patent, so many spinning-mills would be created, that a sufficient num­ber of weavers would not be found to weave the yam pro­duced.@@1 “ Then,” said Dr Cartwright, “ Arkwright must set his wits to work to invent a weaving-mill.” This was pro­nounced impracticable ; but on his return home, Dr Cart­wright exerted his ingenuity, and produced his machine in 1787. He was not sufficiently acquainted with the prin­ciples of mechanics ; and after spending about L.40,000 in a factory at Doncaster, he was compelled to abandon his design.

In 1789, two years after the completion of Dr Cart­wright’s machine, Mr Austen entered a caveat at the pa­tent office for a patent, but he did not then prosecute it. However, in 1798, one of his power-looms was erected by Mr Monteith of Pollockshaws, near Glasgow ; and it seems to have been successful. It was not until 1813, after ten years of laborious and expensive trial, that Horrocks of Stockport constructed a power-loom, which is the basis of Messrs Sharp and Roberts’s power-loom, the compact and efficient machine now in use.

From the description of the ordinary loom which we have already given, and from what we have said of the motions to be produced and the method of producing them, the reader will have no difficulty in understanding the follow­ing diagram (fig. 15), exhibiting the front view of a power cloth-loom, such as is now used in the principal factories of Leeds.

The frame-work A A A A is of cast iron, and is made of great strength, so as to support the heavy work which the cloth-loom has to undergo.

B is the breast-beam, against which the weaver stands, and over which the woven cloth passes in its way to the cloth-beam C, around which it is wound as the work pro­ceeds. The breast-beam is made smooth, the edges being rounded, so that the cloth meets with no impediment in its progress round the cloth-beam.

At the back of the loom is a corresponding arrangement for the warp ; that is, there is a warp-beam parallel with the breast-beam, and a roller parallel with the cloth-beam, so that the plane of the warp is kept in a horizontal position. Its tension is preserved by a weight slung round the warp­roller, and acting in a direction contrary to the winding of cloth-beam. The manner in which this operates will be seen by inspecting figure 16.

The mode of suspending the heddles is shewn by the let-

@@@, This was afterwards the case, as indicated by the advance which took place in weavers’ wages. Io the Report of the Assistant Hand- Loom Commissioners, already quoted, we find a weaver, named John Milner, stating his earnings as follows : 1800, 10s. 1804, 17s. ; 1814, 34s. 6d. ; 1815, 31s. fid. After this, the number of weavers increased rapidly. Men from the plough learned to weave; children were taught in great numbers; and by 1830, the wages of John Milner had declined to 21s. ; in 1831 they were 18s.; in 1835, 15s. fid. ; and in 1838, 12s. fid. The high wages of 1814 were clearly the effect of the improvements in spinning ; and it is well known in the manufacturing districts, that the master-manufacturers had to seek weavers in all directions.