Sheet 1-3 Sheets.

Goodyear & Hirst.

Shuttle Box.

No. 6,986. Patented Jan. 1, 1850.

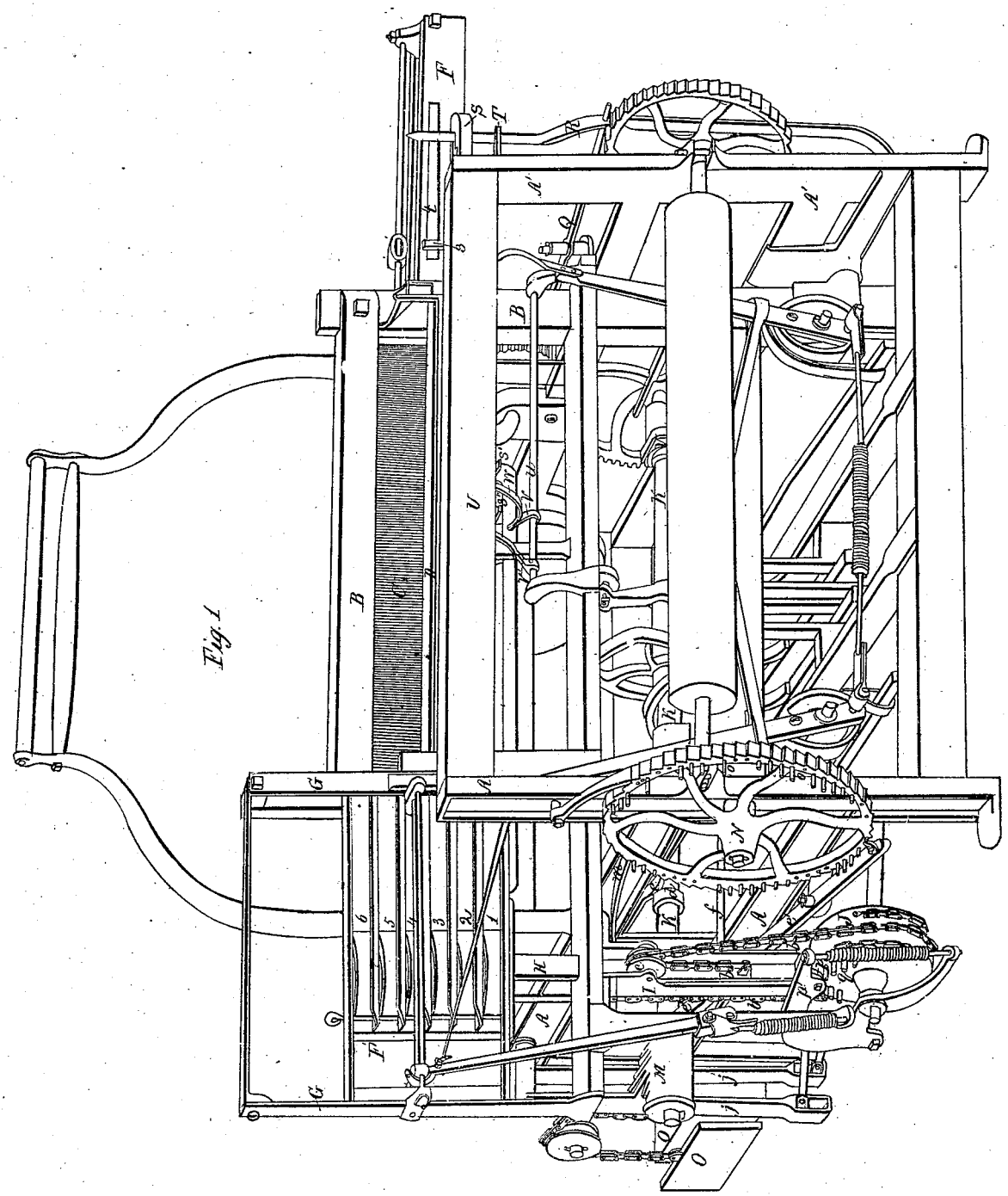


Fig. 1

Sheet 2-3 Sheets.

Goodyear & Hirst.

Shuttle Box.

No. 6,986. Patented Jan. 1, 1850.

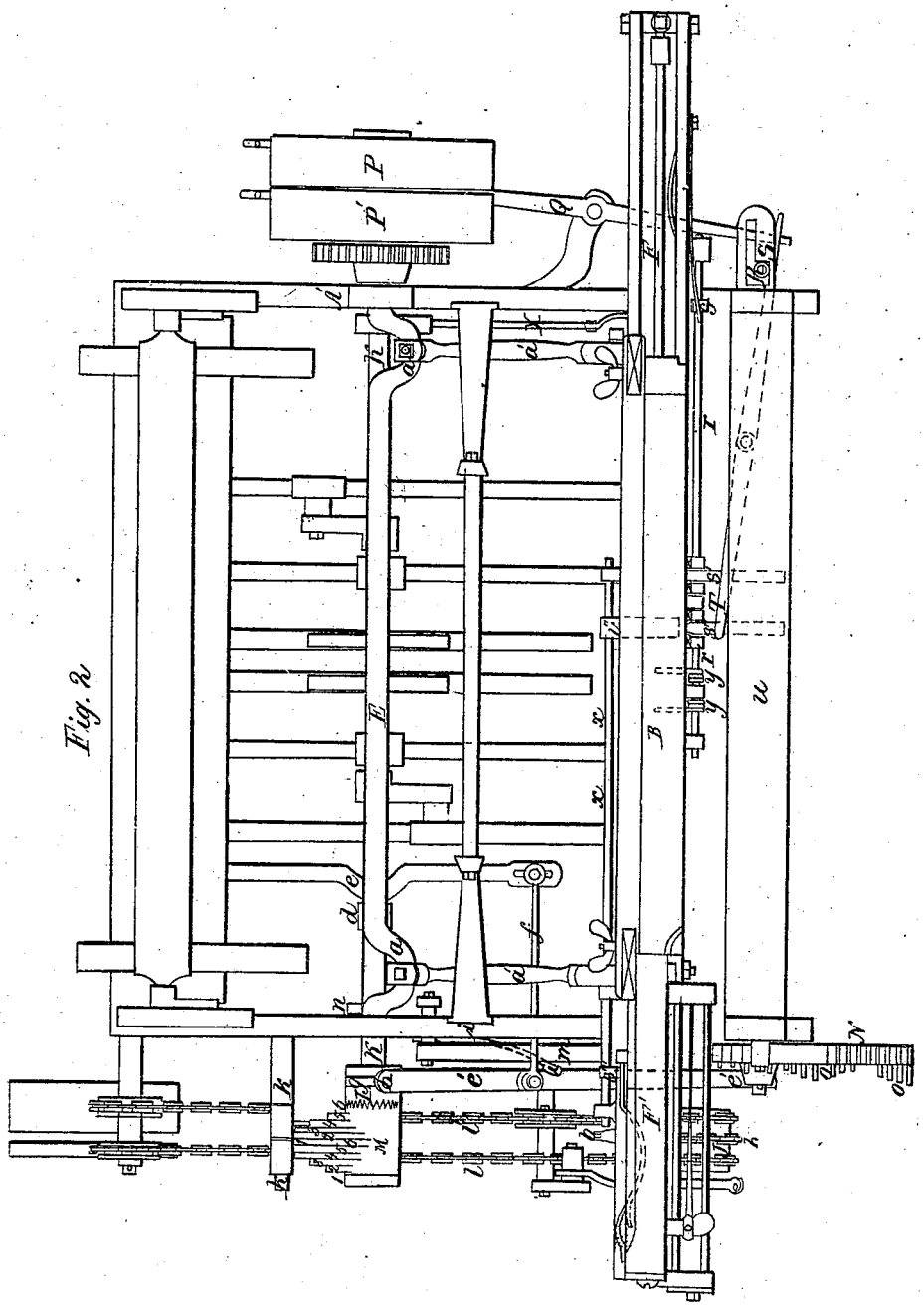


Fig. 2.

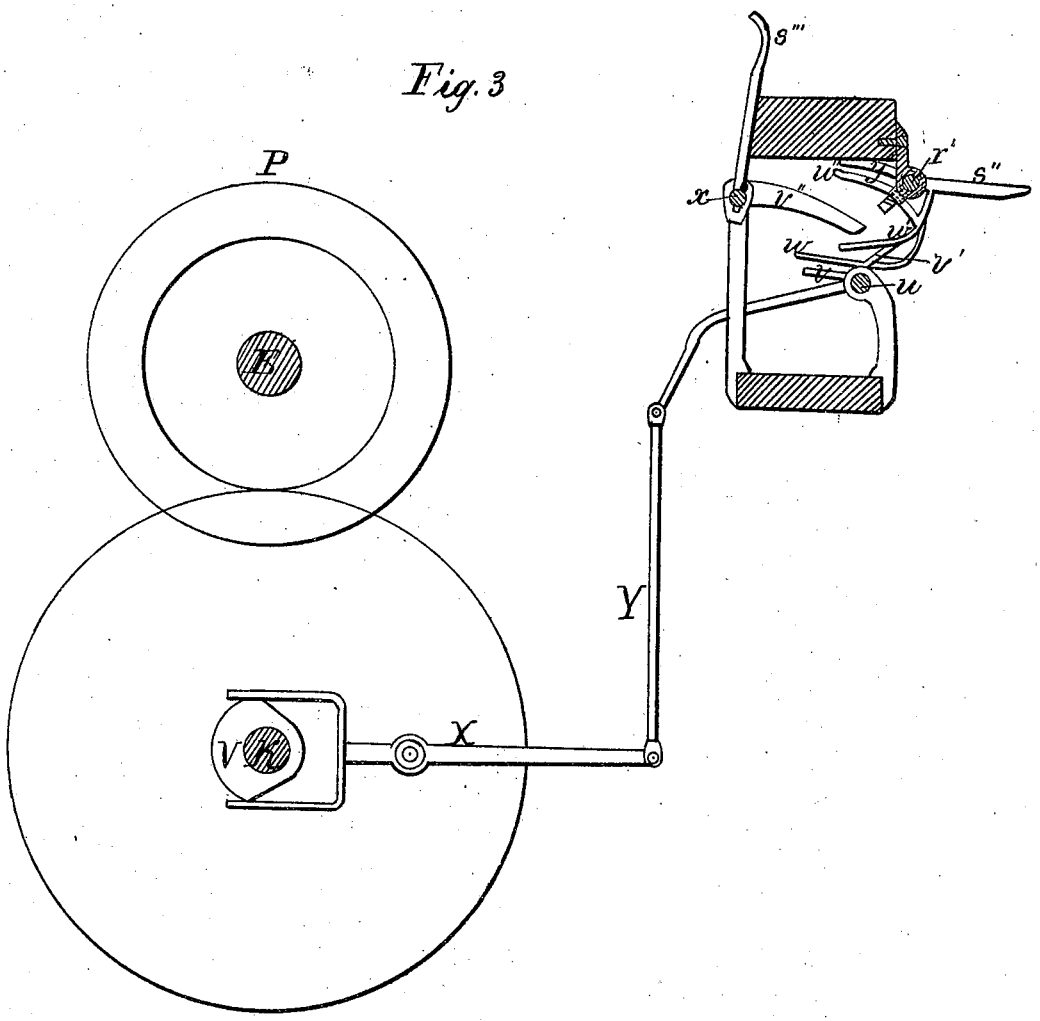
Sheet 3-3 Sheets.

Goodyear & Hirst.

Shuttle Box.

No. 6,986. Patented Jan. 1, 1850.

Fig. 3



UNITED STATES PATENT OFFICE.

R. B. GOODYEAR, OF PHILADELPHIA, AND BENJAMIN HIRST, OF MANAYUNK, PENNSYLVANIA, ASSIGNORS TO ALFRED JENKS, OF BRIDESBURG, PENNSYLVANIA.

OPERATING SHUTTLE-BOXES IN LOOMS.

Specification of Letters Patent No. 6,986, dated January 1, 1850.

To all whom it may concern:

Be it known that we, ROBERT BURNS GOODYEAR, of the city and county of Philadelphia and State of Pennsylvania, and BENJAMIN HIRST, of Manayunk, in the county of Roxborough and State of Pennsylvania, have invented certain new and useful Improvements in Looms; and we do hereby declare that the following is a full, clear, and exact description of the characteristics which distinguish these inventions from all others heretofore known, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective view of such portions of a power-loom as are necessary to show the construction and operation of our improvements, Fig. 2 is a plan of the same, and Fig. 3 is a side elevation of the stop rod motion detached from the machine.

Our invention consists first of a sliding block of cams, arranged and operated in the manner herein set forth, for shifting a series of shuttle boxes containing shuttles with filling of different shades or colors; and second in a device by which the loom stops itself whenever the shuttle does not arrive in its proper box at the proper time.

In the drawings A A′ are the two sides of the loom frame connected with each other by suitable cross beams.

B is the lay to which the reed C and race board D are attached, and to which motion is given by cranks *a*, *a*, on the shaft E acting through connecting rods *a′*, *a′*. The lay is furnished at one end with a stationary shuttle box F, and at its opposite end with a series F′, of movable shuttle boxes to contain shuttles supplied with filling of different colors or shades; the series of shuttle boxes in the loom here represented are arranged one above the other, they are all connected together and slide up and down in a frame G attached to the lay. The series is mounted upon the upper extremity of a bar H sliding in a guide I, a chain or cord *b*, is attached to the lower end of the bar and passing upward and over a pulley *c*, is returned downward and passed around the lower half of a drum J, mounted upon the axis on which the lay rocks, thence returning upward it is attached to the series of shuttle boxes; that portion of the chain which passes around the drum J, is secured thereto in such manner that by turning the drum in one direction the whole series is raised while by turning it in the opposite direction the series is depressed. The drum in the loom here represented is turned in either direction by the cam shaft K, by means of the following device: A face cam *d* is secured to the cam shaft K which acts upon a lever *e*, crossing the shaft and hinged at its hinder extremity to one of the cross beams of the frame, the front end of this lever is connected by a rod *f* with the hinder arm of a second lever *e′*, hinged at a point between its two ends to the side of the frame. The arms of this second lever are of unequal length, the hinder arm which is the longest is forked at its extremity to embrace a ring *g*, sunk in a groove in one extremity of a sleeve L sliding inward or outward upon the cam shaft K, but so connected with the shaft that it will revolve with it; the ring (*g*) is furnished with two pins *h*, which enter holes pierced in each fork of the lever *e′*, the several parts being so arranged that when the lever is moved by the face cam *d* acting through the lever *e* and connecting rod *f*, it shall cause the sleeve L to slide inward upon the shaft; while it is forced outward, when the cam has passed the lever *e*, by a spring *i* acting upon the lever *e′*. A block of cams M is mounted upon the sleeve L; this block of cams is composed of a series of cams, 1 to 6, equal in thickness but of differing projections diminishing in each direction from a central one; these cams act upon two levers *j*, *j′*, which are hung from the same axis *k*, projecting from the side A, of the frame; the levers are each equal in thickness to the face of one of the cams, and are placed at such a distance apart that when one is acted upon by the most projecting cam the other will be operated by the least (which in the block here represented is of the same size as the hub); and the cams intervening between the largest and smallest, on each side of the central one, are so proportioned that the sum of the projections of any two which act upon the two levers at the same time shall always be the same. The lower extremities of the levers are each furnished with a chain or cord *l*, *l′*, which chains are wound in opposite directions upon and secured to the drum J; so that when one lever *j*, is moved backward by the more projecting cam it shall by

its chain turn the drum in one direction, and winding up the chain of the other lever j', shall draw it forward until it touches the proper less projecting cam on the other side of the block; hence if the position of the block of cams is changed, and the motion of the levers is reversed, by the action of a different couple of cams, the drum will be turned in the opposite direction. When the drum is turned in one direction it, acting through the chains b, raises the series of shuttle boxes; and when its motion is reversed, lowers the same series; the distance to which the shuttle boxes are raised or lowered will depend upon the relative projections of the couple of cams which act upon the levers j, j', hence in order to place any given shuttle on a level with the race board it is necessary to place the block of cams M, in such a position that the proper couple of cams shall be opposite the levers. This is done by the combined action of the face cam d, acting through the levers e e', and a pattern wheel N, revolved by a pawl m, which is alternately pushed forward and drawn back by a cam n on the cam shaft K, and which acts upon ratchet teeth on the periphery of the pattern wheel. The face of the pattern wheel opposite the front extremity of the lever e', is studded with a ring of pins o, corresponding in number with the ratchet teeth, and of differing lengths corresponding with the number of shuttles intended to be used. The cam d acting through the levers e, e', upon the cam block M, draws it inward to its full limit at each revolution of the shaft K; during this motion of the block the pattern wheel is moved by the pawl m one tooth, and consequently one pin forward; when the cam d in its revolution passes the lever e, the cam block M is forced outward by the spring i until its motion in that direction is stopped by the front extremity of the lever e' coming in contact with the corresponding pin on the pattern wheel; as then the shaft K with the cam block M revolves, that couple of cams corresponding with the pin on the pattern wheel, acting upon the levers j, j', and through them, and the drum J and chains b, upon the series of shuttle boxes F', move that series until that shuttle which corresponds with the couple of cams now acting is on a level with the race board, when it is thrown by a driver in the usual manner. The cam shaft makes one revolution for every two vibrations of the lay and picker sticks, consequently the series of shuttle boxes remain stationary until the shuttle which has been driven to the opposite side of the loom is returned into its proper box, thus making a double throw, when the cam block is again acted upon and, the pattern wheel being moved forward, a new pin is brought in place to stop the cam block in a new position. If the same shuttle is to make several consecutive double throws, the consecutive pins will project equally from the face of the pattern wheel; if a shuttle above the one used is to be brought into action the succeeding pin will be shorter; and if a shuttle lower in the series was required the succeeding pin would be longer. In order to counterpoise the weight of the shuttle boxes and to keep the chains properly strained two weights O, O', are used which are connected by chains or cords with the levers j, j'; and as it is necessary that the series of shuttle boxes should be kept in the position in which it is placed by the action of the block of cams until that position is to be changed, it is prevented from moving by a wheel p, locking between pins q, on the face of the drum J, this wheel is attached to a spring lever p', which yields when the drum is turned by the cam and allows the pins to pass beneath the wheel; but which, when the drum has come to rest, presses the wheel into the space between the pins with sufficient force to prevent the drum from turning unless some extraneous power is applied to it.

I have thus far described the series of shuttle boxes as arranged one above the other but it is plain that the same effect could be produced if the cam d, cam block M, and pattern wheel acted upon a series of revolving shuttle boxes, or upon one where the shuttle boxes were arranged in a horizontal or inclined position. It is also plain that a sliding motion might be given to the levers j, j', while the cam block remained stationary on its shaft; and that a pattern chain could be substituted for a pattern wheel.

Slight obstructions are continually occurring in the best constructed and most skilfully tended looms which prevent the proper throw of the shuttle, and consequently the latter will not leave the one shuttle box nor arrive in the opposite one at the right time; the loom should be arranged to stop itself when such accidents occur, and the second part of the invention as above stated is a device for effecting this result, called a double action stop. The arrangement of the several parts of this device will be more clearly understood by describing it first as applied to but one of the shuttle boxes, and such a course is adopted in the following description.

The power of the prime mover is transmitted to the loom by a belt which operates on a fast, P, and a loose pulley, P', on the crank shaft E; the belt is embraced by the forked extremity of a belt lever Q, by which it is shifted from one pulley to the other. The opposite or front extremity of the belt lever is connected with an upright spring handle R whose lower extremity is secured to the side

of the loom; and whose upper extremity passes through a slot in a plate S projecting from the side of the loom; a notch or recess is cut in one side of the inner end of this slot, in which recess the handle is engaged when the belt lever is in position to keep the belt running on the fast pulley; and the motion of the loom is stopped by disengaging the handle from the notch, when the force of the spring, acting upon the front extremity of the belt lever, changes the belt from the fast to the loose pulley. A lever T is hinged at about its middle to the bottom of the breast beam U; the outer extremity of this lever acts upon the spring handle and its inner extremity extends a little beyond the middle of the breast beam. A horizontal rod *r*, is hung from the front of the lay in two bearings in which it can turn on its axis; this rod extends from the center of the lay to about the middle of the shuttle box; it is furnished at each extremity with an arm, the one *s*, at the outer extremity, projecting upward against the side of the shuttle box, and the other *s'*, at the inner extremity, projecting forward immediately opposite the inner extremity of the breast beam lever T. The arm *s*, rests against a bar, *t*, sunk in a slot in the face of the shuttle box and hinged to it at its outer extremity; this bar is pressed into the shuttle box by a spring (acting upon the upright arms *s*,) and is forced out by the entering shuttle. When the shuttle enters the shuttle box it forces the bar *t* outward, and acting through the arm *s* upon the rod *r*, turns it with the arm *s'* upon its inner extremity downward, so that the latter passes beneath the breast beam lever T without striking it; but if the shuttle should not enter the box, the arm s', being opposite to the breast beam lever, strikes its inner extremity and forcing its opposite extremity against the spring handle R disengages the latter from the recess, which in turn changes the belt from the fast to the loose pulley and the loom stops its motion. The shuttle is in the same box during only each alternate vibration of the lay, and hence it is necessary to depress the arm *s'*, to prevent it from striking the breast beam lever when the shuttle is in the opposite shuttle box; this is effected by a cam V (see Fig. 3) on the cam shaft K which, acting through a lever X, and connecting rod Y, upon the arm of a shaft *u*, attached to the lay parallel with the stop rod *r*, turns this shaft and raises a toe *v*, projecting from it; this toe acting upon a corresponding toe *w*, projecting backward from the arm *s'* of the stop rod *r*, depresses its front extremity. The cam shaft with the cam makes one revolution for each two vibrations of the lay, and the cam is so set that it shall depress the arm *s'*, only at that vibration during which the shuttle should be in the opposite shuttle box. If the shuttle boxes at the opposite extremities of the race board were both stationary, the second one would have a stop rod arranged in the same manner as the one thus far described, and by adding to the shaft *u* a second toe *v'* projecting in the opposite direction to the first, the same cam motion could be made to depress the two arms *s'*, *s''*, alternately; but as there is a series of shuttle boxes at the opposite extremity of the race board, a modification of the arrangement is required; this consists in shortening the second stop rod *r'* and operating it from the back of the shuttle boxes by a false stop rod *x*, secured in bearings to the back of the race board; this false stop rod (*x*) is furnished at its outer extremity with an arm *s'''* projecting upward at the back of the movable series of shuttle boxes F' and operated by the entering shuttle in the same manner as the arm *s* is at the opposite stationary shuttle box F; the inner extremity of the rod *x* is furnished with a toe *v''* projecting forward and acting upon a corresponding toe *w''* secured to the arm *s''* of the short rod *r'*; as the shuttle enters the box at F', it forces the arm *s'''* backward and thus turns the toe *v''* upward; this latter (*v''*) acting upon the toe *w''* depresses the arm *s''* and prevents it from striking the breast beam lever T at that vibration of the lay. When the shuttle leaves the box at F'' the arm *s''* is returned to its raised position by springs *y*, coiled upon its rod *r'*; and at the alternate vibrations of the lay, that is when the shuttle is thrown to the stationary shuttle box F, this arm *s''* is depressed to prevent it from striking the breast beam lever by the action of the cam V acting through the lever X, connecting rod Y, shaft *u*, and toe *v'*, upon a toe *w'* projecting from the arm *s''*.

Having thus described our improvements in looms what we claim therein as new and desire to secure by Letters Patent is—

Shifting a series of shuttle boxes substantially as herein set forth by means of a corresponding series of cams, acting through levers, cords, or other means, severally brought into action at the required intervals by the pattern wheel face cam and spring or other equivalent devices the whole arranged and operating substantially as described.

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Witnesses:
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