Sheet 1, 5 Sheets.

J. Nield.

Loom.

No. 3,599. Patented May 25, 1844.

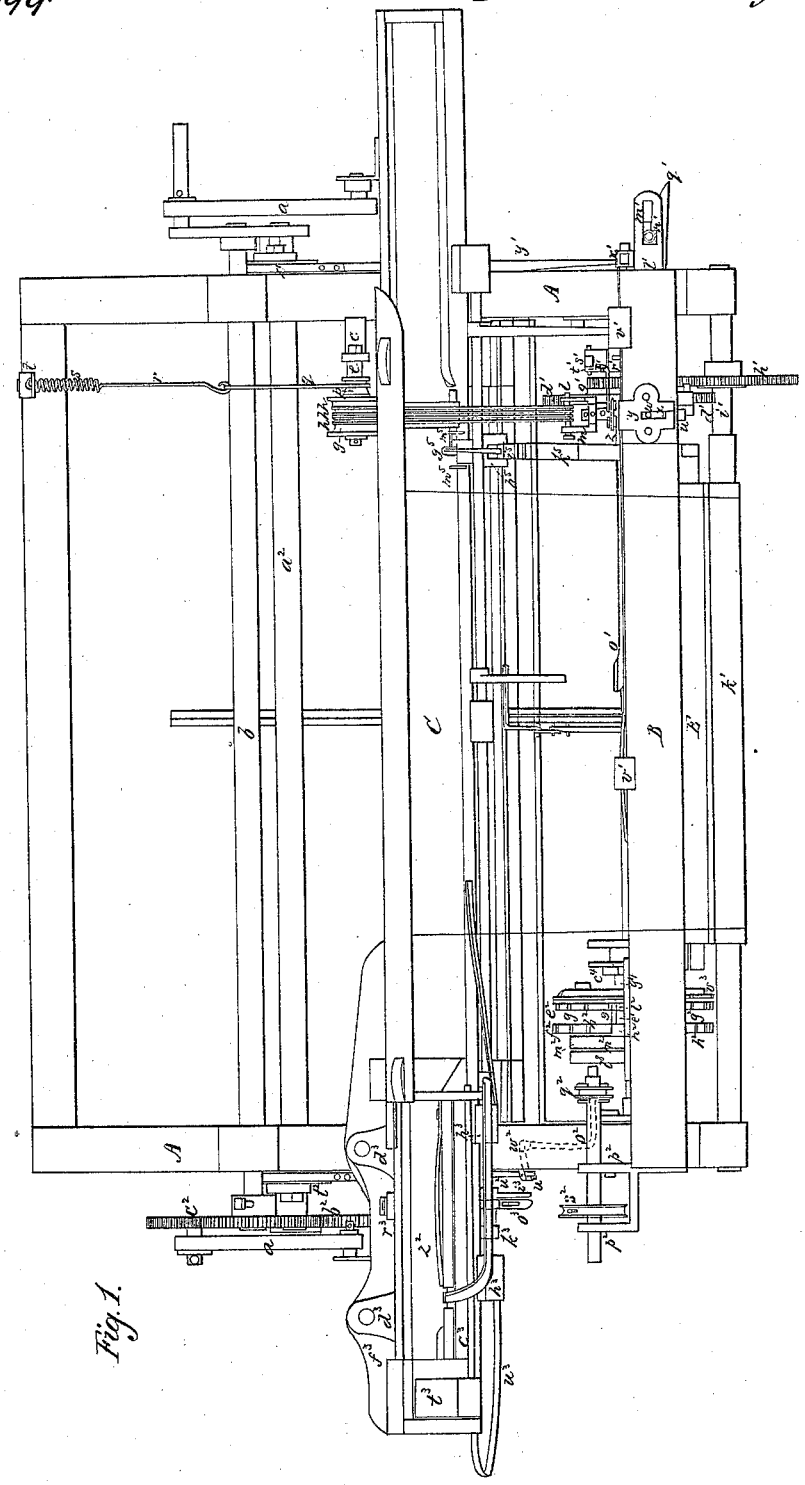

Fig. 1.

Sheet 2, 5 Sheets

J. Nield.

Loom.

No. 3,599. Patented May 25, 1844.

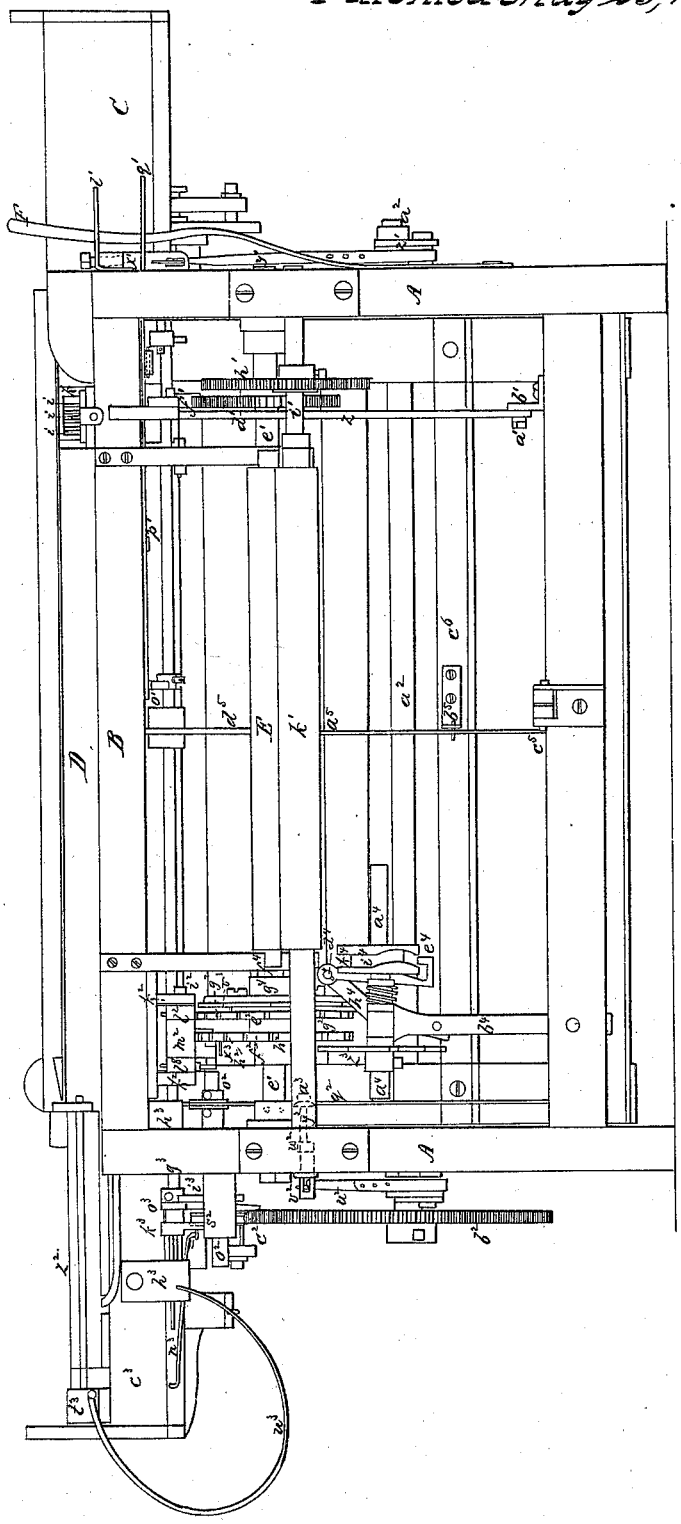

Fig. 2

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J. Nield.

Loom.

No. 3,599.

Patented May 25, 1844.

Fig. 3.

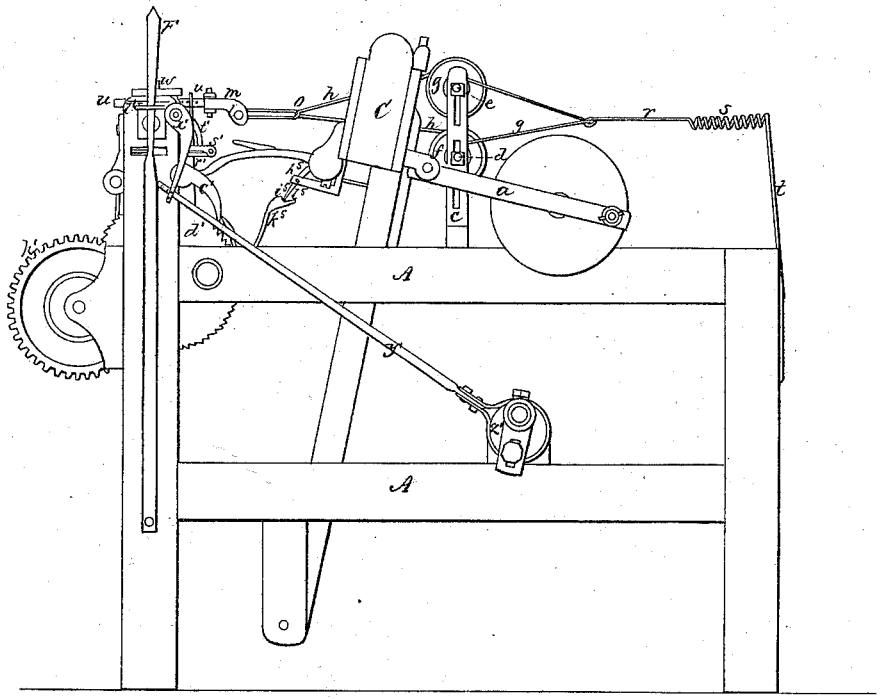
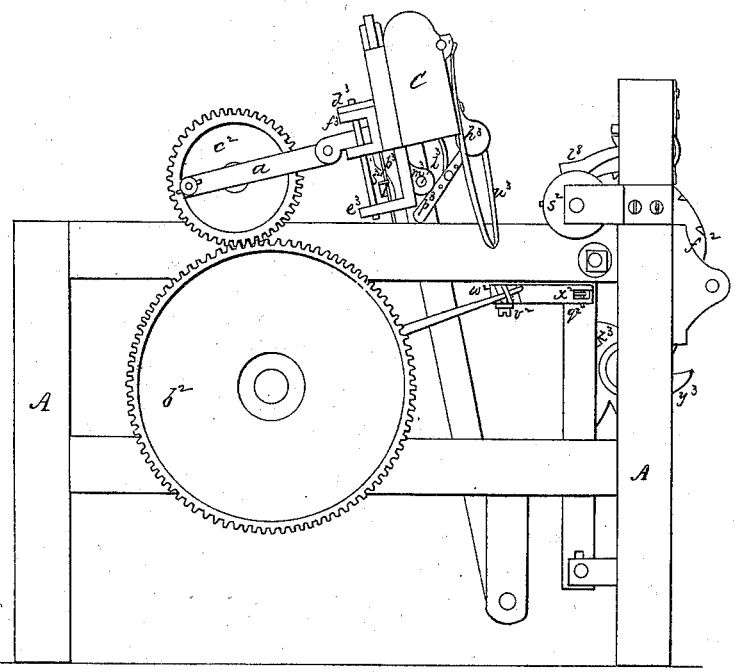


Fig. 4.



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No. 3,599. Patented May 25, 1844.

Fig. 5.

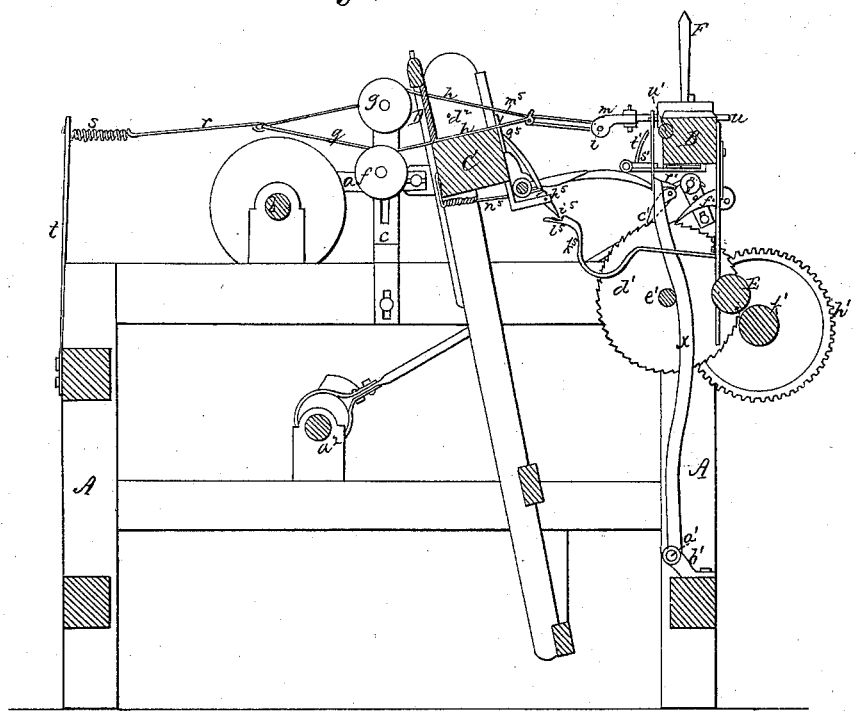
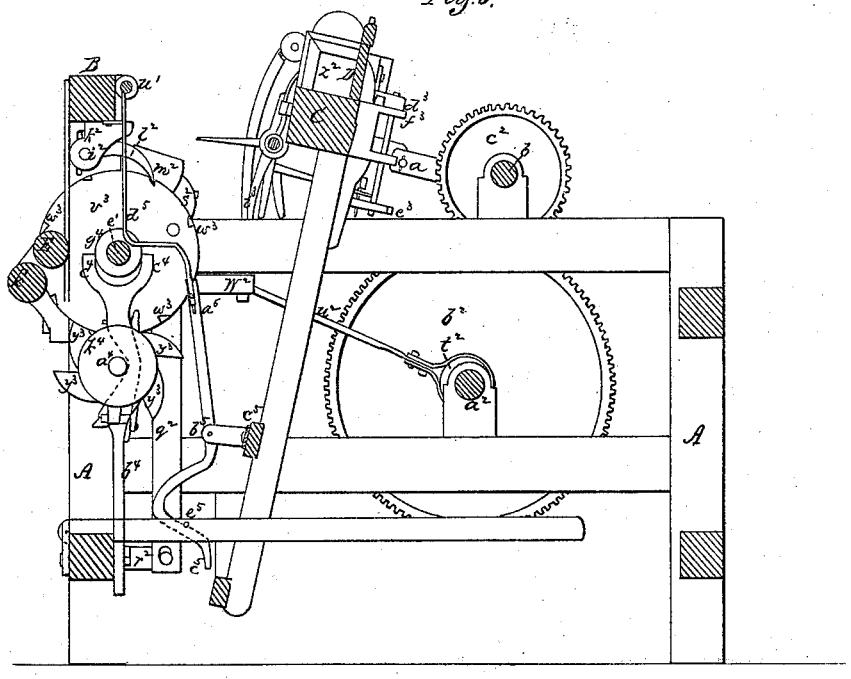


Fig. 6.



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J. Nield.

Loom.

No. 3,599. Patented May 15, 1844.

Fig. 7.

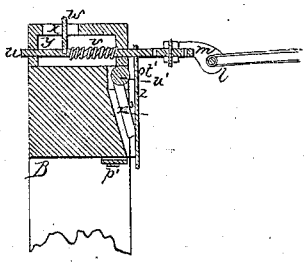


Fig. 8.

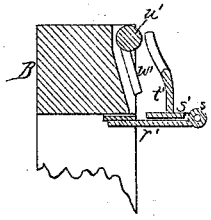


Fig. 9.

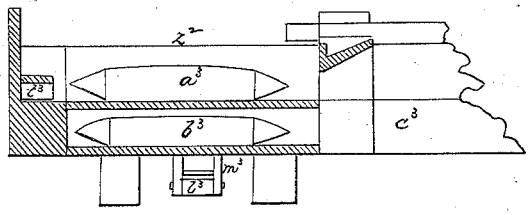


Fig. 10.

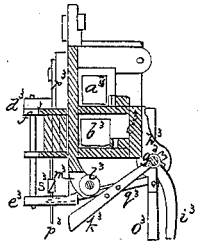


Fig. 12.

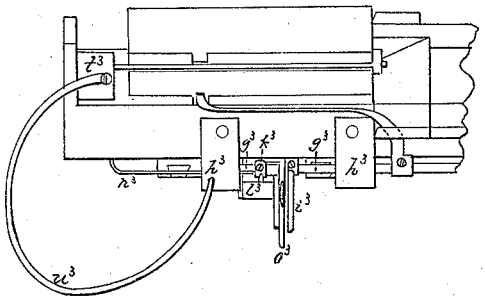
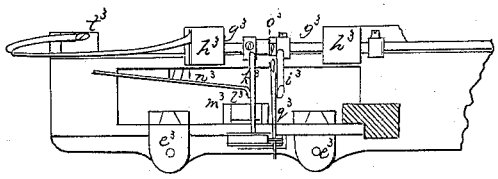


Fig. 11.



UNITED STATES PATENT OFFICE.

JAMES NIELD, OF TAUNTON, MASSACHUSETTS.

POWER-LOOM.

Specification of Letters Patent No. 3,599, dated May 25, 1844.

To all whom it may concern:

Be it known that I, JAMES NIELD, of Taunton, in the county of Bristol and State of Massachusetts, have invented certain new and useful improvements in Looms for Weaving, and that the following specification, taken in connection with the accompanying drawings, forms a full and exact description thereof.

Figure 1, of the drawings above mentioned represents a top view of a loom in which my improvements are embodied. Fig. 2, is an elevation of the breast beam side. Fig. 3, is an elevation of the right hand end. Fig. 4, is an elevation of the left hand end. Fig. 5, is a central and vertical section, which also represents a view of the mechanism of the right hand half of the apparatus. Fig. 6, is a central and vertical section exhibiting a view of the parts of the left hand half of the machine.

Such other figures as are necessary to a more complete representation of the several parts, in detail, are hereinafter referred to and described.

A, Figs. 1, 2, 3, 4, 5, 6, denotes the main frame on which the operative members of the apparatus are supported.

B is the breast beam.

C is the lay for beating the weft into the warps.

D is the reed of the lay.

E is the cloth beam or roller upon which the fabric is wound as the weaving process progresses, the cloth or its selvage edges being represented by red lines in Fig. 1. The lay is vibrated by connecting rods *a*, *a*, proceeding from a crank shaft *b*.

A standard *c*, Figs. 1, 3, 5, applied and secured to the inner side of the right hand end of the frame, has two horizontal arbors *d*, *e*, projecting from its inner face, each arbor supporting one of two small drum pulleys *f*, *g*. One end of each of a series of cords *h*, *h*, *h*, is attached to the front of the periphery of the upper pulley *g*. Each of said cords is passed rearward, and between two of a series of vertical strings *i*, *i*, *i*, arranged (like the wires of the reed) in a small frame *k*, which is fastened vertically upon the lay at or near the end of the reed, and in the plane of the reed continued laterally. From the strings *i*, *i*, *i*, each of the cords *h*, continues to and around a horizontal pin *l*, of a stirrup *m*, and from thence is returned and passed once again between two of the vertical strings *i*, *i*, of the frame *k*, and from thence over the periphery of the lower pulley *f* to the underside of said pulley, where it is properly fastened. The upper and lower halves of each string are knotted or connected together at a point *o*. The pulley *g*, has a smaller pulley *p*, Fig. 1, permanently attached to its side and turning with it upon the same arbor. The lower pulley *f* has also a similar pulley, similarly applied to it, one end of a cord *q*, being attached to the periphery of the lower pulley, and the other end thereof, after passing over the bent end of a wire *r*, being secured to the periphery of the upper pulley *p*. The wire *r* is connected with a helical or other suitable spring *s*, attached to a spring standard *t* applied to the main frame.

The stirrup *m*, before mentioned, is fixed on one end of a horizontal rod *u*, which is supported in proper bearings, that permit it to slide freely, to and fro, in the direction of its length. Fig. 7, exhibits a vertical section of the rod *u*, and the parts immediately adjacent thereto. A small helical spring *v*, through which the rod *u* passes, presses the rod rearward, or in a direction contrary to that in which the spring *s* operates, and the extent, of the motion of the said rod, is determined by a pin or stud *w*, which projects vertically from the same, and moves in an elongated slot *x*, formed in the top of the box *y*, that sustains the rod *u*, the same being seen in Figs. 1 and 7. The upper end of a vertical lever *z*, is suitably jointed to the rod *u*, just in rear of the stirrup *m* as seen in Figs. 1, 5, 7. The fulcrum of the lever *z*, is at its lower end, or in other words, the said lever works upon a pin *a'*, screwed into a standard *b'* attached to the main frame. There is an impelling pawl *c'*, Fig. 5, applied to one side of the lever *z*, one end thereof moving freely on a screw pin which connects it to the lever, and the other or front end engaging with or entering into the teeth of a ratchet wheel *d'* fixed upon a horizontal shaft *e'*. A retaining pawl *f'*, arranged in rear of the pawl *c'*, prevents the return of the ratchet wheel, during the recession of the impelling pawl. The shaft *e'* has a cogged pinion *g'* fixed upon it by the side of the ratchet wheel *d'*, the teeth of the said pinion engaging with those of a gear wheel *h'* arranged upon the

friction drum shaft i' that moves the cloth roller k' in order to take up the cloth as the weaving process progresses.

F, Figs. 1, 2, represents the usual lever by which the mechanism is stopped or moved at pleasure, the lever which changes the belt that drives the loom, being connected to the lever F in the ordinary way. This latter is not represented in the drawings, as the same will be easily understood by any person conversant with weaving machinery. The upper part of the lever F, moves laterally in a slot m' of a horizontal plate l', projecting from the side of the frame as seen in Figs. 1, 2. When the loom is in operation the lever F is supported against a shoulder n', of the slot m', the said shoulder preventing the lever from slipping toward the right.

The lever which actuates the hand lever F is seen at o' p' q', Fig. 2, and is that which is ordinarily moved by the protective lever. It is applied to the underside of the breast beam, has its fulcrum at p', extends through a mortise in the right hand post of the main frame, and rests against the rear side of the hand lever. A small plate or arm r' Figs. 3, 8 (Fig. 8, being a vertical section of the lever o' p' q' and the arm r' and breast beam), extending horizontally from, and at right angles to this lever in a direction toward the lay, has a small plate or piece of metal s' hinged to it at its inner or front end. A wire t', is inserted on the top surface of the plate s' and extends vertically a short distance, and is then bent horizontally toward the left, so as to reach by the front of the lever z and to rest against the front side thereof. A horizontal shaft u' is supported in suitable bearings v', v', applied to the inner side of the breast beam. This shaft has a small arm or stud w' projecting downward from it just in rear of the piece of metal s', the same being seen in Fig. 8. There is also another and similar stud or arm x^8, projecting in the same manner from the shaft and directly in rear of the lever z, the same being seen in Fig. 7. An arm x' Figs. 1, 3, extending downward from the right hand end of the shaft u', is jointed at its lower end to the connecting rod y', of an eccentric z', placed on one extremity of a horizontal shaft a^2, the said shaft a^2 being revolved by a spur gear b^2 placed upon its opposite end and engaging with a pinion c^2 arranged upon one end of the shaft which actuates the lay.

The above described machinery constitutes what may be termed the "take up" mechanism, or that by which, as the weaving of the cloth progresses, it is gradually wound upon the cloth roller. This machinery is so arranged that whenever the filling or weft thread breaks, the operations of the loom shall be arrested, until the thread is mended, and the loom thrown again into action by the attendant. The above effect is produced in the following manner. When the shuttle is thrown through the warps into the shuttle box at the right hand end of the lay, it passes through the vertical triangular spaces d^2 Fig. 5, of the cords h, h, and therein leaves the filling thread in the same manner as it is left between the warps. The lay then beats up, and the vertical cords or strings i, i, i, of the frame k, carry the filling thread back until it is brought in contact with the knots o, o, o, of the cords h, h. The lay still advancing a short distance, relieves the strain of the cords h, h, upon the pin l of the stirrup m, and permits the retroaction of the helical spring v, to draw back the rod u, together with the lever z and impelling pawl c', the latter of which slips over one of the teeth of the ratchet wheel in which it rests, and drops into the space immediately in rear thereof. This being accomplished the return of the lay, permits the reaction of the spring s to draw the lever z and the pawl c' forward and thereby turn the ratchet wheel d' and of course the cloth roller therewith, the cloth being thus wound upon the said roller as it is woven, and this operation will continue at every return of the shuttle, into the right hand box of the lay, provided the filling thread does not break. When the shuttle is thrown back by the picker, or from the right hand shuttle box to the left hand one, it removes the filling from the space d^2.

We will now suppose that during the return of the shuttle from the left hand shuttle box to the right hand one, the filling thread breaks, and the shuttle passes from the space d^2 and does not leave any of the filling thread therein. In this case it is evident that the upright strings i i of the frame k, will pass by the knots o, o, and not actuate the cords h, h, stirrups m, and rod u, so that they will be stationary. Now whenever the rod u is drawn forward toward the lay, as far as the pin or stop w will permit it to move, the lever z will bear against the bent wire t' and lift the plate s' upward or into an angular position with respect to the plate or arm r', or will so elevate the plate s', that when the shaft u' is turned by the action of the eccentric z', so as to move the lower end of the arm w' forward or toward the lay, that this arm will be brought into contact with the elevated end of the plate s', and will press the same, and of course the lever o' p' q' forward, and consequently the vertical hand lever F, which latter being pressed beyond the shoulder n' of the slot m', will instantly spring in a lateral direction through the slot, and thus stop the action of the mechanism. The object of the second arm x^8 is to insure the movement of the rod u forward or toward the lay, at the

proper time, and also the action of other parts of the mechanism to be hereinafter described, and this is effected by the shaft u' which may be actuated as before set forth, by the eccentric z', causes the lower end of the arm x^8 to press against the rear side of the lever z, sufficiently to throw the same and the rod u as far forward as may be necessary.

I shall now proceed to explain that part of the mechanism, by which the weaving of plaids or striped fabrics is effected. Two circular plates or wheels e^2 f^2 Figs. 1, 2, 4, are firmly fixed upon the horizontal shaft e' the said wheels being placed near the left hand end of said shaft, and at a little distance apart from each other as represented in the drawings. The periphery of each of these wheels is regularly divided by angular notches g^2, g^2, g^2 of the one and h^2, h^2, h^2, of the other; but the respective angular notches of the two wheels are not arranged directly opposite to each other, or in radial planes passing through the axis of the shaft. Each of the notches of the first wheel e^2, is arranged somewhat in advance, (in a direction toward the lay), of each of those of the second wheel or plate f^2, or those of one wheel may be arranged midway between those of the other. A horizontal shaft i^2 Fig. 2, is supported and moves in suitable bearings k^2 k^2 applied to the underside of the breast beam, and directly over the plates e^2, f^2, as seen in Fig. 6. A dog or projecting piece of metal l^8 is firmly fixed on the shaft i^2, just within the bearing at its left hand end, the said dog extending at right angles to the shaft and forward, as seen in Figs. 1, 4. A small pawl l^2 is affixed, in a similar manner, upon the opposite or right hand end of the shaft i^2, the front end of this pawl moving over or upon the periphery of the notched circular plate e^2. Another dog m^2, having a pawl n^2, attached to its right hand side, is supported upon the shaft i^2, between the dog l^8 and its pawl l^2, and moves freely and loosely in a vertical direction on the shaft. The dog m^2 and pawl n^2 belong to the second circular plate f^2 the pawl resting and acting on its periphery. A horizontal shaft o^2 supported in suitable bearings p^2, p^2, so as to slide freely, to and fro, laterally or in the direction of its length operates in connection with the dogs l^2 and m^2, the position of this shaft being represented in the drawings. The shaft o^2, is jointed, at a short distance from its right hand end, to the top of a vertical spring lever q^2, whose lower end is attached to a projection or arm r^2 of the main frame. A grooved wheel s^2 is fixed upon the shaft o^2 as seen in Fig. 1, and the shaft is slid to and fro at proper intervals of time, by means of an eccentric t^2, arranged on the shaft a^2, and whose connecting rod u^2 is jointed to one arm x^2 w^2 of a horizontal bent lever v^2 w^2 x^2—the opposite arm w^2, x^2 of this lever being connected, at its extremity x^2 to the vertical spring lever q^2 by means of a short link or rod y^2, the link sliding freely through a hole formed through the spring lever, and having a head or button a^8 upon its right hand end. Thus the spring lever is operated by the lever v^2 w^2 x^2, only in one direction, or is moved by the same toward the left. The left hand end of the lay is provided with a double shuttle box z^2, arranged so as to contain two shuttles a^3 and b^3 as shown in Figs. 9 and 10, the former figure representing a central vertical and longitudinal section of this end of the lay and the latter a transverse vertical section thereof. This shuttle box slides freely up and down through a mortise cut in the beam c^3 of the lay, the extent of its motion being regulated by ears d^3, d^3, e^3, e^3, projecting from its front side. When the box is raised up, so that the lower shuttle may be thrown through the warps, the upper sides of the projections e^3 are brought into contact with the lower side of the beam of the lay, or any suitable part thereof, and when the box is lowered into the requisite position for the upper shuttle to act, it is supported therein by the projections d^3, d^3, resting upon a shelf or projecting part f^3 of the lay.

The mechanism which is applied to the double shuttle box, in order, in connection with other parts before described to raise and depress the shuttle box, may be thus described. Fig. 11, represents a view of the underside of the left hand end of the lay, while Fig. 12, is another view showing an elevation of the front side of this end of the lay, and the mechanism of the same. A short horizontal shaft g^3, is supported in bearings h^3, h^3, projecting from the front side of the lay. An arm i^3 is fixed to and extends downward from the central part of this shaft. There is also another arm k^3, projecting therefrom, and fixed thereto, in a similar manner to the first arm—and extending at an angle of about forty-five degrees with a horizontal plane passing through the axis of the shaft. The arm k^3 by the action of a spring n^3 is forced against a roller l^3, which moves in bearings m^3, m^3, extending from the lower side of the shuttle box. There is also a small lever o^3 placed upon a shaft between the arm i^3 and k^3 or by the side of the former thereof. This lever swings or moves freely back and forth upon the shaft g^3, and is connected to a vertical spring p^3, by means of a rod q^3, extending between them both and jointed to each. The upper end of the spring p^3 is secured to the front side of a small standard r^3 elevated upon the lay, in front of the shuttle box, and the said spring has a horizontal shaft or piece of metal s^3, applied thereto, whose rear is beveled down as seen in the drawings.

The picker t^3 is applied in the usual manner so as to operate the shuttles, with the exception that its back movement may be accomplished by means of a bent whalebone or steel spring w^3.

In order to understand the operation of the several parts as above described, it may be supposed that a plaided fabric or gingham is to be woven, or a piece of cloth in which stripes of white and black alternate, or follow each other in the filling. One of the shuttles, or the upper thereof, contains a bobbin of white thread, and the other one of black. The warp threads being duly arranged, and the shuttle box down or so that the shuttle containing the bobbin of white thread is in action, the dog l^8 is depressed into its lowest position, its pawl l^2 being also at its lowest position in one of the notches of the circular plate e^2. Now while the dog so remains, the right hand end of the shaft o^2 will come in contact with the left side of the dog, whenever the shaft is pressed toward the right, by the action of the spring q^2, and the operation of filling with white thread will proceed until the dog l^8 is raised. The shaft e', being operated or turned by the "take up" motion before described, carries the circular plates e^2, f^2, around with it, and as their revolution progresses the pawl l^2 of the dog l^8 will be lifted out of the notch, and will at the same time elevate the dog l^8. The other pawl of the other dog will afterward fall into a notch of the plate f^2 and carry down the dog to which it is connected. Then when the lay beats up, the horizontal shaft o^2 will pass under the dog l^8 and abut against the side of the dog m^2, and this will bring the grooved wheel s^2 in such a position, that the arm i^3 will be brought to bear against the periphery of the wheel, to such a degree as to turn the shaft g^3 in its bearings, thereby causing the arm k^3 to press against the roller l^3 and lift the shuttle box, so that the lower shuttle will be brought into operation, at the next throw of the picker. The shuttle box will continue elevated, while the dogs remain in their position as last described, and a black stripe of filling will be thrown into the warps, until the shuttle box is lowered, so as to bring the upper shuttle into operation. The depression of the shuttle box is produced by the pawl l^2 of the dog l^8, which, dropping into the succeeding notch of its circular plate, carries the dog downward and arrests the lateral motion of the shaft o^2 and brings the grooved wheel thereof, into such a position, that when the lay beats up, the lever o^3 will be brought against the periphery of the wheel, and will be borne forward to such a degree as to move the shalf s^3 of the spring p^3 from under the end of the arm k^3, and thus permit the descent of the shuttle box. The shuttle box was held up in its elevated position by the arm k^3, the said arm, whenever it is elevated, striking against the beveled side of the shelf s^3 and forcing said shelf outward, until the arm rises above the shelf, when the latter is retracted by the spring p^3, and passes under the arm, and supports it and the shuttle box.

It will often happen, that at certain intervals of time, it may be necessary to throw into the warps a stripe of filling of a greater width than that of the same color before woven. The machinery by which this is effected may be thus described. Another circular plate v^3 Figs. 2, 6, is arranged upon the shaft e' and by the side of the circular plate e^2 before mentioned. This plate v^3 has the same diameter as the adjacent circular plate, and its circumference or periphery is also equally divided by notches, w^3, w^3, in the same manner as that of the plate e^2, with this exception that there is in the plate v^3 but one-half the number of notches formed in the plate e^2. The plate v^3 is so fixed upon the shaft e', as to be capable of being moved away from the plate e^2, a short distance laterally, or in the direction of the axis of its shaft, but not to turn around upon the shaft. When the plates v^3 and e^2 are brought into contact with each other, the pall which rests upon the latter, being made somewhat wider than the plate e^2 or so as to extend by the same toward the right, will rest upon the periphery of the plate v^3 and will operate in those notches of the two plates which are in direct contiguity, for when the two circular plates are brought into opposition, the arc of the circumference comprehended by any two notches of the plate v^3, will be equal to double that formed between any two notches of the other plate e^2. Therefore if any one of the notches of one of the plates is placed in direct apposition with any one notch of the other plate, so as to constitute together a continued notch for the pawl to rest in, we shall find that the succeeding notch of the plate v^3 will be in apposition with the third notch of the plate e^2, and so on, so that in fact the combination of the two plates e^2 and v^3, forms but a circular plate, having but the same number of operating notches as is contained in the plate v^3. Consequently whenever the plate v^3 operates on the dog l^8, it keeps the dog elevated a greater length of time, than it is raised when the plate e^2 only is in operation as before described, or as independent of plate v^3, thus forming a wider stripe in the filling.

The mechanism which causes the plate v^3 to advance toward, and to recede from, the plate e^2 will now be described. The circular plate f^2 has a pin x^3 inserted in and projecting from its left hand side, which pin at every revolution of the plate f^2 comes in

contact with one of the teeth y^3, y^3, y^3, &c of a gear z^3, affixed on a horizontal shaft a^4, the said shaft being supported so as to revolve in a suitable bearing on the top of a standard h^4, extending vertically from the main framework, as seen in the drawings. The forked end c^4 of a vertical lever c^4 d^4 e^4 is inserted in a circular groove f^4 formed in the hub g^4 of the plate v^3. This lever has its fulcrum at d^4 or it moves on a pin properly inserted in the top of an arm h^4, extending from the standard h^4. The lower end of this lever is bent horizontally, and then is turned vertically, as seen in Fig. 2, and inserted in a cam groove i^4 cut in the periphery of a cylinder k^4, fixed firmly on the shaft a^4. Therefore it will be seen, that when the pin x^3, strikes against any one of the teeth of the wheel z^3, it will act upon the said wheel and turn the shaft a^4, and at each entire revolution of the wheel z^3, it will cause the grooved cylinder k^4, to impart, during a certain interval of time, a lateral movement toward the left and then back again towards the right, to the top of the lever c^4 d^4 e^4, and of course to the plate v^3.

From what has been herein above explained, it will be readily comprehended that the elevation and depression of the double shuttle box, is effected by the peculiar arrangement of mechanism intervening between the same and the shaft e', and although many of the operating parts thereof have been represented, (for the sake of being more easily described), as having certain relative proportions, and positions with regard to each other, it may be remarked that the same should be varied or changed according, to the widths of the various stripes of filling, and the peculiar nature or pattern of the fabric to be woven. Such variations and changes of the notches of the circular plates e^2, f^2, v^3, as may be found requisite to adapt the mechanism to the weaving of stripes of filling of equal or unequal width, being within the knowledge of mechanics conversant with weaving machinery, it is unnecessary here to enumerate them. Instead of the rotation of the shaft e' being insured by the operation of the eccentric z' on the shaft a^2, I prefer when plaided or striped goods are to be woven to obtain the motion thereof by means of a bent lever a^5 b^5 c^5, Figs. 2, 5, which turns upon a pin or suitable fulcrum at b^5 applied to a horizontal bar c^5 connected to the swords of the lay. The upper end of the lever a^5 b^5 c^5 is jointed to the lower end of a curved rod d^5 projecting from the shaft u', while the lower part or arm b^5 c^5 of the said lever is curved in a semicircular form as seen in the drawing. During the recession of the lay from the breast beam, a pin e^5 projecting from the side of one of the harness treadles f^5, comes in contact when the said treadle is down with the lower end c^5 of the lever a^5 b^5 c^5, and presses forward the lower end of the lever and thus turns the shaft u' and forces forward the lever z' and impelling pawl c'. Should a thread from the shuttle remain in the space d^2 when the shuttle is thrown into the left hand shuttle box, it is removed therefrom when the lay beats up by a small finger lever g^5 h^5 i^5, which turns on a fulcrum or bearing at h^5, applied to the lay as seen in Figs. 1, and 5. The lower end of the lever rests upon a spring k^5 extending from the frame of the loom, the said spring having a shoulder l^5 on its upper side against which the lower end i^5 of the finger lever strikes when the lay beats up. This throws the upper end g^5 forward, and as this end is bent so as to extend in rear of two vertical pins m^5 m^5 and under the thread, the thread is drawn out of the space d^2 as the lay advances. A small spring n^5 retracts the finger lever.

Having therefore set forth the nature and principles of my improvements, by which they may be distinguished from others of like character, I shall now proceed to point out the grounds therein on which I rest my claims to novelty.

I claim—

1. The mechanism denominated the "take up motion", or which operates by means of the filling thread, that is to say, the series of strings i, i, i, as applied to the lay, in combination with the knotted cords h, h, and other parts connected thereto, and those intervening between the cords and the shaft e', the whole being arranged and operating together substantially as described and for the purpose of producing a regular progressive rotary motion to the shaft e', and also to the cloth roller, in order to wind the cloth on the latter as the weaving process is carried on.

2. I also claim, the apparatus which interrupts the operation of the loom, or causes the same to stop whenever the filling thread breaks, that is to say, the combination with the take up motion of the mechanism intervening between the hand lever F and the lever z, the said mechanism consisting of the horizontal shaft u', having its arms x', x^8, (all of which are actuated by an eccentric on the shaft a^2), and the horizontal lever o' p' q', having its tripping plate s' and other parts connected therewith, the whole being constructed and operating substantially in the manner as above set forth.

3. I also claim, the peculiar mechanism by which the double shuttle box is raised and depressed, in order to adapt the loom to the weaving of striped fabrics, the said mechanism consisting of the notched circu-

lar plates e^2, f^2, the pawls and dogs above the same, the sliding shaft o^2, shaft g^3 and other parts applied thereto and connected with the shuttle box, the whole being combined, arranged together, and operating substantially as above described.

4. I also claim, the combination with the circular plate e^2 of the notched circular plate v^3, the whole being actuated and arranged substantially as described and for the purpose of effecting at certain intervals of time, the weaving of a wider stripe than is woven by the combined action of the other circular plates.

In testimony that the foregoing is a true description of my said invention and improvements I have hereto set my signature this thirty first day of March in the year eighteen hundred and forty three.

JAMES NIELD.

Witnesses:
R. H. EDDY,
EZRA LINCOLN, Jr.