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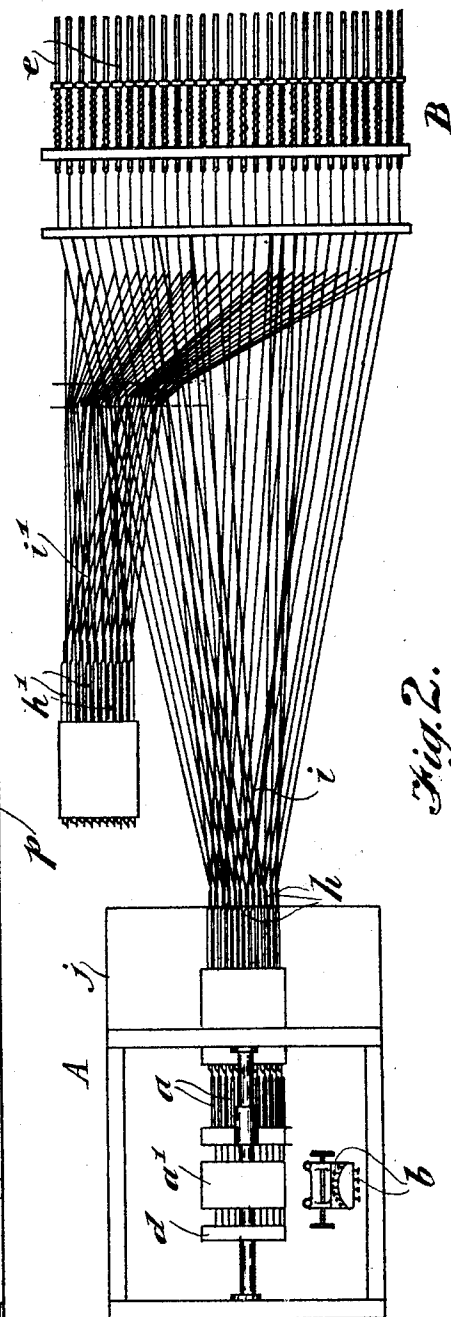
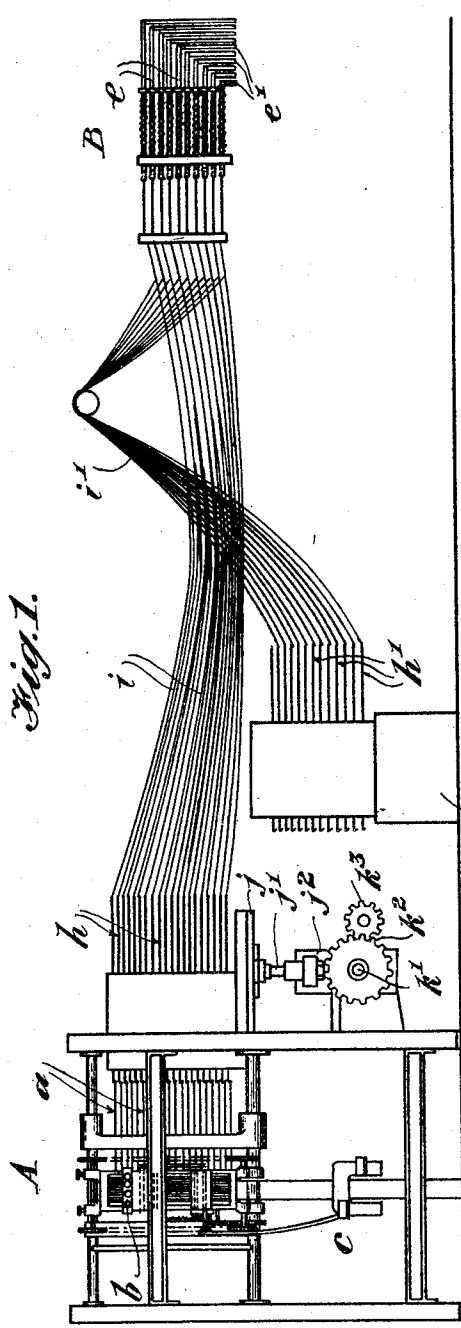
A. FRAME

1,777,967

PUNCHING OF JACQUARD CARDS FOR USE IN LACE AND OTHER WEAVING

Filed Sept. 27, 1927

4 Sheets-Sheet 1



*Inventor;*  
*Archibald Frame.*  
*by his Attorneys*  
*Howson + Howson*

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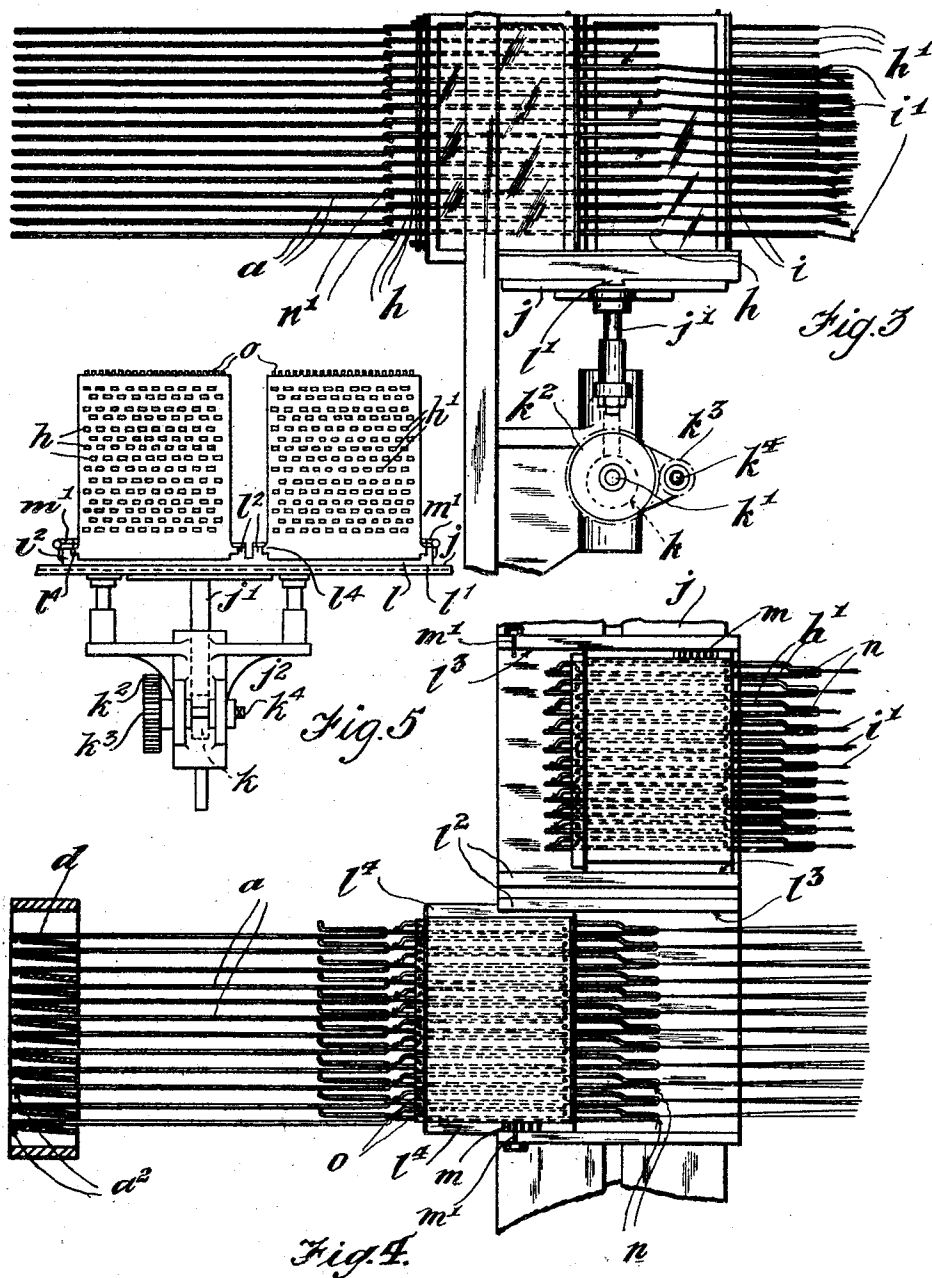
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4 Sheets-Sheet 2



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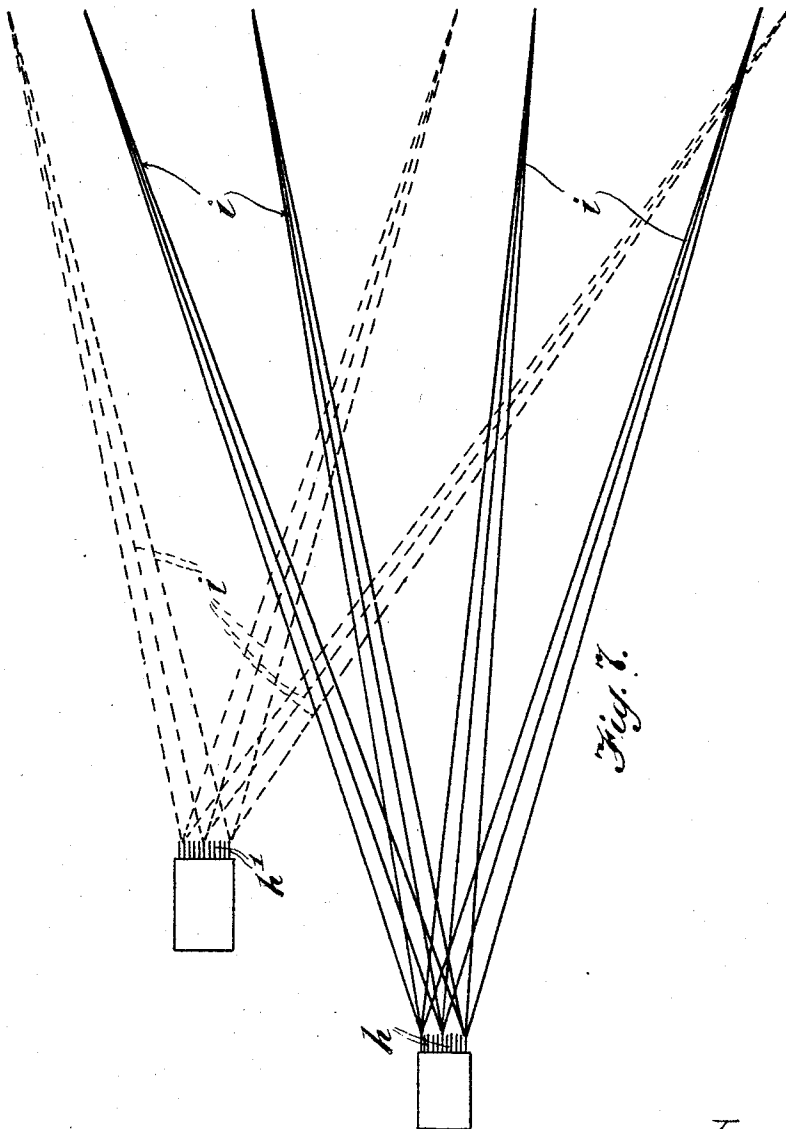
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4 Sheets-Sheet 3



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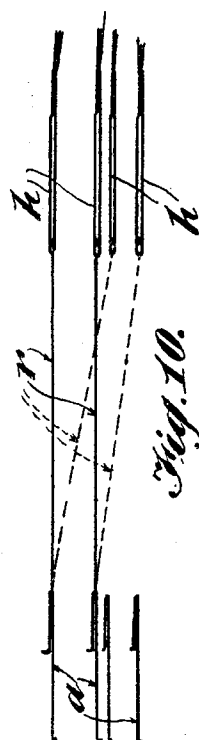
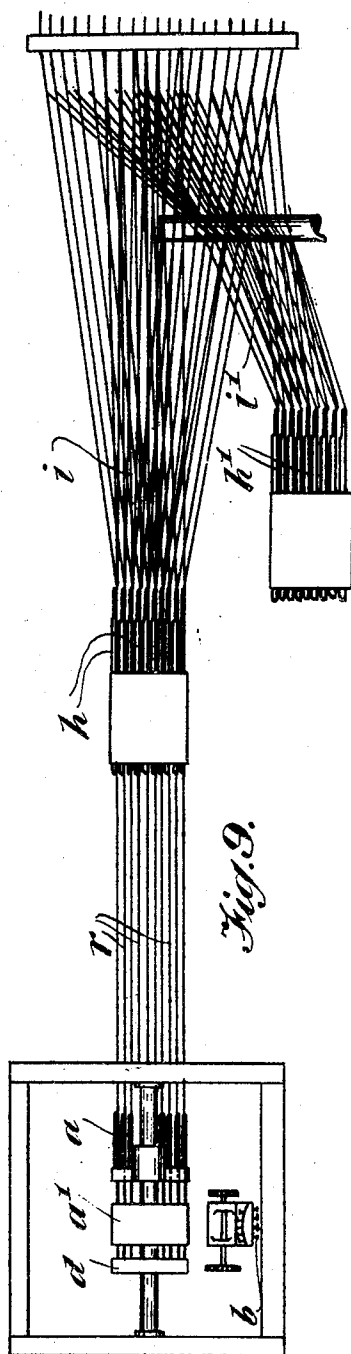
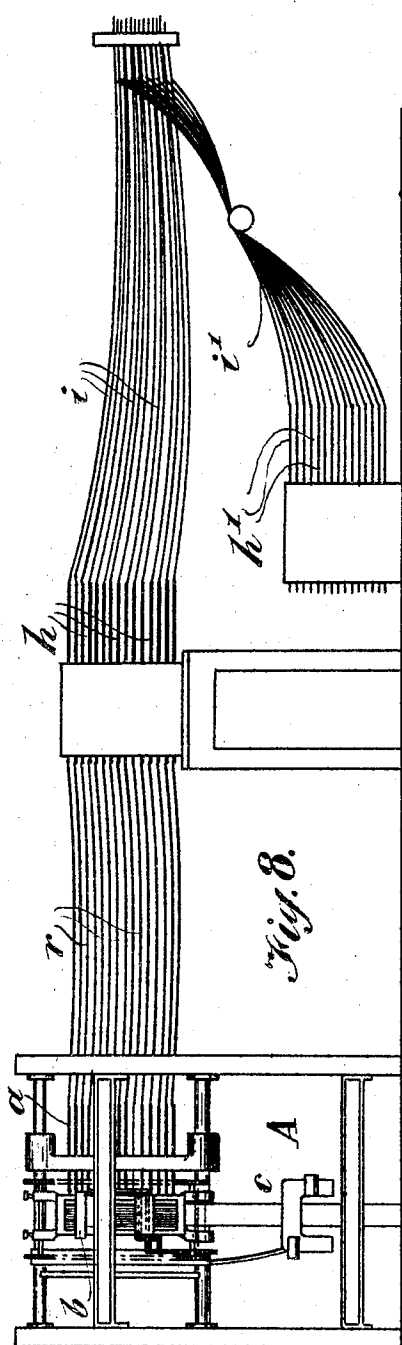
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4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE

ARCHIBALD FRAME, OF DARVEL, AYRSHIRE, SCOTLAND

PUNCHING OF JACQUARD CARDS FOR USE IN LACE AND OTHER WEAVING

Application filed September 27, 1927. Serial No. 222,314.

This invention has reference to the punching of jacquard cards for use in lace and other weaving.

In the punching of such cards the punches are selected by the operation of draw needles, which needles are selected by the operator according to the pattern to be punched on each card.

It is usual for each card to have the same pattern punched therein a plurality of times. That is, each card is punched with a plurality of repeats. For this reason the draw needles have each secured thereto a number of flexible connections, the number depending on the number of repeats, each of such connections being operatively connected to punch selecting mechanism.

Where the pattern is repeated a greater or less number of times than is the case of the cards just previously punched by the machine, it will be apparent that a considerable amount of time and labour must be spent in altering the flexible connections to vary the number of repeats, and during such time it has hitherto been the case that the machine, i. e., both the punch selecting machine and card punching machine, must remain idle.

My invention has for its object to provide improvements whereby the change over, or variation in the number of repeats can be effected whilst the machine is running thereby obviating the waste hitherto invariably caused by allowing the machine to remain idle during such change over.

In order that my invention will be properly understood I have hereunto appended five explanatory sheets of drawings whereon:—

Figure 1 illustrates a machine for selecting the punches together with a card punching machine. The former is of the type set forth in my U. S. A. patent specification No. 1,600,873 and only such parts thereof are shown as are necessary for the proper understanding of my invention. It will be ap-

preciated that other types of machines for selecting the punches may be employed.

The card punching machine is indicated diagrammatically and only such parts of the machine are shown as are necessary for the explanation of my invention.

Likewise other types of card punching machines may be employed.

Figure 2 illustrates a plan view of the punch selecting machine and card punching machine shown in Figure 1.

Figure 3 illustrates to a larger scale an elevation of what I term the intermediate needle boxes showing the intermediate needles contained in one box connected to the draw needles, and the needles of the other box ready to effect a change over.

Figure 4 is a plan view of Figure 3.

Figure 5 is an end elevation of Figure 3 looking to the right.

Figure 6 illustrates a jacquard card punched with four repeats of pattern, each pattern being indicated by three holes.

Figure 7 illustrates diagrammatically the connection to the intermediate needles to effect said number of repeats, and also indicates the connections to make three repeats.

Figure 8 indicates diagrammatically the punch selecting machine and card punching machine with a modified arrangement of intermediate needles.

Figure 9 is a plan view of Figure 8, and

Figure 10 illustrates diagrammatically the manner in which such modified arrangement of intermediate needles is connected to the draw needles and also to the card punching machine.

Referring to the drawings:—

The punch selecting machine A, is as stated, of the type set forth in my said prior patent specification and consists of a large number of draw needles  $a$  and a corresponding number of cross needles, not shown, all being supported within a needle box  $a^1$ , see Figure 2. The left hand end of the draw

needles are hooked as at  $a^2$ , see Figure 4, and by means of keys  $b$  operated by the operator in accordance with the pattern to be punched and also by the operation of treadle or like mechanism  $c$ , selected cross needles are actuated so as to move the hooked ends of the corresponding draw needles clear of a grid  $d$ , see Fig. 4. On the latter being moved to the left the draw needles caught by the grid are caused to partake of a like movement while the other draw needles remain stationary. The other ends of the draw needles are connected to corresponding spring loaded horizontal spindles  $e$  of the card punching machine B. Each of said spindles co-operates with one of a multiplicity of punches  $e^1$  so as to normally prevent same moving upwards. When the draw needles caught by the grid are moved to the left the horizontal spindles  $e$  connected thereto are moved clear of their punches  $e^1$  so that said punches can rise upwards. The spindles connected to the draw needles not caught in the grid remain stationary, and by co-operating with their corresponding punches prevent same rising so that only such punches perforate the jacquard card.

The card shown in Figure 6 is shown punched with four repeats indicated by the groups of holes  $f$ ,  $f^1$ ,  $f^2$  and  $f^3$  and to effect this each draw needle is operatively connected to four of the said spindles  $e$ . Should it be necessary to punch cards having say three repeats, as indicated by the holes shown in dotted lines  $g$ ,  $g^1$  and  $g^2$ , Figure 6, the connections between the draw needles and horizontal spindles have all to be altered so that each draw needle operates three spindles.

The change over in the number of repeats, involving the disconnecting and reconnecting of many hundreds of flexible connections, is an operation which occupies much time and during which it has hitherto been the case that both the punch selecting machine and card punching machine must remain idle. As such changes occur frequently it will be appreciated that there is serious loss in the out-put of the machines.

According to my invention I provide two boxes of intermediate needles  $h$  and  $h^1$  and two flexible connections  $i$  and  $i^1$  controlling each punch of the card punching machine, the one set of intermediate needles  $h$  being removably connected to the draw needles  $a$  and by means of one set of flexible connections  $i$  to the card punching machine, while the other set of intermediate needles  $h^1$  is available for connection to the other set of connections  $i^1$  so as to effect a different number of repeats required for the next pattern to be punched. The arrangement is such that connections can be made whilst the machines are in operation and when required, the set of intermediate needles  $h$  is disconnected

from the draw needles and the other set substituted therefor so as to effect a different number of repeats, such change over being effected in a few minutes.

In Figure 7, for example, the intermediate needles  $h$  are connected to the card punching machine by the flexible connections  $i$  so as to make four repeats while the intermediate needles  $h^1$  are connected to the card punching machine by means of the flexible connections  $i^1$ , shown in dotted lines Figure 7, to make three repeats. Therefore all that is required to vary the number of repeats from four to three is to connect the intermediate needles  $h^1$  to the draw needles  $a$  in lieu of the intermediate needles  $h$ .

It will be obvious that both sets of intermediate needles may be connected to make any other number of repeats.

As shown in Figures 1 to 5 the punch selecting machine is provided with a horizontal table  $j$  carried by a pillar  $j^1$  adjustable vertically within a hollow standard  $j^2$ . Immediately below said pillar is a cam  $k$  mounted on a spindle  $k^1$  to which is keyed a spur wheel  $k^2$ . A pinion  $k^3$  mounted on a spindle  $k^4$  gears with said spur wheel. It will therefore be seen that by turning said spindle  $k^4$  by means of a suitable tool the said cam can be rotated through said gearing and by such means the table can be raised and lowered.

Carried by the table so as to be capable of a transverse movement thereon is a bed plate  $l$ , a tongue  $l^1$  on the bottom thereof fitting into a corresponding groove in the face of the table  $j$ . Said bed plate is provided with rails  $l^2$  having over-hanging lips  $l^3$  which receive the longitudinally extending ribs  $l^4$  formed on the sides of the boxes containing the intermediate needles. Short racks  $m$  are secured to the said boxes on one side thereof and pivoted catches  $m^1$  carried by the bed plate  $l$  are adapted to engage therewith so as to prevent the boxes being dragged forward.

As clearly shown in Figure 4 the intermediate needles  $h$  and  $h^1$  are bent as at  $n$  to permit the knotted ends of the connections  $i$  and  $i^1$  being slipped into and retained by the said ends.

The other end of the said needles are provided with hooks  $n^1$  adapted to engage with the bent over ends of the draw needles, see Figure 3.

The two end plates of the boxes carrying the intermediate needles are provided with tiers of short horizontal slots, each alternate tier being staggered with respect to the tier immediately above and below said slots in combination with stout vertical wires  $o$  serving to guide the intermediate needles during the longitudinal movement periodically imparted thereto. By arranging the ends of the intermediate needles staggered there is more freedom for the operator in disconnect-

ing and connecting the flexible connections thereto.

In Figures 1 and 2 the intermediate needles  $h$  are shown connected to the draw needles while the box containing intermediate needles  $h^1$  is shown supported on a pedestal  $p$  in such position as to facilitate the flexible connections  $i^1$  being connected thereto. When this has been done said box is placed on the bed plate  $l$  as shown in Figures 3, 4 and 5. When it is necessary to effect the change over the catch  $m^1$  is moved so as to permit the box carrying the intermediate needles  $h$  being moved slightly to the left, i. e., towards the draw needles. By means of a suitable tool the spindle  $k^4$  is rotated, this resulting in the cam being rotated through the said pinion and spur wheel and the pillar  $j^1$  with table and intermediate needles raised to such extent that the hooked ends of the intermediate needles  $h$  are out of engagement with the draw needles  $a$ . The box containing the intermediate needles  $h$  is then removed so that the flexible connections  $i$  can be disconnected therefrom, and again secured thereto to effect another variation in the number of repeats. The base plate carrying the box containing the intermediate needles  $h^1$  is moved until the hooked ends of the said intermediate needles are immediately over the ends of the draw needles. By operating the spindle  $k^4$  the table  $j$  is lowered and then the said box moved slightly to the right so that the hooked ends of the needles  $h^1$  are in engagement with the draw needles.

The machines are now ready to punch cards having a number of repeats corresponding to the number of flexible connections  $i^1$  secured to each intermediate needle  $h^1$ .

In the modification shown in Figures 8, 9 and 10 the intermediate needles are connected to the draw needles by flexible connections  $r$ . Such modification does not permit of the same quick interconnection of the draw needles and intermediate needles but under certain circumstances, i. e., for certain classes of work, such modification is particularly suitable.

Thus assume that each flexible connection  $r$  is connected to a draw needle  $h$  and that the number of repeats subsequently required to be made is a multiple of that for which the flexible connections  $i$  are arranged. This can then be effected by connecting each draw needle  $a$  to two or more intermediate needles  $h$ . Each draw needle then controls a multiple of the number of punches previously controlled thereby.

In Figure 10 the connections are indicated in full lines showing two draw needles each controlling a single intermediate needle and in dotted lines the connections made so as to control two intermediate needles.

What I claim is:—

1. Means for punching jacquard cards for

lace and other weaving comprising draw needles, means for manipulating the draw needles according to the pattern to be punched; a card punching machine, two sets of flexible connections operatively connected to control the punches of the said machine, a series of intermediate needles removably connected to said draw needles and to one of the sets of flexible connections and a second set of intermediate needles adapted to be connected to said draw needles and connected to the other set of flexible connections.

2. A machine for manipulating the punches of a jacquard card punching machine comprising draw needles, means for operating the draw needles according to the pattern to be punched and a set of intermediate needles removably connected to said draw needles and adapted to be connected to flexible connections controlling the punches of a card punching machine.

3. A machine for manipulating the punches of a jacquard card punching machine comprising draw needles, means for operating the draw needles according to the pattern to be punched, a set of intermediate needles adapted to be connected to flexible connections controlling the punches of a card punching machine and having hooked ends for engagement with said draw needles, a support for said intermediate needles and means for raising and lowering said support to bring said hooked ends into and out of engagement with the draw needles.

4. A machine for manipulating the punches of a jacquard card punching machine comprising draw needles, means for manipulating said needles according to the pattern to be punched, a set of intermediate needles, said intermediate needles being adapted for connection to flexible connections controlling the punches of a card punching machine and having hooked ends for connection to the draw needles, a box containing said intermediate needles, a support for said box, guide rails on said support to receive said box, and means for raising and lowering said support to bring the hooked ends of the intermediate needles into and out of engagement with the draw needles.

5. A machine for manipulating the punches of a jacquard card punching machine comprising draw needles, means for manipulating said needles according to the pattern to be punched, a set of intermediate needles, each intermediate needle being bent to receive the ends of flexible connections controlling the punches of a card punching machine and provided with a hook at the other end, a box for said intermediate needles and end plates to said box provided with tiers of slots to receive and slidably support said intermediate needles.

6. Means for punching jacquard cards for

lace and other weaving comprising draw  
needles, means for manipulating said needles  
according to the pattern to be punched,  
a card punching machine, intermediate  
needles, which are removably connected to  
the draw needles, and flexible connections  
by which each draw needle can be arranged  
to control a plurality of punches of the  
punching machine, and a further set of in-  
termediate needles together with flexible  
connections which can be arranged to con-  
trol any other combination of punches and  
which second set of intermediate needles can  
be substituted for the first mentioned set.

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