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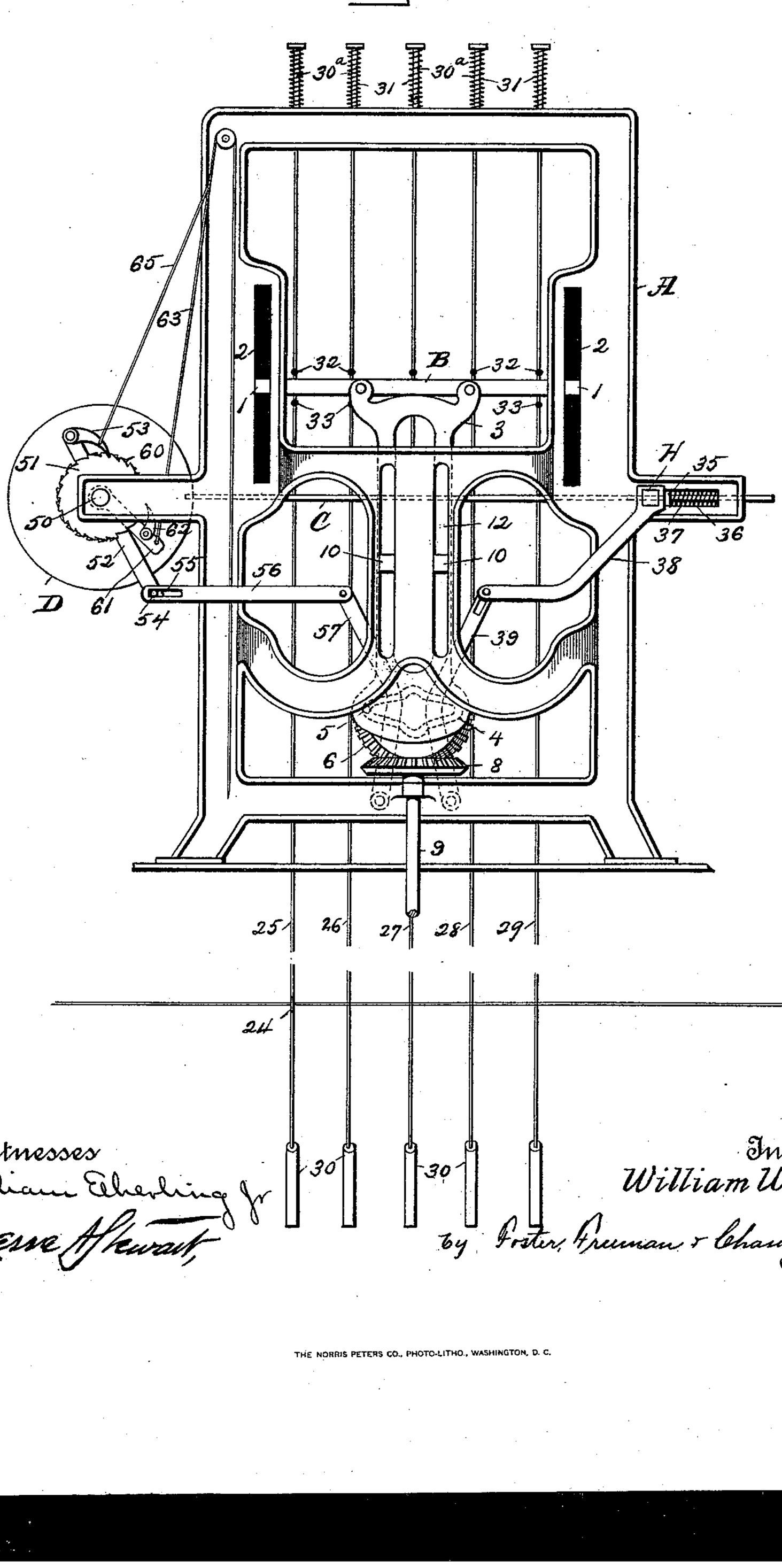
W. WEAVER.

JACQUARD MECHANISM FOR LOOMS.

No. 541,646. Patented June 25, 1895.



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(No Model.) 6 Sheets—Sheet 2.

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JACQUARD MECHANISM FOR LOOMS.

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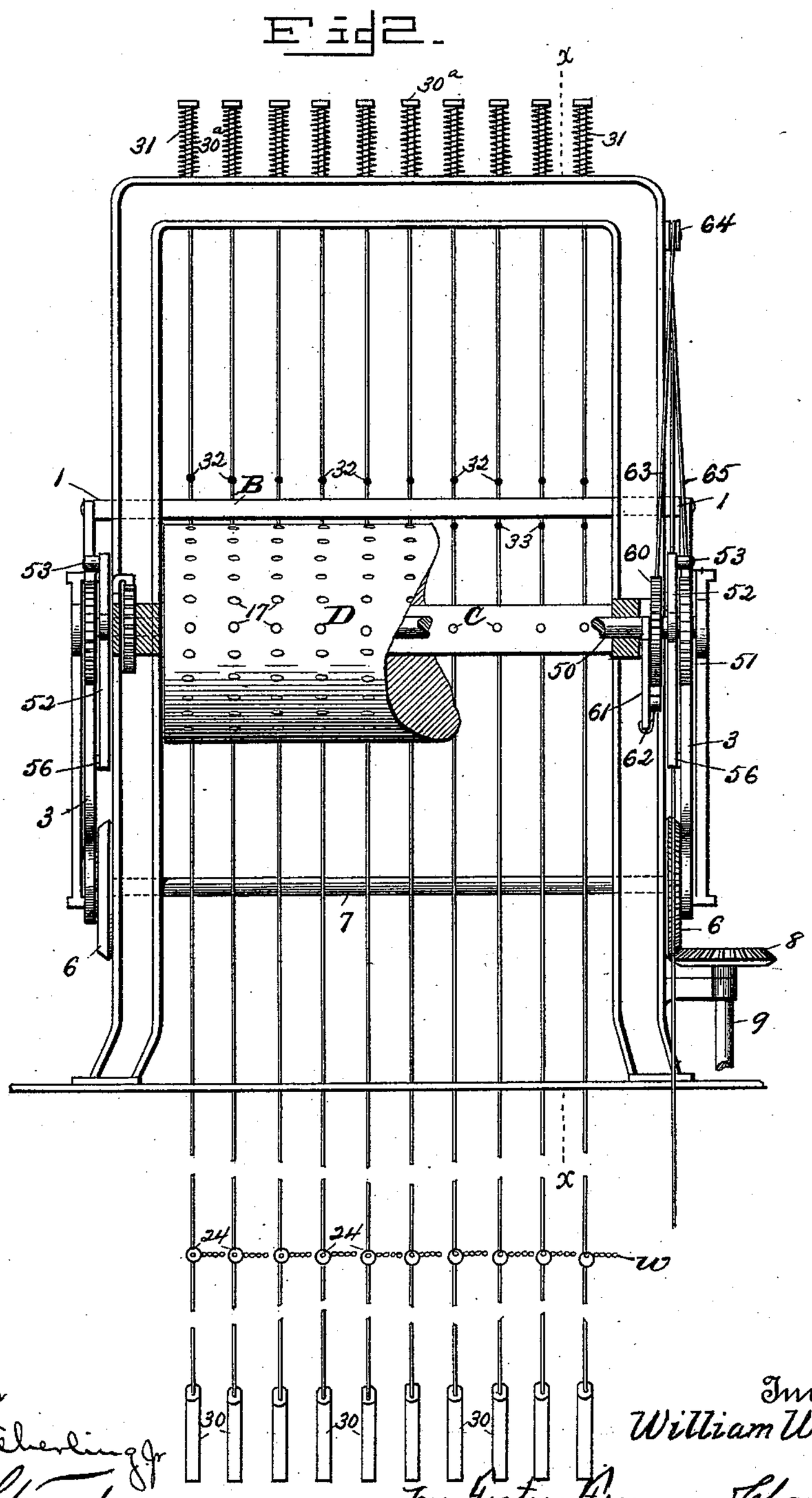

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JACQUARD MECHANISM FOR LOOMS.

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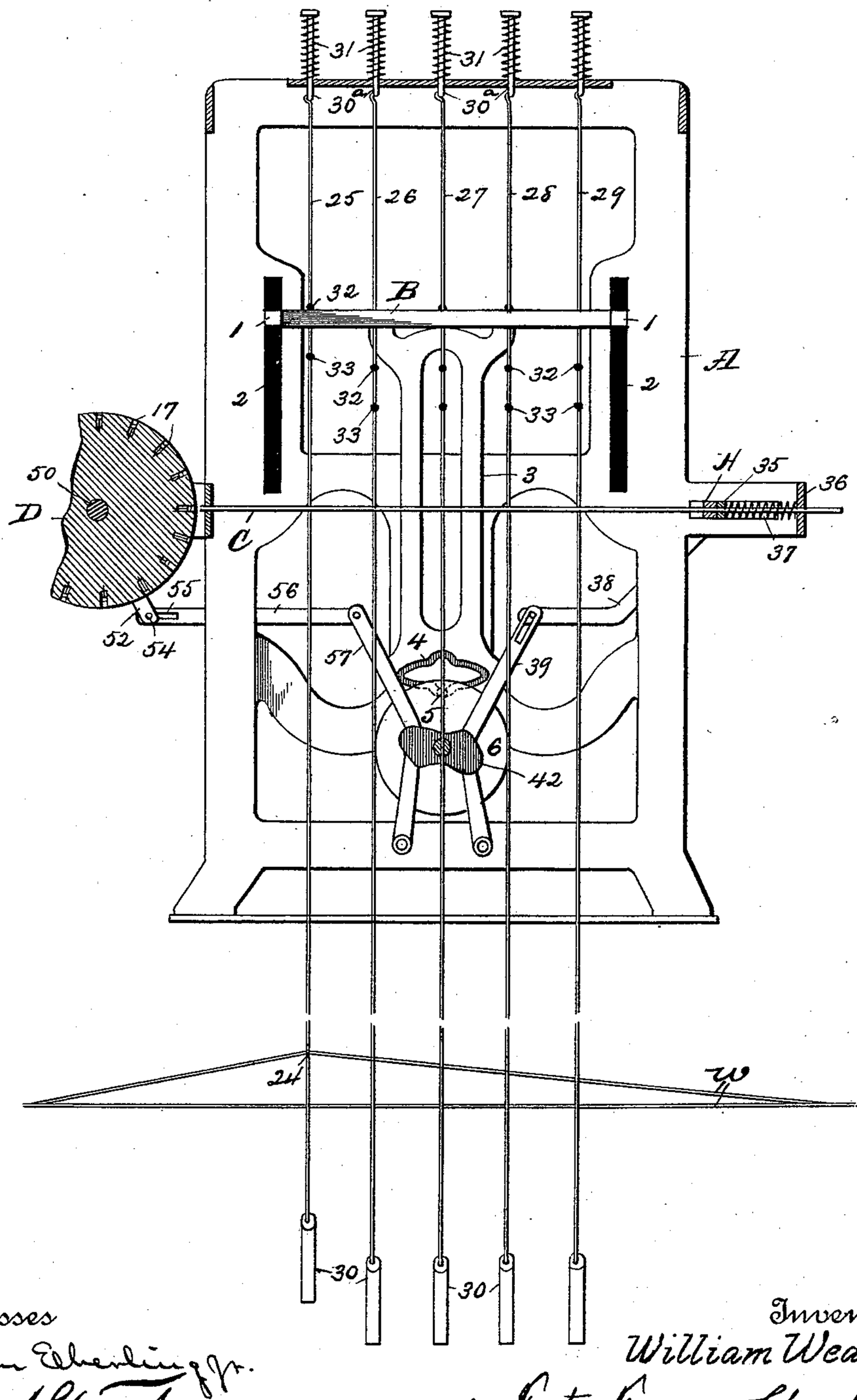
Fig. 3.



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(No Model.) 6 Sheets—Sheet 4.

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JACQUARD MECHANISM FOR LOOMS.

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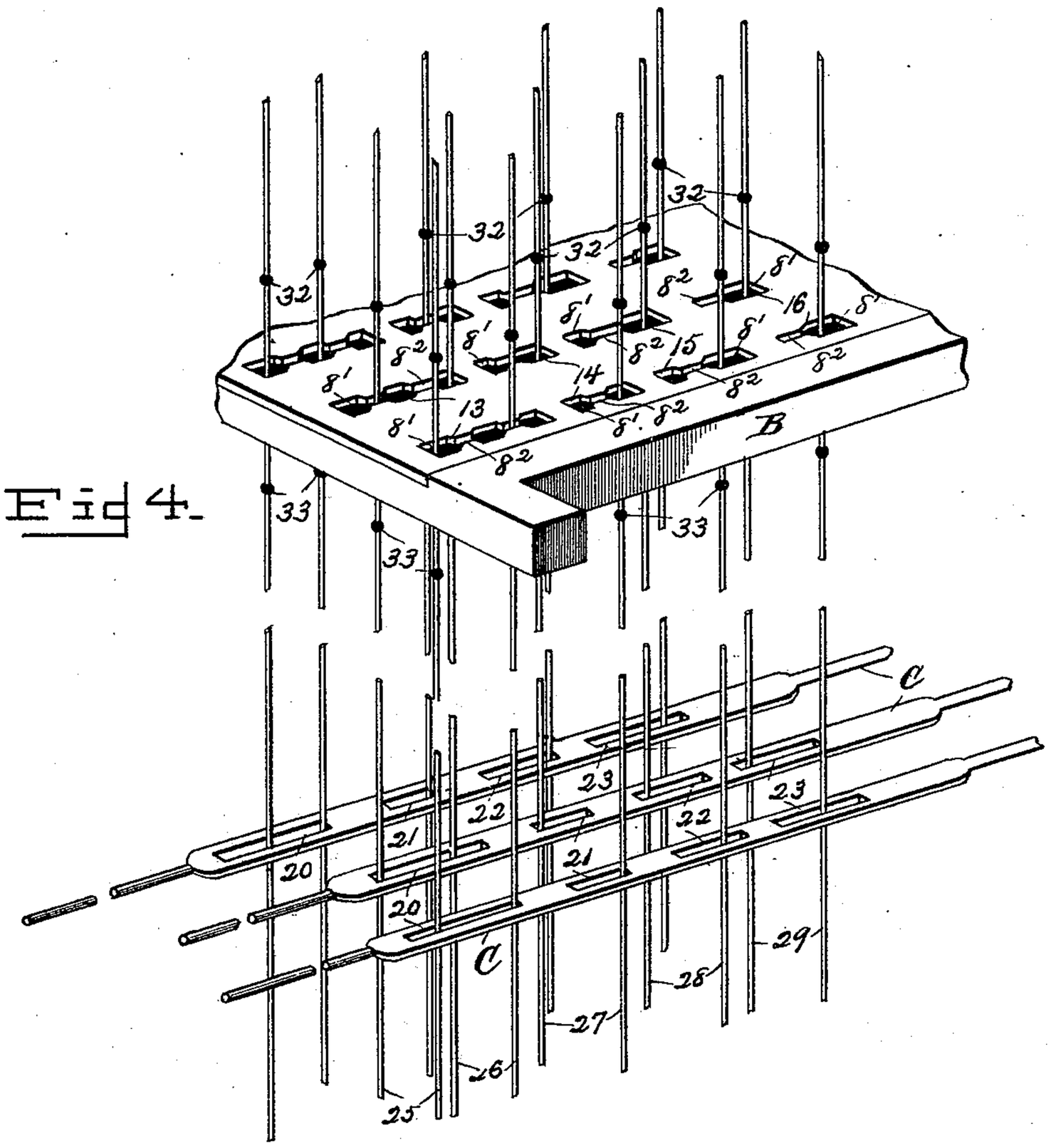
Fig 4.



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(No Model.) 6 Sheets—Sheet 5.

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JACQUARD MECHANISM FOR LOOMS.

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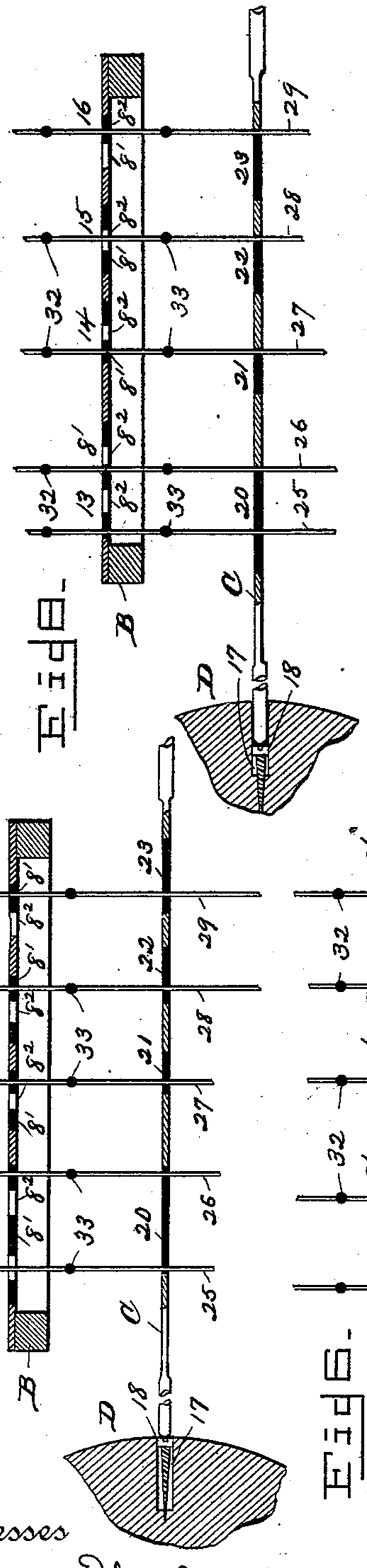

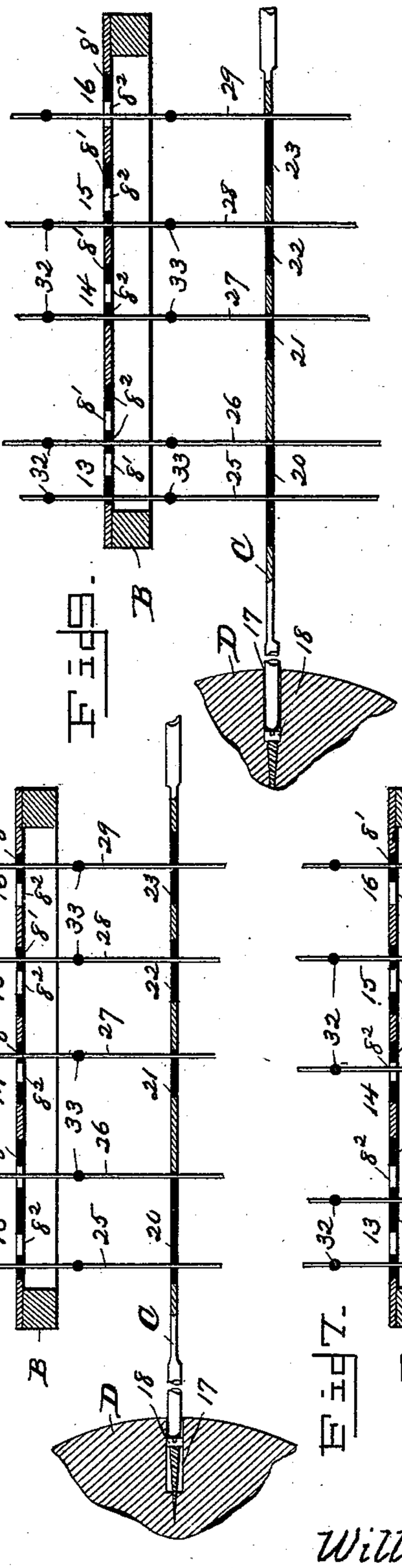

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JACQUARD MECHANISM FOR LOOMS.

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Fig 10.

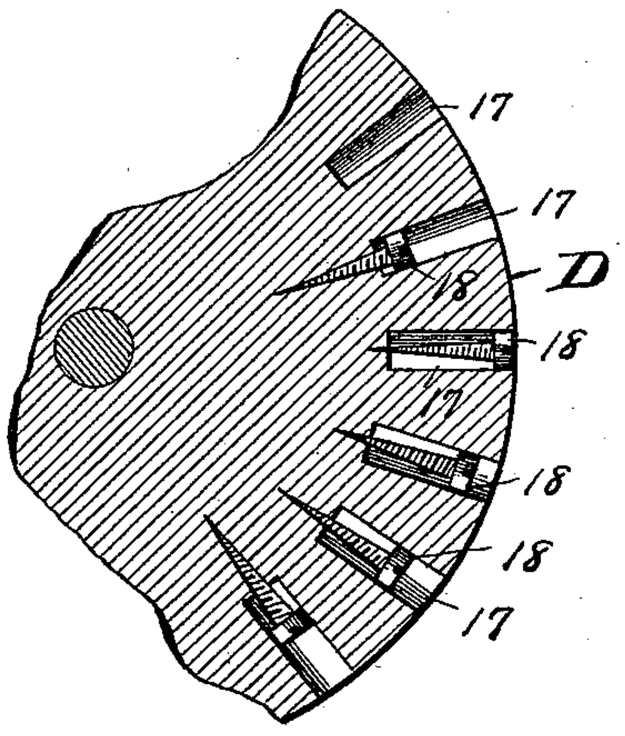


Fig 12.

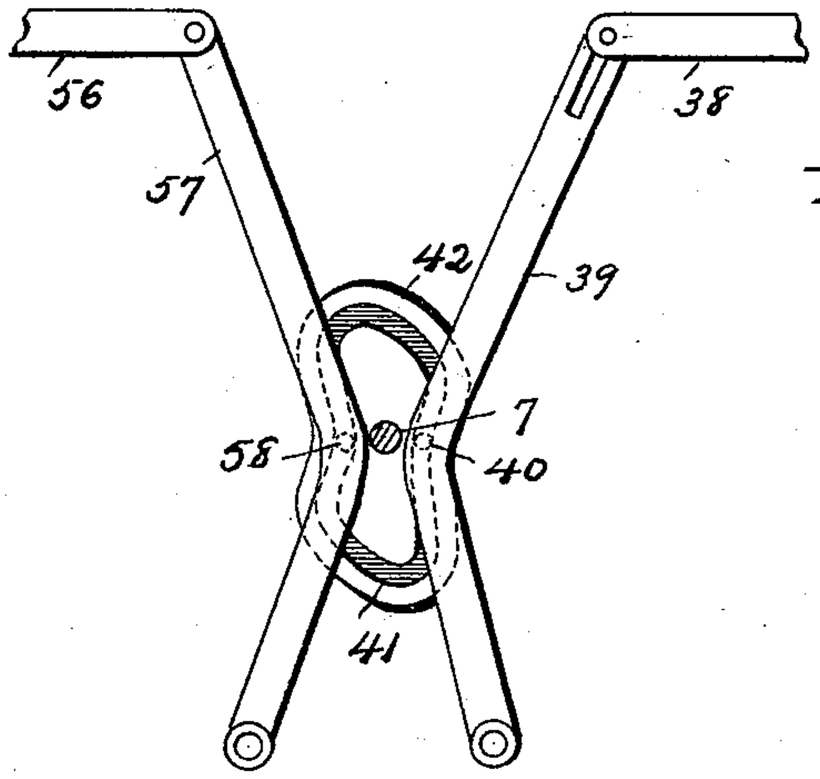


Fig 11.

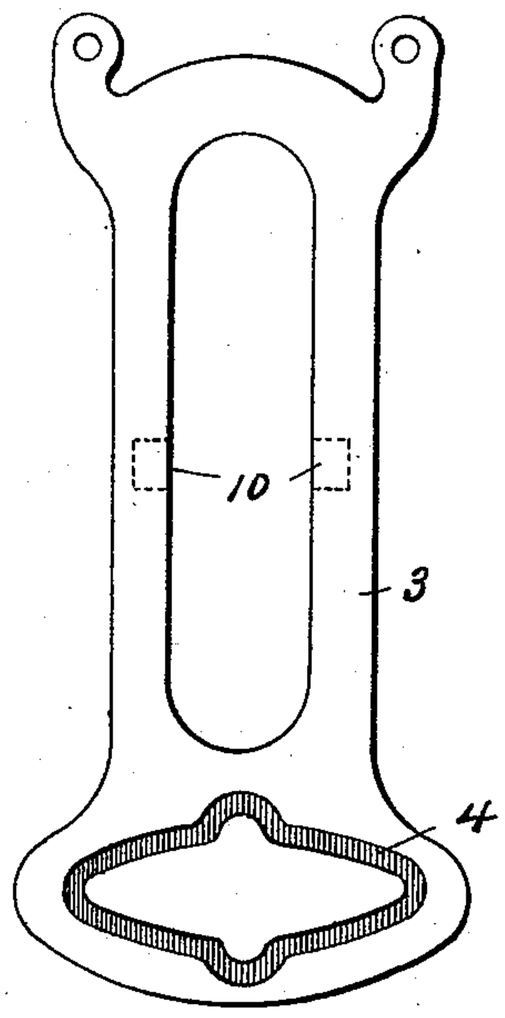
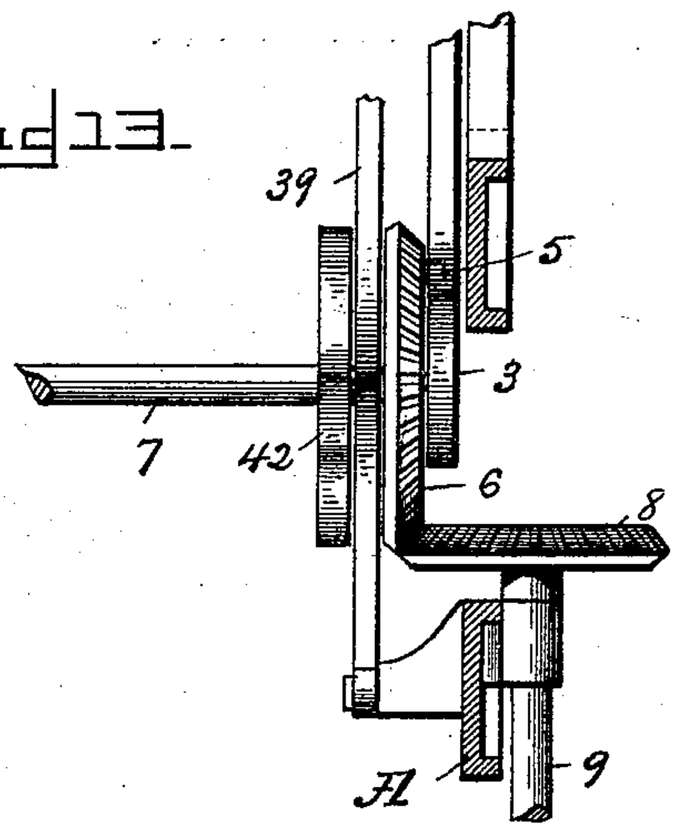


Fig 13.



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UNITED STATES PATENT OFFICE.

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JACQUARD MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 541,646, dated June 25, 1895.

Application filed January 22, 1895. Serial No. 535,809. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WEAVER, a citizen of the United States, residing at Norwalk, county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Jacquard Mechanism for Looms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an improvement in Jacquard mechanism for looms.

It has for its object to provide mechanism of the character described, which may be applied to any ordinarily constructed loom, and by the use of which a double-faced fabric may be woven, the pattern on each side being either identical or totally different in design.

In the accompanying drawings, forming a part of this specification, and in which like letters of reference indicate corresponding parts, Figure 1 is a side elevation, certain parts being broken away and others in section, illustrating the position of the parts when the lifting and depressing board is in its normal position. Fig. 2 is a front elevation of the invention, portions of the pattern and pattern-cylinder being broken away to illustrate the positions of the needles in relation thereto. Fig. 3 is a vertical sectional view taken on the line *x x* of Fig. 2, the lifting and depressing board being shown in its elevated position. Fig. 4 is a detail perspective view, parts being broken away, illustrating the construction of the shifting needles and lifting and depressing board and their relative arrangement with respect to each other. Fig. 5 is a vertical sectional view taken longitudinally through one of the shifting needles and transversely through the lifting and depressing board, illustrating more particularly the positions of the warp-supporting cords and shifting needles with respect to the pattern-roll just previous to the elevation or depression of the first cord of the series. In this figure parts of the needles and pattern-cylinder are broken away. Fig. 6 is a similar view showing the position of the second cord just previous to its elevation or depression by the lifting or depressing board. Fig. 7 is a similar view showing the position of the third cord just previous to being elevated or depressed by the lifting or depressing board. Fig. 8 is a similar view illustrating the position of the fourth warp-supporting cord previous to its being elevated or depressed by the lifting or depressing board. Fig. 9 is a similar view showing the position of the fifth cord just previous to its elevation or depression by the lifting or depressing board. Fig. 10 is a detail sectional view of the pattern cylinder, portions being broken away. Fig. 11 is a detail view of the supporting-frame of the lifting and depressing board, showing more particularly the construction of the cam-groove therein. Fig. 12 is a similar view of the mechanism for rotating the pattern-cylinder and for reciprocating the needles; and Fig. 13 is a detail vertical sectional view of the mechanism shown in the two preceding figures, illustrating the relative arrangement of said mechanisms.

I am aware that, heretofore, Jacquard mechanism has been devised for weaving double-faced fabric, the patterns on both sides being identical in design, but different in color. This may be accomplished by the use of my invention, but in addition to this, a double-faced fabric may be woven with my machine, the patterns on the two faces of which are entirely distinct as to design, the same number of colors being used in each pattern, or each pattern may be woven of different colors.

With these ends in view my invention consists of a combined lifting and depressing board designed to be alternately reciprocated above and below its normal position, to lower and elevate the warp-supporting cords respectively. It further consists of a series of needles which engage and are regulated in their movements by pattern devices, for automatically determining the proper warp supporting cords to be elevated and lowered; and finally it consists in the novel construction and arrangement of the parts, as claimed, for accomplishing the objects of the invention.

In the accompanying drawings: A represents the frame adapted to be secured upon or adjacent to any ordinary loom, (not shown).

B is a vertically reciprocating lifting and depressing board guided in its movements by means of projection 1 which engage vertical

slots 2 in each side of the frame A. Connected to the lifting board, on opposite sides, thereof, are lifting frames 3, which project vertically downward therefrom and are provided in their lower ends with cam grooves 4. These grooves are engaged by studs 5 on the faces of gears 6, said gears being keyed upon a shaft 7 which is in turn supported in frame A. Motion is imparted to the gears 6 by means of an intermeshing gear 8 supported upon the end of a vertical shaft 9 which is connected at its lower end to suitable driving mechanism (not shown). The lifting frames are guided in their reciprocating movement by means of lugs 10 which engage slots 12 of the frame A. As the gears 6 are revolved the studs 5 travel in the cam grooves 4 and lift the frame 3, which in turn lift the lifting and depressing board B above its normal position where it is allowed to dwell a sufficient length of time to permit a thread carrier to be thrown through the shed which has just been opened above the upper face of the fabric by the upward movement of the lifting and depressing board. After this operation has taken place the lifting and depressing board is lowered to its normal position and dwells there while the warp-supporting cords are being shifted, by their shifting mechanism, hereinafter described. The lifting and depressing board is then lowered below its normal position and permitted to dwell at the terminal of said movement sufficiently long to permit a thread carrier being thrown through the shed which has just been opened below the lower face of the fabric by the downward movement of the lifting and depressing board. The said board is then returned to its normal position and held there during the shifting of the warp supporting cords previous to their being again lifted by the upward movement of the lifting and depressing board.

The lifting and depressing board B is provided with a transverse series of slots 13, 14, 15, and 16, which differ both in width and length. The series of slots are duplicated across the lifting and depressing board to correspond to the number of spaces in the reed of the loom. (Not shown.) The slots 13, 14, 15, and 16 are each formed with enlargements 8′ and with narrower portions 8^2 which merge with said enlarged portions to form a continuous and unobstructed passage between them. The slots 13 are each formed with three enlargements 8′, spaced apart, and connected together to form a continuous and unobstructed passage from one to the other, by two narrower portions 8^2. The slots 14 consist of two enlargements 8′, connected by a narrower portion or bearing 8^2, formed intermediate of said enlargements. The slots 15 are of the same shape as the slots 14 but longer. The slots 16 are formed with an enlargement 8′, and a narrower portion or bearing 8^2, merging into said enlargement. These slots 13, 14, 15 and 16 forming a series are arranged transversely across the lifting and depressing board in line with one another.

Arranged below and parallel to the lifting and depressing board is a series of slotted shifting needles C, one needle being provided for each series of slots 13, 14, 15 and 16. These needles are supported near their front and rear ends in the frame A, and are adapted to move independently toward a pattern cylinder D journaled in the frame A. This pattern cylinder D is provided in its face with annular series of recesses 17, each recess being of the same diameter and depth. One of these annular series of recesses is provided for each shifting needle C, and each recess of a series is designed to be successively brought into alignment with the point of its needle. In order to vary the extent of the forward movement of the needles C, the recesses 17 are each provided with a flat-headed screw 18, the head of which is of the same diameter as the recesses 17. The shank of said screw is adapted to be screwed into the bottom of said recesses, and accordingly as the head of the screw 18 is near the top or bottom of its recess, is the extent of the forward movement of the needle lessened or increased. As the recesses 17 are brought into alignment with the points of the shifting needles C said needles are caused to pass into said recesses. The extent to which the shifting needles C are permitted to engage said recesses 17 determines the extent of the forward movement of the needles and the length of this forward movement determines the colors or characters, of the warp threads to be next raised or lowered by the lifting and depressing board B, as will appear farther on.

It will be apparent that as only one pattern cylinder is used in the present invention the recesses in said cylinder must of necessity be arranged to regulate the movement of the shifting needles C so as to form the different patterns on the opposite faces of the fabric. Accordingly the recesses 17 which are arranged in series around the circumference of the pattern cylinder form also transverse series across said pattern cylinder, the depths of one transverse series being arranged to form the pattern on the upper face of the fabric and the depths of the next series being arranged to form the pattern on the lower face of said fabric and so on, recesses of the proper depths to form the two patterns being arranged across the pattern cylinder in alternate transverse series.

The recesses 17 are thickly distributed over the whole surface of the pattern cylinder and, as has been said, each of these recesses is provided with a flat headed screw and accordingly as the heads of these screws are near the top or the bottom of said recesses is the extent of the forward movement of the shifting needles lessened or increased respectively.

Owing to the great number of shifting needles used and to the closeness with which

they are assembled it is necessary to form them of very thin material and as the needles in some cases move several inches there would be extreme liability of their becoming bent or broken when they are projected into engagement with the pattern cylinder, unless some means to guide them and prevent lateral movement were provided. In order to guard against injury to the needles, the screws 18 are inserted in recesses as described above and the walls of these recesses serve to prevent the lateral movement of the ends of the needles. In addition to this, by providing the pattern cylinder with the recesses 17, I am enabled to adjust the cylinder much nearer the ends of the shifting needles than if the screws were arranged on the periphery of the cylinder.

By the employment of a thickly recessed pattern cylinder D, and of the flat headed screws 18, adapted to be adjusted in said recesses, it will be evident that the pattern of the fabric being woven may be readily changed by readjusting the positions of the screws 18 in accordance with a new pattern, and thus the necessity and expense of making new pattern devices whenever it is desired to change the design or pattern of a fabric, is obviated.

A step by step rotary movement is imparted to the pattern cylinder D, to bring the recesses 17 formed therein into alignment with the points of the shifting needles C to be successively engaged thereby. Mechanism for accomplishing this will be described later on.

The shifting needles C are each provided with a series of slots 20, 21, 22, 23, which vary in length and which normally align with the slots 13, 14, 15 and 16 in the lifting and depressing board. (See Fig. 5.)

I have illustrated my invention as being adapted for weaving a fabric of five colors, but it will be understood that any number of colors may be used by increasing the number of slots in the shifting needles C and lifting and depressing board B. In weaving a fabric the warps *w* are separated into series, each of which contains one thread of each color used, and each series of warp threads are passed through one space in the reed. Each of the warp threads, however, is threaded through an eye 24 of the warp supporting cords or tail cords 25, 26, 27, 28, and 29. (See Figs. 2 and 3.) These cords are elevated and lowered to open the shed upon both faces of the fabric by the action of the lifting and depressing boards in the manner described farther on. Upon the lower ends of each of the warp supporting cords lingoes 30 are secured, as is usual. The warp supporting or tail cords 25, 26, 27, 28, and 29 are secured at their upper ends to rods 30^a each of which is encircled by a spring 31, against the action of which the rods 30^a pulled down whenever the warp supporting cords are lowered. Each of the warp supporting cords extends vertically downward from its rod 30^a and is provided with knots or enlargements 32 and 33, normally located one above and one below the lifting and depressing board B. These knots or enlargements are sufficiently small to permit of their easy passage through the enlargements 8′, of the slots 13, 14, 15 and 16, but are too large to pass through the narrower portions or bearings 8^2 of said slots. The warp supporting cords 25, 26, 27, 28 and 29 are designed to be shifted into the slots 13, 14, 15, and 16 through which they pass, by the action thereon of the reciprocating needles D, and it will be apparent that whenever one of said cords is shifted into one of the narrower portions or bearings 8^2, of the slots 13, 14, 15, and 16 it will be raised at the next elevation or lowering of the lifting and depressing board B, by reason of the failure of the knots 32 and 33 passing through the said lifting and depressing board. It will be noted that the construction of the shifting needles C and the slots 13, 14, 15, and 16 in the lifting and depressing board is such that only one of each series of warp supporting cords 25, 26, 27, 28, and 29 can be shifted at the same time, into a narrow portion or bearing 8^2, of the slots 13, 14, 15, and 16, the remaining four cords of the series passing through the enlarged portion 8′, of said slots in order to permit the knots or enlargements 32 and 33 on said cords to pass through the lifting and depressing board B at its next elevation or depression. From this it will be seen that only one of each series of warp supporting cords and its corresponding warp thread can be elevated or lowered at one time, but different cords of each duplicate series of the warp supporting cords may be elevated or lowered simultaneously.

The warp supporting cords 25 and 26 pass through the slots 20 in the shifting needles C at opposite ends thereof and through the slot 13 in the lifting and depressing board B. The warp supporting cords 27 pass through the slots 21 in the needles C, and through the slot 14 in the lifting and depressing board B, respectively. The warp supporting cords 28 pass through the slots 22 in the shifting needles C and thence through the slots 15 in the lifting and depressing board B; and the warp supporting cords 29 pass through the slots 23 in the needles C and through the slot 16 in the lifting and depressing board B. The relative arrangement of the warp supporting cords 25, 26, 27, 28, and 29, the shifting needles C and the lifting board B is best illustrated in Figs. 5 to 10 of the drawings.

As has already been stated, the positions of the warp supporting cords 25, 26, 27, 28, and 29 in the slots 13, 14, 15, and 16 of the lifting and depressing board B, just previous to the elevation or lowering of said board, determine which one of each duplicate series of said warp supporting cords is to be raised or lowered at the next elevation or lowering of the lifting and depressing board B respectively, and as has also been previously stated, the warp supporting cords are shifted in the

slots 13, 14, 15, and 16 by the action therein of the shifting needles C, through the slots of which they pass. These shifting needles C are horizontally and independently reciprocated into engagement with the pattern cylinder D, whenever the lifting and depressing board B occupies its normal position and are simultaneously withdrawn from engagement with the said pattern cylinder D, to permit the cylinder being rotated one step, just subsequent to the starting of the lifting or depressing board on its downward movement. A description of the mechanism whereby this is accomplished will presently appear.

When the points of the shifting needles C are flush with the outer face of the pattern cylinder D, as shown in Fig. 5, by reason of the head of the screw 18 in the recess 17 being adjusted to align with the outer face of the pattern cylinder, the said needles occupy their normal positions. When in this position the warp supporting cords 25 are moved into the narrow portion or bearing, 8^2, of the slot 13 of the lifting and depressing board B, in order that when the said board is next elevated or depressed the cord 25 and the warp thread which it supports, will be moved correspondingly.

When the shifting needles C are engaging the recesses 17 to the extent shown in Fig. 6, the warp supporting cords 26 will be moved into the narrow portion or bearing 8^2, of the slot 13 of the lifting and depressing board B, to the end that their knots or enlargements 32 or 33 will engage the said board at its next elevation or depression and the cords be moved accordingly.

In Fig. 7 of the drawings, the shifting needles are permitted to pass into the recesses 17, by reason of the adjustment of the flat headed screw 18, a greater distance than in the preceding figure, to the end that the warp supporting cords 27 will be shifted into the narrower portions or bearings, 8^2, of the slot 14, in order that said cords will be operated at the next elevation or depression of the lifting and depressing board B.

Fig. 8 illustrates the shifting needles as engaging a recess 17 of greater depth than that shown in Fig. 7, and when the needles are in this position the warp supporting cords 28 are moved by said needles into the narrower portion or bearing 8^2, of the slot 15, previous to their being elevated or lowered by the lifting and depressing board B.

In Fig. 9 the shifting needles are shown in engagement with a recess 17 of the pattern device, of the greatest depth in consequence of which the warp-supporting cords 29 are in engagement with the narrow portion or bearing 8^2 of the slot 16.

Various means for imparting a step by step rotary motion to the pattern cylinder D, and for independently reciprocating the shifting needles C into and simultaneously withdrawing them from engagement with the pattern cylinder, will suggest themselves to the skilled mechanic, but I will now describe those which in practice I have found the most effective.

The shifting needles C near their rear ends pass through a cross-head H, and are each provided with a collar 35, secured thereon intermediate of the cross-head H and the rear of the frame A. Each needle is encircled by a spring 36 interposed between the collar 35 and the frame A, which spring tends to throw said needles into engagement with the pattern cylinder D. The cross-head H is guided in a slot 37 in opposite sides of the frame A, and is secured to horizontal arms 38 arranged on each side of the frame and extending parallel therewith. The forward ends of the arms 38 are connected to the upper ends of vertical levers 39, which are in turn pivoted at their lower ends to the frame A. These levers 39 are provided about midway of their lengths with studs of projections 40 (see Fig 12) which engage a groove 41 in a cam 42, secured upon the shaft 7. This cam is constructed so as to operate the cross-head H and permit the shifting needles C to engage the pattern cylinder D only when the lifting and depressing board is in its normal position. Secured upon the shaft 50 of the pattern cylinder, near the opposite ends thereof, are ratchet wheels 51 and levers 52. These levers are journaled about centrally of their lengths upon the shaft 50, and each carries a pawl 53, on its upper end, which engages the adjacent ratchet wheel 51. The lower ends of the lever 52 are provided with pins 54 which engage slots 55 in the ends of horizontal links 56. These links are connected to the upper ends of vertical levers 57 which are pivoted at their lower ends to the frame A and are provided with studs 58 which engage the groove 41 of the cam 42. It will be observed that the levers 39 and 57 through which the needles C and pattern cylinder D are moved, are operated simultaneously by the cam 42. Now as the shifting needles C must first be withdrawn from engagement with said pattern cylinder D before said cylinder can be rotated, the slots 55 in the links 56 are engaged by pins 54 which normally rest in the forward ends of the slots 55 and consequently the links 56 are moved for a short distance before the levers 52 are moved. While the links are moving through this space, the needles are being withdrawn from engagement with the pattern cylinder D by the devices described above.

As it may sometimes be desired to turn the pattern cylinder D backward I have provided mechanism for accomplishing this. This mechanism consists of a ratchet wheel 60 journaled upon one end of the shaft 50 and designed to be rotated in an opposite direction to the ratchet wheels 51, adjacent to one of which it is secured. A lever 61 is journaled upon and depends from the shaft 50 adjacent to the ratchet wheel 60. This lever is provided with a pawl 62 which normally hangs out of engagement with the ratchet wheel 60

and is designed to be drawn up into engagement with it by means of a cord 63 passing over a pulley 64 and extending downward to a point within easy reach of the operator. At the same time the pawl 62 is thrown into engagement with its ratchet wheel 60, the pawls 53 are lifted from their ratchet wheels 51 by means of a branch 65 of the cord 63, to allow the pattern cylinder to be turned back. (See Fig. 1.)

The operation of the invention is as follows: Assuming the lifting and depressing board B to be in its normal position and the shifting needles C in engagement with the pattern cylinder D (as shown in Fig. 1) the lifting board will be elevated, causing one of each series of warp supporting cords 25, 26, 27, 28 and 29 to be lifted. When these cords are lifted, the warp threads *w*, which pass through the eyes 24 thereof, will be drawn upward (as shown in Fig. 3) thereby opening the shed above the normal plane of the warps to permit a thread carrier or pile wire to be passed therethrough. Simultaneously with the elevation of the lifting and depressing board B the shifting needles C are withdrawn from engagement with the pattern cylinder D and said cylinder is rotated one step to bring a new series of recesses into alignment with the points of the shifting needles. The lifting and depressing board B is then returned to its normal position and the shifting needles C are permitted to engage the pattern cylinder D to shift the warp supporting cords in accordance with the pattern on the lower face of the fabric. The board B is then lowered to open the shed below the normal plane of the warps and after a thread carrier or pile wire has been passed therethrough the lifting and depressing board is returned to its normal position prior to being again elevated.

I do not wish to be understood as claiming broadly herein the construction of the shifting needles and lifting and depressing board, as the same forms the subject matter of a copending application filed July 19, 1894, Serial No. 518,047.

The advantages of the several parts of my improvements will be appreciated by those skilled in the art to which they pertain; and within the scope of my invention, as defined in the following claims, modifications may be made in the form, construction and position of the parts and some features of my invention may be used without others, since

What I claim is—

1. In Jacquard mechanism for looms, the combination of suitable warp supporting devices, a lifting and depressing board and means for moving the lifting and the depressing board above and below its normal position respectively, substantially as described.

2. In Jacquard mechanism for looms, the combination of the shifting needles, pattern devices provided with recesses adapted to be engaged by the shifting needles, means for positively withdrawing the shifting needles from engagement with the recesses of the pattern devices and adjusting devices within said recesses whereby the extent of the engagement of the recesses by the shifting needles is regulated, substantially as described.

3. In Jacquard mechanism for looms, the combination of the warp-supporting devices, a suitable lifting and depressing device adapted to move above and below its normal position, means for operating the lifting and depressing device and pattern controlled mechanism for moving the warp supporting devices into engagement with the lifting and depressing device, substantially as described.

4. In Jacquard mechanism for looms, the combination of suitable lifting and depressing mechanism, warp supporting devices each provided with engaging portions arranged above and below the lifting and depressing mechanism and means for shifting the warp supporting devices into engagement with the lifting and depressing mechanism, substantially as described.

5. In Jacquard mechanism for looms the combination of the warp-supporting devices, suitable lifting and depressing mechanism, means for alternately elevating and lowering the same from its normal position and pattern controlled devices adapted to shift the warp supporting devices into engagement with the lifting and depressing mechanism previous to the elevation or depression thereof substantially as described.

6. A pattern device for forming two separate and distinct patterns, said pattern device being provided with recesses arranged in transverse series, each alternate series of recesses being formed in accordance with one pattern while the intermediate series are formed in accordance with the second pattern and adjusting devices within the recesses, substantially as described.

7. A pattern device provided with recesses and an adjusting device in each recess whereby the extent to which said recesses may be engaged is regulated, substantially as described.

8. A pattern device provided with recesses, a screw within each of said recesses the upper end of said screw being of substantially the same diameter as the recesses, substantially as described.

9. In Jacquard mechanism for looms, the combination of the shifting needles, a pattern device provided with recesses adapted to be engaged by the shifting needles, and adjusting devices within the recesses of the pattern device whereby the extent of the engagement of the recesses by the shifting needles is regulated, substantially as described.

10. In Jacquard mechanism for looms, the combination of suitable warp supporting devices, lifting and depressing mechanism, and means for elevating and lowering the lifting and depressing mechanism above and below

its normal position and for permitting it to dwell at the terminal of its upward and downward movement, substantially as described.

11. In Jacquard mechanism for looms the combination of suitable warp supporting devices, lifting and depressing mechanism adapted to move above and below its normal position, the shifting needles for moving the warp supporting devices into engagement with the lifting and depressing mechanism and a pattern device for controlling the shifting needles, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM WEAVER.

Witnesses:
PAUL W. STEVENS,
FRANK T. HYATT.