

W. BOWKER.
PATTERN MECHANISM.
APPLICATION FILED SEPT. 7, 1909.

1,005,803.

Patented Oct. 17, 1911.

4 SHEETS—SHEET 1.

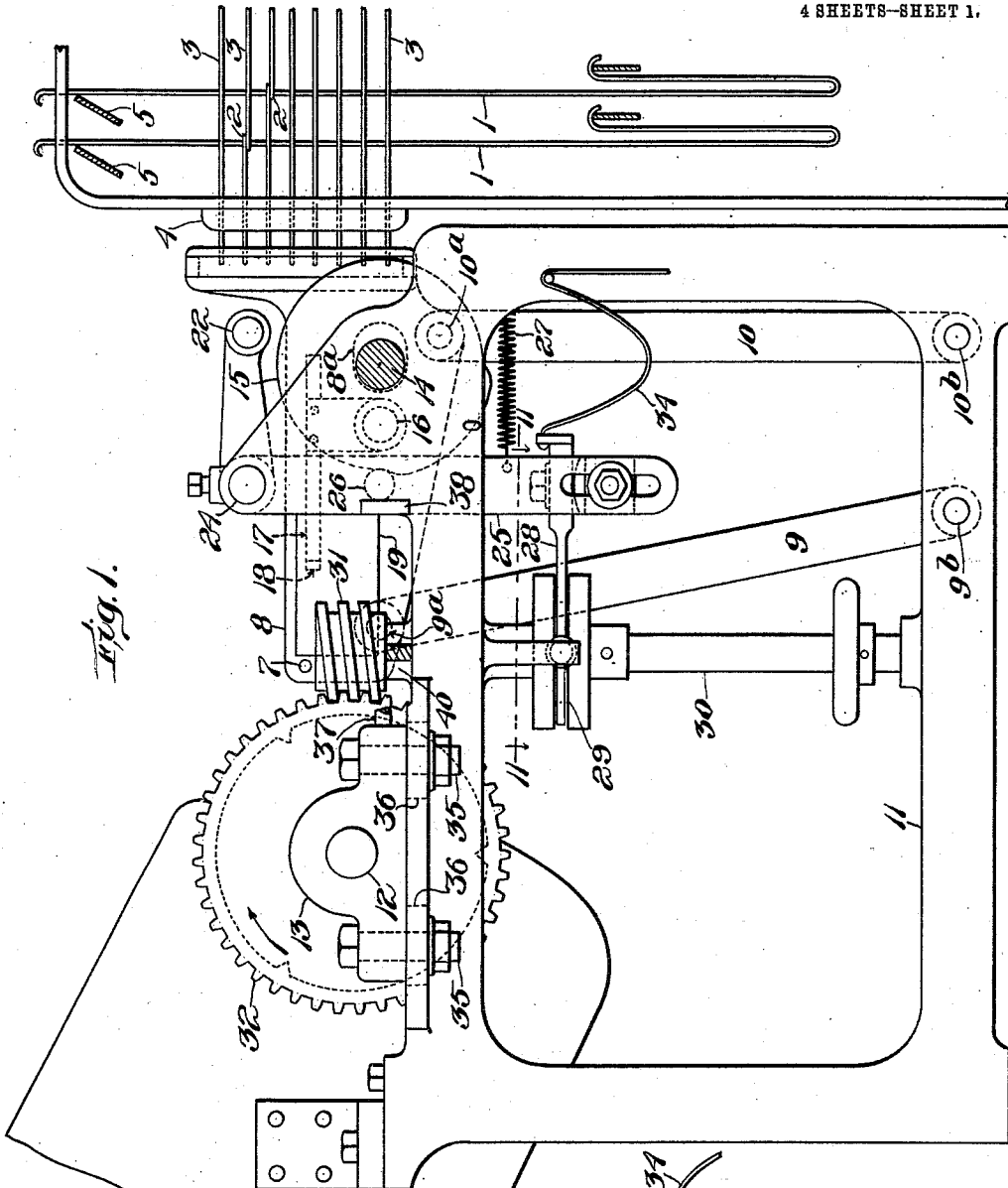


Fig. 1.

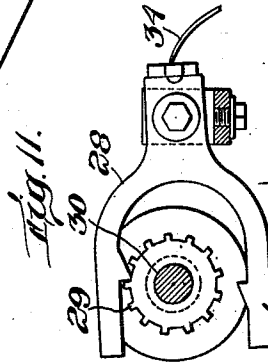


Fig. 11.

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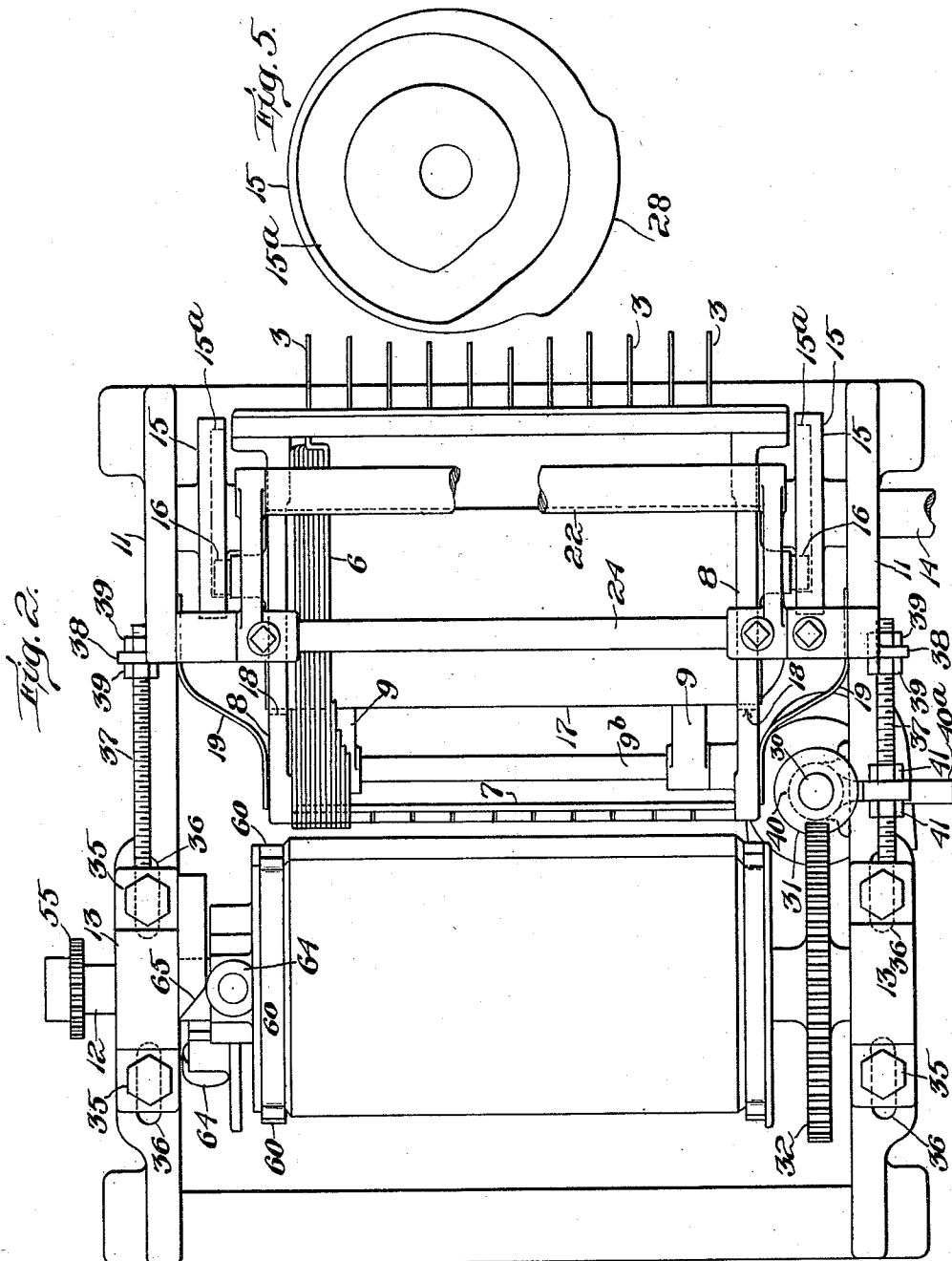
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4 SHEETS—SHEET 3.

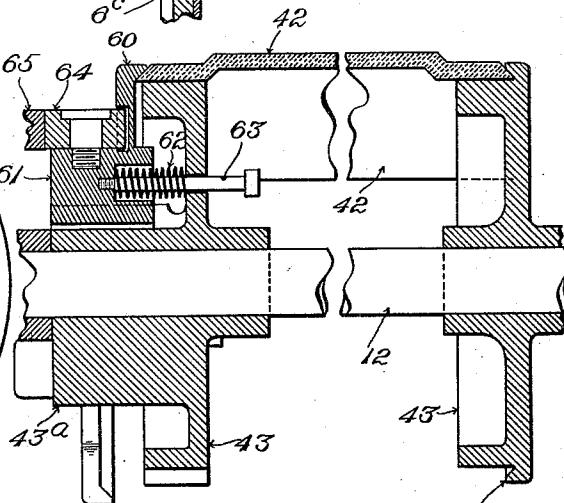
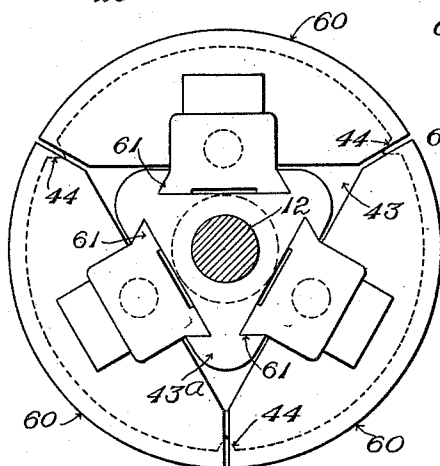
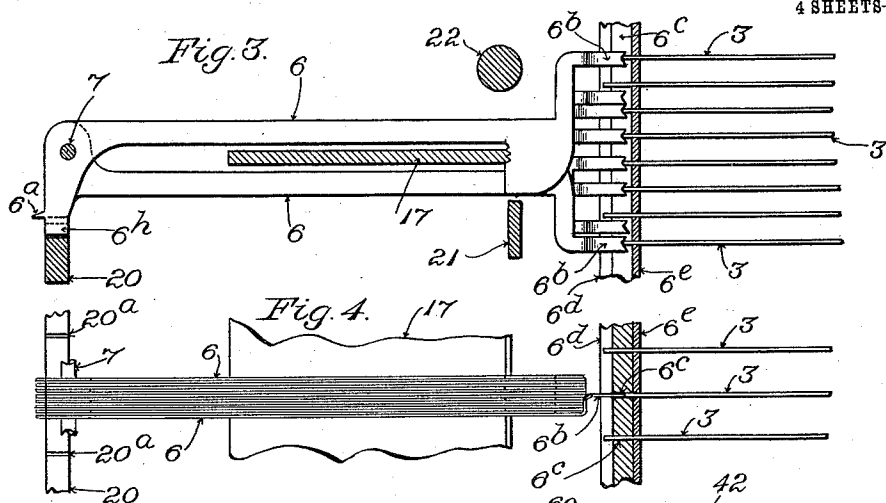


Fig. 8.

Fig. 9.

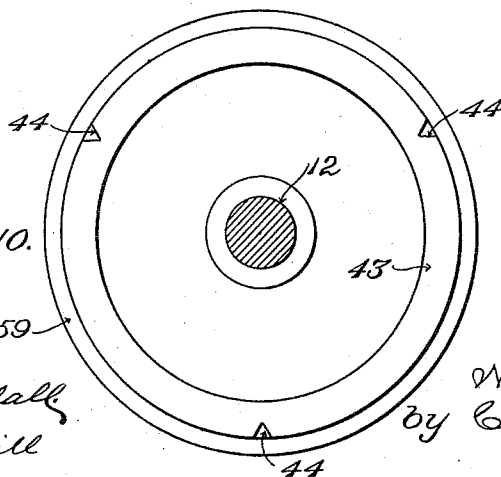


Fig. 10.

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4 SHEETS-SHEET 4.

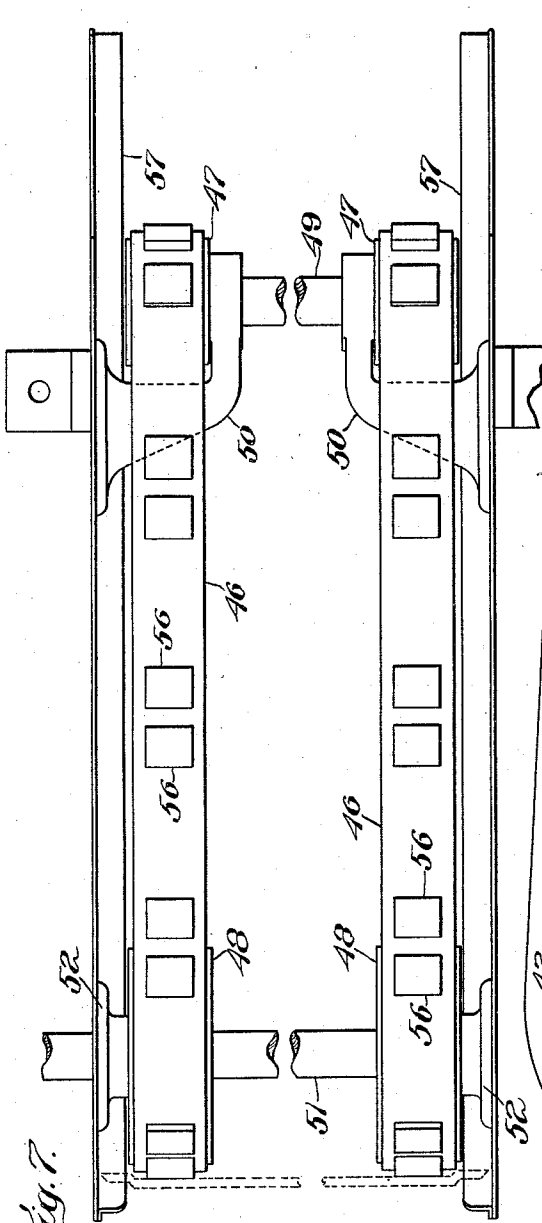


Fig. 7.

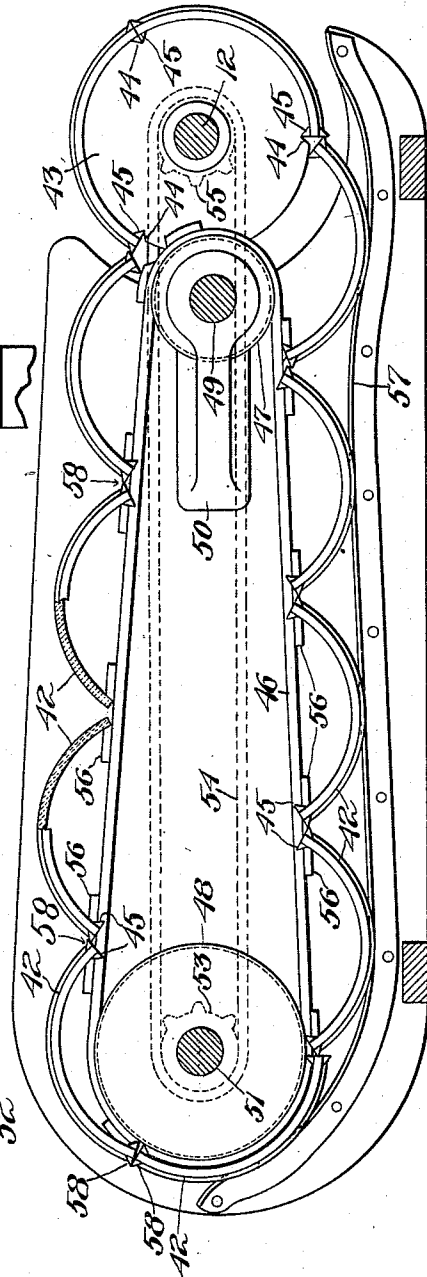


Fig. 6.

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UNITED STATES PATENT OFFICE.

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PATTERN MECHANISM.

1,005,803.

Specification of Letters Patent.

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Application filed September 7, 1909. Serial No. 516,440.

To all whom it may concern:

Be it known that I, WILLIAM BOWKER, a citizen of the United States, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented a certain new and useful Improvement in Pattern Mechanisms, of which the following is a specification, reference being had therein to the accompanying drawings.

10 The invention is an improvement in pattern mechanism of the jacquard class.

It dispenses with perforated pattern-cards and employs instead, for determining the action of the needles and the lifting of the hooked uprights by the griff, a pattern-surface having the pattern-indicators thereof constituted by prominences and depressions that are arranged in successive transverse lines. Preferably, though not necessarily in all cases, the pattern-indicators which come into action for a given lift of the griff are arranged in the same transverse line. The said pattern-surface is, or may be, made by casting the same in a suitably prepared matrix, and may readily be produced in a manner similar to that in which linotypes and stereotype plates or segments are produced for use in printing machines.

15 In carrying the invention into effect I employ in connection with the pattern-surface aforesaid a set of key-points or contacts arranged in line correspondingly with the pattern-indicators, a set of keys, and a carriage supporting the keys and key-points or contacts, such carriage having movement toward and from the pattern-surface imparted thereto. The movement of the carriage toward the pattern-surface causes the key-points or contacts to approach the latter and to engage with the pattern-indicators which are in position to act, thereby setting the keys. The movement of the carriage from the pattern-surface separates the key-points from the pattern-indicators prior to and during a feeding movement of the pattern-surface, permitting such feeding movement to take place without interference from the key-points, or injury and wear to either the key-points or the indicators. At the time of this latter movement of the carriage the needles are actuated in accordance with the setting of the keys. The manner

of actuating the needles under control of the keys may vary in different cases but according to the preferred construction the keys are locked, at the beginning of the separating movement of the carriage, in the respective positions in which they were just set by the pattern-indicators last in action, some with engaging portions thereof in line with the adjacent ends of certain of the needles and some with their engaging portions out of line with the ends of the corresponding needles. Those engaging portions which take against the ends of the corresponding needles push such needles endwise, but those needles which are missed by the engaging portions of their keys remain at rest. In this manner the needles are actuated as may be required to determine the lifting of the hooked uprights by the griff. When the carriage moves toward the pattern-surface again, the keys are unlocked and caused to resume their normal positions in readiness for being reset through engagement with the line of pattern-indicators which has just been brought into position to act.

A feature of the invention consists in a pattern-surface composed of pattern-plates or segments arranged in a continuous series, though not linked together, and novel means of supporting them, presenting them successively for coaction with the key-points, and feeding them to and past the latter. Any required number of pattern-plates or segments may be employed in the series, according to the size of the pattern.

An embodiment of the invention in preferred form is shown in the drawings, in which latter,—

Figure 1 is a side elevation of a pattern mechanism containing the said embodiment, the supporting and feeding devices for the pattern surface being mostly omitted. Fig. 2, sheet 2, is a plan view, partly broken away, of the parts which are shown in Fig. 1. Figs. 3 and 4, sheet 3, are detail views showing the keys and associated parts. Fig. 5, sheet 2, shows one of the cams for actuating the bar for moving the carriage and locking the keys. Fig. 6, sheet 4, is a side view, partly sectional, of the series of pattern-plates or segments and the means for

supporting the same, holding in place the one which is presented in position for co-action with the key-points, and feeding the plates or segments so as to present successive lines of pattern-indicators to the key-points. Fig. 7, sheet 4, is a plan view of a portion of Fig. 6. Fig. 8, sheet 3, is an end view of the rotatable holder for the plates or segments. Fig. 9, sheet 3, is a view in longitudinal section of the said rotatable holder and the operating cam for the clamp-sections. Fig. 10, sheet 3, is a view of the head at the right hand side in Fig. 9. Fig. 11, sheet 1, is a detail view, partly in horizontal section on line 11, 11, of Fig. 1, showing the means for actuating the worm-shaft which drives the pattern.

Having reference to the drawings,—at 1, 1, Fig. 1, are hooked uprights or harness-hooks, only two thereof being shown, extending through eyes 2, 2, of needles, 3, 3, which are mounted in needle-board 4 and a spring-box (not shown) and spring-pressed toward the left in such figure, all as usual. The needles are arranged in vertical rows, as customary, one of such rows being represented in Fig. 1 and another in Fig. 3, and the different rows being indicated in plan in Fig. 2, sheet 2, and Fig. 4, sheet 3. 5, 5, are two of the blades of the vertically-moving griff, which is operated in known manner, the said blades, through engagement with the hook-portions of the said uprights or harness-hooks, lifting the latter as the griff rises.

The keys 6, 6, Figs. 2, 3 and 4, are arranged in a bank adjacent the ends of the needles, at the left thereof in Figs. 1, 2, 3 and 4. They are in the form of flat levers, and are pivoted side by side upon a supporting rod 7 that is fixed in the carriage 8, Figs. 1 and 2. The carriage is supported by being mounted at each end thereof upon swinging arms or links 9, 10, each end-piece of the carriage being connected by pivots 9^a 10^a, to the upper ends of the corresponding arms or links, the lower ends being connected to the fixed framework 11 by pivots 9^b, 10^b. This mode of supporting the carriage provides advantageously for the slight to and fro horizontal movement which is given to the same in line with the needles, between the latter and the pattern-surface. The pivots 9^b at the lower ends or feet of the arms or links 9 are set in under the carriage, so that the distance between the same and the pivots 10^b for the feet of the arms or links 10 is less than the distance separating pivots 9^a from pivots 10^a at the upper ends of the arms or links. Consequently, arms or links 9 occupy an inclined position, the effect of which is to produce a tendency of the carriage to gravitate toward the pattern-surface. Hence at the end of the stroke of the carriage toward the pattern-surface

the tendency is to hold the key-points in contact with the pattern-indicators.

At 12 is shown the shaft of the "cylinder" around which the pattern-surface passes, and by which the pattern-surface is supported in position to coöperate with the key-points. The said shaft is mounted in fixed bearings at 13, 13, upon the opposite side-pieces of the machine-framing, at the left of the carriage in Figs. 1 and 2, and is rotated by convenient actuating means, presently to be described.

Each key 6 is made with a relatively short vertical arm and a relatively long arm extending horizontally from the pivotal supporting rod 7 toward the needles. The corresponding key-point or contact, 6^a, which is acted upon by pattern-indicators for setting the key, is in this instance combined with the vertical arm by being formed thereon, although the mode of combining the key-point with the key may be varied in practice. The horizontal arm is employed to bring about the indicating action of the needles 3, 3. The relative proportions of the two arms aforesaid of the key are such as to enable a comparatively slight extent of displacement of the key-point or contact to produce a movement of sufficient extent of the working portion of the key, *i. e.*, the portion which indicates the corresponding needle into action. Although the invention in its broadest phase is not limited with respect thereto, the keys of this embodiment of the invention are designed to transmit directly to the needles the endwise movement through which the latter determine whether or not the hooked uprights shall be engaged and raised by the blades 5, 5, of the griff. With this purpose in view, the keys are constructed at the free extremities of their horizontal arms with working portions 6^b, 6^b, that are adapted to take against the adjacent ends of the needles to push the selected needles endwise as the carriage and keys move from the pattern-surface toward the needles. These working portions are notched to receive the needle-ends, as shown in Fig. 3, so as to prevent a key and needle from accidentally becoming disengaged from each other in operation by relative vertical displacement. The keys are in groups corresponding with the different vertical rows of needles, there being comprised in each group a key for each needle of the corresponding row, the respective working ends being formed at different heights as shown in Fig. 3, sheet 3, to correspond with the heights of the respective needles with which such ends coact, and being offset laterally as shown in Fig. 4, same sheet, so as to bring them all into the same vertical plane with the needles of the row. To keep the working ends of a group of keys and the ends of the needles of the

row with which they coact in vertical alignment with one another, the said working ends, which are in one vertical plane, are all confined in a vertical groove 6^e in a board or plate 6^d, and the proximate ends of the needles occupy holes which are bored in a plate 6^e and also in the board or plate 6^d so as to intersect the said groove. The said ends of the needles are in the same vertical plane with the groove. The board or plate 6^d and plate 6^e are mounted upon the carriage. The diameter of the needles being a little greater than the width of the groove, the needle-ends are confined from springing up or down. Normally the working portions of the keys occupy positions below the ends of the needles with which they co-operate, as in the case of two of the keys in Fig. 3, so as to miss such ends in the movement of the carriage toward the needles. The keys which are selected and set by the pattern-indicators for indicating the needles into action have their working portions thereby raised into line with the ends of the corresponding needles, so that the said movement of the carriage causes them to engage with such ends and push the needles ahead of them, as in the case of the remaining keys in Fig. 3.

The to-and-fro movement of the carriage is produced through the employment of a shaft 14, Figs. 1 and 2, extending transversely of the mechanism and mounted in bearings in the upper part of framework 11. The shaft passes through slots 8^a in the end-pieces 8 of the carriage, such slots being elongated in the direction of movement of the carriage. It is rotated by any suitable driving connections which will give it the proper relative timing. Upon it are fixed the cam-disks 15, 15, one of which is shown separately in Fig. 5, sheet 2. The inner faces of such cam-disks are formed with cam-grooves 15^a, 15^a, receiving studs or rolls 16, 16, in connection with the carriage. By the action of the walls of the said cam-grooves upon the said studs or rolls the carriage is moved first toward the pattern-surface to carry the key-points against the latter, to set the keys in conformity with the line of pattern-indicators which is in position for action, and then from the pattern-surface toward the needles, to cause the working ends of the keys to act upon the needles.

For the purpose of preventing loss of position by the keys during the movement of the carriage from the pattern-surface toward the needles, after having been set, the keys are locked during such movement in the positions which they have been caused to assume by the pattern-surface. This locking is effected by means of a bar 17 which extends transversely of the bank of keys and is mounted on the carriage. The

edge of this bar adjacent the needles is formed with two longitudinal V-shaped ribs, and each of the keys has a vertical projection that is formed with a series of three V-shaped notches to receive the said ribs. When the ribs occupy notches of a key, as in Figs. 3 and 4, sheet 3, the key is locked so as to prevent vertical movement of the same. To accomplish the locking and unlocking, the end-portions of bar 17 are placed in horizontal slots 18, 18, in the end-pieces of the carriage. The said slots are slightly longer than the bar is wide, thus providing for a limited amount of play of the bar edgewise upon the carriage. The studs or rolls 16, 16, are carried by the ends of the bar. The result of this construction is that as the shaft 14 and cam-disks rotate, the action of the walls of grooves 15^a, 15^a, upon the said studs or rolls in beginning the stroke in either direction is first to move the bar 17 independently a short distance, the carriage remaining at rest until the advancing edge of the bar brings up against the walls in front of it at the ends of the slots 18, 18. The carriage then starts and the bar and carriage move in unison to the extent of the throw of the cam-grooves 15^a, 15^a, in that direction. Thus, starting with the carriage in its closest proximity to the needles, and the bar 17 in locking engagement with the keys as in Figs. 3 and 4, movement of the said bar from right to left in the drawings will act first to disengage the locking edge of the bar from the notched portions of the keys, unlocking the latter, and then the engagement of the advancing edges of the bar with the ends of slots 18, 18, will cause the carriage to accompany the bar toward the pattern-surface until the key-points have been carried against the latter, and the acting pattern-indicators have operated to select and set the keys for their next action upon the needles. The return movement of the bar 17 will first operate to carry its locking edge into engagement with the notched projections of the keys, thereby locking the keys with their respective working ends either up or down according as the keys may have been set by the pattern-indicators, and then move the carriage toward the needles to cause the keys to act upon the needles. To retard the carriage so that it shall not begin to move in either direction until the bar 17 in its movement engages with end-walls of the slots 18, 18, friction-springs 19, 19, which are attached to the side-pieces of the machine-framing are arranged to make contact with the opposite ends of the carriage. These springs also operate to prevent rebound of the carriage at the conclusion of its stroke in either direction, and thereby serve to keep the key-points pressed home against the pattern-indicators until the locking action has taken

place, and also serve to keep the needles and hooks in the positions into which they have been indicated until the griff-blades have become securely engaged with the hook-portions of the uprights.

For the purpose of keeping the keys uniformly spaced apart and the key-points or contacts in proper register with the indicators of the pattern-surface a bar 20, Figs. 3 and 4, sheet 3, is mounted in the carriage below the vertically depending arms of the keys, this bar having transverse grooves 20^a, 20^a, in its top at short intervals apart, and certain of the said depending arms are provided with extensions 6^a which work in the said grooves. Separating blades or strips may also be interposed between the keys themselves, the employment of such blades or strips having the advantage that the movement of one key does not affect the movements or positions of the keys at opposite sides of it.

The normal position of the keys in the carriage is fixed by means of a stop-bar 21, Fig. 3, below the horizontal arms of the keys adjacent their working portions. After the keys have acted to indicate the needles and hooked uprights, and as soon as the working portions of the keys have become disengaged from the needle-ends, the keys are all restored to the said normal position, prior to contact of the key-points with the pattern-surface, by an evener-rod 22 located above the horizontal arms of the keys and carried by arms fixed on a rockshaft 24 extending transversely across the mechanism above the carriage. The said rockshaft is mounted in bearings on the side-pieces 11, 11, of the framework, and provided with a depending arm 25 carrying a stud or roll 26 which is held pressed against the cam-shaped edge of one of the disks 15 by means of a contracting spiral spring 27, Fig. 1. The elevated portion at 28 of said cam-shaped edge acts to depress the rod 22 to even up the keys in their normal position, and the rod is raised by the action of the spring.

The arm 25 carries a double pawl 28, Figs. 1 and 11, sheet 1, acting upon a toothed wheel 29 on an upright shaft 30 carrying at its upper end a worm 31 engaging with the worm-wheel 32 fixed on shaft 12 of the cylinder. Thereby the cylinder is slowly rotated intermittingly to advance the pattern-surface. The pawl is pivotally mounted upon arm 25 and acted upon by a spring 33, Fig. 11, which holds one of the acting portions of the pawl normally in position to engage the wheel 29 to produce the regular advance of the pattern-surface. By pulling upon the cord 34 which is attached to the pawl the pawl may be swung to place the other acting portion thereof in position to engage the wheel, for reversing the di-

rection of movement of the pattern-surface, as in case of a mis-pick.

To enable the cylinder and the pattern-surface carried thereby to be set properly with relation to the limit of the movement of the carriage in that direction, to insure proper coöperation of the pattern-indicators and key-points in setting the keys, so as to permit the extent to which the keys are moved through the action of the pattern-indicators to be regulated to a nicety, the bearings 13, 13, of the shaft 12 of the cylinder are provided in slides that are made adjustable toward and from the carriage. Thus, the said bearings are fixed in place upon the side-pieces of the fixed framework 11 by bolts 35, 35, which pass through vertical slots 36, 36, in the horizontal top-flanges of such side-pieces. For convenience in setting the bearings threaded stems 37, 37, are attached thereto, these stems passing through holes in fixed ears 38, 38, projecting from such side-pieces, and nuts 39, 39, are applied to the said stems on both sides of the said ears. By turning these nuts the adjustment may be effected with the required nicety. The upper bearing 40 for worm-shaft 30 is carried by one of the slides, so that the relation between the worm 31 and worm-gear 32 remains the same during and after the adjustment. To enable the worm-shaft to be separately adjusted so as to cause the worm to mesh properly with the worm-gear, the said bearing 40 is made as a separate piece and is provided with an ear 40^a, Fig. 2, through a hole in which the corresponding screw-threaded stem 37 passes. Nuts 41, 41, upon the said stem clamp the ear between them and thereby fix the position of the bearing. By turning the nuts upon the stem the bearing may be set to cause the worm to mesh as required with the worm-gear.

The employment of keys formed of thin flat strips, and the setting of the same close together side by side, as in Figs. 2, 3 and 4, enables the entire set to be comprised within a comparatively small space transversely of the mechanism. Such space corresponds in extent substantially with the width of the space occupied by the entire outfit of needles. All the key-points are or preferably will be arranged in a single transverse line, and coöperate with a single transverse line of pattern-indicators upon the pattern-surface. This fact, and the further fact that the successive rows of pattern-indicators are set close together, one after another, reduces the length of the series of pattern-plates or segments comprising the pattern-surface so that such length is only a small part of that of an ordinary chain of perforated pattern-cards. Only a short advance of the pattern-chain is required in order to present a succeeding line of pat-

tern-indicators in position to act in connection with the key-points. The invention, however, is not necessarily restricted in every case to key-points disposed in a single line, for in some embodiments of the invention the key-points may be divided into two or more rows, and in that event the pattern-indicators with which they coact will be contained in a corresponding number of rows upon the pattern-surface, and the pattern-surface will be advanced a correspondingly-increased extent at each of the intermittent feed-movements thereof.

The plates or segments of the pattern-surface are marked 42, 42, etc., Fig. 6, sheet 4. Each thereof bears a number of successive rows of pattern-indicators. These plates or segments may in some cases be linked together into a connected chain, but one feature of the invention consists in the combination comprising a series of plates or segments which are not linked together, and the means of supporting the same, presenting them for coaction with the key-points, and feeding them intermittently. The plates or segments shown are curved to the same radius as the disks 43, 43, Figs. 6, 9 and 10, of the cylinder. Such disks are fixed upon the intermittently rotated shaft 12. They have notches 44, 44, 44, at their peripheries to receive the inwardly-projecting teeth 45, 45, with which the plates or segments are provided at their front and rear edges. These teeth are located at the extreme ends of the plates or segments. Through the engagement of the said teeth in the said notches the plates or segments, when fitting the peripheries of the disks, are locked to the latter so as to compel them to turn in exact unison therewith. By means of the said disks the pattern-plates are presented in position to coact with the key-points, and by the intermittent rotation of the disks the successive rows of pattern-indicators upon the respective plates or segments are fed past the key-points. For the purpose of presenting the plates or segments successively to the disks so that they may be carried around by the latter, and for that of conducting them away from the disks after passing around them, conveyer-belts 46, 46, are provided. These belts are supported by opposite pairs of sheaves 47, 47, and 48, 48, around which they travel. The sheaves 47, 47, are located in close proximity to the disks 43, 43, and partly lap with the latter. They are fixed upon a shaft 49 which is mounted in bearings in stands or brackets 50, 50. The sheaves 48, 48, are located at a distance from disks 43, 43, and are fixed upon a shaft 51. The said shaft rotates in bearings at 52, 52, and has also fixed thereon a sprocket-wheel 53, Fig. 6, around which passes a sprocket-chain 54, which also passes around a sprocket-wheel

55, Figs. 2 and 6, which is fixed upon the shaft 12 of the cylinder. Through the described driving connections the belts are actuated so as to move at a speed corresponding with the peripheral speed of disks 43, 43. Upon the exteriors of the two belts are provided projecting pieces 56, 56, etc., arranged in pairs, a pair on one belt being opposite a pair on the other belt. The projections of each pair are spaced apart from each other sufficiently to receive between them the proximate edges of two plates or segments located close together, side by side. The plates or segments are arranged in an endless series extending around the belts and the disks of the cylinder. The substantially horizontal upper runs of the belts support some of the plates or segments, and by the travel of the belts these plates or segments are advanced toward the cylinder, the engagement of the projections 56, 56, with the edges of such plates or segments serving to insure the advance. As the leading edge of an advancing plate or segment is presented to the disks 43, 43, the inwardly-projecting teeth at such edge are received in notches 44, 44, of such disks, so that at the said leading edge the said plate or segment becomes engaged with the disks and moves with the peripheries of the latter. As the plate or segment is delivered by the belts to the disks it fits itself to the said peripheries, arranging itself concentric around such shaft by the rotation of the shaft and disks. On arriving at the under side of the disks the leading edge of the plate or segment is caused to approach the lower runs of the belts until it enters the space between a pair of the projections 56, 56, on each belt. By the engagement of the rear projections of the said pairs with the inwardly projecting teeth of such edge the latter is pressed downwardly away from the peripheries of the disks until the plate or segment rests upon ways 57, 57, extending beneath the said lower runs. Such engagement also serves to draw the plate or segment along the said ways, and in addition around the sheaves 48, 48, to the upper runs again. One plate or segment follows another in the described travel, just as though they were linked together into an endless chain or series. It will be apparent that at any time the plates or segments resting upon the upper runs of the belts may be removed by simply lifting them from the belts, and may be readily applied by simply laying them upon the said runs with their edges properly engaged between the pairs of projections 56, 56. For the purpose of preventing wear or other injury of the pattern-indicators along the meeting edges of the plates or segments, through contact between those of one plate or segment with

those of the adjacent plate, as the plates or segments are being carried along by the belts or are being transferred to the disks 43, 43, or being discharged therefrom, outwardly-projecting lips or lugs 58, 58, are provided upon the said edges, at the ends of the plates or segments. The lips or lugs of one edge of a given plate or segment engage with those of the proximate edge of the adjoining plate or segment so as to hold the meeting edges spaced apart and separated from each other, at all times except when the plates or segments fit concentrically upon the disks. When the plates or segments are concentric with the shaft 12 and its disks, radial faces of the teeth 45, 45, and lips or lugs 57, 57, meet so as to permit the edges of the successive plates or segments to come close together.

The plates or segments are clasped securely to the disks 43, 43, of the cylinder, and prevented from radial displacement in passing around the latter, by means of a fixed beveled flange 59, Figs. 9 and 10, sheet 3, upon one of said disks, such flange facing toward the other disk, and a sectional beveled flange at the outer side of the latter disk. The segmental sections 60, 60, 60, Figs. 8 and 9, of the latter flange, have dovetailed feet 61, 61, 61, moving in undercut guideways formed in the hub 43^a of disk 43, such guideways extending lengthwise of shaft 12. Expanding spiral springs 62, Fig. 9, compressed between the respective segmental sections and the adjacent disk 43 act with a tendency to move such sections farther away from the other disk 43 and its flange 59. The said springs surround the stems of screws 63 projecting laterally from the respective sections through holes in the said adjacent disk, and the flanged heads of such screws serve through their engagement with the web of the said disk to limit the extent of such movement. By this opening movement of a section the transfer of a plate or segment from the belts to the disks is facilitated. After such plate or segment has become fitted to the peripheries of the disks, the section is moved positively so as to close its beveled flange-portion against the correspondingly beveled adjacent end of the plate or segment (see Fig. 9). This forces the plate or segment endwise slightly so as to crowd its opposite beveled end in under the flange 59, thereby securely clamping the plate or segment in place, preventing it from becoming dislodged as the cylinder turns therewith, and holding it firmly for presentation to the key-points. The clamping action results from contact of a roll 64, which is carried by the segmental section, with a stationary cam-piece 65, Figs. 2 and 9. The succeeding plate or segment is in like manner clamped in position upon the disks

43, 43, and so on. As each plate or segment arrives in turn at the under side of the said disks, the roll 64 of the corresponding clamping section 60 passes off the cam 65, releasing such clamping section so that its spring 62 communicates the opening movement thereto. The bevels of the ends of the plate or segment facilitate its disengagement from flange 59 and from the beveled flange of the corresponding segmental section 60, as it is delivered from the cylinder to the ways 57, 57.

I have shown herein a key and its key-point or contact combined in a single lever-like device. This direct connection and unitary construction is not essential in the case of some embodiments of the broad principles of the invention.

In case the key-levers should not occupy exactly their correct positions at the time when the locking bar becomes engaged therewith, the action of the inclined faces of the projecting ribs of the edge of the said bar against the inclined faces of the notches of the key-levers will shift the key-levers slightly either up or down, as the case may be, as the said ribs are forced home into the said notches, and thereby will bring the engaging ends of the key-levers into exactly the intended positions.

The constructional features of a mechanism embodying the features of the invention may be varied in many respects.

What is claimed as the invention is:—

1. In a pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, a carriage and means for moving the same back and forth between the pattern-surface and needles, and indicating levers mounted on said carriage, set in indicating position by the pattern-surface as a result of the movement of the carriage toward the latter, and in the opposite movement actuating the needles to indicate the required hooked uprights for action.

2. In a pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, a carriage and means for moving the same back and forth between the pattern-surface and needles, indicating levers mounted on said carriage, set in indicating position by the pattern-surface as a result of the movement of the carriage toward the latter, and in the opposite movement of the carriage actuating the needles to indicate the required hooked uprights for action, and locking means acting to hold the selected levers in set position during the latter movement and releasing them during the movement of the carriage toward the pattern-surface.

3. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, indicating keys and contacts com-

bined therewith, and means for traversing the said keys and contacts with reference to the needles and the pattern-surface, the contacts being caused to engage with the pattern-surface by movement in one direction, thereby selecting and setting the keys, and being withdrawn by movement in the opposite direction to permit the pattern-surface to be fed, and the selected keys in their movement engaging and actuating the needles and thereby indicating the hooked uprights for action.

4. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, indicating keys and contacts combined therewith, means for traversing the said keys and contacts with reference to the needles and the pattern-surface, the contacts being caused to engage with the pattern-surface by movement in one direction, thereby selecting and setting the keys, and being withdrawn by movement in the opposite direction to permit the pattern-surface to be fed, and the selected keys in their movement engaging and actuating the needles and thereby indicating the hooked uprights for action, and locking means by which the selected keys are retained in their working position until after they have actuated the needles.

5. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, needle-actuating levers and contacts combined therewith, and means for traversing the said levers and contacts with reference to the needles and the pattern-surface, the contacts being caused to engage with the pattern-surface by movement in one direction, thereby selecting and setting the levers, and being withdrawn by movement in the opposite direction to permit the pattern-surface to be fed, and the selected levers in their movement engaging and actuating the needles and thereby indicating the hooked uprights for action.

6. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, needle-actuating levers and contacts combined therewith, means for traversing the said levers and contacts with reference to the needles and the pattern-surface, the contacts being caused to engage with the pattern-surface by movement in one direction, thereby selecting and setting the levers, and being withdrawn by movement in the opposite direction to permit the pattern-surface to be fed, and the selected levers in their movement engaging and actuating the needles and thereby indicating the hooked uprights for action, and means for locking the selected levers in their working position until after they have actuated the needles.

7. A pattern-mechanism comprising an intermittingly fed pattern-surface, a plural-

ity of needles, a plurality of needle-controlling keys, a movable support for said keys, means for operating the key-support to carry the keys into and out of engagement with the pattern-surface during each period of rest of the latter to selectively adjust the keys and to cause the keys to actuate the selected needles during the movement of the key-support away from the pattern-surface.

8. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface, indicating keys, means for traversing the said keys with reference to the pattern-surface to select and set the keys, and with reference to the needles to cause the keys selected and set by the pattern-surface to engage the needles and actuate the latter to thereby indicate the hooked uprights for action, and an evenner by which the keys are restored to normal position.

9. In pattern-mechanism, in combination, the hooked uprights, the needles, indicating levers, a pattern-surface by which such levers are selected and set, means for traversing the levers with reference to the pattern-surface to select and set the keys, and with reference to the needles to cause the levers which are selected and set by the pattern-surface to engage the needles and actuate the latter to thereby indicate the hooked uprights for action, and an evenner device which restores the levers to normal position.

10. In pattern-mechanism, in combination, the needles, a pattern-surface, indicating levers which are selected by the said pattern-surface, a lever-support movable to cause the selected levers to engage and actuate the needles endwise, and a locking bar which locks the levers from displacement during the stroke in which they thus actuate the needles.

11. In pattern-mechanism, the needles, a pattern-surface, a carriage and means for moving the same back and forth between the needles and pattern-surface, indicating levers mounted on said carriage, selected and set by the pattern-surface at time of movement of the carriage in one direction, and adapted to engage and actuate the needles as the carriage moves in the other direction, each lever having a plurality of V-shaped teeth, and a locking bar having a V-edge which engages with such teeth to lock the levers in the selected positions during the movement by which the needles are actuated.

12. In pattern-mechanism, in combination, hooked uprights, needles, a pattern-surface, a movable carriage, keys mounted on said carriage, selected and set by the pattern-surface in movement of the carriage toward the latter, said keys having each a plurality of V-shaped notches, and a locking-bar having a V-shaped working edge, engaging in said notches to lock the keys in

their respective positions after selection and until by engagement of the keys with the needles the latter have been moved endwise to indicate the uprights for action.

5 13. In pattern-mechanism, in combination, a guide having a groove or slot, a row of needles in the same plane as such groove or slot, the needle-ends entering the latter, a series of indicating levers mounted side
10 by side and having all of the engaging ends thereof in such plane and occupying such groove or slot, a pattern for determining the alinement of the respective needle-ends, and means for operating the said levers to
15 communicate endwise movement to the needles.

14. In pattern-mechanism, in combination, a guide having a groove or slot, a row of needles in the same plane as such groove
20 or slot, the needle ends entering the latter, a series of indicating levers mounted side by side and turning about the same pivotal axis, and having the respective engaging ends thereof at different heights corresponding
25 ing with the heights of the respective needles and all such ends in such plane and occupying such groove, a pattern which determines the alinement of the respective engaging ends with the respective needle-ends,
30 and means for operating the said levers to communicate endwise movement to the needles.

15. In pattern-mechanism, in combination, a cylinder, a series of pattern-plates
35 or segments, means for supplying such plates or segments successively to the said cylinder at one side thereof, and clamping means in connection with the cylinder, engaging with each plate or segment in turn
40 thus fed and holding it on the cylinder against displacement so as to cause it to be presented for coöperation with suitable indicating devices, and then releasing it after passing such devices.

45 16. In pattern-mechanism, in combination, a cylinder, a series of pattern-plates or segments not linked together, means co-operating with said cylinder and plates or segments to cause the latter to travel in an
50 endless circuit in which they pass partly around the cylinder, and clamping means in connection with the cylinder engaging with each plate or segment in turn and holding it on the cylinder against displacement
55 while being presented for coöperation with suitable indicating devices and fed past the latter, and then releasing it after passing such devices.

60 17. In pattern-mechanism, in combination, a cylinder, a series of pattern-plates or segments, means for supporting such plates or segments and causing them to travel toward the receiving side of the cylinder and from the delivery side thereof, a flange in con-

nection with the cylinder, a set of segmental
65 flange-sections in connection with the cylinder for coöperation with the said flange in clamping the successive plates or segments to the cylinder, and means for actuating the said flange-sections to clamp and unclamp. 70

18. In pattern-mechanism, in combination, a series of pattern-plates or segments, a rotating cylinder-shaft, disks or heads on such shaft and a flange or rim in connection with one thereof, a set of segmental clamps
75 in connection with a second disk or head, means for actuating the said segmental clamps as the cylinder rotates, to alternately secure a plate or segment and cause the same to be presented to suitable indicator devices
80 and then release such plate or segment, and means for carrying the plates or segments to the clamp-devices and delivering them thereto, and carrying them away after being released. 85

19. In pattern-mechanism, in combination, a series of pattern-plates or segments, a rotating cylinder-shaft, disks or heads on such shaft and a flange or rim in connection with one thereof, a set of segmental clamps
90 in connection with a second disk or head, means for actuating the said segmental clamps as the cylinder rotates, to alternately secure a plate or segment and cause the same to be presented to suitable indicator-devices and
95 then release such plate or segment, traveling endless belts for carrying the plates or segments to the clamp-devices and delivering them thereto, and carrying them away after being released, and guideways supporting
100 the plates or segments through a portion of their travel.

20. In pattern mechanism, in combination, the hooked uprights, the needles, a pattern-surface having the indicators there-
105 of constituted by prominences and depressions arranged in line, keys having combined therewith key-points correspondingly in line, and a carriage supporting the keys and key-points, and means for moving the
110 same toward and from the pattern-surface, the movement toward the latter causing the key-points to coact with the pattern-indicators which are in position to act, thereby giving to the keys their indicating position,
115 and the indicating action upon the needles and hooked upright taking place in the movement of the carriage from the pattern.

21. In pattern-mechanism, in combination, the hooked uprights, the needles, a pattern-surface having the indicators thereof
120 constituted by prominences and depressions arranged in line, keys having combined therewith key-points correspondingly in line, a carriage supporting the keys and key-
125 points, and means for moving the same toward and from the pattern-surface, the movement toward the latter causing the key-

points to impinge against the pattern-indicators which are in position to act, and the indicating action upon the needles and hooked uprights taking place in the movement of the carriage from the pattern, and
5 the lock acting during the latter movement to hold the keys in the indicating position.

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

WILLIAM BOWKER.

Witnesses:

CHAS. F. RANDALL,
EDITH J. ANDERSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
