we subjoin a section (all the above being in the nature of *ground plans,* so to speak) cut across the piece, so as to expose the ends of the warp and the whole course of the weft. Here the shoot of weft passes over four yarns and under

one. The next shoot will pass over the one and under the four. At the next stage of the process, the interlacing will shift one thread laterally, so as to produce the diagonal structure already described. We have already stated, that by increasing the number of colours, and varying the ar­rangement of the heddles, a considerable number of com­binations may be produced. That number may, of course, be increased by an increased number of heddles ; and the only check to this is the want of force possessed by a single weaver to work a large number, and the inconvenient man­ner in which they would crowd the space of an ordinary loom. To remedy these inconveniences, the draw-loom was formerly very generally resorted to, and it is now used to a very considerable extent in weaving carpets and figured damasks.

A reference to the article on Carpet-Weaving, and to the plates belonging to it, will explain the general nature of the draw-loom ; but the harness part requires further explanation. The harness of the draw-loom is so arranged that no part of the warp is depressed, but such of the threads as are to be above the weft are raised, and the shuttle is passed through.@@1

Each cord of the harness of the draw-loom has a metallic eye or loop for the warp, called a *snail,* and the cord is kept stretched by a weight of lead. A frame C is placed hori­zontally over the loom, either perforated with holes or divided by wires, so as to form guide-holes or guide-pins to the cords of the harness. In practice the cords are very numerous and close to each other, as in the plates already referred to ; but their operation will be best understood by exposing a small number, as in the annexed figure, which may be deemed an analysis of the gearing of the draw-loom.

The perpendicular cords A, called the *simples,* and termi­nating each in a handle called a *hob,* descend from the *tail* of the cords, each of which passes over a pulley at B, and is made fast to a piece of wood at D, called the table. If one of the handles or bobs A be pulled, it will depress the tail of one set of cords at *a,* and raise the set or system of cords *d d d* attached to it. In addition to this harness, the loom is geared in the ordinary way with heddles and their corresponding treadles, so that the weaver works as usual ; and all that the draw-loom does, is to raise a portion of the warp out of the weaver’s way, and so marking a certain por­tion of the figure, so long as the portion of the warp included in each set of cords affected is kept above the weft. When the figure requires a change, the cord previously held down is permitted to regain its position, which it does by the combined operation of the warp yarns, and of the weights *d d d* attached to the cords. Another set of threads is then raised, and the weaver again works in the ordinary way as long as necessary.

But the draw-loom has of late years been to a consider­able extent superseded by the *Jacquard* engine, so named from its inventor, a weaver of Lyon. It is not too much to say, that this machine, simple in fact, though complicated in its appearance, has raised the silk manufactures of Spitalfields to their present state of excellence. Until the introduction of this machine, the production of the superior figured silks depended wholly on the skill of the weaver, and that to a degree which few attained. The necessity of extreme carefulness and skill is now considerably dimi­nished ; in other words, the production of the most costly fabrics is laid open to a larger number of operatives.

The Jacquard engine may be attached to almost any loom, and is generally owned by the manufacturer, and is furnished to the weaver with the warp. It is fixed to the top of the loom, in a direction perpendicular to the har­ness, the cords of which are attached to the lifting hooks *a a a a.* Every one of these lifting hooks is passed perpendicularly through an eye in a corresponding needle *bbb b.* These needles lie in rows in the frame *c c c c.* Let it be re­membered that the fi­gure is a mere skeleton of the engine itself, as the holes and needles are extremely nume­rous, say eight rows of fifty each, forming as many leases in the warp. The horizontal needles protrude through the frame c *c* at *b b b b,* and are kept extended in their position by spiral springs *e e e,* placed in cavities at the opposite end of the frame *c* *c*. By this arrangement the needles have a play in the direc­tion of the spring. They yield to pressure, and on its removal return to their former position. The needles have an elongated loop at the extremity nearest the spiral spring *f f,* with a pin passing through it so as further to limit the range of the needle. The following figure repre­sents one of these needles, with its eye-let, loop and pin, and spring.

Immediately over the frame *c c,* is a corresponding frame *g,* having bars arranged across, that is, at right angles with the needles. There is one bar for every row of lifting hooks. This frame, when the engine is in operation, is alternately lowered upon the frame c c, and raised from it by a strong lever attached to the treadle and moved thereby. When the frame is lowered, the lifting bars, the ends of

@@@1 Carpet-weaving is the only branch of manufacture in which we have seen the *picker* or fly-shuttle dispensed with. In Mr Howards carpet factory at Leeds, where many colours are used in the warps, the shuttles are thrown in the primitive manner.