(No Model.) 4 Sheets—Sheet 1.

A. LOCKWOOD.

SHUTTLE BOX OPERATING MECHANISM FOR LOOMS.

No. 573,276. Patented Dec. 15, 1896.

Fig. 1

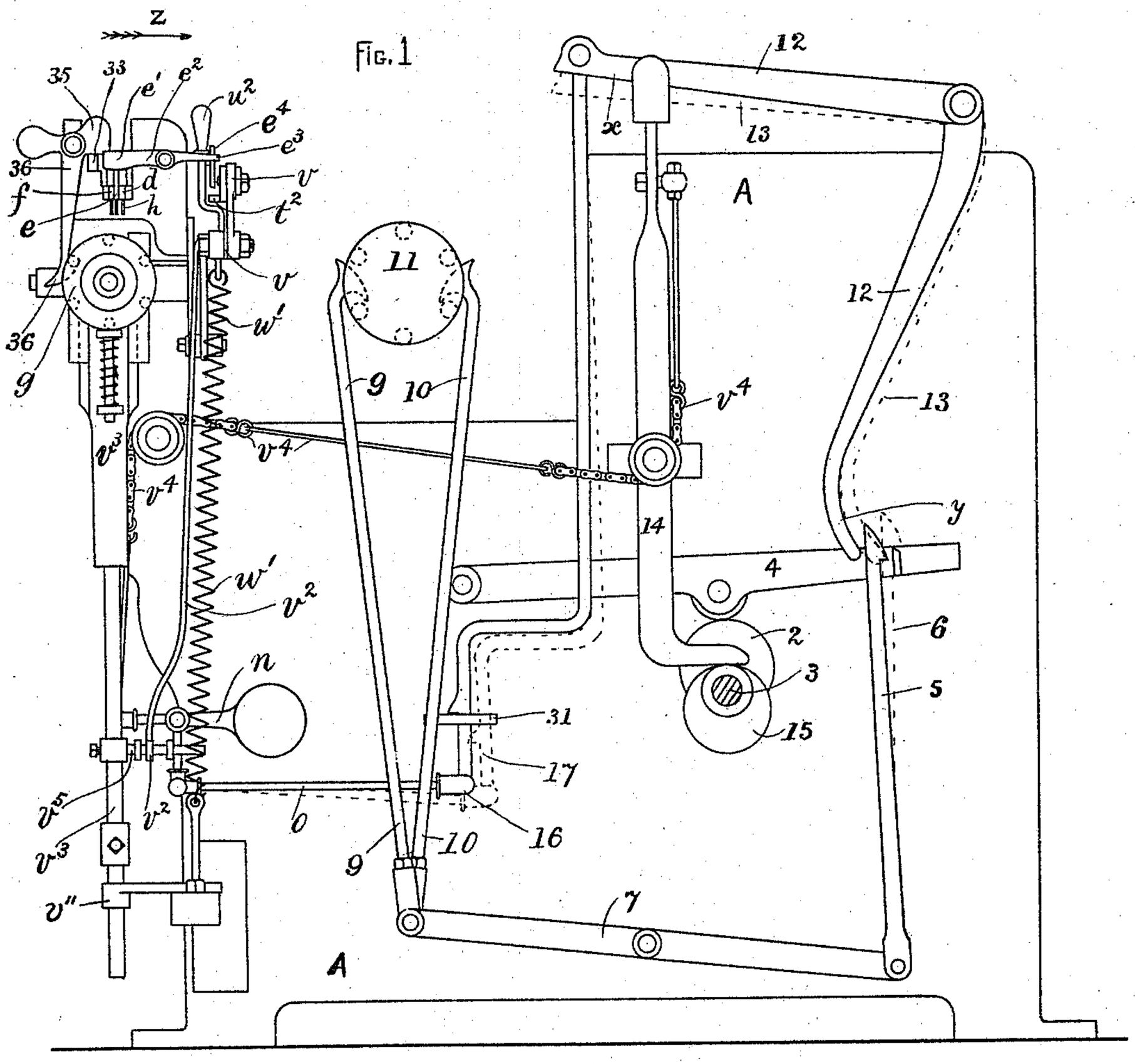


Fig. 5

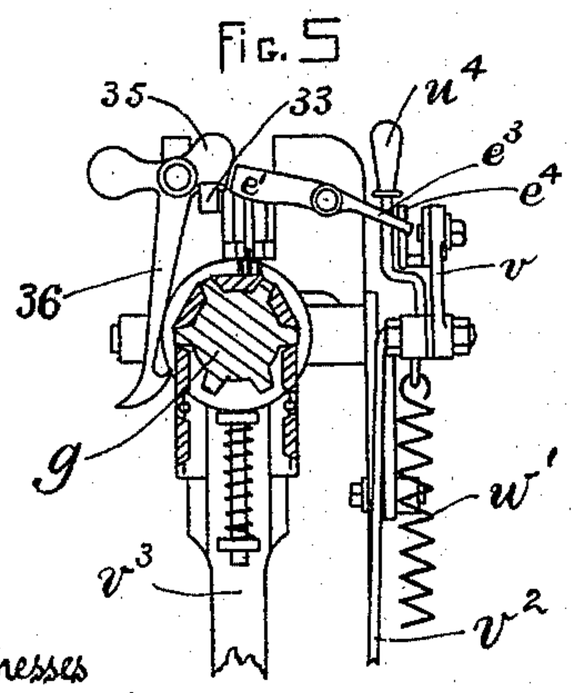
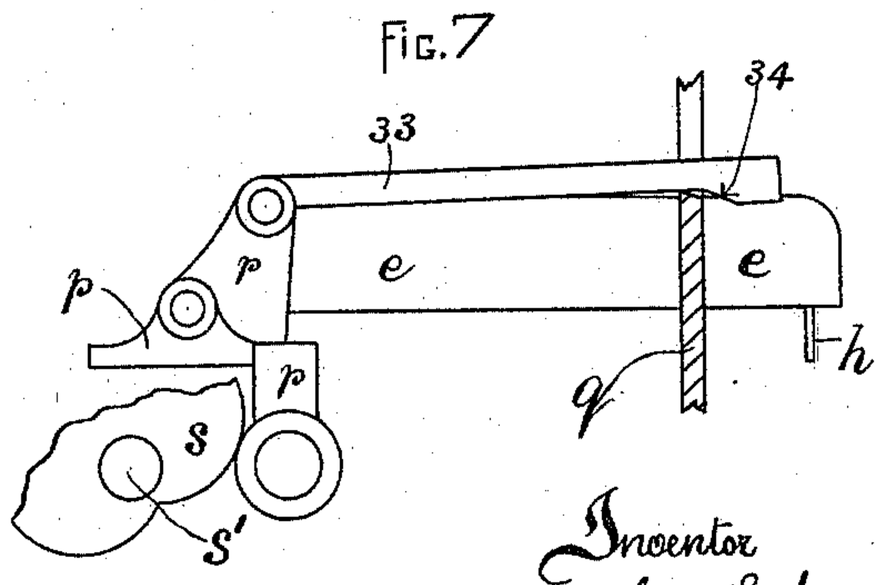


Fig. 7



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(No Model.) 4 Sheets—Sheet 2.

A. LOCKWOOD.

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Fig. 4

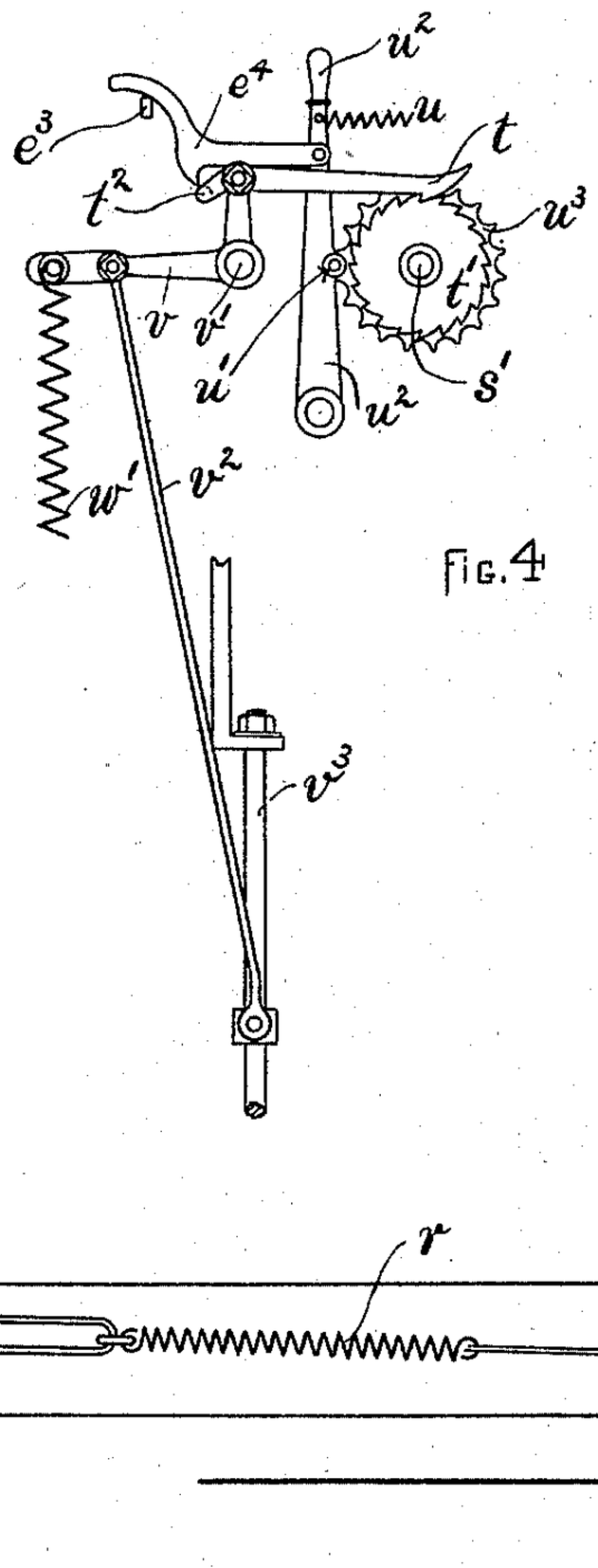


Fig. 2

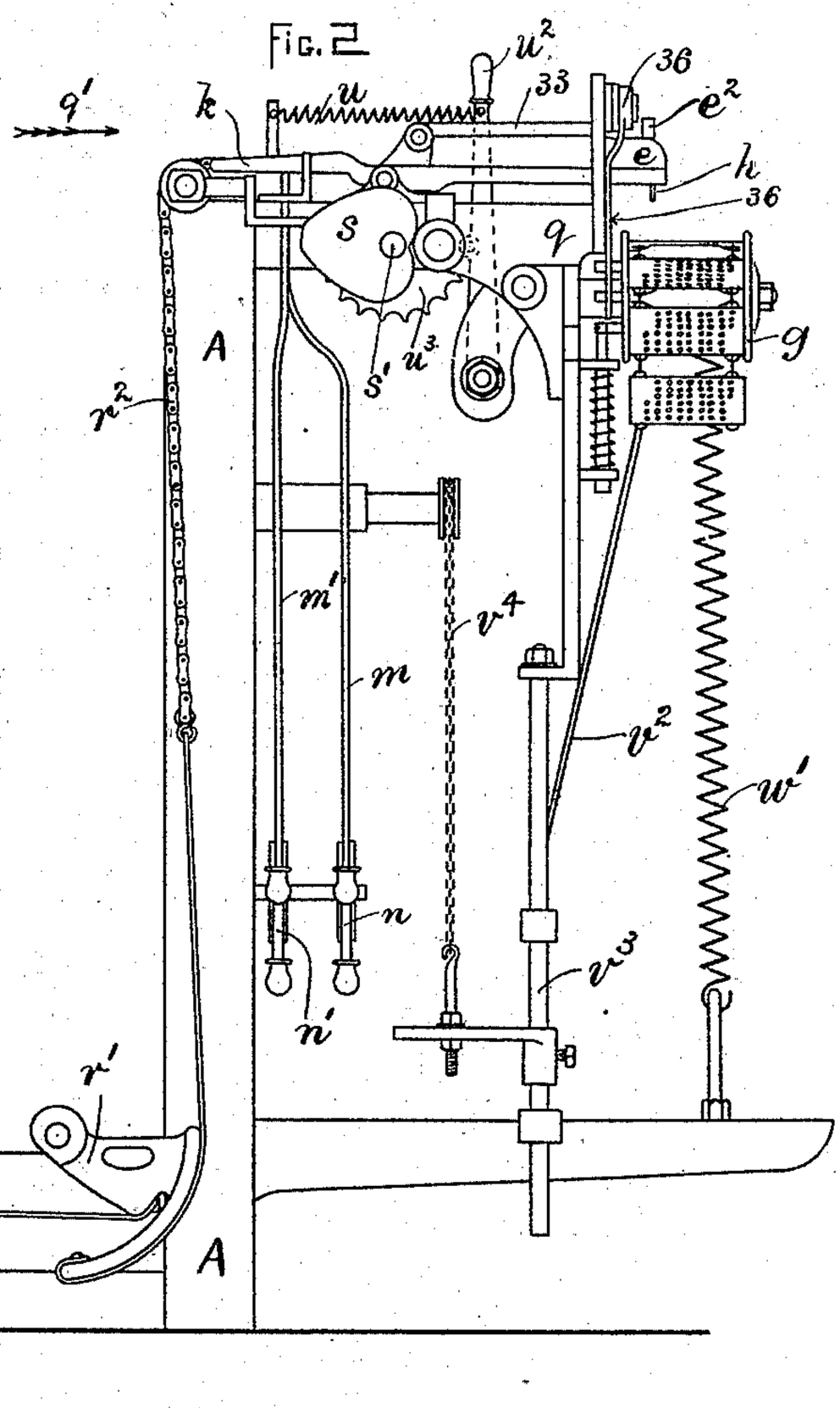


Fig. 6

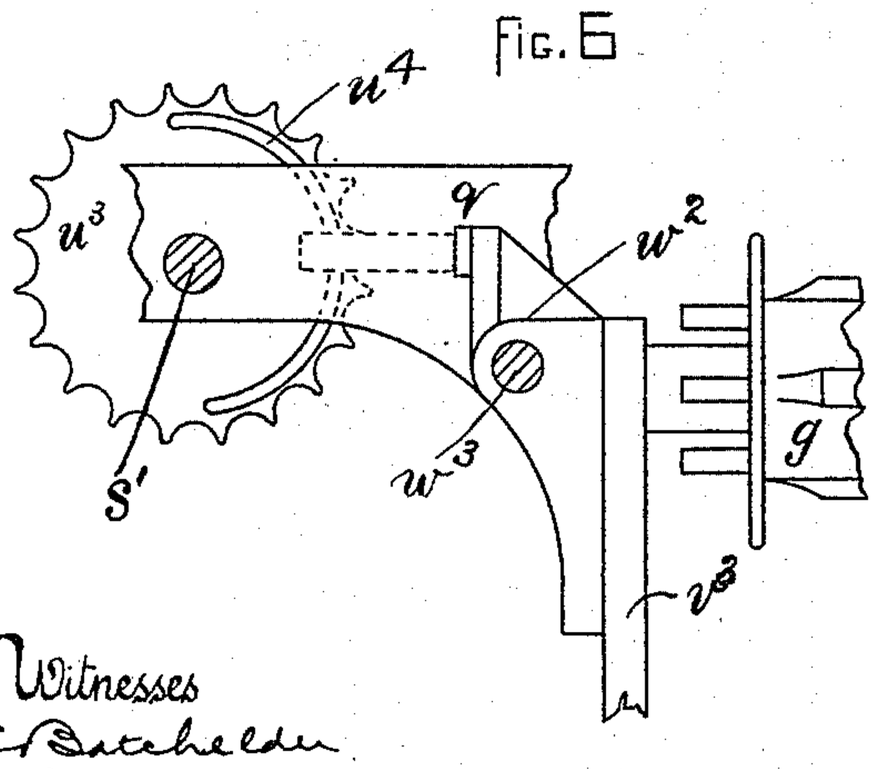
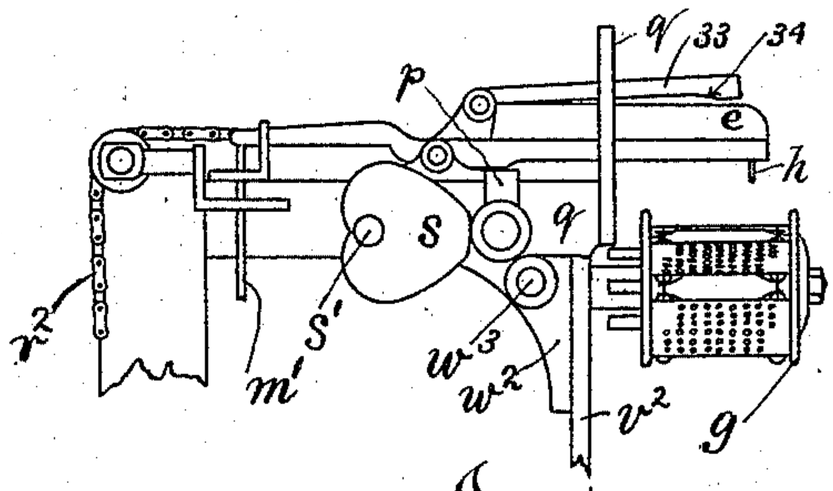


Fig. 3



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(No Model.) 4 Sheets—Sheet 3.

A. LOCKWOOD.

SHUTTLE BOX OPERATING MECHANISM FOR LOOMS.

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Fig. 9

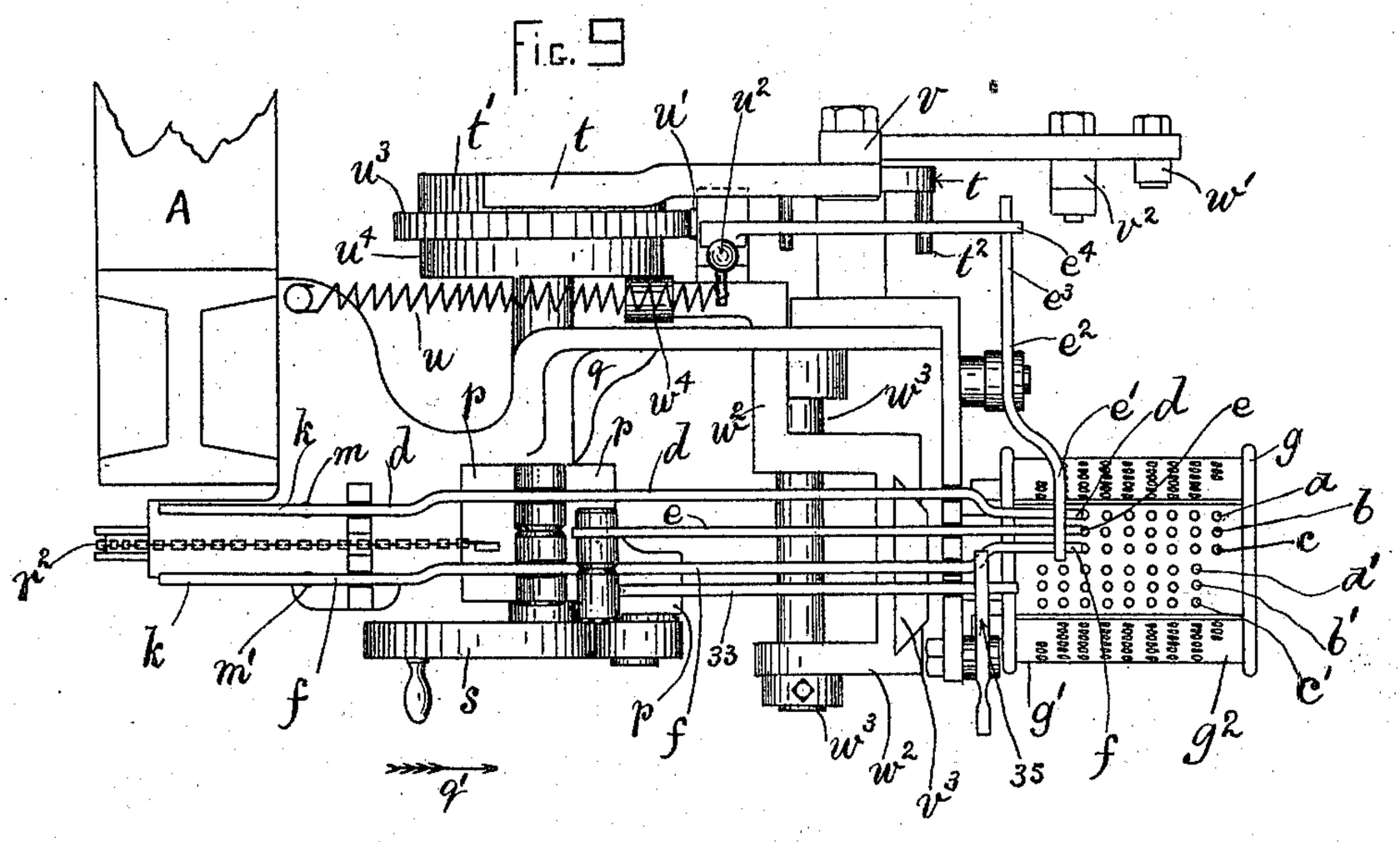


Fig. 11

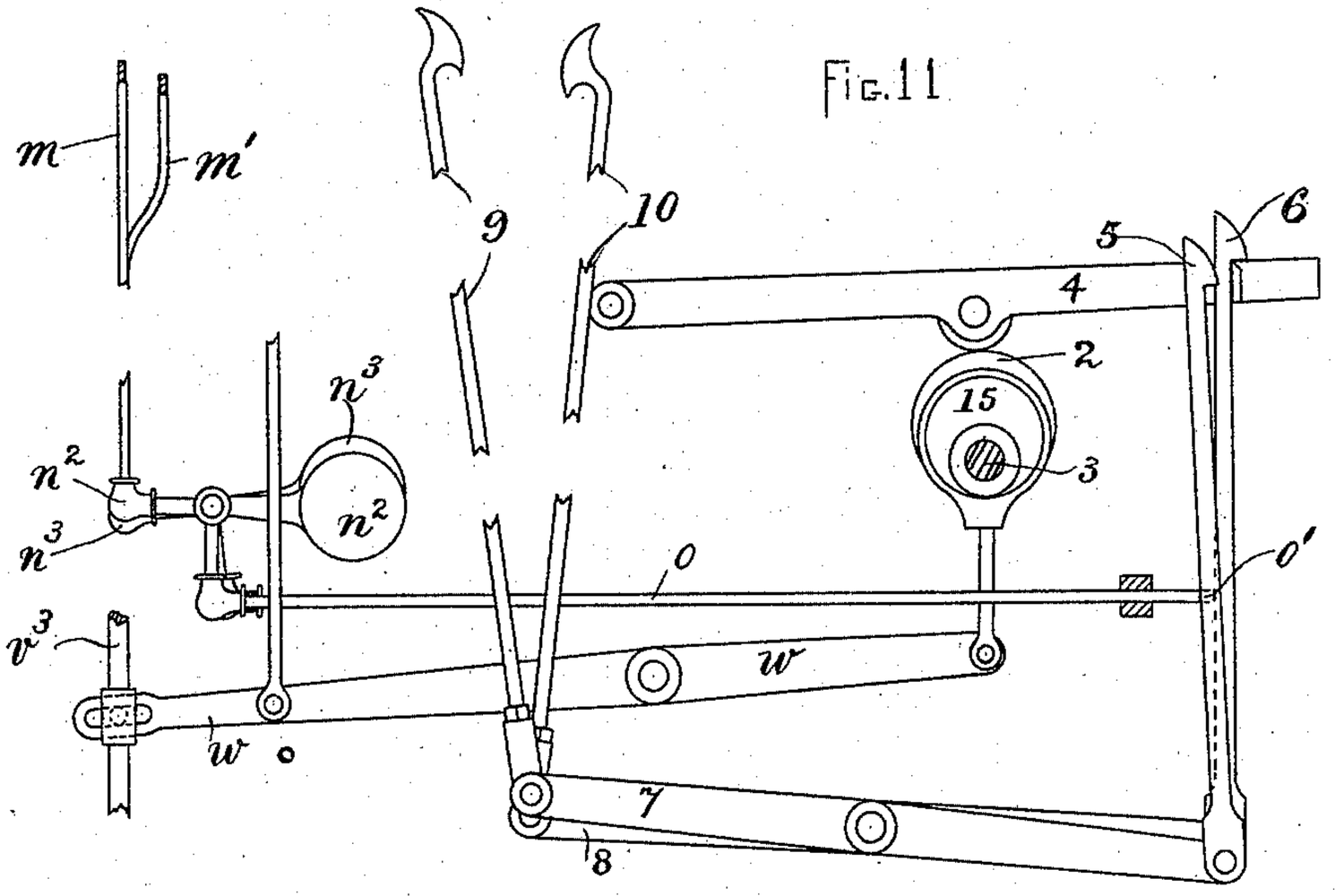
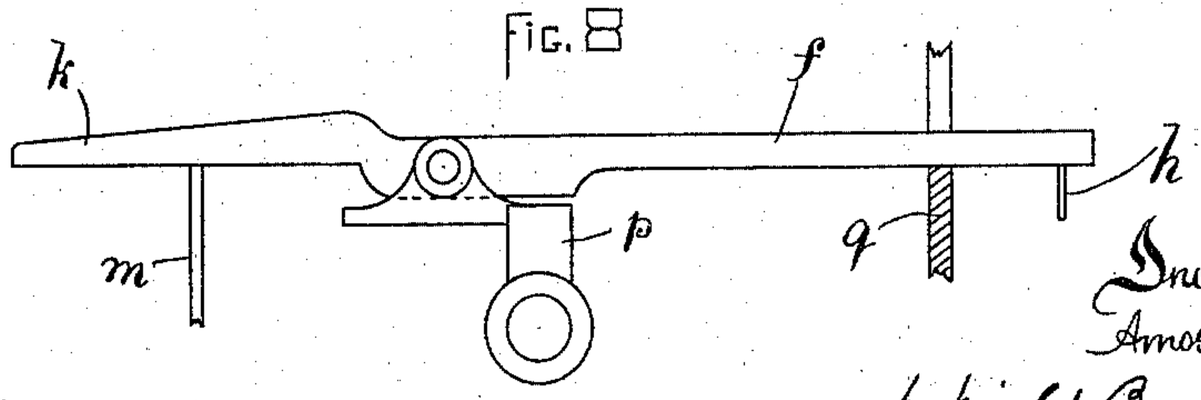


Fig. 8



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4 Sheets—Sheet 4.

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SHUTTLE BOX OPERATING MECHANISM FOR LOOMS.

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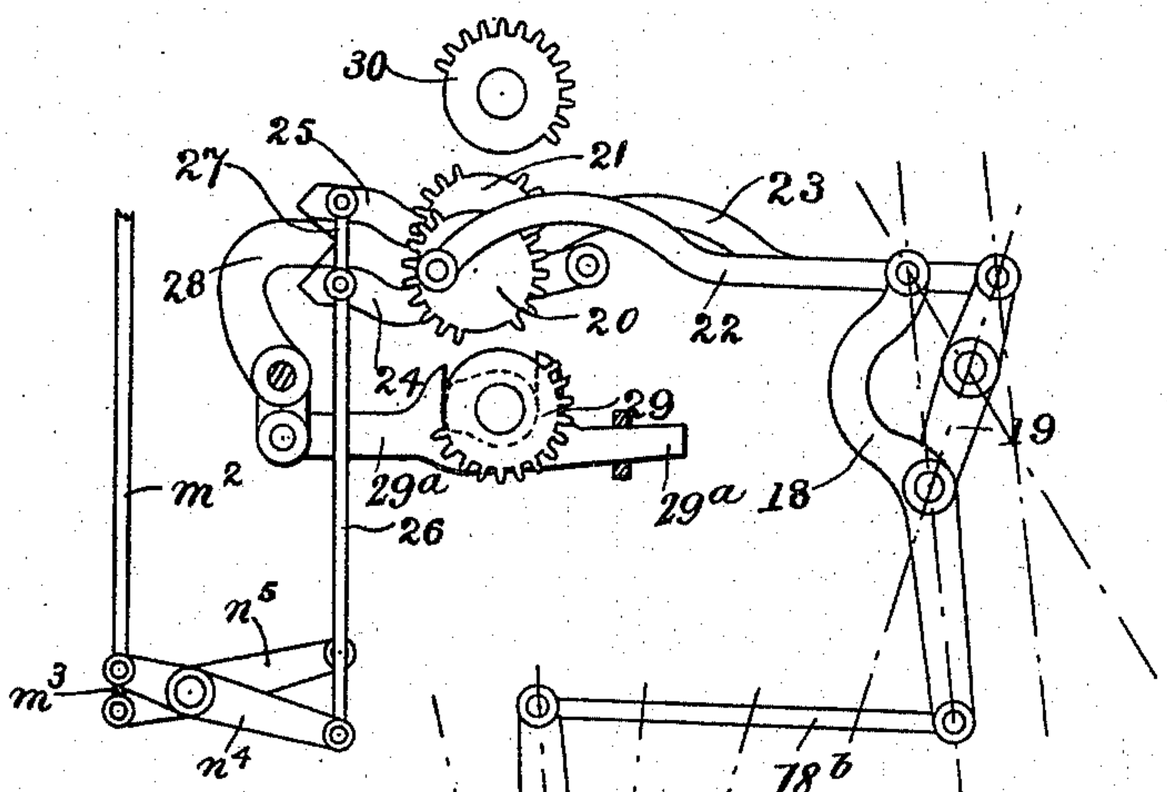

Fig. 12

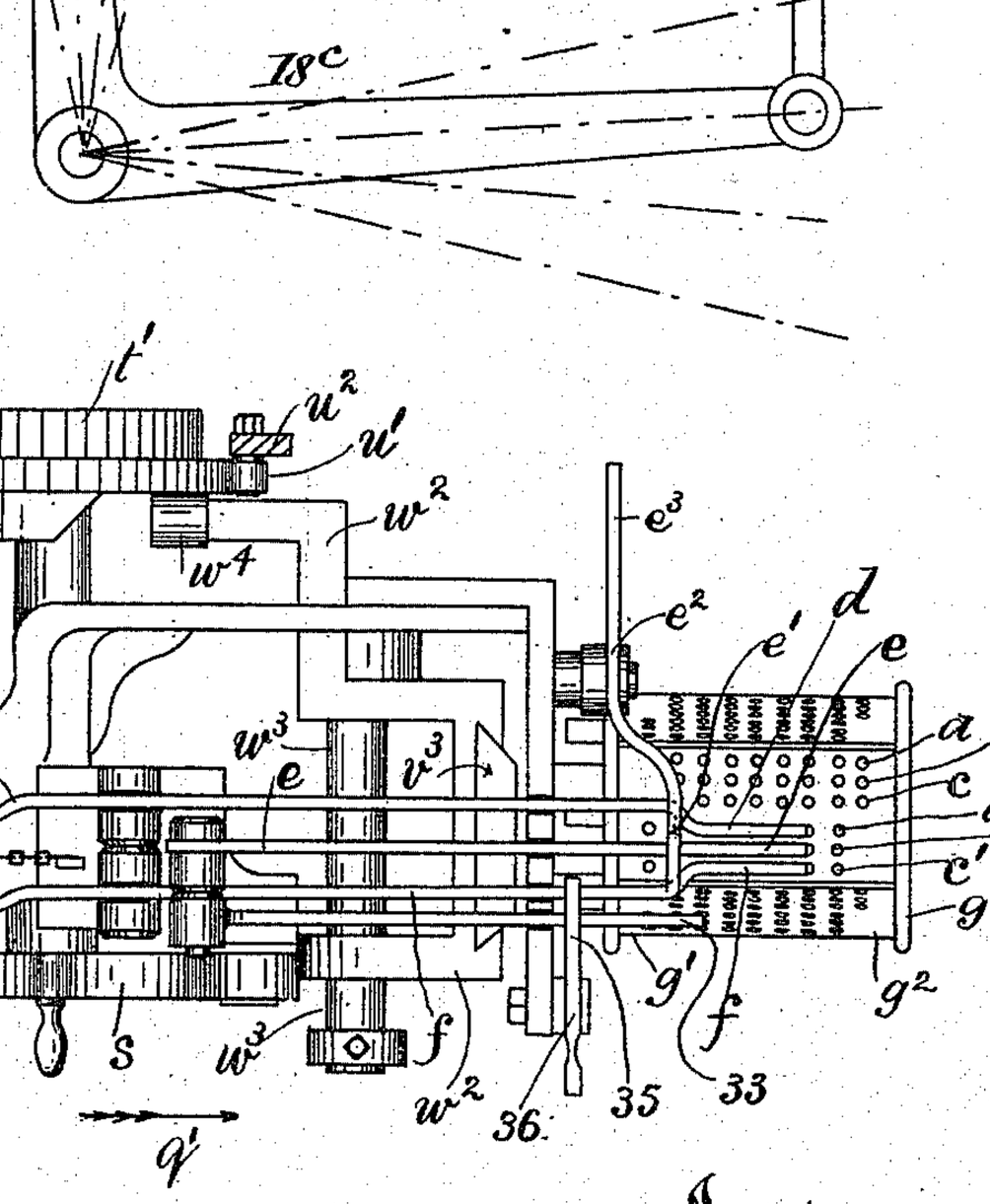

Fig. 10

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UNITED STATES PATENT OFFICE.

AMOS LOCKWOOD, OF HALIFAX, ENGLAND.

SHUTTLE-BOX-OPERATING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 573,276, dated December 15, 1896.

Application filed August 3, 1895. Serial No. 558,060. (No model.)

To all whom it may concern:

Be it known that I, AMOS LOCKWOOD, a subject of the Queen of Great Britain, residing at 38 Willow Bank, King Cross, Halifax, in the county of York, England, have invented a new and useful Shuttle-Box-Operating Mechanism for Looms, of which the following is a specification.

In looms having movable shuttle-boxes (either of the class known as "rotary" or those called "rising and falling" shuttle-boxes) which are arranged to be operated so as to bring each of the several shuttles into operation in accordance with the design to be produced it is often found that a long series of changes has to be passed through before such design repeats itself or is repeated. Consequently it is necessary to employ a pattern-surface of considerable magnitude to effect such production. Heretofore this pattern-surface has consisted of either paper or metal cards operating in connection with the old well-known devices whereby one card was required for each shot of weft. Thus thousands of these cards have had to be employed to attain the desired result, or at other times a pattern-barrel having its peripheral surface perforated for the reception of indicating-pegs has been employed; but in this case the range of pattern is limited, while, further again, wooden lags, each having a row of holes arranged along its length, together with lever mechanism for visiting each hole in succession from one end thereof to the other, have been made use of; but in this case on these levers arriving at the outer end of the lag to which they have advanced they have had to jump or recede therefrom at one bound to the end from which they started. Consequently the speed of the mechanism may be such as would not allow time for such said receding actions of these levers, so that in this manner the speed and output of the loom are considerably curtailed.

Now the object of my invention is to provide mechanism that may be reliable in its actions and that may be run at any rate of speed at which the other parts of the loom are operated, and, further, will utilize peg-lags having two series of rows of holes, one series to be used on the advancing motion of the levers that their pegs have to operate, and the other to be requisitioned on the receding motion of said levers. Thus each lag answers all that is required of it and that for double the number of shots of weft that it has heretofore been able to indicate for or control, while mechanism is produced that may be fitted to any of the well-known kinds of looms. This object I attain by the employment of means hereinafter described, and as illustrated by the accompanying sheets of drawings, in which—

Figures 1 and 2 are end and front elevations of a sufficient portion of a loom to show the application of my invention in connection with a common revolving-box loom. Fig. 3 is a similar view to Fig. 2 with certain of the parts omitted, while other parts are shown to have assumed different relative positions hereinafter explained. Fig. 4 is a view of parts shown by Fig. 2 as seen from behind, the framework being omitted for the sake of clearness. Fig. 5 is a part sectional end elevation illustrating the several parts in altered positions as compared with their positions shown by Fig. 1. Figs. 6, 7, and 8 are sectional front elevations, enlarged scale, showing parts in detail in order that their functions may be more readily understood from the following description. Fig. 9 is a view, enlarged scale, of parts shown by Figs. 1 and 2 as seen from above. Fig. 10 is a similar view to Fig. 9 with certain parts omitted, while other parts are shown in other relative positions. Fig. 11 is a similar view to Fig. 1 with the framework omitted and illustrates an arrangement of parts whereby other old parts of the box-controlling mechanism may be dispensed with. Fig. 12 is a diagram showing how my improved mechanism may be employed in connection with a rising or drop box loom.

Like letters and figures of reference indicate like parts throughout the several views.

A indicates the end frame of the loom.

To attain the object of my invention, I make use of cards or peg-lags (preferably the latter; hence they alone are shown in the annexed drawings and referred to in the following description, although it is well known that the former are often and extensively used in place of the latter) having six (or more than six, as will hereinafter be de-

scribed) rows of indicating-holes *a b c* and *a' b' c'*, half the number of said rows of holes being in operating position at one time, the other half at another time, as shown by Figs. 9 and 10, the rows *a b c* being shown in operating position by the former figure, while those at *a' b' c'* are shown in operating position by the latter.

In connection with each of the rows of holes that are in operating position I arrange to operate a lever, as the levers *d e f*, one of these levers (the lever *e*) having control over the movements of the pattern-cylinder *g*, while the other levers, *d* and *f*, are for controlling the movements of the shuttle-boxes by putting the box-operating mechanism into and out of motion, as and for the purposes desired, be the said box-operating mechanism any one of the several well-known kinds or descriptions.

The well-known kind of rotary shuttle-box-operating mechanism herein shown, consists of the cam 2, fixed on the loom's rotary shaft 3, so that it may impart reciprocatory motion to the lever 4, in order that when either of the catches 5 or 6 is made to engage with this lever 4 its respective box-lever 7 or 8 will cause its hooker 9 or 10 to rotate the shuttle-box through the medium of the peg-wheel 11, and the engagement of these catches 5 and 6 with the lever 4 is effected by the levers 12 and 13, which are caused to oscillate by the rod 14, operated by the eccentric 15, the outer ends *x* of these levers being heretofore allowed to descend directly into contact with the pattern-surface of a pattern-cylinder, which arrested them in such descent, so as to prevent their other ends *y* from causing their catches 5 and 6 to engage with the lever 4, or it allowed them to descend, so that these catches would be placed into contact with the lever 4, as the case might be. However, in connection with my invention these levers 12 and 13 have the pendent detaining-catches 16 and 17 pivotally attached to them, so that they may be controlled by the cylinder *g*, as hereinafter described, or the levers 12 and 13 and the catches 16 and 17 may be dispensed with, as shown by Fig. 11, wherein the catches 5 and 6 are directly operated by the cylinder *g*.

In Fig. 12 the drop-box mechanism, consisting of the differential levers 18 and 19, operated by the gear-cranks 20 21, through the rods 22 23, is the one shown as being suitable for controlment by my improved mechanism, the cylinder *g* in my said mechanism being arranged to select or operate the gear-cranks 20 21 through the medium of the levers 24 25, upon which they are respectively mounted, and the rods 26 27, which latter are coupled to the levers n^4 n^5, to which are attached the rods m^2 m^3, the functions of which levers n^4 n^5 and rods m^2 m^3 are identical with those of the rods *m m'* and levers *n n'*, and which are hereinafter explained, so that said gear-cranks 20 and 21 may be moved in order that by their retaining-lever 28 (to which reciprocatory motion is intermittently imparted by the cam-surface on the toothed segment 29 through the medium of the connecting-rod 29^a) they may be put into gear with one or other of the toothed segments 29 or 30, by which they are operated to move the rod 18^a, (which is coupled to the drop shuttle-boxes in the well-known manner,) through the medium of the rod 18^b and the lever 18^c, their several and varied positions being indicated by chain-lines representing the center lines of the levers.

The actions of my pattern mechanism for putting the shuttle-box into motion are as follows: When the cylinder *g* has its pattern-surface prepared to act upon the levers *d f*, as by pegs being placed in the holes *a c* or *a' c'*, on such cylinder *g* being raised against the levers *d* and *f* said pegs will come in contact with the outer ends of the levers *d f*, (into which are fixed the pins *h*,) raising said ends of these levers *d f* and depressing the other ends at *k*, so that the rods *m m'* are forced downward, overcoming the actions of gravity on the levers *n n'* (or n^2 n^3) and forcing, by their rods *o o'*, the catches 16 and 17 off their retaining-piece 31 and allowing the levers 12 and 13 (which at such time would not be held suspended by the rod 14 and its eccentric 15) to move the catches 5 and 6 as desired; or the rods *o o'* would act upon the catches 5 and 6, as shown by Fig. 11.

The rods m^2 m^3 (shown by Fig. 12) are operated by the levers *d* and *f* in the same manner as are the rods *m m'*. Thus the levers n^4 n^5 are moved in the same way as are the levers *n n'* or n^2 n^3. However, in this case the levers n^4 n^5, by their rods 26 and 27, operate the levers 24 and 25, so as to enable the presser or dividing lever 28 to force them in such direction as to bring their gear-cranks 20 and 21 into gear with their segments 29 and 30, as hereinbefore described.

It will be seen from the foregoing that more than two of these levers *d* and *f* might be employed, provided a corresponding increase in the number of rows of indicating-holes *a c* is made in the lags, although only two of such levers and their respective connecting-rods and parts are shown and described, since only a common revolving and not a skip rotary box is shown, nor is a more extensive drop-box than one with a series of four compartments referred to, because by describing my invention in connection with these simpler forms it will be more readily understood, while its carrying out in a more extensive manner only requires an increase in the number of its several parts.

The levers *d e f* are mounted upon the sliding piece *p*, which is caused to move or advance upon the bearing *q* in the direction indicated by the arrow *q'*, Figs. 2, 9, and 10, by the cam *s*, while its return movement is effected by the spring *r* through the lever *r'* and chain r^2, although such return may be controlled by the cam *s*, as is hereinafter de-

scribed. This cam *s* is intermittently rotated by the ratchet *t* through the wheel *t'*, which is fixed upon the cam-shaft *s'*, its position at each movement being secured by the spring *u* forcing the bowl *u'*, carried by the lever u^2, against the star-wheel u^3, while the ratchet *t* receives its reciprocatory motion by being mounted upon the lever *v*, pivoted at *v'* and operated by the rod v^2, which couples it to the vertical support v^3, upon which the cylinder *g* is mounted.

The vertical movement of the support v^3 (and consequently the cylinder *g*) is effected by the eccentric 15 through the rod 14 and the chain v^4, as shown by Fig. 1, or through the lever *w*, as shown by Fig. 11, while the return movement of this cylinder *g* is effected by gravity, aided by the spring *w'*, which by its actions on the lever *v* causes the rod v^2 to press the support v^3 in a downward direction, and the attachment of this rod v^2 to the support v^3 by the projecting arm v^5, in addition to its downward pressure, also tends to force its upper end, on which the cylinder *g* is mounted, in the direction indicated by the arrow *z*, by which means the piece w^2, which slides horizontally upon the bearing-shaft w^3 and in which the upper end of the support v^3 slides vertically, (see Figs. 9 and 10,) is always pressed forward, so that its antifriction-bowl w^4 is thus constantly kept in contact with the cam-surface u^4 on the star-wheel u^3. In explanation of the above-mentioned lateral movement imparted to the support v^3 it may be said that the latter loosely engages a guide near its lower end, and this guide serves as a fulcrum for the support to work upon under the impulse of the spring *w'*, the point of engagement of the rod v^2 being laterally removed from the vertical plane of the support. As the cam *s* is thus intermittently rotated the outer ends of the levers *d e f*, carrying the pins *h*, are made to advance over the pattern-cylinder *g* in successive steps, which are made to agree with the distances that the holes are from each other lengthwise their rows, the turn of rest of such cams and levers *d e f* being arranged to take place at the time of the ascent of the cylinder *g*, (the extending ends *k* of said levers *d f* being sufficiently long, so that they will not be drawn clear of the rods *m m'* in or by their said advancing movements,) so that their said outer ends are successively presented or brought into position for being operated upon by each hole in their respective rows of holes, commencing at the end *g'* of the peg-lags, traveling over it on the rows *a b c* to the other end g^2, and as regularly traveling back again along the other rows *a' b' c'*, the cylinder *g* having advanced in the direction of the arrow *z*, since the semicircular cam-surface u^4 (see Figs. 6 and 9) will have allowed it to do so at this time, notwithstanding and in addition to its continued rising and falling movements.

The lever *e*, which is referred to herein as governing or controlling the movements of the cylinder *g*, does so in a certain measure as far as regards its rotary motion, and this is effected as follows: Provided the end of the design being produced falls at any part on the pattern-surface along the series of holes *a b c*, then such pattern-surface will be prepared, as by a peg being placed in the lag, so that on the rising of the cylinder *g* the lever *e* is raised. Then the end *e'* of the lever e^2 will be raised while the end e^3 is lowered. Thus the catch e^4, which it supports, falls into contact with the projecting pin t^2 on the ratchet *t* in order that on the next movement of the lever *v* it may be lifted out of contact with its wheel *t'*, while at the same time it overcomes the resistance of the spring *u*, pulling the lever u^2 and its bowl *u'* clear of the wheel u^3. Thus the pressure of the retracting-spring *r*, now that the cam *s* is not held, forces the slide *p* back to its normal position, as shown by Fig. 9, bringing with it the levers *d e f* that it carries. On the levers *d e f* returning to the position last described the lever 33, which is also pivoted on the slide *p*, returns to its rear position, in which its inclined edge 34 is pulled over the portion of the bearing *q* which supports it. Thus it is raised, bringing with it the weighted arm 35 of the ratchet 36, (which weighted arm by gravity always tends to keep the ratchet 36 clear of the peg-wheel on the cylinder *g*,) so that this latter is brought into contact with the ratchet-wheel on said cylinder, by which means, on the cylinder again descending, it is caused to rotate to bring its next peg-lag into position. Again, provided the end of the design or pattern being woven falls upon the rows of holes *a' b' c'*, then the indicating-lever *e* will again be operated, so that the slide *p* and its levers *d e f* will be caused to continue their receding movement, but at this time will finish same at one bound and will arrive in their said normal positions, in which the lever 33 will cause the cylinder again to rotate.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder, means for laterally shifting the cylinder at predetermined times; means for intermittently rotating the same; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism, said devices including abutments overhanging the pattern-cylinder to be actuated by the pattern devices thereon under vertical movement of the cylinder; and means for intermittently varying the relative positions of the said abutments and the cylinder longitudinally of the latter.

2. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylin-

der; means for laterally shifting the cylinder at predetermined times; means for intermittently rotating the same; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism, said devices including one or more levers on a support movable in the direction of the length of the cylinder, said levers having abutments overhanging the latter and adapted to be acted upon by the pattern devices under vertical movement of the cylinder; and means for intermittently moving the lever-support.

3. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder; means for laterally shifting the cylinder at predetermined times; normally inoperative means for converting vertical into rotary movement of the cylinder; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism, said devices including one or more abutments overhanging the cylinder and carried by a support movable longitudinally of the cylinder; means for intermittently moving said support; and a shipper carried by said support and operating at one extreme of the latter's movement to render operative the means for converting reciprocating into rotary movement of the pattern-cylinder.

4. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder; means for laterally shifting the cylinder at predetermined times; normally inoperative means for converting vertical into rotary movement of the cylinder; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism said devices including one or more abutments overhanging the cylinder and carried by a support movable longitudinally of the cylinder and yieldingly impelled in one direction; means for effecting step-by-step movement of said support in both directions; pattern-actuated devices for rendering inoperative the said means for producing step-by-step movement; and a shipper carried by the said support and operating at one extreme of the latter's movement to render operative the means for converting reciprocating into rotary movement of the pattern-cylinder.

5. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder; means for laterally shifting the cylinder at predetermined times; normally inoperative means for converting vertical into rotary movement of the cylinder; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism said devices including one or more abutments overhanging the cylinder and carried by a support movable longitudinally of the cylinder and yieldingly impelled in one direction; a cam engaging said support; pawl-and-ratchet mechanism for moving said cam step by step; pattern-operated means for disconnecting said pawl-and-ratchet mechanism; and a shipper carried by the said support and operating at one extreme of the latter's movement to render operative the means for converting reciprocating into rotary movement of the pattern-cylinder.

6. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder; means for laterally shifting the cylinder at predetermined times; normally inoperative means for converting vertical into rotary movement of the cylinder; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism said devices including one or more levers overhanging the cylinder and carried by a support movable longitudinally of the cylinder; means for moving said support step by step; and a hinged arm on the support and having a cam-surface to coact with a suitable abutment on the frame of the machine, movement of said arm effecting operativeness of the means for converting reciprocatory into rotary movement of the pattern-cylinder.

7. The combination of a vertically and laterally movable rotary pattern-cylinder; means for vertically reciprocating said cylinder; means for laterally shifting the cylinder at predetermined times; normally inoperative means for converting vertical into rotary movement of the cylinder; normally-disconnected shuttle-box-shifting mechanism; devices for rendering operative said shuttle-box-shifting mechanism said devices including one or more abutments overhanging the cylinder and carried by a support movable longitudinally of the cylinder and yieldingly impelled in one direction; a cam engaging said support; pawl-and-ratchet mechanism for moving said cam step by step; locking mechanism for retaining the cam in its different positions; a lever on the movable support and arranged to be operated by the pattern devices; and means actuated by said lever for releasing the said locking mechanism and disconnecting the pawl-and-ratchet mechanism for the purpose described.

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