

April 15, 1941.

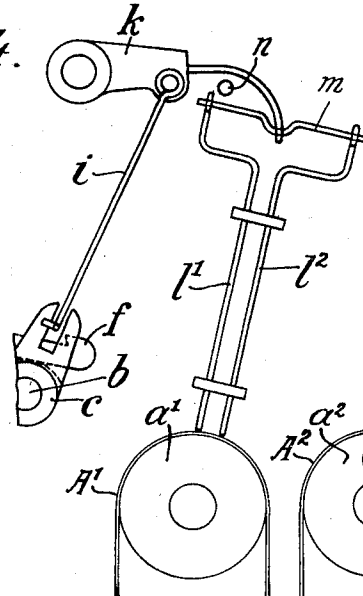
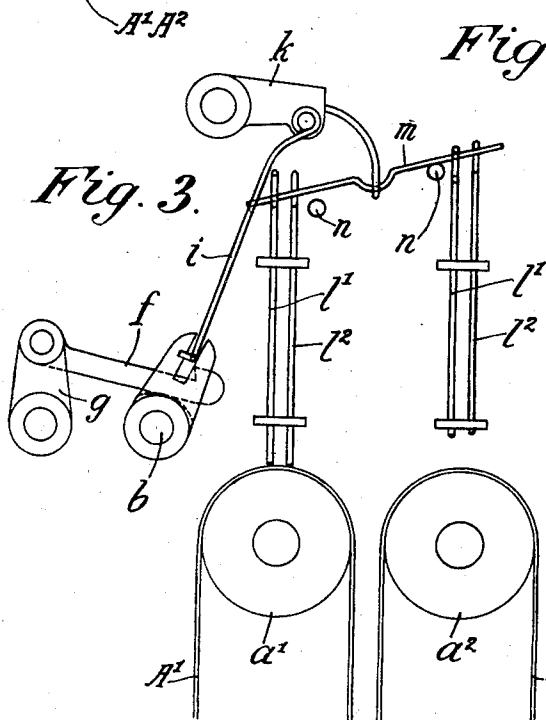
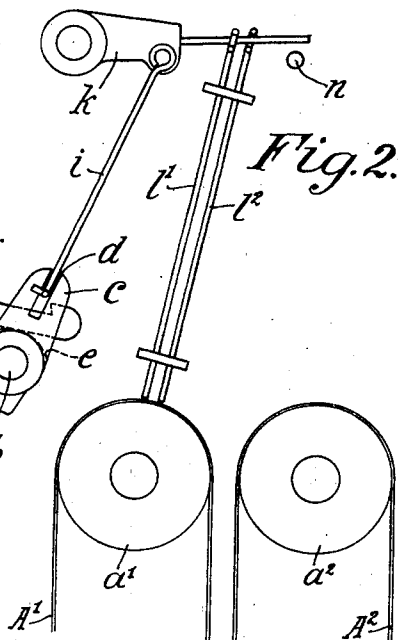
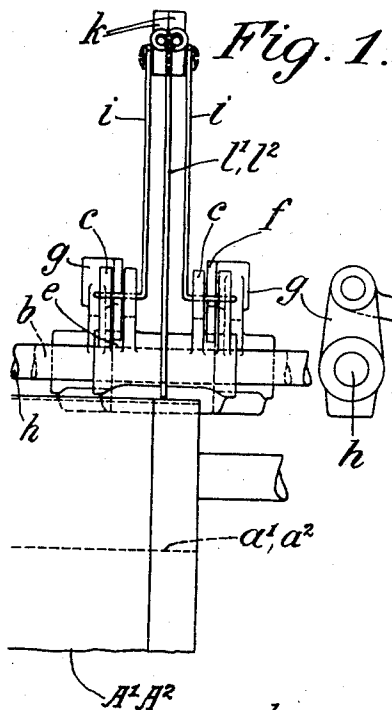
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2,238,663

SHED FORMING MACHINE

Filed April 2, 1940

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

Fig. 5.

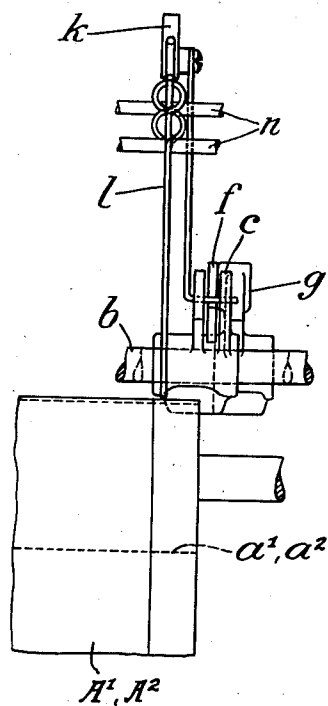
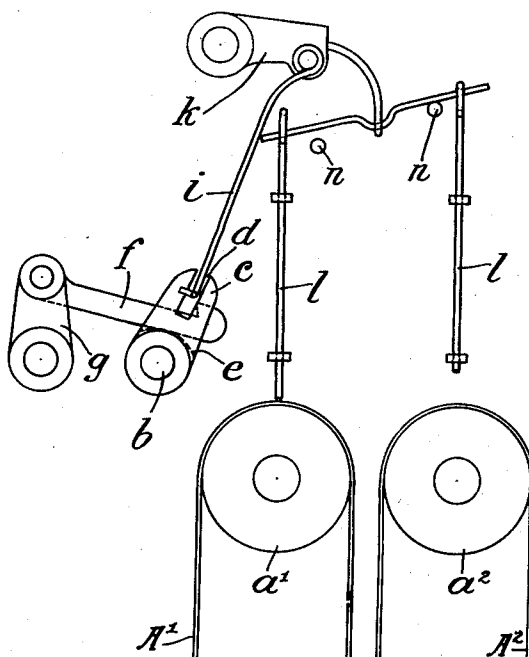


Fig. 6.



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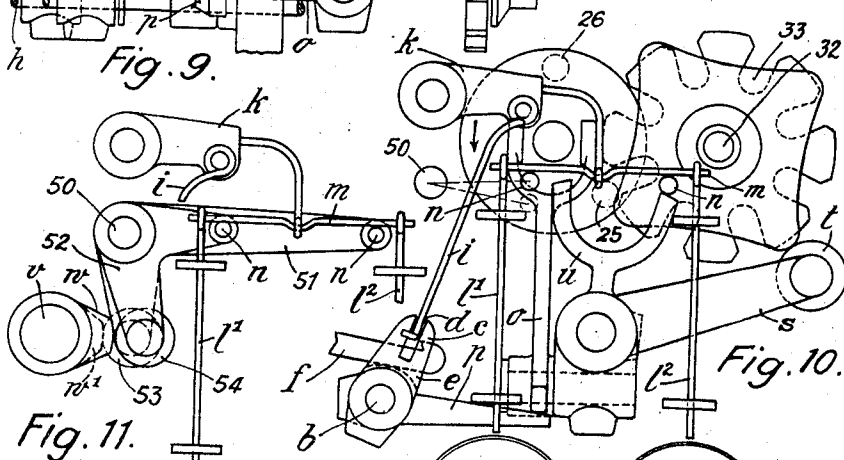
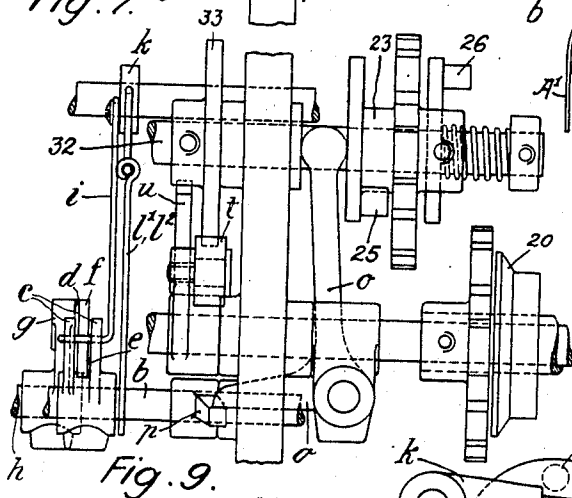
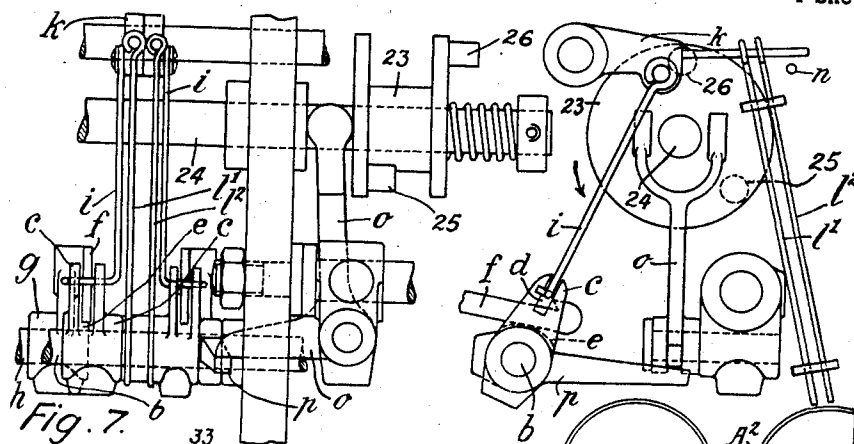
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SHED FORMING MACHINE

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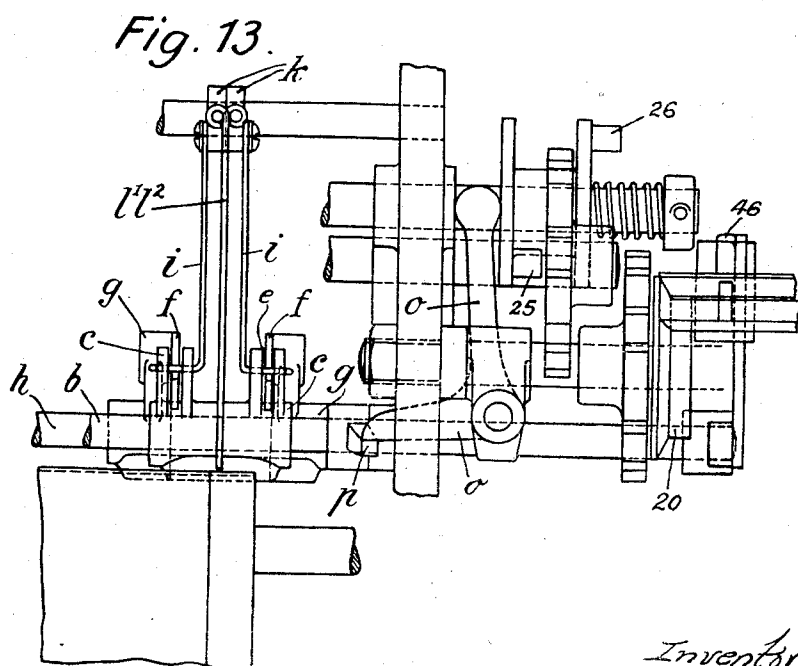
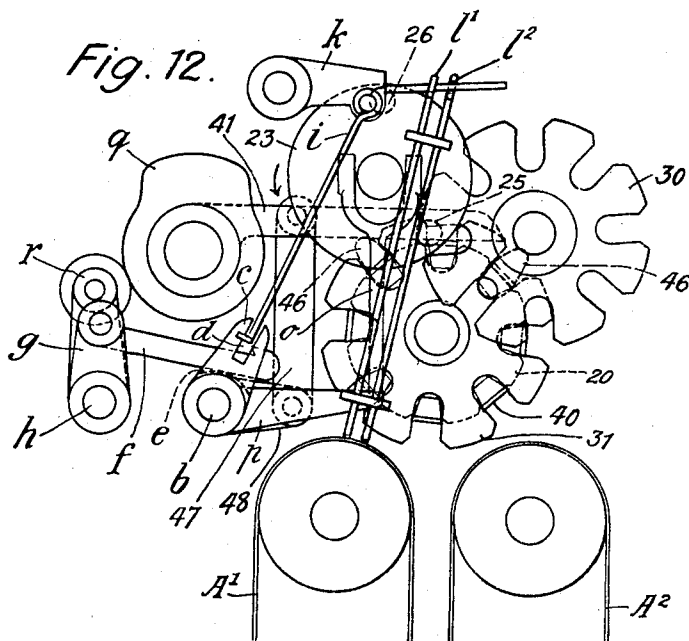
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SHED FORMING MACHINE

Filed April 2, 1940

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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SHED FORMING MACHINE

Hugo Stäubli, Zurich, Switzerland, assignor to
Gebr. Stäubli & Co., Horgen, SwitzerlandApplication April 2, 1940, Serial No. 327,509
In Switzerland December 13, 1938

14 Claims. (Cl. 139—67)

In applicant's prior patent specification (Serial No. 205,581) filed May 2, 1938, a shed forming machine comprising more than one pattern-card cylinder is shown and described which enables the re-opening of woven in wefts in the correct sequence both in forward and in backward weaving.

In combination with said machine pattern cards are used which have two special controlling elements, such as holes or projections, for each repeat thereof, a feeler member being used which is adapted to be influenced by two of said special controlling elements either on the same pattern card or on different pattern cards within the time of two subsequent pick-reading actions. Said feeler member, when influenced by one or the other of said controlling elements, acts to render operative a lever system by the operation of which a counting cylinder and, eventually, a changing over mechanism for changing the drive of the pattern cards and the reading of picks from one pattern card to another are actuated.

It is apparent from said prior specification that for changing over from one pattern card to another two impulses are transmitted to said lever system at each repeat of the operative pattern card both in forward and in backward weaving, the first one of said impulses being imparted for changing over to the other pattern card at forward weaving while the second impulse is designed to produce the same effect at backward weaving. Both impulses are read off by one and the same feeler member adapted to be influenced subsequently by two special controlling elements, a swinging motion being imparted to said feeler member in the direction from one to the other pattern card. If at the first reading action a peg or an iron roller is provided on the counting cylinder such a swinging motion of the feeler member takes place and the further reading is effected on this other pattern card.

According to the present invention said two impulses are read off with other relative arrangements between the feeler members and the special controlling elements, namely either by the action of two controlling elements on each pattern card for each repeat thereof upon two feeler members, one for each cylinder, reading successively on the same pattern cards, or by the action of one controlling element for each repeat on each pattern card upon two feeler members adapted to successively read on the same pattern card or on different pattern cards at two subsequent pick reading actions.

In the accompanying drawings various embodi-

ments of the invention are illustrated by way of example.

Fig. 1 is a front view and Fig. 2 is a side view of the first embodiment.

Figs. 3 and 4 are side views of the second and third embodiments.

Fig. 5 is a front view and Fig. 6 is a side view of the fourth embodiment.

Figs. 7 and 8 represent in side and front elevation a part of a lever system for transmitting the reading off motion of the feeler members to a counting cylinder.

Figs. 9 and 10 show in side and front view a mechanism connecting the feeler members with the counting cylinder and the change over mechanism.

Fig. 11 represents a mechanism for lifting said feeler members out of contact with the pattern cards.

Figs. 12 and 13 are side and front views of the feeler member and lever system shown in Figs. 1 and 2 and represent further the mechanism connecting this lever system with the counting cylinder and the change-over mechanism.

The aforementioned patent specification states that the counting cylinder controls the changing over mechanism for changing the reading needles from one card cylinder to the other one by means of a lever mechanism 41, 47, 48, b, p, o, 23, 25, 30 (Figs. 12 and 13) in such a way that the said changing over mechanism is actuated by this lever mechanism each time the lever 41 meets a wooden peg 46 or an iron roller mounted on the counting cylinder 20. A disc 23 which is slidably mounted on its shaft 24 and constantly rotates therewith (at forward weaving in the direction of the arrow shown in Fig. 8) carries two pins 25, 26 by means of which it effects the feeding movement of the counting cylinder and of the changing over mechanism in a known manner. When the feeler needle *l* falls into a hole of the pattern card *a*¹ or *a*² the said constantly rotating disc 23 is displaced in axial direction by means of a bell crank lever *o* and its pins then act upon the counting cylinder and eventually also upon the changing over mechanism.

For the purpose of moving the said disc 23 in the shed forming machine according to the present invention the arrangements illustrated in the accompanying drawings are provided.

In all embodiments of the present invention shown in the drawings *a*¹ and *a*² indicate the two pattern card cylinders over which the usual endless pattern cards A¹ and A² consisting of cardboards, Verdol paper or similar thin material

run. The above mentioned bell crank lever *o* (Figs. 7, 8, 9, 10, 12, 13) is operated from a control shaft *b* by means of a lever *p* fixed on said shaft.

In the embodiment represented by Figs. 1, 2, 3, 12 and 13, two similar arms *c* are fixed on the control shaft *b* each of which is provided with two radial slots *d* and *e* at right angles to each other. Through each of the two slots *e* which are at right angles to the shaft *b* the catches *f* project which are movably pivoted on a swinging arm *g* fixed on a shaft *h*. This swinging arm *g* is moved to and fro by means of a cam disc *q* acting upon an arm *r* fixed on shaft *h*. The two arms *c* may have a common hub or they may have individual hubs.

To each of the two lifters *k* a needle *l*¹ and *l*² for reading the change holes or the projections on the associated pattern card is attached and also a wire *i*, the lower right-angle bent end of which projects into the slot *d* of the relative arm *c*. As shown in Figs. 13 and 12 both the needles *l*¹ and *l*² are arranged in the same plane which is perpendicular to the shafts of the cylinders *a*¹ and *a*².

In the position of the parts according to Figs. 2 and 12, in which the needles *l*¹ or *l*² has not fallen into a change hole, the lower end of each wire *i* is above the periodically to and fro moving catch *f* and thus the outwardly swinging movement of the arm *g* does not affect the shaft *b*.

If, however, one of the needles *l*¹ and *l*² (before called feeler-members) falls into a change hole of the pattern card *A*¹ or *A*², the lifter *k* concerned moves downwards and thus the lower end of the particular wire *i* comes within reach of the catch *f* so that when the arm *g* swings to the left, the arm *c* is carried with it, the shaft *b* is partly rotated and the counting cylinder 20 (Fig. 13) is actuated in the known manner by means of the above mentioned pin 26 provided on the disc 23. If the counting card 40 is provided at this place with a peg 46 or iron roller for supporting a lever 41 as described in the aforementioned patent, then the change-over of the reading device from one pattern card cylinder to the other one takes place.

In the embodiment according to Fig. 3, each of the two pattern card cylinders *a*¹ and *a*² has its own pair of change needles *l*¹ and *l*², the first of which is used for reading the change hole or the projection while the holes of the first picks of a repeat of the pattern card are read and the other one whilst reading the last ones of a repeat. Two needles of the two pairs of needles are suspended from a common wire arm *m* which is movably secured to a lifter *k*. The methods for reading a change hole are the same as those of the first embodiment. The small rods *n* which pass under all the reading needles are used for periodically lifting the needles which hang above the respective cylinders *a*¹ and *a*². Figs. 9, 10 and 11 represent a mechanism adapted to lift the rods *n* simultaneously and to hold one or the other in its raised position.

As shown in Fig. 10, a roller *t* provided on an arm *s* of a bell crank lever is held, by means of a spring (not shown), in constant contact with the circumference of a reversing eccentric 33 mounted on a shaft 32 as already represented in my prior specification mentioned herebefore. Thus said bell crank lever receives a periodical swinging motion which brings the two ends of the bifurcated lever arm *u* alternately below one or the other of said two bars *n* when in raised position, while the other bar *n* is free to go back to its reading off

position as indicated in dotted line for the left hand bar.

Fig. 11 represents a mechanism for lifting the bars *n* simultaneously out of reach of the pattern-cards. According to this figure, two cams *w*, *w*¹ are mounted on a shaft *v*, this latter receiving one revolution for each pick-reading action. Each of the two bars *n* is mounted on the outer end of one arm of a bell-crank lever 51, 52 respectively, the other arms of these levers bearing rollers 53, 54 respectively which, by means of springs (not shown) are constantly held in contact with the circumference of the cams *w*, *w*¹ respectively. Thus the bars *n* receive simultaneously a lifting motion during each pick-reading period. As soon as they have reached their upmost position represented on Fig. 11 the bifurcated arm *u* of the bell-crank lever *su* may change its position according to the position of the reversing eccentric 33 to change the reading action from one cylinder to the other.

In the embodiments according to Figure 4 a reading needle *l*¹ or *l*² is suspended at each end of a transverse wire *m* movably pivoted to the lifter *k* in such a way that when one or the other of these two needles falls into a hole of the pattern card *A*¹ or *A*², the lifter *k* follows and thus the lower bent end of the wire *i* comes within reach of the catch *f*. In the present arrangement the number of the constituent parts is considerably reduced in that only a single lifter *k* with the parts *i*, *c*, *f*, *g*, operated thereby is necessary for both the needles *l*¹ and *l*². The method of changing the said needles from one cylinder to another is the same as in the first embodiment.

The embodiment according to Figs. 5 and 6 differs from that shown in Fig. 3 substantially by the fact that only one reading needle *l* is suspended at each end of the transverse wire *m*, this needle being adapted to be influenced by two subsequent control elements (perforations or projections) on the same pattern card *a*¹ or *a*².

Assuming one of said needles *l*, for instance that above the cylinder *a*¹, be fallen into the first of said two perforations whilst the ordinary pick reading needles read off the last pick (or last two picks in a double lift dobby or jacquard machine) of a repeat. Then in the manner stated above, the counting cylinder is actuated. If, after this operation, a peg or an iron roller on the counting card becomes effective, then the bell-crank lever *s*, *u* is actuated by the reversing eccentric 33 and the reading of the pattern card on the cylinder *a*² takes place.

This embodiment may of course also be realized with two lifters *k*, one for each needle *l*.

What I claim is:

1. A shed forming machine comprising more than one pattern card of paste-board, Verdol's paper or other thin material, special controlling elements on these pattern cards, feeler members adapted to be influenced by said special controlling elements, a counting cylinder for counting the repeats, a lever mechanism inserted between said feeler members and said counting cylinder for transmitting two impulses to said counting cylinder when the feeler members are influenced by said special controlling elements.

2. A shed forming machine comprising more than one pattern card of paste-board, Verdol's paper or other thin material, a cylinder for each of these pattern cards, at least one special controlling element on each of said pattern cards for each repeat thereof, at least two feeler members adapted to alternately read off said special con-

trolling element, a lever mechanism adapted to become effective if one or another of said feeler members is influenced by said special controlling element, and a change-over mechanism controlled by said lever mechanism.

3. A shed forming machine, comprising more than one pattern card of paste-board, Verdol's paper or other thin material, a cylinder for each of these pattern cards, at least one special controlling element on each of said pattern cards for each repeat thereof, at least two feeler members adapted to read off, under predetermined conditions, in a given direction of weaving and at two subsequent pick-reading actions, the special controlling elements on different pattern cards, lifters for said feeler members adapted to be actuated if an associated feeler member is influenced by one of said controlling elements, a control shaft, a lever mechanism adapted to be coupled with this shaft if the associated lifter is actuated, and a change-over mechanism controlled by this lever mechanism.

4. A shed forming machine, comprising more than one pattern card, a cylinder for each of these pattern cards, a special controlling element on each of said pattern cards for each repeat thereof, two feeler members adapted to be influenced successively by said special controlling elements, a lifter the position of which depends from the relative position of said feeler members to one or the other of said pattern cards, a change over mechanism adapted to bring said feeler members to read the special controlling elements on another pattern card, a lever mechanism for controlling said change-over mechanism and a member attached to said lifter and connected with said lever mechanism so as to cause, under predetermined conditions, the change-over mechanism to be operated if one of said feeler members is influenced by one of the special controlling elements.

5. A shed forming machine comprising more than one pattern card, a special controlling element on each of these cards for each repeat thereof, two feeler members adapted to be alternately influenced by said special controlling elements, a lifter from which said feeler members are hanging, a change-over mechanism for changing the position of said feeler members so as to be influenced by the controlling elements on another pattern-card, a lever mechanism controlling said change-over mechanism, a rocking shaft for actuating said lever mechanism, a catch mounted on this rocking shaft and a member depending from said lifter and adapted to couple said catch with the lever mechanism when one of said feeler members is influenced by one of said special controlling elements.

6. A shed forming machine, comprising more than one pattern card, a special controlling element on each of these pattern cards for each repeat thereof, two feeler members adapted to be influenced by said special controlling elements alternately on one and another of said pattern cards, a change-over mechanism for changing said feeler members to be influenced by the special controlling elements of another cylinder, a lever mechanism for actuating said change-over mechanism, a lifter for each of said two feeler members, a periodically operated catch and a wire on said lifter adapted to couple said catch with said lever mechanism when the associated feeler member is influenced by one of said special controlling elements.

7. A shed forming machine comprising two

pattern cards, a rotatable cylinder for each of these pattern cards, a special controlling element on each of these pattern cards for each repeat thereof, two rockable arms hanging above said two cylinders transversely thereto, two reading needles suspended on each of these arms at opposite sides of its rocking axis, one over each cylinder and all four needles in the same vertical plane situated at right angles to the axis of said cylinders, the distance between the two needles hanging above the same cylinder corresponding to the way made by the pattern card between two pick-reading actions and means for alternately allowing the reading needles above the same cylinder to read off the special controlling element concerned in two successive reading actions.

8. A shed forming machine comprising more than one pattern-card cylinder, a pattern card of paste-board, Verdol's paper or other thin light material for each of these cylinders, two special controlling elements provided for each repeat on each of these pattern cards besides the usual pick controlling elements, a feeler member for each of said pattern cards adapted to be influenced by said controlling elements on the associated card, whether the machine is turned forward or backward, at determined moments relatively to those of the reading of said usual pick controlling element.

9. A shed forming machine comprising two pattern cards, two special controlling elements on each of these pattern cards for each repeat thereof, a rockable arm hanging above these two pattern cards transversely thereto, two feeler members suspended on this arm on opposite sides of its rocking axis, one above each of said pattern-cards, these feeler members being adapted to be influenced by two subsequent controlling elements on the same pattern card.

10. A shed forming machine comprising two pattern cards of paste-board, Verdol's paper or other thin material, a special controlling element on each of these pattern cards for each repeat thereof, two feeler members adapted to be influenced by said special controlling element on either of said pattern cards in subsequent reading actions, a lifter for each of said feeler members, a change-over mechanism adapted to swing these feeler members from one of said pattern cards to the other under predetermined conditions, a lever mechanism for operating said change-over mechanism, a rocking arm and catch for actuating this lever mechanism and a wire member depending from each of said lifters to couple the catch with the lever mechanism if the associated feeler member is influenced by one of said special controlling elements on either pattern card.

11. A shed forming machine comprising two pattern cards of paste-board, Verdol's paper or other thin material, two special controlling elements on each of said pattern cards for each repeat thereof, a feeler member for each of these cards adapted to be influenced by the controlling elements, in subsequent reading actions, a common lifter for these two feeler members, a change-over mechanism adapted to bring alternately one or the other feeler member to a position where it can be influenced by a controlling element of the associated pattern card, a lever mechanism for operating said change-over mechanism, a rocking shaft and catch connection for operating said lever-mechanism and a wire member depending from said link and adapted to

couple by said catch said rocking shaft with the lever mechanism when either of said feeler members is influenced by one of said special controlling elements.

12. A shed forming machine comprising two pattern cards, a special controlling element on each of these pattern cards for each repeat thereof, two feeler members adapted to be influenced alternately by one and the other control element either on the same pattern card or alternately on both cards, a lifter for each of said feeler members, a wire hanging down from this lifter, a control shaft, a counting cylinder and a change-over mechanism controlled by this shaft, an arm mounted on said control shaft, a constantly moved swinging arm, a reciprocating catch operated by this arm and extending towards said arm on the control shaft and adapted to be coupled therewith by said wire when the associated feeler member is influenced by said special controlling element on one or the other pattern card.

13. A shed forming machine comprising two pattern cards, a special controlling element on each of these pattern cards for each repeat thereof, at least two feeler members adapted to be alternately influenced by said special controlling elements under predetermined conditions, lifters

for said feeler members, a wire suspended on each of these lifters and having at its lower end a horizontally bent portion, a control shaft, an arm fixed on this shaft and containing two radial slots arranged at right-angles one to another, the horizontally bent portion of said wire being guided in one of said slots, a swinging arm, a catch mounted thereon and guided in the other of said slots in such a way that when said lifter falls the catch grips the horizontal portion of said wire whereby the control shaft and the swinging arm are coupled together, a counting cylinder and a mechanism for changing the drive of the pattern cards and the reading of picks and special controlling element from one pattern card to another being controlled by said control shaft.

14. A shed forming machine comprising two pattern cards, a rotatable cylinder for each of these pattern cards, a rockable arm hanging above these cylinders transversely thereto, two reading needles suspended on said rod on opposite sides of its fulcrum one above each of said cylinders, a mechanism for periodically lifting both reading needles simultaneously, and means for maintaining in its raised position that reading needle which shall not come to read.

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