No. 805,244. PATENTED NOV. 21, 1905.

J. SZCZEPANIK.

WEAVING DIAGRAM AND METHOD OF MAKING THE SAME.

APPLICATION FILED MAR. 25, 1897.

Fig. 1.

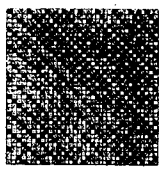


Fig. 2.

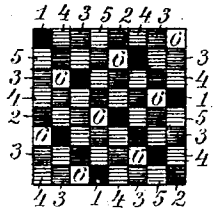


Fig. 3.

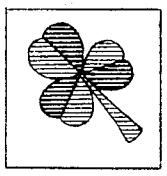


Fig. 6.

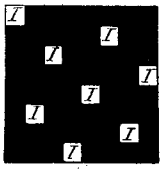


Fig. 7.

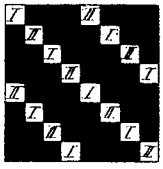


Fig. 3a.

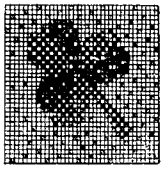


Fig. 8.

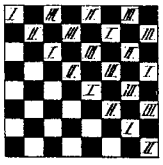


Fig. 9.

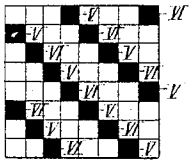


Fig. 10.

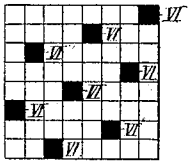


Fig. 4.

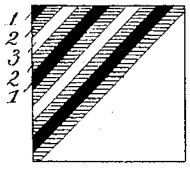
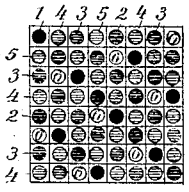


Fig. 5.



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By Munn & Co
Attorneys.

UNITED STATES PATENT OFFICE.

JAN SZCZEPANIK, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO BARMEN BANK-VEREIN, HINSBERG, FISCHER & COMP., OF BARMEN, GERMANY, A CORPORATION.

WEAVING-DIAGRAM AND METHOD OF MAKING THE SAME.

No. 805,244. Specification of Letters Patent. Patented Nov. 21, 1905.

Application filed March 25, 1897. Serial No. 629,255.

To all whom it may concern:

Be it known that I, JAN SZCZEPANIK, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Weaving-Diagrams and Methods of Making the Same, (for which patents have been obtained in Austria, dated October 30, 1896, and registered Vol. 46, Fol. 4,394, and Belgium, dated December 17, 1896, No. 125,230;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention has for its object the production of weaving-diagrams directly from drawings or designs in such a manner that the modes of crossing or intersecting of the threads of the loom forming the several shaded parts of the design in a finished fabric will be indicated and the heretofore necessarily costly and tedious manual determination of the various crossings that serve to bring out the outlines, shadings, and shadows will be obviated. This object is attained by producing by photography a transparency, which may be either a negative or a positive copy of the original drawing or design that it is desired to weave, to be used in connection with a superposed or underlying screen composed of fields or sets of fields, each field or set of fields of varying degrees of transparency and arranged alternately. In this manner with continued exposure there are produced on the corresponding portions of the copying-paper compartments or fields grouped in various ways, depending upon the lights and shadows of the particular positive or negative used, which fields correspond in their arrangement to the thread-crossings necessary to reproduce the design in a woven fabric, and thus a diagram is made by photography from which cards can be perforated directly without manually drawing in the design for the card-punching machine.

Referring to the drawings, in which like parts are similarly designated, Figure 1 illustrates a screen constructed according to this invention. Fig. 2 shows part of the same on a larger scale. Fig. 3 illustrates an original drawing or design; Fig. 3ª, a pattern or weaver's design produced with the aid of the screen. Figs. 4 and 5 represent portions of other forms of screen; and Figs. 6 to 10 illustrate the effects of the screen, Figs. 1 and 2, on the copying-paper.

The screen shown in Figs. 1 and 2 may be composed of any kind of transparent material—such as film, glass, tracing-paper, and the like—and has quadrilateral portions of, for example, six different degrees of transparency, which are indicated in Fig. 2 by the numbers 1 to 6 and there shown as arranged in sets. The squares 1 are quite opaque, (black,) and those 6 are entirely transparent (white,) while those 2 to 5 each have a degree of transparency lying between these limits. The squares that correspond to shades 3 and 4 are each arranged in diagonal rows, while in the two next diagonal rows the squares 1 and 2 and 5 and 6 alternate with each other, as shown in Fig. 2. The whole screen thus consists of diagonal rows of fields 1 and 2, 4, 3, and 5 and 6, which constantly recur in the order mentioned. The degrees of transparency of 2, 3, 4, and 5 are different, but such that when squares 2 and 5, as well as when squares 3 and 4, are added they are equal in opacity to 1.

For the purpose of explaining the mode of operation of this screen in its application to the method of this invention I shall first describe the production of patterns separately for each of the most generally employed modes of crossing or intersections.

When the screen is copied direct on a sensitized paper—that is to say, is exposed for a longer or shorter time to the action of light without a superposed or underlying diapositive or negative—there is produced a copy (shown in Fig. 6) in which the white compartments (marked I) appear upon a black ground, the former corresponding in size, shape, and arrangement to the completely opaque fields 1 of the screen, Fig. 2, and indicate a satin crossing. With a sufficiently long exposure the light will act upon all those parts of the underlying copying-paper that are immediately under the more lightly shaded fields 2 to 6 of the screen without distinction of shade of these compartments and will pro-

duce the well-known effect of overprinting, thereby coloring the print uniformly under all of them, while only those parts of the copying-paper under the perfectly opaque fields 1 of the screen will be protected from the action of the light.

If on the screen, Fig. 1, there be placed a transparency or photographic film of a uniform high degree of transparency 5, the fields 2 of the screen, combined with the film or plate of a density the same as 5, will equal in density that of fields 1, so that by printing the combined screen and film on a sensitized paper those fields 2 of the screen will also protect the paper beneath them from the action of light, and the result will be a diagram similar to Fig. 7, in which there are diagonal rows of fields I and II on a black or dark ground corresponding to the arrangement known as "twill-crossing," all of the other fields in the screen being overprinted and uniformly dark. If before making another print there be placed on the screen in place of the film of the degree of density 5 a darker plate of the degree of density 4, then the fields 3 of the screen will also in like manner, as above described, protect the paper from the action of light, and the result will be the print, Fig. 8, having alternate light and dark squares both in a vertical and a longitudinal direction, producing the well-known design of canvas crossing.

By placing over the screen, Fig. 1, a film or transparency of a uniform density 3 twill crossing is again produced with the dark portions V and VI appearing on a white ground, as in Fig. 9, and, finally, by placing over the screen a film having a density of the degree 2 satin crossing is again produced, but with dark squares VI on a white ground, as in Fig. 10.

If more modes of crossing are to be produced, the number of degrees of transparency must be correspondingly increased.

In carrying out my invention instead of plates or films having only one degree of transparency—a photographic transparency—the positive or negative of the design or picture to be woven is laid upon or under the screen, and said positive or negative may be considered as a plate having different degrees of transparency at different places corresponding to the high lights, shadows, and half-tones in the picture. If now this positive or negative, together with the screen, be copied (for instance, in a dark chamber or camera obscura) then the equally lightly shaded portions on the copy will appear as a grouping of fields that will at once indicate the mode of crossing that is necessary for weaving the same. Also the equally darkly shaded portions will appear as a grouping of fields that corresponds to another definite mode of crossing. Also the intermediate degree of shading will indicate other modes of crossing.

The copy, Fig. 3[a], made from a positive or a negative, Fig. 3, is employed directly as a pattern or design for perforating the cards for the jacquard mechanism. When the copy is made of a bad conductor of electricity upon a good conductor thereof, it can be directly employed in electrically-operated looms or in electrically-operated card-punching machines, as described in my patent of the United States No. 701,775, granted June 3, 1902.

A diagram composed of squares that facilitate the taking of a comprehensive view in perforating the cards requires, of course, for its production a screen divided into sets of fields, each field being a square, and which must be provided with a network of lines in the manner of the "carta-rigata" paper, the arrangement being such that each line of the network on the screen is double and composed of two parallel lines, of which one is black and the other is white, so that all the black squares of the copy will be shown as separated by white lines and all of the white squares of the same will be shown as separated by black lines.

The size of the fields of the screen is determined by the size of the picture to be woven or in the case of recurring designs by the latter.

In the case of large pictures they are divided in proportion to the size of the screen, and each portion is printed or copied by photography.

As large portions of the picture which are equally shaded and quite dark will appear quite white on the copying-paper and would not indicate any modes of crossing, this drawback is preferably obviated in the following manner:

Before printing from or copying the positive or negative the screen alone is placed on the paper and exposed for a short time to the light. By this means, as already mentioned with regard to Fig. 6, satin crossing is indicated on the whole of the sensitized surface, but not so sharply as with overexposure. If then the diagram is made as described, those portions of the diagram that correspond to the dark-shaded parts of the positive or negative show the previously-produced satin crossing, indications which may be taken as the mode of crossing of those portions of the picture.

Instead of square fields the screen may be composed of or comprise fields of other shapes, such as strips or bands, Fig. 4, or circular fields, Fig. 5. In the latter case the surface between the circular fields must be made correspondingly dark or opaque.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The method of producing weaving-diagrams for making loom pattern-cards, which consists in passing light through a transparency and sets of fields, each set of fields of the same transparency arranged to indicate a

weaving-crossing, onto a sensitized medium, substantially as described.

2. The method of producing weaving-diagrams, which consists in passing light through a finished photographic plate and sets of fields of different degrees of transparency, onto a sensitized medium, each set of fields arranged to indicate a weaving-crossing, substantially as described.

3. The method of producing weaving-diagrams, which consists in passing light through a transparency and sets of fields in the same plane onto a sensitized medium, each set of fields of different transparency and arranged to indicate a different weaving-crossing, substantially as described.

4. The method of producing weaving-diagrams, which consists in passing light through a finished photographic plate and sets of transparent fields onto a sensitized medium, all of the fields of the same set of the same degree of transparency and arranged to indicate a weaving-crossing, substantially as described.

5. The method of producing weaving-diagrams, which consists in passing light through a transparency and sets of fields of different transparency, each set of fields arranged to indicate a weaving-crossing, and sets of fields combining to indicate a different crossing, onto a sensitized medium, and varying the time of exposure, thereby producing images of the photograph indicated by different weaving-crossings, substantially as described.

6. The method of producing weaving-diagrams, which consists in passing light through sets of fields, the fields of a set having the same degree of transparency and arranged to produce a weaving-crossing onto a sensitized medium, thereby producing a photographic impression, then inserting between said fields and sensitized medium a finished photographic plate, whereby the image on said plate will be indicated on the sensitized medium by different sets of fields of different intensity, substantially as set forth.

7. The method of producing weaving-diagrams, which consists in passing light through sets of rectangular fields, each set differing in degree of transparency from another set and the fields of each set arranged to indicate a weaving-crossing different from that indicated by another set, and through a finished photographic plate onto a sensitized medium, substantially as set forth.

8. The method of producing weaving-diagrams, which consists in arranging sets of fields in the order of weaving-crossings, the fields of each set differing in arrangement and intensity from those in the others, passing light simultaneously through the sets of fields and a transparency to a sensitized medium, substantially as set forth.

9. The method of producing weaving-diagrams, which consists in passing light through sets of rectangular fields, the fields of a set of the same degree of transparency and the sets of fields of different degrees of transparency, each set arranged to indicate a weaving-crossing and two or more sets combining to indicate a crossing different from an individual set, onto a sensitized paper, then passing light through said fields and a suitable transparency of the design to be woven, whereby said design will be printed on the said paper and the various parts thereof will directly indicate the weaving-crossing to be used, substantially as set forth.

10. A weaving-diagram, comprising a photographic impression of sets of fields, the fields of each set arranged to indicate a weaving-crossing and differing in intensity and arrangement from those of another set, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAN SZCZEPANIK.

Witnesses:
JOS. RICH. BISÉ,
HARRY BELMONT.