No. 770,258. PATENTED SEPT. 20, 1904.

G. H. BROWN, W. R. McMURRAY & M. C. ANDREWS.

JACQUARD MACHINE FOR LOOMS.

APPLICATION FILED JUNE 20, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.

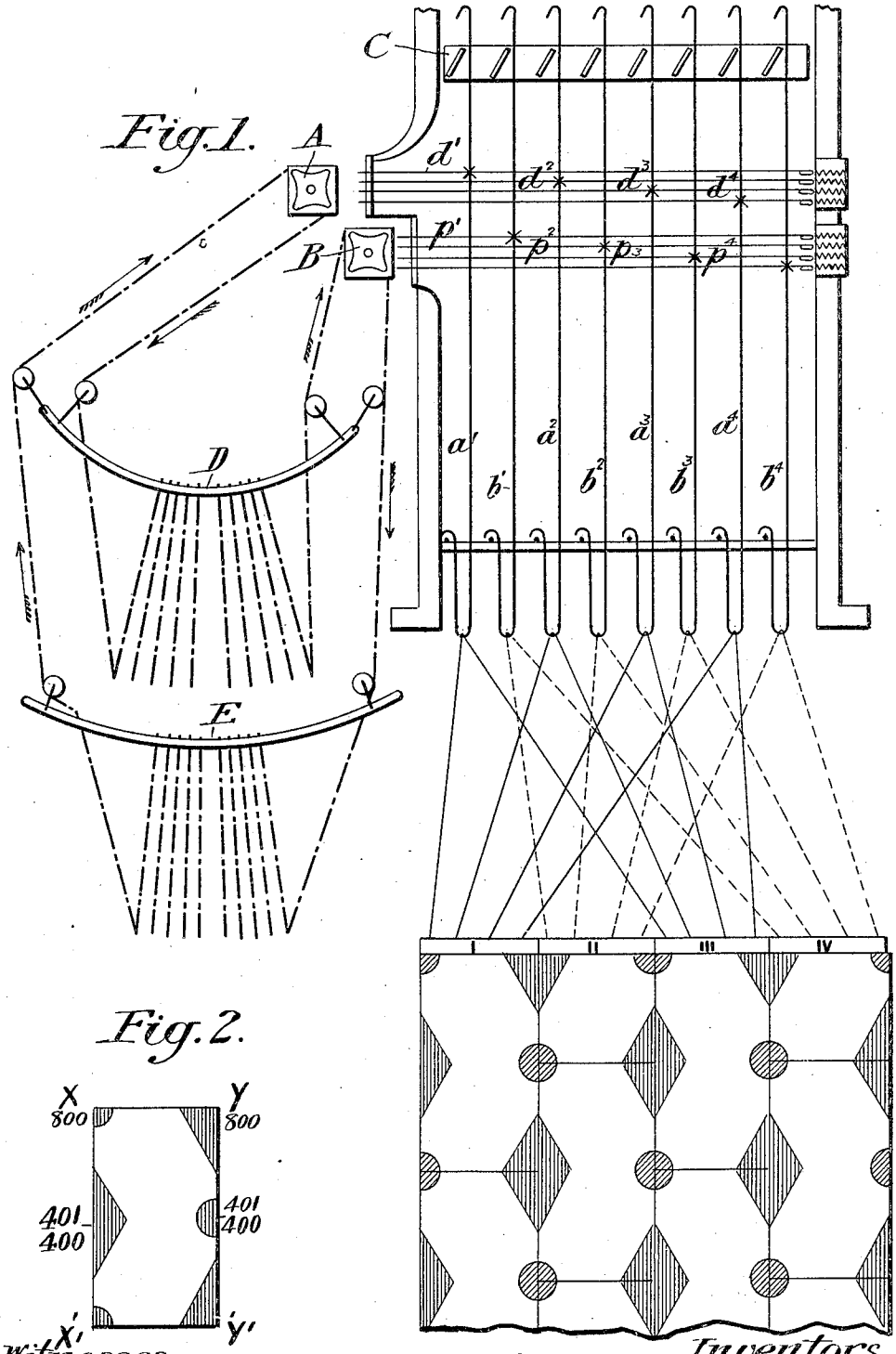

Fig. 2.

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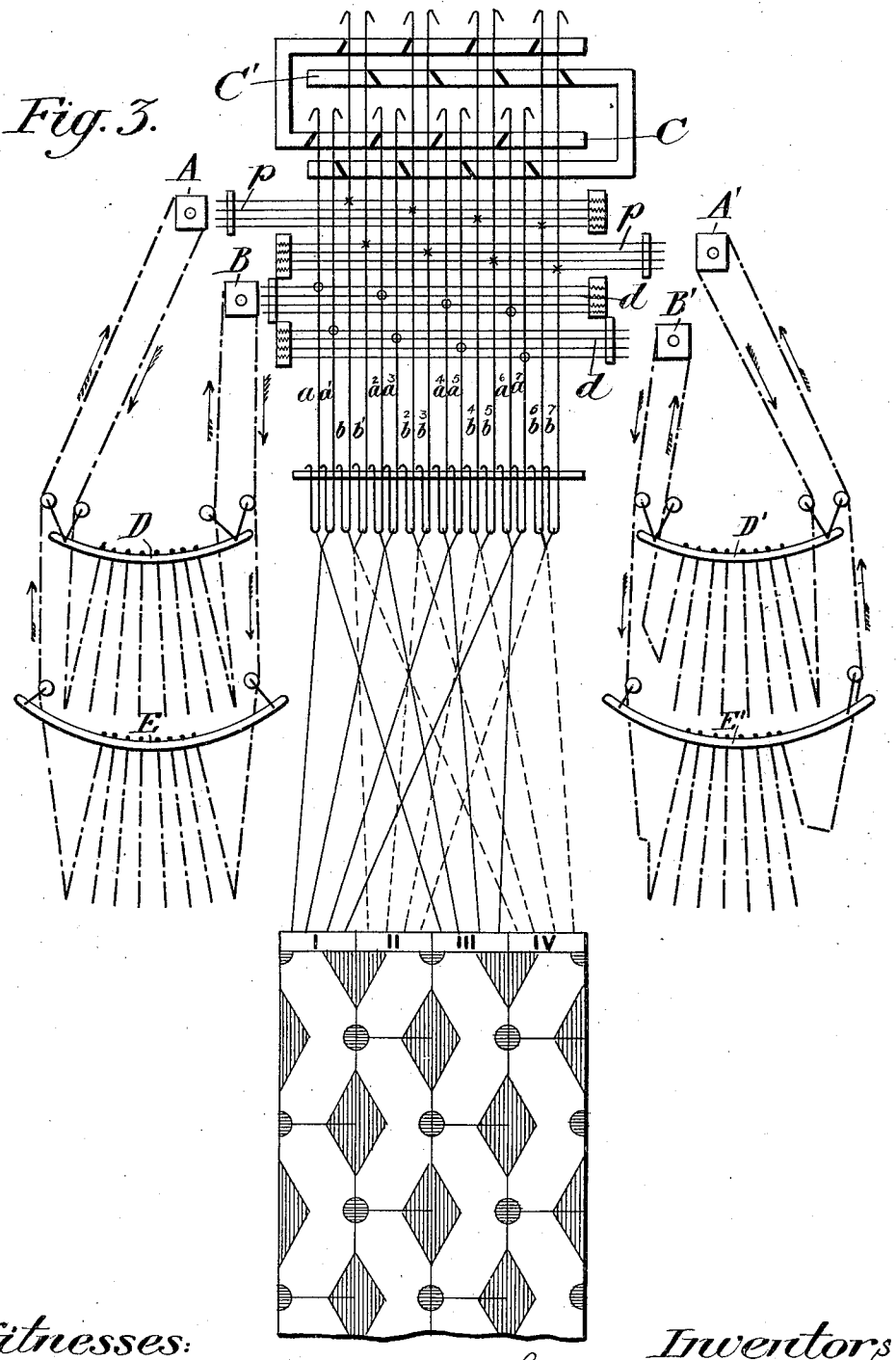
NO MODEL. 5 SHEETS—SHEET 2.

Fig. 3.



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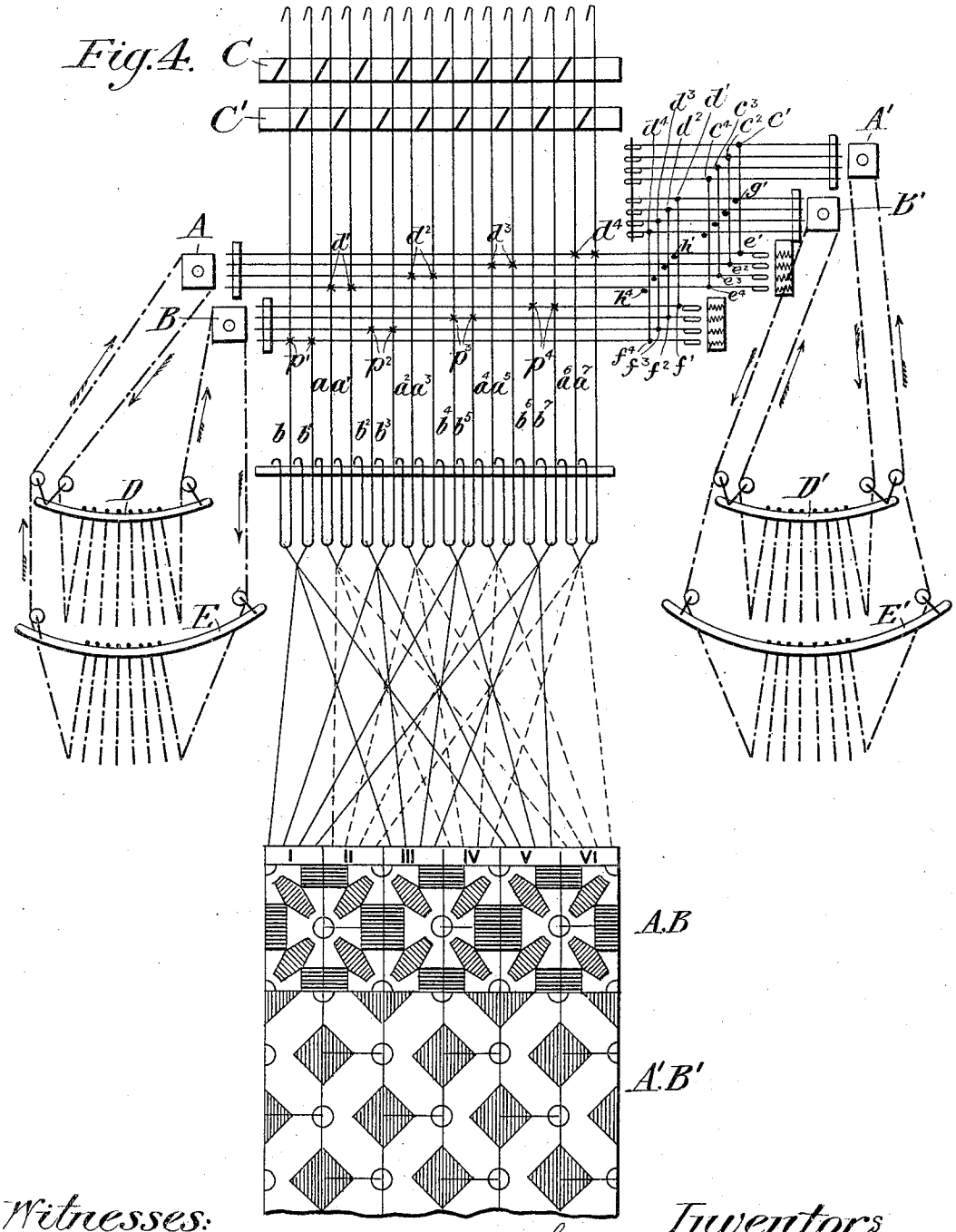
NO MODEL. 5 SHEETS—SHEET 3.

Fig. 4.



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JACQUARD MACHINE FOR LOOMS.

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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 6.

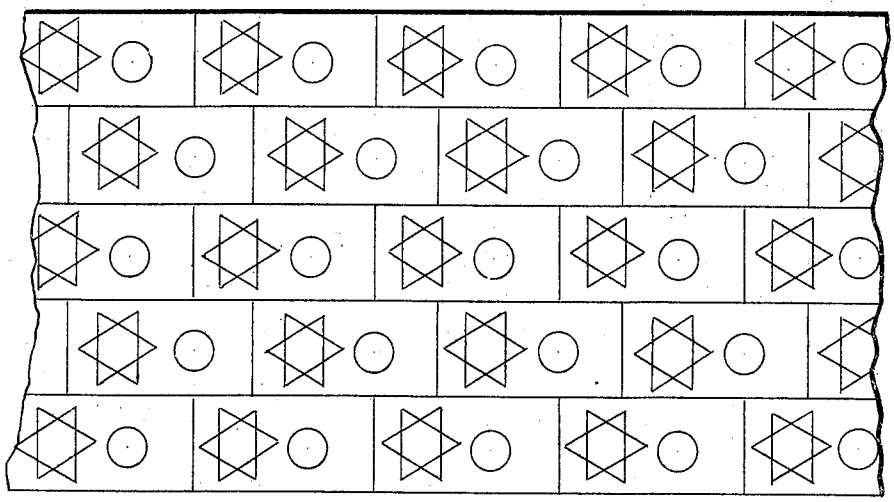
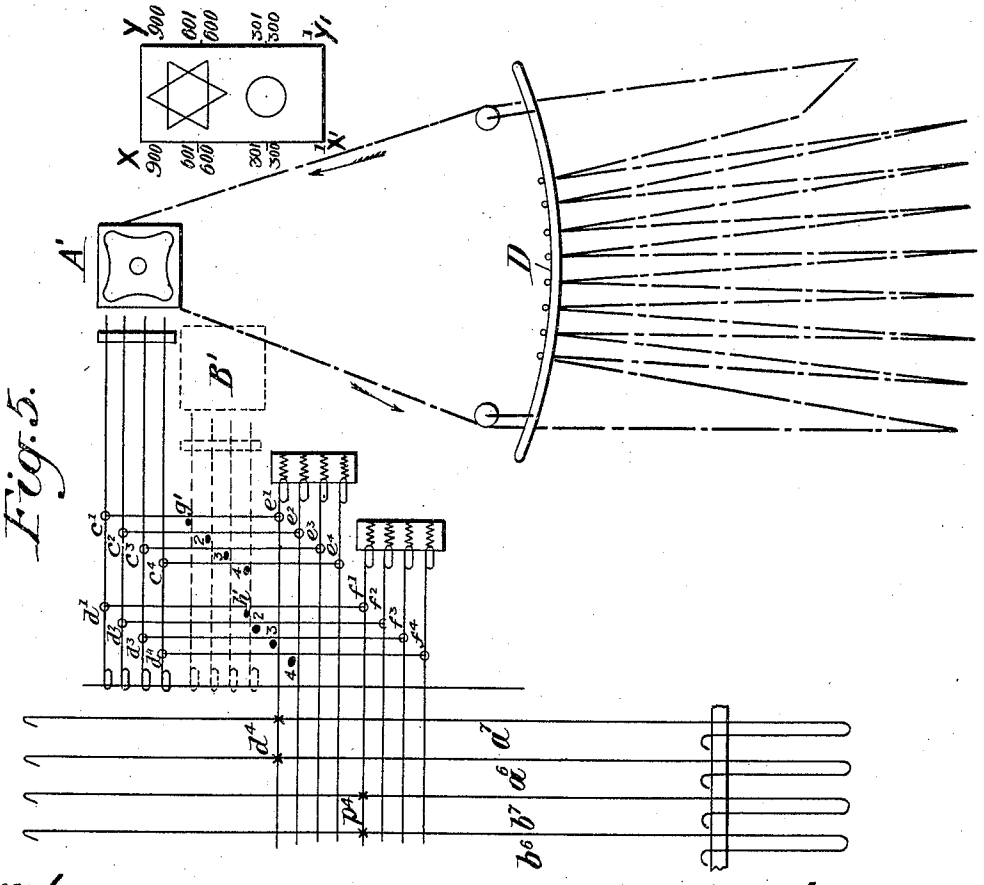


Fig. 5.



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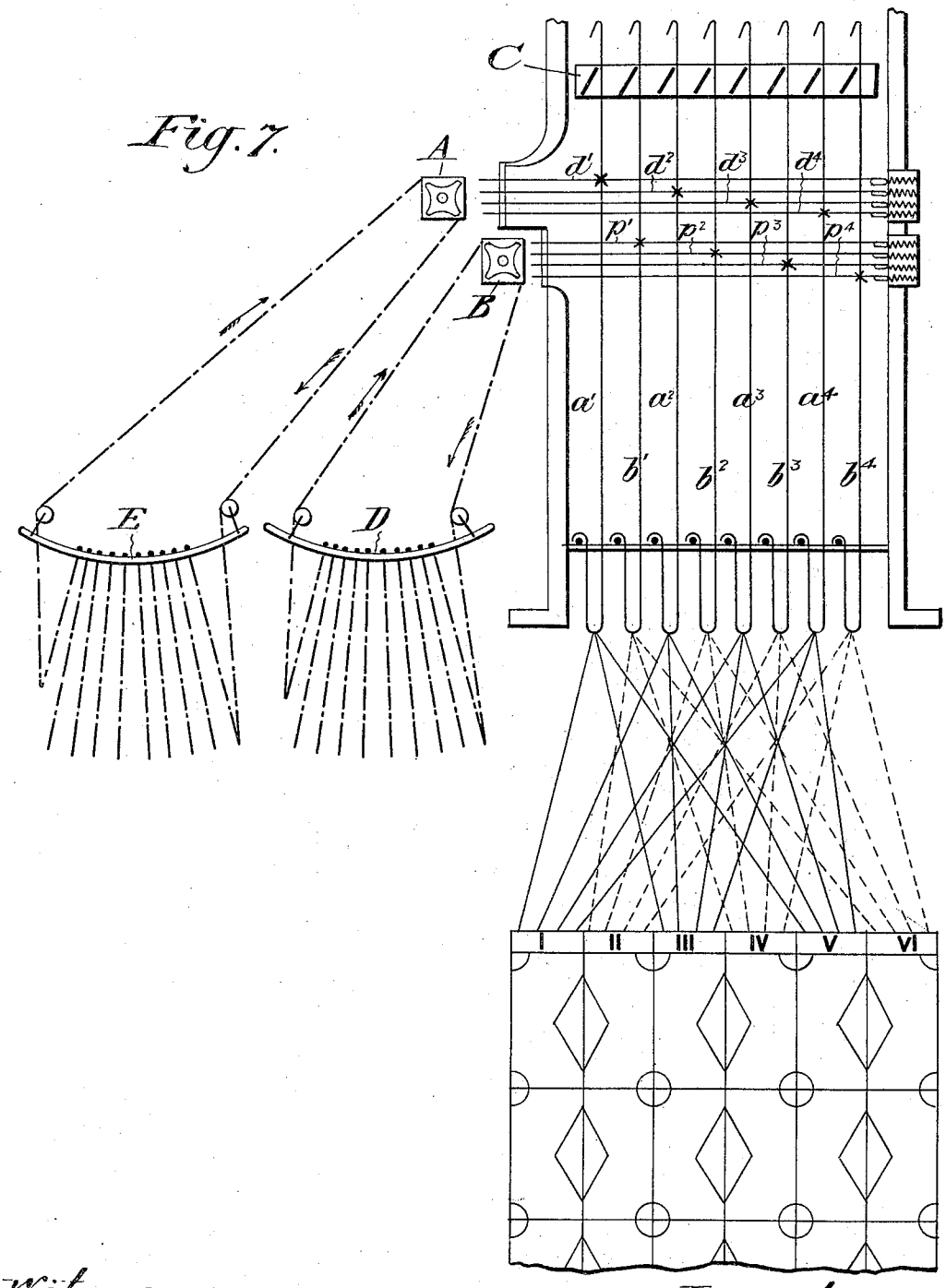
JACQUARD MACHINE FOR LOOMS.

APPLICATION FILED JUNE 20, 1902.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 7.



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UNITED STATES PATENT OFFICE.

GEORGE HERBERT BROWN, WILLIAM RICHEY McMURRAY, AND MICHAEL CORBET ANDREWS, OF BELFAST, IRELAND.

JACQUARD-MACHINE FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 770,258, dated September 20, 1904.

Application filed June 20, 1902. Serial No. 112,513. (No model.)

To all whom it may concern:

Be it known that we, GEORGE HERBERT BROWN, linen manufacturer, WILLIAM RICHEY McMURRAY, linen manufacturer, and MICHAEL CORBET ANDREWS, manager, subjects of the King of Great Britain and Ireland, of Royal Ulster Works, Belfast, Ireland, have invented new and useful Improvements in Jacquard Mechanism for Looms, (for which we have obtained a patent in Great Britain and Ireland, numbered 23,697 and dated November 22, 1901,) of which the following is a specification.

The invention relates to jacquard-machines and apparatus connected therewith, and has for its object the production of what is known as a "drop-repeat" design in damasks and other figured fabrics which are woven with more than one repeat of the pattern in the width.

The invention comprises a special jacquard-machine having a special arrangement of cords or leashes in the harness or mounting of the loom and a painted design and a method of working the pattern-cards upon the jacquard-machine.

The jacquard may be of any type, either single or double acting lift, with either single or double acting cylinders, cross-bordering, twilling, or the like.

Referring to the drawings which form a part of this specification, Figure 1 represents diagrammatically a vertical section of the invention as applied to a jacquard-machine with single-acting lift and with single-acting cylinders. Fig. 2 shows the design required to be painted and transferred to the pattern-cards for the pattern shown on the piece in Fig. 1. Fig. 3 shows the invention applied to a jacquard fitted with double-acting lift and cylinders. Fig. 4 shows the invention applied to one form of cross-border jacquard. Fig. 5 shows the invention with one cylinder only working an ordinary straight repeat (using one cylinder only) on the cross-border side of the jacquard. (Shown in Fig. 4.) Fig. 6 shows the pattern arranged to work with a drop of one-third the length of its repeat. Fig. 7 shows the invention applied to a single-acting jacquard working a straight repeat of double the ordinary width.

According to this invention the four rows of horizontal needles d' d^2 d^3 d^4 and p' p^2 p^3 p^4 shown in each of the two sets govern the eight rows of vertical hooks a' a^2 a^3 a^4 and b' b^2 b^3 b^4 in the usual manner by means of the ordinary loop or crank. Any number of rows of hooks and needles may be employed, and each set of needles is provided with its own face or needle plate, back grate, spring-box or spring-board, and all the ordinary fittings usually employed. The lifting-knives C are of ordinary pattern and are mounted in a frame which is given a vertically-reciprocating motion to the extent required for the shed or draft of the harness-cords and warp-threads.

The card-cylinders A and B in the single-acting-cylinder jacquard are mounted each with its own ordinary fittings one above the other, but both in one frame, to which is given a swinging or horizontally-reciprocating motion. The cylinders may be each one turned separately by means of the usual catches, or one alone may be turned by this means, the other being connected to the first by means of bands, chains, or the like, so that they turn together and in the same direction. The card upon the face of the cylinder A acts upon the needles d' d^2 d^3 d^4, and these needles govern, respectively, the hooks a' a^2 a^3 a^4. The card upon the face of the cylinder B acts upon the needles p' p^2 p^3 p^4, which govern the alternate rows of hooks b' b^2 b^3 b^4 in the same way. The cords or leashes of the harness or mounting are shown, Fig. 1, tied down for a "lift-over" repeat; but any convenient style of harnessing may be employed. For convenience the harness and cloth are shown with one-quarter turn relatively to the jacquard machine and cards, and, as shown, the cards would hang over one side of the loom; but the harness may be so arranged that the cards hang either over the back or the front. The cords from the hooks a' a^2 a^3 a^4 are tied down to repeats I III V of the harness, while the cords from the alternate rows

of hooks b' b^2 b^3 b^4 are tied down to the alternate repeats II IV VI of the harness. Mails and lingoes, as usual, are attached to the harness-cords, and the warp-threads are drawn into them as desired. The result of this arrangement of machine and harness is that the design in the repeats I III V is governed by the cards acting on the face of the cylinder A, while the design in the alternate repeats II IV VI is governed by the cards acting on the face of the cylinder B. The design is arranged on the drop-repeat principle, in which the pattern does not repeat itself straight across the width of the fabric, as in a straight repeat, but has every alternate repeat displaced lengthwise for a certain portion of its length, usually one-half.

Fig. 2 shows the whole quantity of design necessary to be painted and transferred to the pattern-cards for the pattern shown on the cloth at Fig. 1, which is dropped one-half length of the repeat. The full repeat is so arranged that if there be, say, eight hundred cards in its complete length, then taking X X′ as the left-hand edge and Y Y′ as the right-hand edge in Fig. 2 cards Nos. 1 to 400 on X X′ will join with cards Nos. 401 to 800 on Y Y′ and cards Nos. 401 to 800 on edge X X′ will join with card Nos. 1 to 400 on edge Y Y′. The last edge of the repeat X Y joins with the first edge X′ Y′ of the next repeat in the ordinary way. This arrangement of the design allows the whole pattern to be completed, as shown in the cloth in Fig. 1, if while card No. 1 is governing the weave on any one repeat card No. 401 is governing the weave on the two adjacent repeats upon the right and left hand of the first repeat, and in the same way when card No. 401 is governing the weave on the first-mentioned repeat card No. 1 is governing the weave on the adjacent repeats, and so on in the same way in regular rotation with all the intermediate cards. Thus to complete the pattern when designed in this manner the card which is governing the weave in any set of alternate repeats must be always one-half the total number (in this case four hundred) of cards ahead of the card which is governing the weave on the other set of alternate repeats. Thus card No. 1 is governing repeats Nos. I III V, while card No. 401 is governing repeats Nos. II IV VI; card No. 400 is governing repeats Nos. I III V, while card No. 800 is governing repeats Nos. II IV VI; card No. 401 is governing repeats Nos. I III V, while card No. 1 is governing repeats Nos. II IV VI; card No. 800 is governing repeats Nos. I III V, while card No. 401 is governing repeats Nos. II IV VI. The pattern-cards are punched from the painted design and laced together in any of the ordinary ways. The card-carriers D and E are arranged in two sets, one vertically above the other. The cards are shown placed on the carriers so that each bears one-half of the complete set of cards necessary for the repeat; but they may be divided thereon in any other given definite proportion for which the design has been arranged. When working, one or more cards are turned in either direction for every complete stroke of the cylinder-mounting or one card is turned for any other number of strokes of the same as may be required, both the cylinders being turned at the same time.

The cards are guided by rollers or other guides, and in working they pass upward from the outside of the bottom carrier E and round the top cylinder A, returning to the outside of the top carrrier D. They pass from the inside of this carrier D upward and round the bottom cylinder B and thence downward to the inside of the bottom carrier E, from the back of which they are ready to pass again through the same or other sequence. The direction of the cards when working as described is indicated in the figure by arrows; but this direction may be reversed at any desired point.

The design is so arranged as to be completed by an even number of pattern-cards, and these are placed upon the card-carriers and passed round the cylinders of the jacquard-machine, as just described, so that there are exactly one-half of the total number of cards counting from the card on the face of the cylinder A to the card on the face of the cylinder B and also one-half of the total cards counting from the card on the face of the cylinder B to the card on the face of the cylinder A, counting in the same direction as before along the cards as laced. Thus if there be eight hundred cards in the complete repeat of the pattern the cards will be arranged as shown in the figure, so that card No. 1 is on the face of the cylinder A and card No. 401 is on the face of the cylinder B. As the two cylinders are actuated and revolved simultaneously, the cards will retain the same position relatively to one another and to the cylinders and card-carriers during the working of the whole repeat and until such time as they again return into their original position—that is to say, the cards on the cylinder B will always be four hundred numbers in advance of the card on the cylinder A counting in cyclic order round the entire set and beginning again at No. 1 immediately after No. 800. Thus when card No. 1 is on cylinder A card No. 401 will be on cylinder B; when card No. 400 is on cylinder A, card No. 800 will be on cylinder B; when card No. 401 is on cylinder A, card No. 1 will be on cylinder B; when card No. 800 is on cylinder A, card No. 400 will be on cylinder B, and so on.

By the whole arrangement of jacquard-harness, design, and cards it will be seen that card No. 1 on cylinder A governs the pattern in repeats I III V at the same time that card No. 401 on the cylinder B governs the pattern in the alternate repeats II IV VI, and in the same way card No. 1 on cylinder A governs

repeats I III V at same time that card No. 400 on cylinder B governs repeats II IV VI, card No. 400 on cylinder A governs repeats I III V at same time that card No. 800 on cylinder B governs repeats II IV VI, card No. 401 on cylinder A governs repeats I III V at same time that card No. 1 on cylinder B governs repeats II IV VI, card No. 800 on cylinder A governs repeats I III V at same time that card No. 400 on cylinder B governs repeats II IV VI, which conforms with the conditions described as necessary for the production of a half-dropped repeat in the pattern, so that the result of the complete arrangement is to produce that effect in the fabric.

For convenience in working, and more especially to enable the cards to be adjusted with ease and accuracy upon the cylinders in case they become disarranged, the set of cards may be numbered in the following manner: Start with the first card of the repeat and number it "No. 1" and continue numbering the cards in regular sequence for one-half the total number of cards required in the set. Then commence again at No. 1 and continue in regular sequence to the end of the repeat, finishing on the same number as in the first half; but in numbering the second half distinguish each card from the one bearing the same number in the first half by means of some special mark—say "×." Thus the cards in the repeat mentioned above would be numbered from "No. 1" to "No. 400" and then from "No. 1×" to "No. 400×," thus making up the total set of eight hundred cards. By following this method of numbering it will be seen that a card bearing the same number will always appear at the same time upon the corresponding faces of the two cylinders; but the one will be distinguished from the other by its special mark. Thus in the specified repeat of eight hundred cards while the plain numbers from "1" to "400" are working on the cylinder A the marked numbers from "1×" to "400×" will be working number for number on the cylinder B. The plain cards on the cylinder A will be followed in regular sequence by the marked numbers, and at the same time the marked numbers on the cylinder B will be followed by the plain numbers thus: card No. 1, cylinder A, 1× cylinder B; card No. 400, cylinder A, 400× cylinder B; card No. 1×, cylinder A, 1 cylinder B; card No. 400×, cylinder A, 400 cylinder B, and so on, again and again.

In the following diagrams are shown a few of the other applications of the invention to jacquards of other types. The principle is the same as for that already described; but the arrangements are varied to suit the various classes of jacquards. In the diagrams the same letters have been used throughout for the same parts as in the first figure.

Fig. 3 shows the invention applied to a jacquard fitted with double-acting lift and double-acting cylinders. The four cylinders are shown at A A′ B B′, the lifting-knives at C C′, and the card-carriers at D D′ E E′. In this case the cylinders are fitted in pairs either to each end of a reciprocating slide or to two swing-battens. The hooks are each one governed by a needle in the order usually employed in jacquards of this class, only there are double the ordinary number of hooks and also double the ordinary number of needles. The hooks and needles governed by the card on the face of the cylinders A and A′ are arranged in the same manner as in an ordinary jacquard of this class, as are also the hooks and needles governed by the cards on the faces of the cylinders B B′. The rows of hooks are coupled together in pairs, as is usual in double-lift machines, the hooks a and a' being connected, also hooks b and b', the hooks a^2 and a^3, b^2 and b^3, and so on. The cords of the harness are connected to these neck-cords and are tied down in any convenient sequence, following the same method described in Fig. 1, all the cords from the neck-cords connecting the hooks $a\ a'$, $a^2\ a^3$, $a^4\ a^5$, and $a^6\ a^7$ being tied down to the repeats I III V, while the cords from the neck-cords connecting the hooks $b\ b'$, $b^2\ b^3$, $b^4\ b^5$, and $b^6\ b^7$ are tied in the same or other sequence to the alternate repeats II IV VI. The painted design is prepared in exactly the same manner as that already described. The cards are laced in two sets as ordinary for double-acting-cylinder jacquards, the cards bearing odd numbers being laced together in one set, while the alternate cards bearing even numbers are laced together in a separate set. One of these sets is put up on one side of the jacquard on the carriers D and E in exactly the same manner as that described for Fig. 1, the other set being put up in the same way on the other side of the jacquard on the carriers D′ and E′. The cards in working follow on either side exactly the same path as described, the cylinders on either side being simultaneously actuated and alternately with those on the other side, and so being turned alternately the cards from either side are taken from their respective carriers alternately. The jacquard is worked in the ordinary way for this class of machine, the two sets of lifting-knives C and C′ being reciprocated vertically and alternately with one another, the cylinders on each side being also reciprocated horizontally and alternately with one another in such a manner that the cards on the cylinders A B on the one side select the hooks to be raised by the lifting-knives C, while the cards on the cylinders A′ and B′ select the hooks to be raised by the lifting-knives C′.

Fig. 4 shows the invention applied to one form of cross-border jacquard. In this jacquard while the lift remains double-acting all the time and the same lifting-knives and hooks are in use all the time the cylin-

ders on either side of the machine may be worked independently of those on the other side, so that either of two separate and distinct designs may be produced at pleasure in the fabric, according to which cylinder and set of cards is brought into work, which can be done by means of changing mechanism. This is very convenient for the working of fabrics which are required to have a distinct cross or end border and for other purposes of the like nature. The two sides of the machine may be considered each separately as working as a double-lift single-acting-cylinder jacquard, the cylinders on the one side, A and B, acting in the ordinary manner, while the cylinders on the other side, A′ and B′, act when required upon the same hooks through the medium of the short needles, levers, and fulcrum-bars, as shown. The two sets of cards are cut from separate designs, and each set is put up and worked on one side of the machine in exactly the same manner as described in Fig. 1, thereby producing the dropped-repeat effect in both the sets of design employed, as indicated in Fig. 4.

By altering the arrangement of levers and fulcrum-bars and using only one cylinder on the right-hand side of the cross-bordering jacquard shown in Fig. 4 the machine may be used to work an ordinary straight repeat in the fabric while the cylinder and cards on this side are in work, while it still produces a dropped-repeat effect when the cards and cylinders on the other side are in work. The arrangement is shown in Fig. 5, which shows the special side of the machine to an enlarged scale. The cylinder B′ is shown removed, (dotted lines;) but it is immaterial which of the two is so removed. Two eyes instead of only one are formed in each of the short or subsidiary needles. These eyes are lettered c' d', c^2 d^2, c^3 d^3, c^4 d^4. The levers passing through the eyes c' c^2 c^3 c^4 also pass through the eyes e' e^2 e^3 e^4 in the top set of the long main needles of the jacquard exactly as in Fig. 4. The levers passing through the eyes d' d^2 d^3 d^4 also pass through the eyes f' f^2 f^3 f^4 in the lower set of long or main needles. Each of the levers in each set turns about a fulcrum-bar, of which there are two sets, g' g^2 g^3 g^4 for the top set of needles and h' h^2 h^2 h^4 for the bottom set in the usual manner. The leverage of each row of levers is so arranged that whenever the cards on the cylinder A′ press any of the short needles the amount of motion communicated to the hooks of the machine is sufficient to clear their top gibs or hooks from the lifting-knives when they rise. The cards being cut from an ordinary straight-repeat design are laced together in one set and placed upon a single carrier D′ and worked round the cylinder A′ in the usual manner. It will be seen that the cards on cylinder A′ govern all the hooks in the machine. Hence they govern the weave in all the repeats in the fabric, all the repeats I II III IV V VI being in this case similar and repeated in the ordinary straight manner, while the cards working on the other side of the machine may be used to work a drop-repeated design whenever it is required.

In any jacquard used to work a drop repeat, if it be desired to produce an ordinary straight repeat this may be done without any alteration of the jacquard itself or of the harness by painting a straight repeat of double the ordinary width and cutting it on two sets of cards, one set taking all the pattern on one side of the design from one edge up to the middle line and the other set taking the pattern from the other edge up to the middle line. These two sets of cards are laced in two distinct sets and are put up on two sets of card-carriers, as shown in Fig. 7, D and E, one behind the other. The set from the back carrier E are worked round the top cylinder A and those from the front carrier D round the bottom cylinder B, both in the ordinary manner, the cards on cylinder A governing the design in repeats I III V and the cards on cylinder B governing the design in the alternate repeats II IV VI, as before described. It will be seen that an ordinary straight repeat of width equal to two repeats will be produced in the fabric. In the single-acting-cylinder jacquard shown in Fig. 1 the above is done on one side of the machine only, as shown in Fig. 7. In the jacquard described in Fig. 3, it being a double-acting cylinder, this is done on both sides of the machine, while in the cross-bordering jacquard described in Fig. 4 it may be done on either side desired or on both sides. If done only on any one side, that side may be used to produce a straight repeat of double width, while the remaining side is still used to produce a dropped repeat; but if done on both sides then the straight repeat will be produced by both sides of the jacquard.

All the foregoing descriptions are applicable to a design on which the pattern is dropped for one-half the total length of the repeat; but the design can equally well be arranged to drop some other definite proportion of the length of the repeat, as one-quarter, one-third, three-quarters, or two-thirds.

Fig. 6 shows pattern arranged to drop one-third the length of its repeat. Using the same lettering as in Fig. 2 and taking nine hundred cards as the total length of the repeat, Nos. 1 to 300 on X X′ is made to join with Nos. 601 to 900 on Y Y′, and edge 301-900 on X X′ to join with edge 1 to 600 on Y Y′. This kind of dropped-repeat design could be worked upon any of the jacquards above described, a different proportion, however, than one-half the cards being borne by each carrier and one cylinder being a different number of the total proportion of cards in the repeat than one-half in advance of the cards upon the other cylinder, according to the arrangement of the

design. An extension of the system of numbering the cards could also be adopted employing more than one distinctive mark and numbering the cards in more than two sequences. In the design shown at Fig. 6 one-third of the cards would be borne by one carrier and two-thirds by the other. The cards on one cylinder would lead by one-third the total number of cards in the repeat, and the cards would be numbered in three sequences with two distinctive marks.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

A Jacquard loom comprising two series of leash-hooks arranged to control adjacent series of warp-threads, a series of horizontal needles for one set of hooks, a second series of horizontal needles for the other set of hooks, a card-cylinder for the first set of needles, a card-cylinder for the second set of needles and a single series of cards for the card-cylinders controlling the needles and the two sets of hooks to produce repeated designs across the fabric, one part of one design being woven simultaneously with another part of a repeat of the said design.

In witness whereof we have hereunto set our hands in presence of two witnesses.

GEORGE HERBERT BROWN.
WILLIAM RICHEY McMURRAY.
MICHAEL CORBET ANDREWS.

Witnesses:
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SAMUEL CATHCART BLACK.