



upwards are used in making very rich satins. Fig. 87 on the preceding page represents the order in which the intersections are made, and Fig. 88 shows the appearance of the face of a sixteen-leaved satin when magnified. The intersections only occurring once in sixteen times, the weft threads, although they may be of a different colour, are scarcely discernible in the face of the cloth. The warp threads, when very numerous and crowded together, naturally tend to cover over the few intersections, and the threads thereby give that smooth and unintersected appearance by which rich satins are distinguished.

Fig. 89 shows the arrangement of the intersections of the common satin, which is woven with eight leaves, and Fig. 90 the satinnet, which is woven with five leaves. Satins are usually woven with the face of the cloth downwards, for if this were not so, in the case of weaving a sixteen-leaved satin fifteen leaves out of the sixteen would have to be raised at every pick, and only one would remain at rest. On the other hand, with the face downwards, only one out of the sixteen is raised, whilst fifteen remain at rest, and thus the friction on the warp and the labour of the process is not only proportionately saved, but the appearance and quality of the cloth is improved.

The principle upon which the regular twills and zigzags are produced having been explained by the aid of Fig. 49, &c., in a former article, we shall now show how it is extended for the production of small figures. Fig. 91 is a plan of a warp with six headles, and shows a portion of cloth woven. No reed is shown, nor anything that would tend to complicate the figure, and it will be understood that only a few threads are represented, for the pattern in actual cloth would be simply repeated. W and W' show the warp threads which are passed through the eyes of the headles H, in the order shown by the circles, which represent a sectional plan of the headles at the line B B, Fig. 92.

Each of the headles, Fig. 91, being marked with letters, the effect they produce on the cloth can be readily traced at C, and, consequently, the principle upon which the system depends. Thus the first pick of the weft A, has been inserted when the headles *a b f* had been raised; the second pick when *a b c* have been raised; and so on to the last pick—the letters at C being clearly traceable to the letters at H. Fig. 92 is a section of Fig. 91, showing the shed open. Fig. 91 and Fig. 93 represent the plan of the pattern woven as it would be shown by the weaver in order to arrange the loom.

We need not say that, at first sight, there appears no clue to connect or associate the plan Fig. 93 with the pattern woven Fig. 91, but a little attention to the matter will be amply repaid by learning the ingenious and simple manner in which the subject is planned by the weaver. In a former instance lines with marks at their intersections were shown, but weavers also use spaces as well as lines for the purpose. Hence the circles in the spaces Fig. 93, correspond to the marks at the intersections before mentioned. Sometimes two or three descriptions of marks are used, and in this case the use of spaces instead of lines is desirable as affording more room and distinctness.

On comparing the warp threads W and W', Fig. 91, with the figures 1, 2, 3, 4, &c., at W, Fig. 93, a resemblance is at once detected in the arrangement of the figures with the circles, representing the eyes of the headles H, Fig. 91. In short, the spaces marked by the letters *a b c d e f*, Fig. 93, represent the headles marked with the same letters in Fig. 91, and the order of entering the warp threads W, Fig. 91, is the same as shown at W, Fig. 93. In the same figure the treadles, six in number, are shown at T. The numbers above T represent the consecutive order in which the treadles are worked, which is simply backwards and forwards, and by this means the diamond form of the pattern is woven.

The small figures under the letter T show the order in which the treadles could be worked more conveniently—beginning with the right foot at 1, the left at 2, and so on. Therefore, after it is shown in what order the treadles have to be raised in, as shown by the figures above T, the connexions between the headles and the treadles are “tied up,” according to the convenience of the weaver for working them, as shown by the figures below T. The circles in plan, Fig. 93, show which of the headles are raised and correspond with the letters at *c*, Fig. 91. For instance, the first pick A' has been effected by the raising the headles marked *a b f*, as marked at *c*. In like manner circles are to be

found on the headles *a b f*, Fig. 93, where they intersect No. 1 treadle, which corresponds to No. 1 pick at A', Fig. 91. Consequently the treadle No. 1 is attached to and has raised the headles *a b f*.

A great variety of figures can thus be made with comparatively few headles, and combinations of figures can also be made; one example of which, Fig. 94, may be sufficient to give an idea of the system. In this instance a cross and a diamond are combined in alternate order, or the figures are “bosomed” together.

By another modification of the same principle another variety of figures may be woven at pleasure. This is shown at Fig. 95, and can be conveniently used for forming spots, or small figures; hence it is known as spotting harness. As the figures and letters in Fig. 95 correspond with the descriptions given of Fig. 91, they scarcely need any further explanation.

When a considerable number of headles were used, such as in weaving with twenty leaves and upwards, it became necessary to adopt some means to dispense with the treadles, and we have already described one of the machines used for that purpose, viz., the “Jack in the box.” There is another machine of far greater range, the draw-boy, which was formerly used to a great extent. It will be described in connexion with the draw loom, although it was equally applicable to the weaving of smaller figures. It is now, perhaps, entirely superseded, but as it supplied the principal means the weaver formerly had to assist him previous to the adoption of the Jacquard machine, it could not be omitted in a description of the old method of weaving. The machine was worked by two treadles, although in a more simple form one treadle was used, and instead of the headles being raised by the cords attached to the coupers and long marches, they were attached from the coupers, or top levers, direct to the draw-boy machine. But as the machine was of far more importance when used in connexion with the draw loom its mode of action will be shown in connexion with the draw loom.