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Loom.

No. 5,379. Patented Nov. 27, 1847.

Fig. 1.

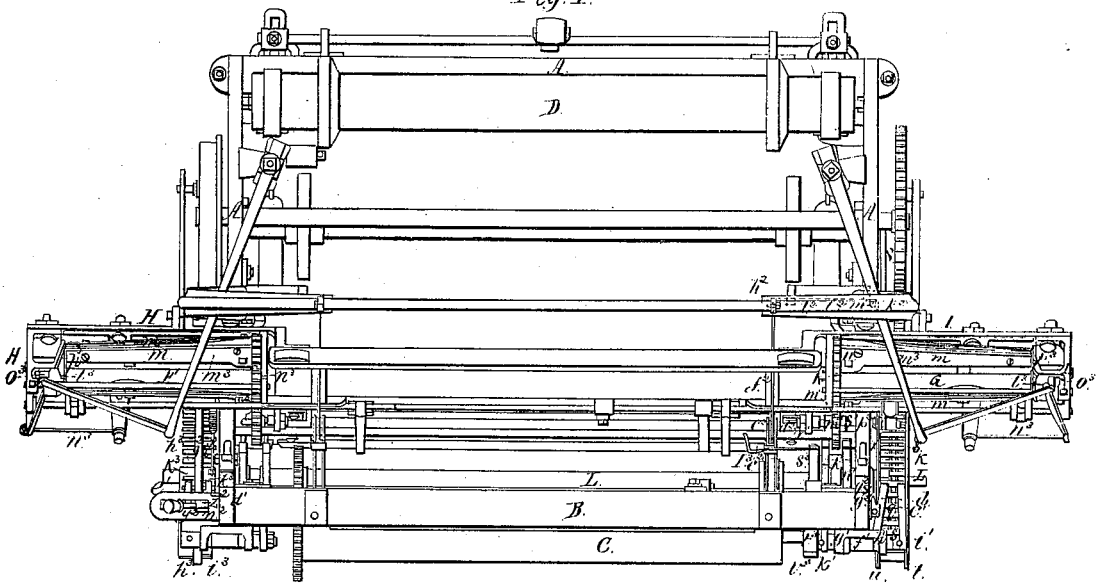

Fig. 2.

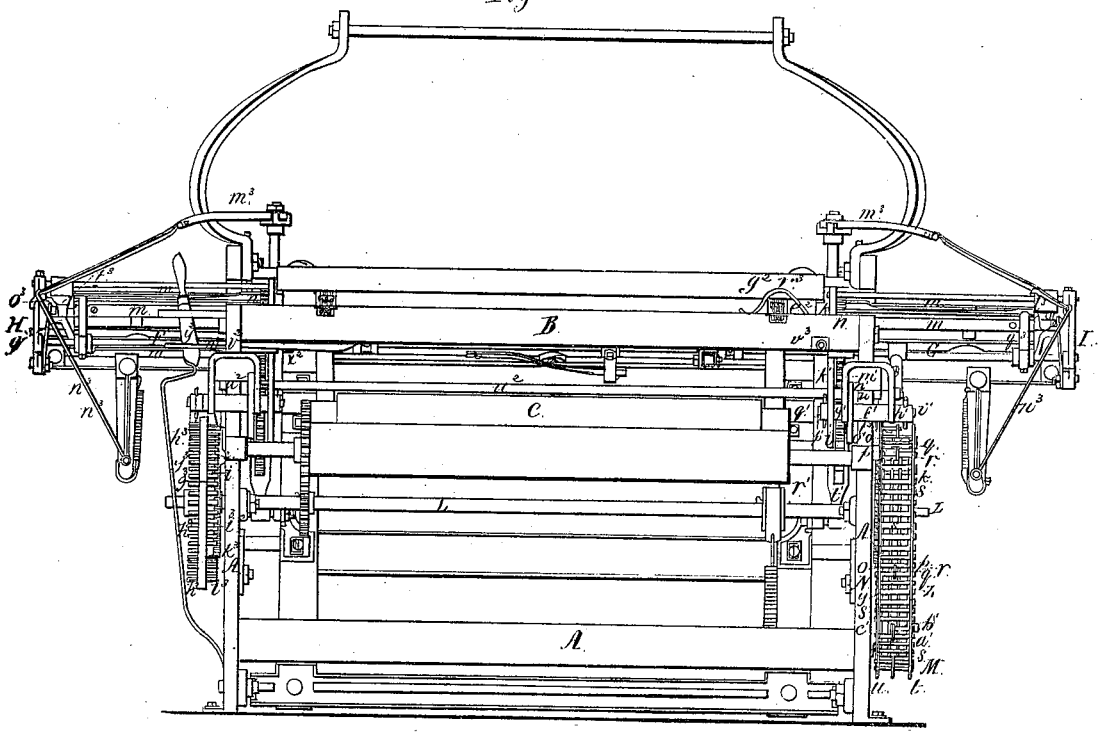

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Fig. 3.

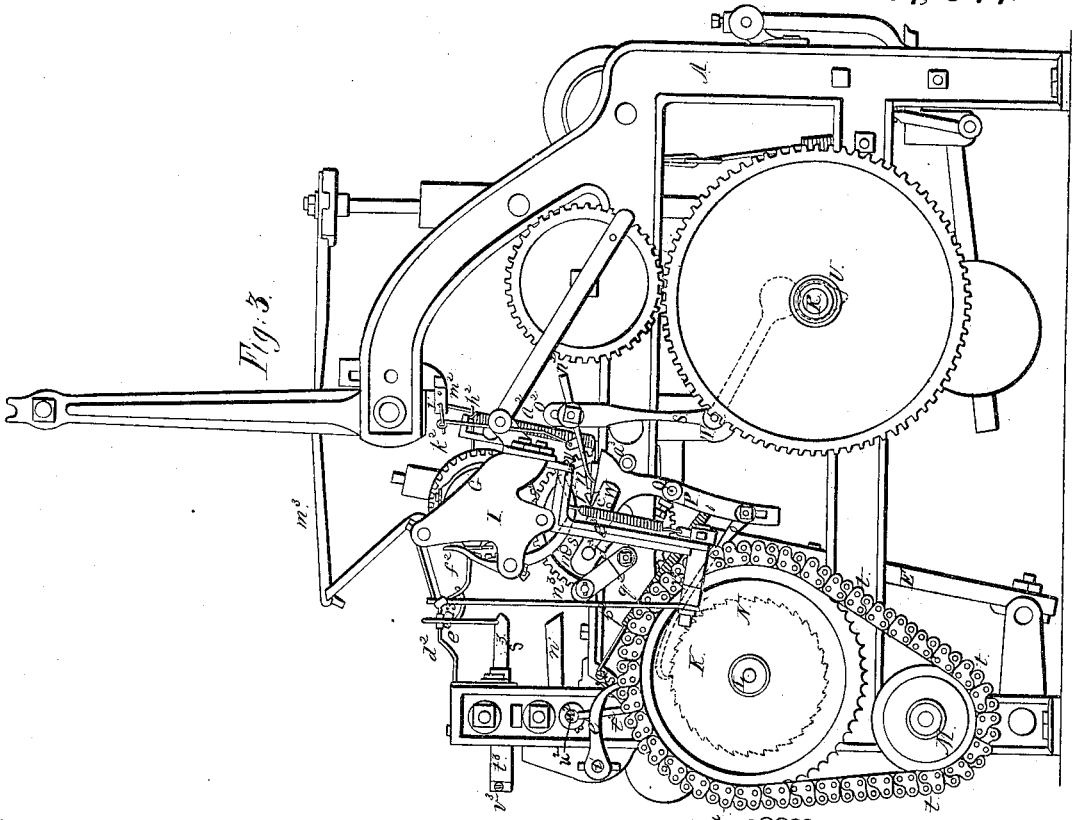

Fig. 4.

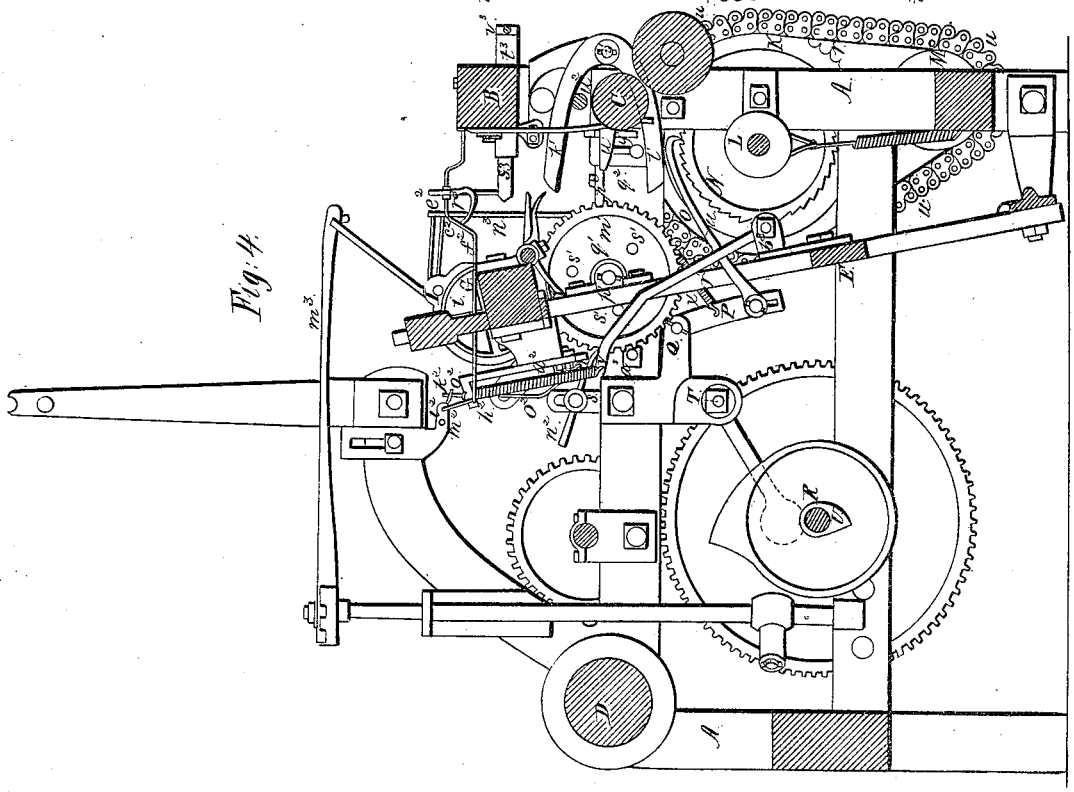

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Fig: 5.

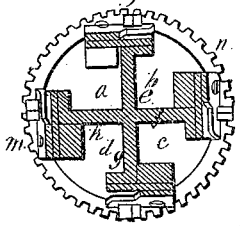


Fig: 9.

Fig: 10.

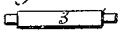


Fig: 12.

Fig: 6.

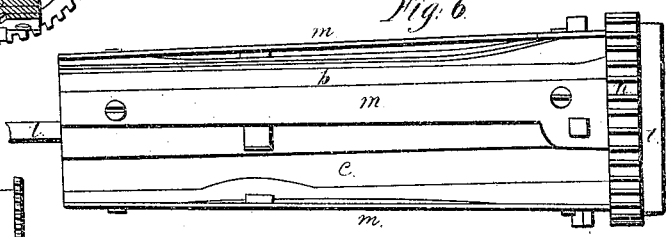


Fig: 8.

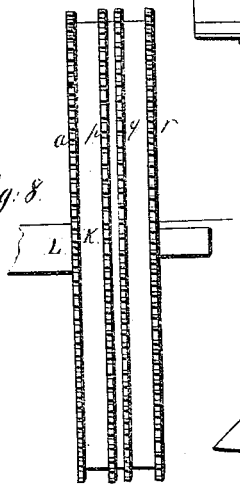


Fig: 7.

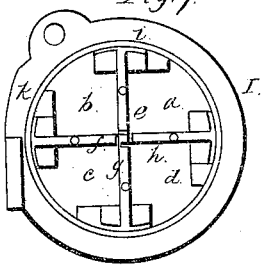
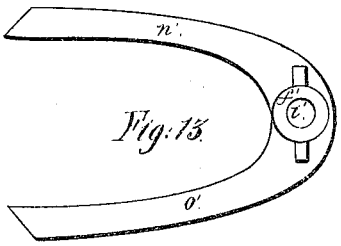


Fig: 11.

Fig: 13.



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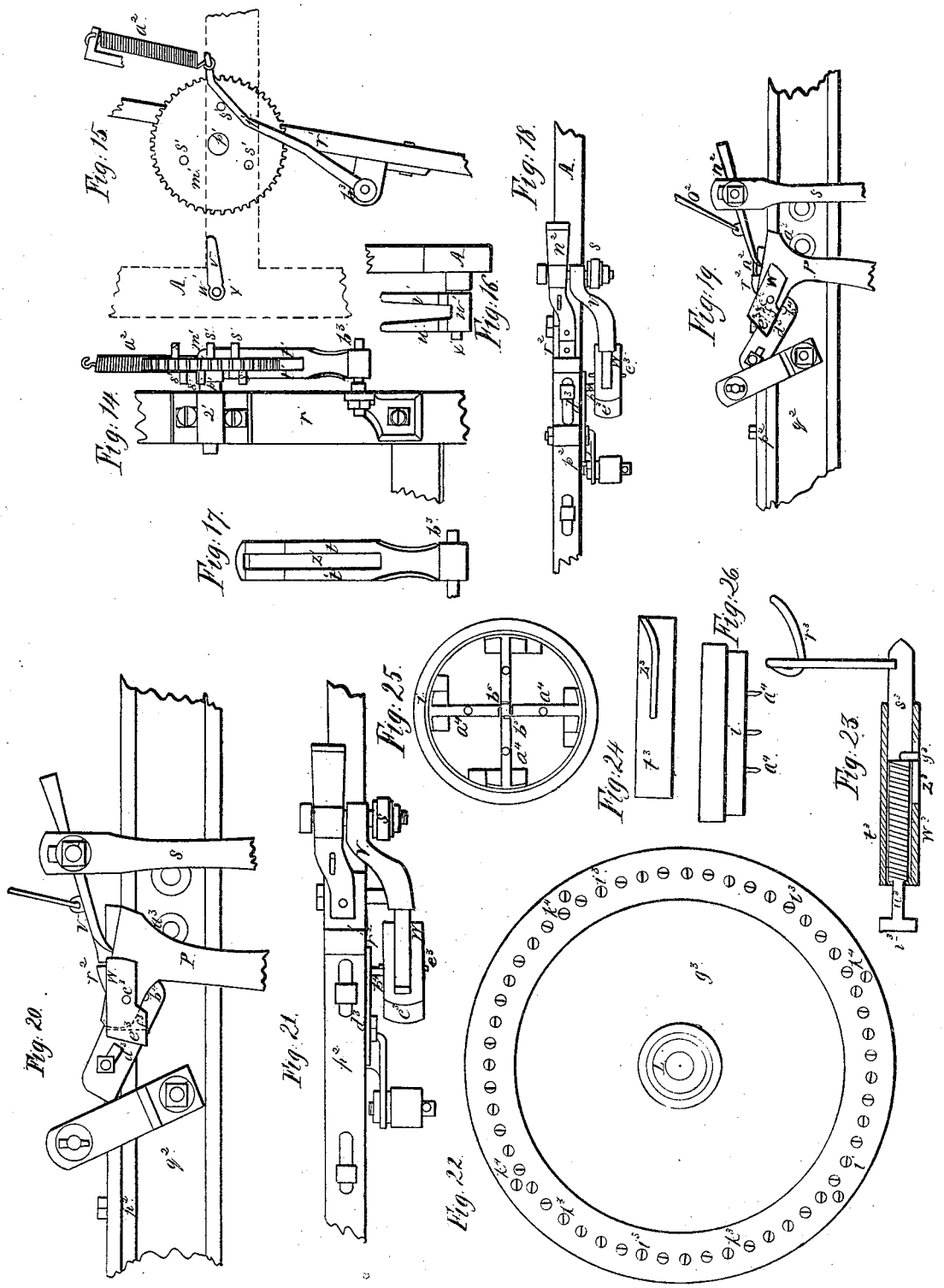

UNITED STATES PATENT OFFICE.

JAMES NIELD, OF TAUNTON, MASSACHUSETTS.

LOOM FOR WEAVING.

Specification of Letters Patent No. 5,379, dated November 27, 1847.

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 Checked, Striped, or Figured Fabrics; and I do hereby declare that the same are fully described and represented in the following specification and accompanying drawings, letters, figures, and references thereof.

Of said drawings Figure 1 represents a top view of my improved loom. Fig. 2 is a front elevation, or an elevation of the breast beam side of it. Fig. 3 is an elevation of the right hand end of it. Fig. 4 is a vertical central and transverse section of it, taken as if the spectator was looking toward the right hand end of it.

Such other figures as may be necessary to illustrate the several parts to be hereinafter described will be hereinafter referred to and explained.

In the said drawings A denotes the main frame of the loom.

B is the breast beam, C the cloth beam and D the yarn beam. Of other parts which are common to most every loom, some are and others are not represented in the drawings. Such as are exhibited require no description as they will be readily recognized by mechanicians.

E is the lay.

In the said loom I employ two series of revolving shuttle boxes F G placed respectively at opposite ends of the lay or loom, and so applied to the race beam, that the bottom surface of each shuttle box may be brought successively to a level with, and in line of the top surface of the said race beam. Each of said series of shuttle boxes is held in position by one of two metallic frames H I firmly fixed to the lay, or loom frame as the case may require. In the drawings they are shown as affixed to the lay, and so as to move backward and forward with it. They may however be attached to the main frame of the loom, and be stationary while the lay alone is made movable. Each of said series of shuttle boxes is composed of four shuttle receptacles, as seen at *a*, *b*, *c*, *d*, Fig. 5, which denotes a cross section of one of the series.

A side elevation of one of the said series is removed from the lay and its frame is seen in Fig. 6.

I do not intend to confine my invention to the use of four shuttle boxes only in each series, as any other suitable number may be adopted. For the convenience of manufacturing then they are partly composed of four metallic plates *e*, *f*, *g*, *h*, arranged together so as to depart from a common center and be at right angles to each other, as seen in Fig. 5. At one end or that which is placed against the race beam they are united to, and surrounded by a circular ring *i* (see Fig. 7 which is a view of the inner end of one of the series and its frame I or H), which forms a journal, as it were to sustain one end of the series in position, and is inserted and rotates, in a circular aperture made through the part *k* of the frame I. The other end of each of the said series of shuttle boxes, has a small journal *l* projected centrally from it, as seen in Fig. 6, the said journal being inserted and made to rotate in a suitable bearing or box, made in the frame I. Each of the said series of shuttle boxes is completed by having a spring shuttle binder *m* applied to each shuttle box or receptacle, or plate *e*, *f*, *g*, *h*, of it as seen in the drawings, and each series has a circular rim of cogs or teeth *n* applied to it near its inner bearing journal as seen in Figs. 1, 2 and 6. A revolving or rotating series of shuttle boxes, substantially like those above specified, is represented and described in Letters Patent of the United States of America numbered 3954, and granted to me, on the fifteenth day of March one thousand eight hundred and forty five.

In the specification of said Letters Patent, but one revolving series of shuttle boxes is described, as applied to the lay of the loom; a loom so made not being capable of producing what is termed "shot about" weaving, as two passages of any shuttle through the warps must be made before any thread of another shuttle can be woven into them, that is to say the shuttle must be thrown through the warps into the fixed box at the opposite end of the lay, and returned back again from whence it started before another shuttle can be operated. My improvement of having two series of revolving shuttle boxes, admits of a shuttle of one colored yarn, being thrown once through the warps and of being immediately followed by that of another colored yarn, as is required in shot about weaving. Each of said series of shuttle boxes should have rotating mecha-

nism applied to it, so as to cause it to revolve in its bearings either in one direction or the opposite, as the case may require. The mechanism I employ to effect the rotation of each series of shuttle boxes and which I shall now proceed to describe, is in some respects similar to that described in my aforementioned Letters Patent, although in others it is essentially different.

K (Figs. 1, 2, 3) is what I term a sprocket wheel. It is fitted on the end of a horizontal shaft L which extends across and through the loom frame, and is sustained by, and revolves in suitable bearings applied thereto, the position of the said wheel being represented in the drawings. A top view of the said wheel is seen in Fig. 8. It has four series of teeth *o*, *p*, *q*, *r*, projecting from its periphery, in the relations to each as seen in the said Fig. 8. Each series has an equal number of teeth, each tooth thereof is placed in line (transversely of the periphery of the wheel) with three teeth of the other three series, as seen in the drawing. The said wheel so constructed is intended to receive upon its periphery an endless belt or chain of wires *s*, *s*, *s*, &c. each of said wires thereof when the chain is laid on the wheel, being received between the teeth of that part of the periphery, in which the chain is in contact. The said wires are arranged parallel to each other and at equal distances apart respectively and are maintained in position by two endless chains *t*, *u*, each chain being composed of a succession of links or plates of the form represented in Fig. 9. Each of said links has three holes *v*, *w*, *x*, made through it the two lower ones *v* and *w* being for the reception of the ends of two of the wires *s*, *s*. When the chains are formed, the hole *w* of one link is placed against the hole *v* of the succeeding link, and one end of one of the wires (a top view of one of said wires being represented in Fig. 10) inserted in or passed through said holes and riveted down outside so as to hinge the two links together. The upper hole *x* of each link is raised above the hole *v* for a purpose which will be hereinafter described.

Occasionally in the chain of wires or as circumstances may require, I place a link *y* between the two series of teeth *p q*, or centrally between the two outside chains of links, as seen in Fig. 11, which exhibits a top view of part of the endless pattern chain of wires, and Fig. 12 which denotes a longitudinal vertical and central section of said chain.

I connect the hole *x* of the said links *y* with one of the links of one of the chains by a short wire *z*. In other parts of the chain, as the pattern may require, I employ other links as seen at *a'*, and instead of extending a wire *s* entirely across from one chain *t* to the other *u*, I extend a short wire *b'* from one of the chains to the short link *a'* and I connect the two opposite links of the opposite chain, by a short hinge pin *b''*. I thus leave a space *c'* through the chain.

Resting on the top of the windlass pattern belt of wires, and sprocket wheel are two dogs or arms *d'*, *e'*, the former of which projects forward and downward from a short horizontal shaft *f'* sustained between projections *g'*, *h'* (extending from the main frame) and by a cylindrical shaft or pin *i'* passing through it, and said projections. The dog *e'* is fixed on one end of the said shaft or pin *i'*. On the other end of the shaft are two curved arms *k'*, *l'*, which are made to project toward one side of a cogged wheel *m'* to be hereinafter described. The arm *k'* is placed directly over and some distance above the arm *l'* as seen in Fig. 4. The tubular shaft *f'* has a similar set of arms projected from it, one of which *n'* is seen in Fig. 1 the other *o'* being seen in Fig. 13 which denotes a side view of them.

Both series of arms, are arranged on their respective shafts, at a distance apart, from one another, sufficient to allow the wheel *m'* before mentioned to pass between them when the lay beats up, the said wheel being confined to the lay so as to move with it. The wheel has an arbor *p'* affixed to, and projecting from it centrally, the said arbor being sustained so as to revolve (and permit the wheel to revolve) by a box *q'* secured to the sword *r'* of the lay. Fig. 14 exhibits a front view of a part of the sword of the lay together with the wheel *m'*, as attached to it. The wheel has cogs or teeth cut or formed, on its periphery, which engage with the cogs or teeth *n* of the rotating shuttle box. Three or any other suitable number of pins *s'*, *s'*, *s'*, are inserted in, and made to project from each side or fall of the wheel *m'*, those of one side of the wheel being seen in Fig. 15, which denotes a side view of the wheel *m'* and a spring lever *t'*, which works in connection with the wheel *m'*, a front view of the said spring lever being seen in Fig. 14. The pins *s' s' s'* projecting from both faces of the wheel *m'*, are to be arranged in such manner or at such distances from the center of the wheel, that while the dogs *d' e'* rest on one or more of the wires *s*, *s*, of the pattern belt, they shall so elevate the arms *k' n'* that when the lay beats up, neither of the projections *s' s' s'* of the wheel *m'*, will strike against the arms, but when the pattern belt moves under the clogs, so as to cause the lower end of one of them to drop into one of the spaces *c'*, and by so doing to lower the arm *k'* or *n'* attached to the shaft of the said dog, one of the pins *s'* will meet the end of the arm when the lay beats up, and as the lay continues to advance will cause the wheel *m'* to turn on its axis

far enough to partially rotate, the series of shuttle boxes—that is to say to so far rotate them as to cause a succeeding shuttle box to be brought into line with the lay.

The spaces c' of the pattern chain—the dogs—arms k' n' and wheel m' with its pins, serve to operate the shuttle box, in substantially the same manner as do certain notched circular plates and other mechanism, described in the Letters Patent aforementioned. I have however combined with them the arms l' o', and the short wires z, z, &c., with the pattern chain, for the purpose of reversing the rotary movement of the series of shuttle boxes, or causing them to rotate in an opposite direction whenever necessary. This is effected in the following manner. When the sprocket wheel is revolved so as to move any one of the wires z under and in contact with either of the dogs d', e', said dog will be elevated or raised up from the wires s, s. This elevation of it will cause a corresponding rise of the arm l' or o' of its shaft f' or i', and to such degree that when the lay next beats up, one of the pins of the wheel m', will meet the end of the elevated arm, and as while the lay continues to advance toward the breast beam, the pressure against the pin will cause a partial rotation of the wheel m', sufficient to partially rotate the series of shuttle boxes, in a reverse direction.

By the above described mode of making the pattern belt, it may be adapted to rotate the shuttle boxes, in such directions as may be necessary to weave any required figure, or changes of weft, the supplementary wires z, z, &c., and spaces c', &c., being arranged, at such distances apart, and in such number as may be required by the circumstances of the case. The pattern chain or belt passes underneath a guide and straining pulley or wheel M Fig. 3, which is to be formed of the proper shape, and arranged in the right position, to keep the chain down upon the sprocket wheel.

The sprocket wheel is to be regularly and progressively rotated in one direction. This is effected by mechanism as follows. On the shaft L is a ratchet wheel N which is actuated by a pulling pawl o, jointed to the lower end of a lever P which turns on a fulcrum or pin Q, see Fig. 3, wherein the ratchet wheel, and the part of the pulling pawl, behind the sprocket wheel, are denoted in dotted lines. Between the lever P, and the cam shaft R of the loom, is a bent lever S which moves on a fulcrum or pin at T. The lower arm of the lever S rests on a cam or wiper U, as seen in dotted lines in Fig. 3, the said cam being fixed on the cam shaft R. To the upper end of the lever a small pawl V is jointed the said pawl being made to rest on the top of the lever P and to act against a shoulder piece W jointed to the lever. Now each revolution of the cam shaft R causes a rise and fall of the lower arm of the lever S, or such a movement, of the said lever as shall actuate the lever P, on its fulcrum, in the manner necessary to cause the pulling pawl o, to partially rotate the ratchet wheel N shaft L, and sprocket wheel, thus moving the pattern chain the distance required. The pulling pawl is retracted and the lever, to which it is attached, moved on its fulcrum at a suitable time (or while the cam U is not acting, so as to raise the lever over it) by means of a spring X, one end of which is attached to the slide p^2 to be hereinafter described, and the other to the lower arm of the lever P.

In order that the momentum of the mechanism when the wheel m' is turned by any one of the arms k', n', o', l', may not cause the series of shuttle boxes, to revolve too far, or in other words, in order that the bottom of each shuttle box of said series, may be brought into the plane of the top of the race beam, when said shuttle box is moved into action with the said race beam. I provide the wheel with certain contrivances for some one of the pins s', s', to abut against at the expiration of each partial rotation of the said wheel. The said contrivances are the spring lever t—Fig. 15, and two small vibrating arms u' v' one of which u' is seen in Fig. 4, and the other in Fig. 15, a top view of both being given in Fig. 16. The said arms project from a short tubular shaft w', which rests and turns on a pin x' projecting from the main frame of the loom. The arms are preserved in a horizontal position, by a small shelf or projection y' (Fig. 4) from the main frame on which they are made to rest. When the lay beats up toward the race beam, and either one of the lower arms l' o' are made to act upon the wheel m', the rotation of the wheel will be arrested by one of the pins s' striking on the top of one of the arms u' v'. So when the wheel m' is revolved in the opposite directions or by the upper arms, the spring lever t' answers the same purpose. A front view of the spring lever t' is given in Fig. 17. It will be seen that it has a long slot z' made through it, to receive the wheel m' which passes through it as seen in the drawings.

The lever t' is held up to the range of pins s', by means of a spring a^2. The lower end of the lever works on a fulcrum b^2. Should any one of the pins s', strike against the under side of either one of the arms u' v', when the wheel is rotated by the action of either of the arms k' n', the said arms u' v' will rise with it until the pin passes by them, which being accomplished they will drop down upon their bearing or rest y'.

If during the passage of a shuttle across

the race beam, the filling thread thereof should break the rotation of the sprocket wheel and pattern belt, should be arrested, so as not to cause any rotary motion of the series of shuttle boxes, until the broken thread is removed, and a whole thread passed in the place of it, through the warps. This is effected through the agency of the mechanism, which stops the loom when a filling thread breaks.

In Fig. 1 two wires c^2 d^2 are seen as disposed about parallel to each other. They are bent into the shape denoted in side view in Fig. 4, and pass through a piece of metal e^2 which serves to keep them apart. They rest at their rear ends, and slide in the breast beam of the loom. They are connected to a bent wire f^2 which is united at one end to the piece e^2, and is bent downward, until it passes by the wires, and extends through a small reed or series of vertical wires g^2, and at its other end is jointed to the lower end of a vertical arm h^2 of a bent lever h^2 i^2 k^2, the part i^2 of the lever being horizontal and parallel to the race beam of the lay, while the arm k^2 is horizontal or slightly inclined and extends toward the lay, and at right angles to the part i^2, as seen in the drawings. The shaft or part i^2 of the lever is sustained in bearings l^2 m^2 projecting from the loom frame. The said arm k^2 is connected to a pawl n^2 by a chain or wire o^2. The pawl n^2 is jointed to the top of the bent lever S (before described) as seen in Figs. 18 and 19, the former being a top view of said pawl and a part of the lay frame below it (extending from the pawl to the front of the loom). It also exhibits the slide p^2 which rests on said part of the frame, and is operated by the said pawl. Fig. 19 is a side elevation of the said parts, and of the top part of the lever P.

The slide p^2 is applied to the top bar q^2 of the frame A in such manner as to rest thereon, and to be capable of being moved to and fro in a longitudinal direction. It has a small shoulder r^2 made on the top of it, against which the pawl n^2 is intended to act. A bent arm s^2 extends downward from the opposite end of the slide and in front of an arm t^2, which extends down from the horizontal shaft u^2 which extends underneath and parallel to the breast beam. A small arm v^2 extends upward from the opposite end of the shaft u^2 as seen in Fig. 2 and bears against a horizontal lever w^2 which turns on a fulcrum at x^2 and rests against the usual shifting lever y^2 of the loom.

The above mechanism for arresting the progress of the loom when a thread breaks is essentially similar to other mechanism in use for the same purpose. Its action is well understood by mechanicians. While a thread lies between the small reed g^2 and those parts of the wires c^2 d^2 f^2 which are bent upward between the piece e^2 and the reed, it will cause the lay when it beats up to drag upon the wire f^2 in such manner as to raise the pawl n^2 entirely above the shoulder r^2 of the slide p^2 and keep it so raised, while the upper arm of the lever S advances toward the cloth beam side of the loom. But if there should happen to be no thread between the wires c^2, d^2, and the reed g^2 there will be no action of the lay on the wire f^2, so as to elevate the pawl n^2 above the shoulder of the slide. Consequently when the upper arm of the lever S moves up, it will press the pawl against the shoulder, and cause the slide p^2 to move forward, so as to carry its arm s^2 against the arm t^2, and thereby turn the shaft u^2, sufficiently to actuate the mechanism which throws the shifting lever off its notch z^2, and thus stop the loom. The slide p^2, is retracted by the action of the spring X before mentioned. The said spring acts to retract the slide after the lever P has met or rests against a stud or pin a^3.

The contrivance by which I arrest the action of the sprocket wheel, and pattern belt, when a thread breaks, is connected to the slide p^2, and the lever P. It is as follows: A small weighted lever, or shoulder piece W, is jointed to the top of the lever P, in such manner as to move vertically on a center pin, or fulcrum c^3 passed through it and the lever P. The end e^3 of the lever W is made much heavier than the opposite end of it, in order that the latter end, may be elevated somewhat above the top of the lever P, so as to constitute a shoulder as it were for the pawl V to act against.

An arm d^3 having a pin b^4 projecting from its lower end is secured to the slide p^2 of the loom in such manner as to bring the pin b^4 when the slide is rotated, into the situation with respect to the lower part of the lever W as seen in Figs. 20 and 21—the former of which is a side view of some of the said parts, and the latter a top view of them. The lower part of the weighted end of the lever is shaped as seen at f^3, so that when the slide p^2 is moved forward by the action of the pawl n^2 of the lever S, it (the slide) shall carry the pin b^4, against the said curved part f^3, and thereby elevate the weighted end of the lever, sufficiently to depress the opposite end entirely below the top surface of the lever P. The pawl n^2, should be made a little longer than the pawl V—in order that the slide p^2 may be moved forward, a short distance, before the end of the pawl V can be brought into contact with the end of the lever W. The pin b^4 will therefore so act on the lever W as to depress its end next to the pawl V, to such extent that when the lever S advances, it will produce no movement of the lever P, and consequently no rotating motion of the sprocket wheel, and pattern belt.

Each series of shuttle boxes is to have a

pattern belt, and auxiliary apparatus as above specified, applied to it, for rotating it, both in one or the opposite direction, at such times as the circumstances may require. Instead however of a sprocket wheel, and pattern belt of wires, I sometimes employ where the pattern to be woven is not complicated, a simple circular plate g^3, Fig. 2, a side view of which is represented in Fig. 22. It is placed on the shaft L and rotated by machinery like that before described as applied to the sprocket wheel.

Each face of the plate g^3 has a series of pins h^3, h^3, &c., i^3, i^3 &c., screwed into it, the pins of each of the said series, being arranged at equal distances asunder respectively, and the whole in a circle near the periphery of the plate as seen in Fig. 22. The two dogs d', e', before mentioned, which operate the arms k' l' m' o' before described rest respectively on the two series of pins.

In order to depress each of the dogs at proper times, in the manner and for the purpose, herein before mentioned, I remove now and then a pin in such series, as seen at k^3, k^3, so as to make a space wide enough for the lower end of the dog resting on the circle of pins to drop into, when brought around directly under the said dog. And in order to elevate the dog, or each of the dogs, at such times as may be necessary I insert in each side of the plate, and in proper situations, and at little greater distances from the center of the plate, than the pins h^3, h^3, or i^3, i^3 are—other pins k^4, k^4, as seen in the drawings. If an exterior circle of screw holes is made in both faces of the plate g^3, and having a radius to correspond, to the distance of the pins k^4, from the center of the plate, I am thus enabled to make a pattern plate, where the pins may be changed, or such of them removed from the inner circles of screw holes, and others placed in the outer circles of screw holes, as may be required to impart to the shuttle boxes, their desired movements.

The pickers are represented at l^3, l^3, m^3, m^3 being the picker staves, and n^3 n^3 spring retracting levers, all of which are operated in the usual manner. A spring o^3, is placed in rear of the rear end of each series of shuttle boxes, for the picker to abut against, when driven back by the shuttle, the object of the spring being to cause the shuttle to rebound into the shuttle box, to a distance sufficient to release it (the shuttle) entirely from the picker, so that when the shuttle boxes revolve, the picker shall present no obstruction to them. In order that the rear end of the shuttle, if at any time it should project from the rear end of a shuttle box, may not prevent or obstruct the rotation of the series of shuttle boxes, I place two inclined cams or planes p^3, q^3, Figs. 1, 2, in rear of the end of the shuttle boxes, and in such position, that when the series of shuttle boxes, are revolved either in one direction or the opposite, the point or end of the shuttle protruding from the box, shall be carried in contact with one of said cams or planes, and by it forced back into its shuttle box.

r^3 is a bent wire, shaped as seen in Fig. 1. It is affixed to the end of a round rod s^3, which moves like a piston, in and out of a socket t^3, affixed to the underside of the breast beam. The rear end of the rod s^3, is joined to a smaller rod u^3, which has a button or head v^3 upon it. Between the rod s^3 and the bottom of the socket t^3, and around the rod u^3, a helical spring w^3, is placed, as seen in Fig. 23, which represents a longitudinal section of the rod s^3, and its socket t^3, rod u^3, and spring w^3. The rod s^3 has a small pin y^3 projecting from it, which pin moves in a long inclined or helical groove z^3, made in the inside of the socket, as seen in Fig. 24, which represents a view of the underside of the socket as detached from the rod, etc. The said groove should be so arranged that when the rod s^3 is forced back, it will cause the rod to turn around, in such manner as to elevate or throw up the arm r^3. The slide s^3 should be arranged in such position as to have its front end struck by the lay when it beats up. Now when the lay beats up, it will force the slide back into its socket, and as the slide moves back, it will also turn so as to elevate the arm r^3, which being arranged close to the selvage of the cloth, will lift out of the way of the apparatus, which stops the loom when a thread breaks, any loose ends or parts or parts of weft threads which may happen to be hanging from the selvage. When the lay retreats, the spring w^3, reacts so as to throw forward the slide s^3, until the button v^3 of it, abuts against the end of the socket. The helical groove z^3 acts in the mean while on the projection y^3, in such manner, as to partially revolve the slide s^3, and throw down the arm or wire r^3.

In the inner end of the bottom plate, of each shuttle box, of each series I insert one or move small pins, as seen in Figs. 25, and 26, the former being an end view of one of the series of shuttle boxes, and the latter a top view of said end. Or instead of said pins, I make small notches or grooves b^5 b^5 in the plates respectively as seen in Fig. 25. As the shuttle boxes are revolved, the said pins or grooves receive the threads of the respective boxes upon them (or in them) and act against the threads of the shuttles in the boxes, in such manner as to strain them a little in the warps, or in other words to take out the looseness of said threads.

Having thus described my improved loom, I wish it distinctly understood that I do not intend to confine my invention or

improvements, to the precise forms, or arrangements as specified, but I mean to vary them in any manner, while I do not depart from the principles or parts claimed as new.

I do not claim two sets of rising and falling shuttle boxes, applied respectively to both ends of the lay, or both sides of the loom, nor three or four series of shuttle boxes applied to the lay or loom and made to operate in such manner as to move back and forth horizontally, as well as to rise and fall vertically, at suitable intervals of time, nor do I claim, a simple series of rotating or revolving shuttle boxes applied to one end of the lay or loom in combination with one simple shuttle box, applied to the other end of the lay or loom, but

That which I do claim is—

1. The combination of two revolving series of shuttle boxes applied respectively to both ends of the lay of the loom, and made to rotate forward and backward, or operate together in manner as specified. By the employment of two revolving series of shuttle boxes, instead of rising and falling ones, very important advantages are gained, in their combined operation. When a series of boxes is composed of four or more, and they are arranged the one over the other so as to rise and fall, if a shuttle is to be thrown from the first box, and be succeeded by one in the last box, the whole of the series must be gradually raised upward, or depressed as the case may be, before the shuttle of the last box can be ejected therefrom. This requires a great waste of time. Now, when the series are arranged around a revolving axis or shaft, or what are termed revolving boxes, the first box of the series, may be said to lie directly along side of the last one. To throw the last shuttle, the series would only require to have its movements reversed the breadth of one box. Thus it will be seen a great saving of time can be effected in "shot about" weaving. The arrangement of the boxes around an axis, to revolve, enables me to bring many of them into action, much sooner or with more despatch, than when they are arranged in line with each other and the one over the other, and are made to rise and fall vertically.

2. I also claim, the pattern belt of changeable wires, external and central links, as made combined and applied together, and to a sprocket wheel or other equivalent substantially as specified, in combination with the reversing arms l' o' and supplementary wires z, z, of the pattern belt, or other equivalents, as combined with the apparatus or mechanism for rotating, either series of shuttle boxes; the said arms and wires being for the purpose of reversing the motions of the boxes as specified.

3. I consider the combination of a circular plate g^3, and changeable screw pins inserted in it as above explained, and as applied and used in manner set forth, as a mechanical equivalent for the pattern belt above described.

4. I also claim the weighted lever W, and pin b^4, or any equivalents therefor, in combination with lever P and stop motion of the loom, the same being for the purpose of arresting the motion of the sprocket wheel, and pattern belt, or the pattern plate g^3, when a filling thread breaks, as specified.

5. I also claim one or more inclined planes or cams p^3, q^3, as applied to or combined with the loom frame or lay and revolving series of shuttle boxes, for the purpose herein before specified.

6. I also claim the contrivance for elevating the loose filling or weft threads, out of the way of the stop motion of the loom, the same consisting of the arm r^3 as arranged and operated substantially as specified.

7. I also claim the combination of pins a^4, a^4, notches b^5 or other similar contrivances, with the front end of the revolving series of shuttle boxes, in the manner and for the purpose, substantially as set forth.

In testimony whereof I have hereto set my signature this twentieth day of April, A. D. 1847.

JAMES NIELD.

Witnesses:
R. H. Eddy,
C. Richmond.