(No Model.)

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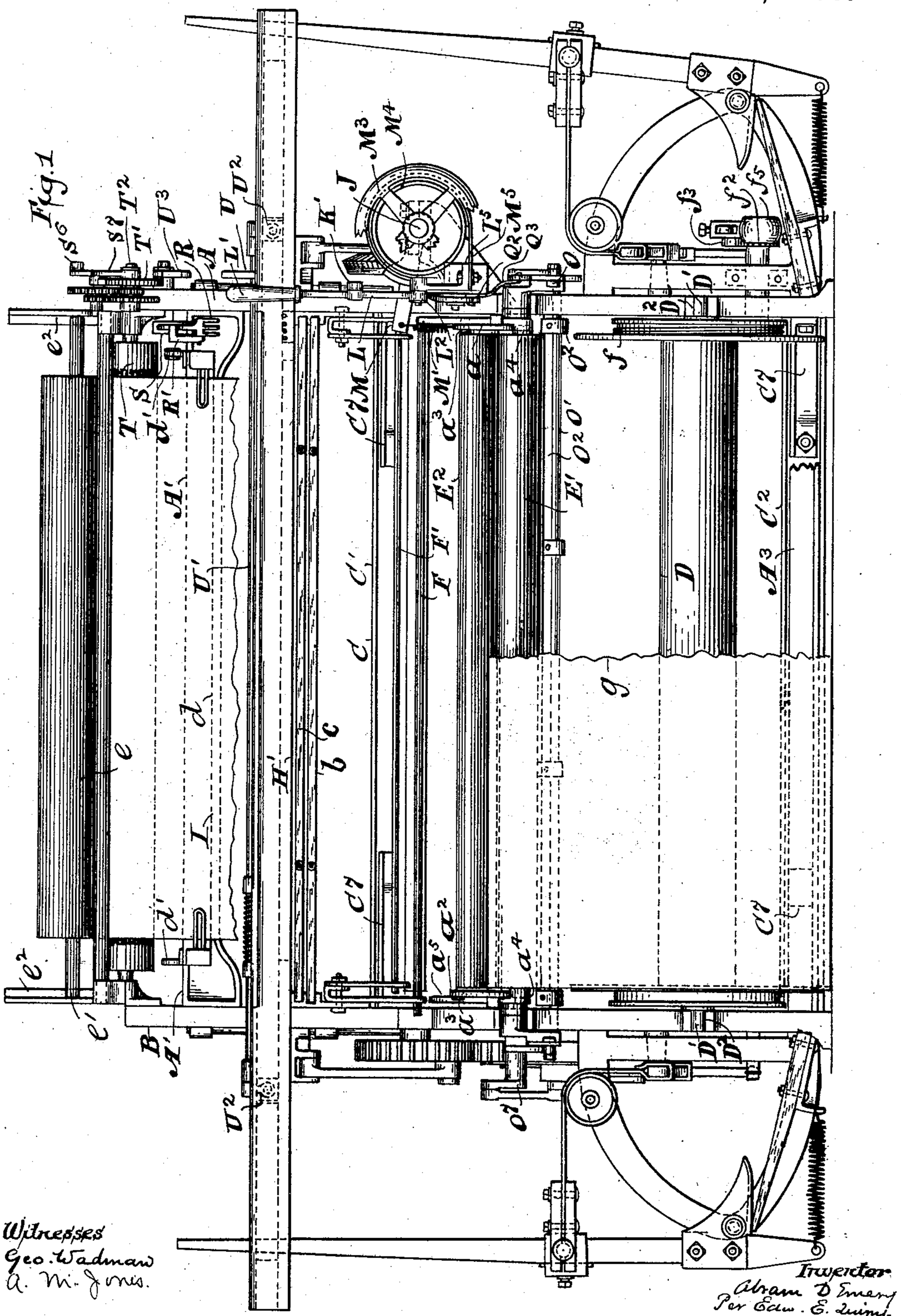
LOOM.

No. 605,603. Patented June 14, 1898.

Fig. 1



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7 Sheets—Sheet 2.

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Fig. 2.

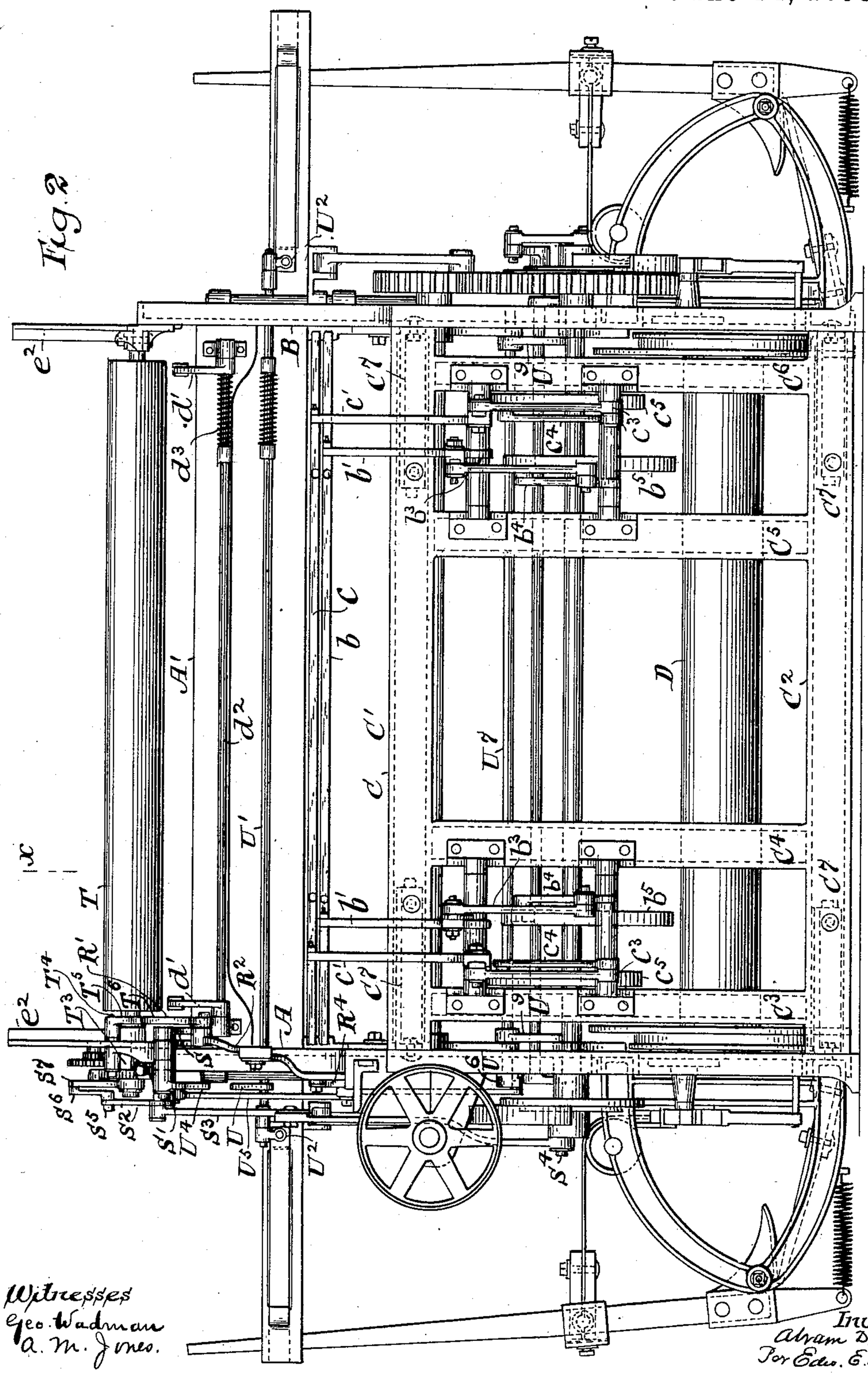

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Fig. 3

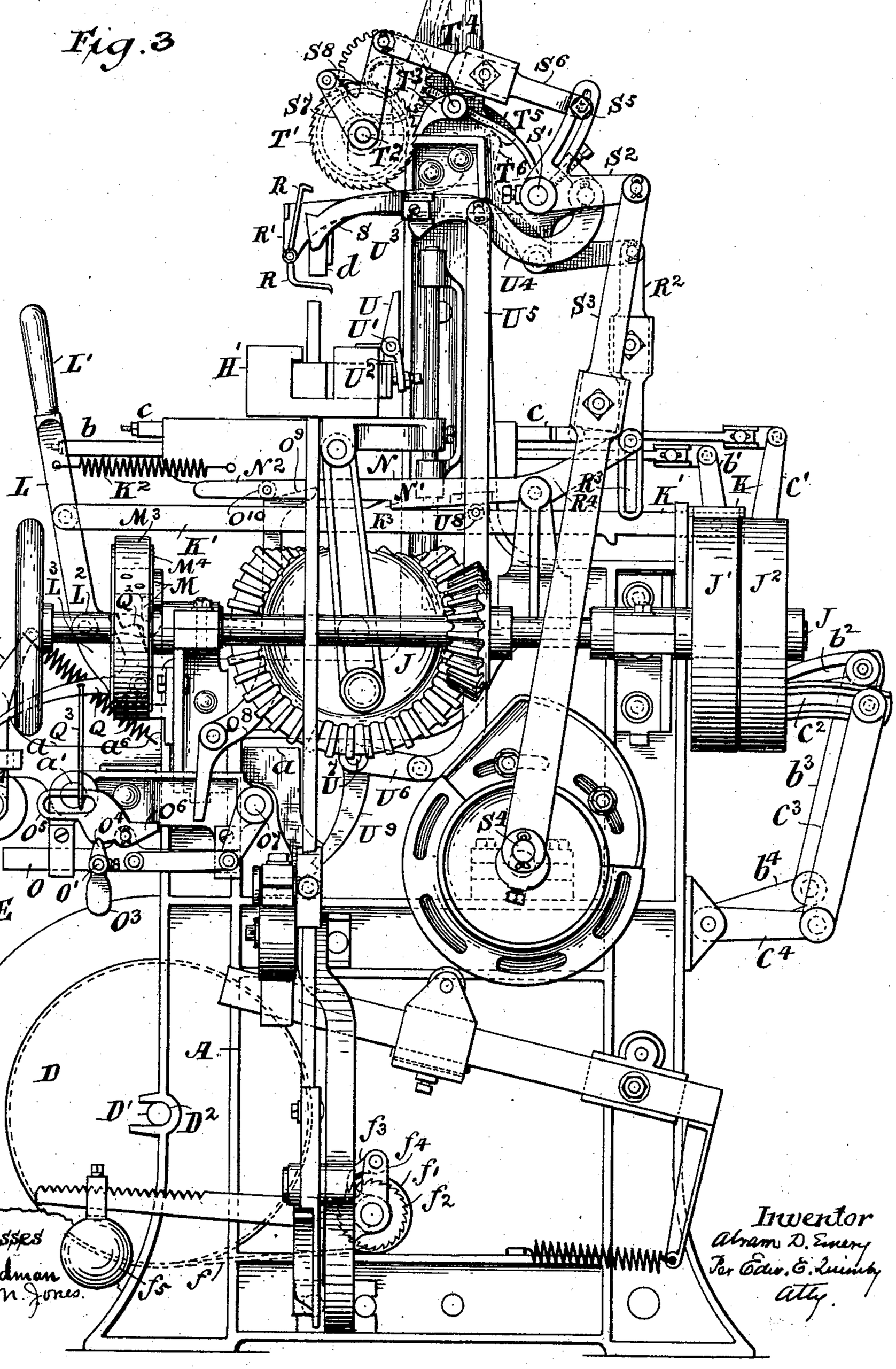

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Fig. 4

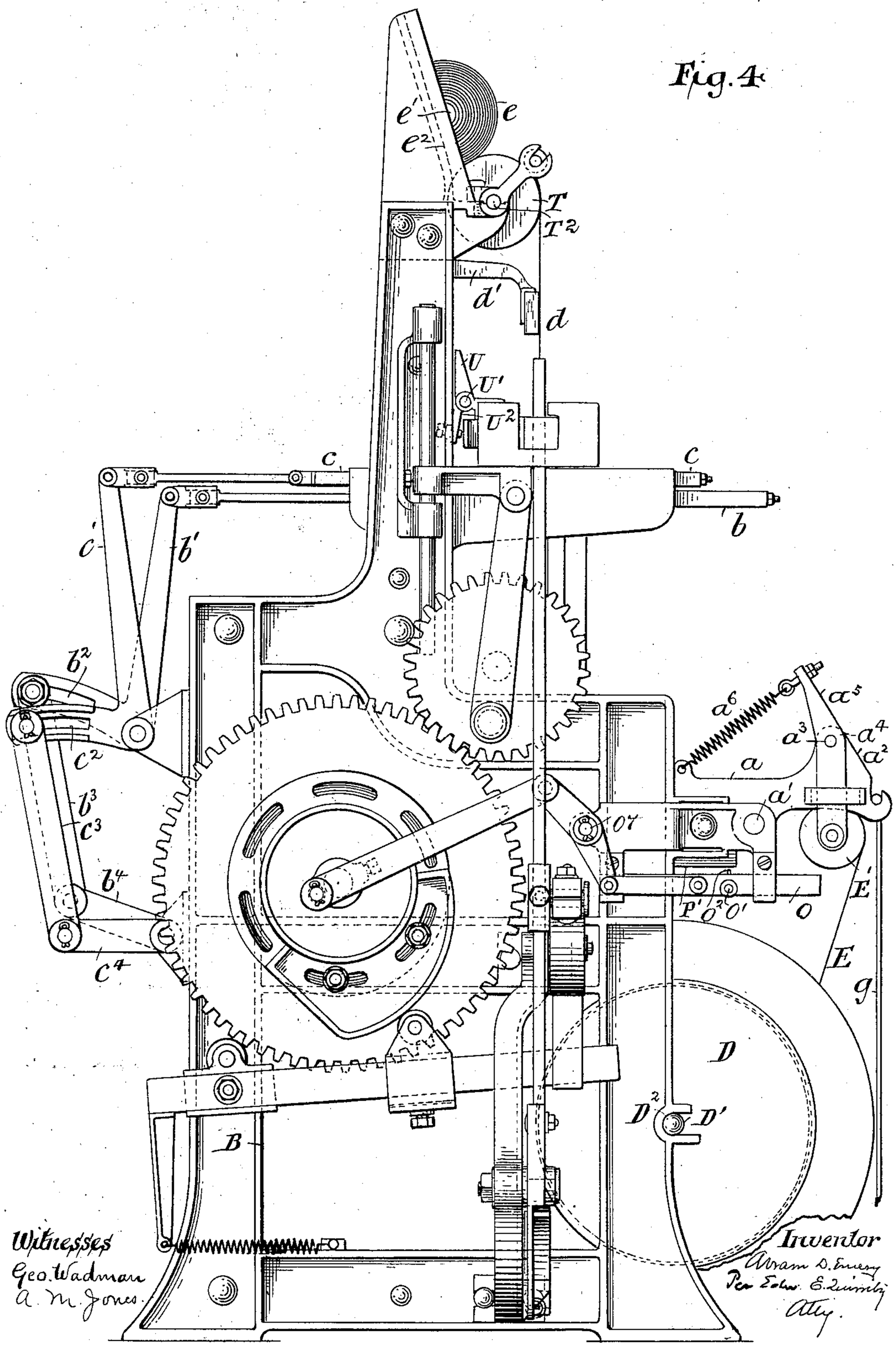

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Fig. 5

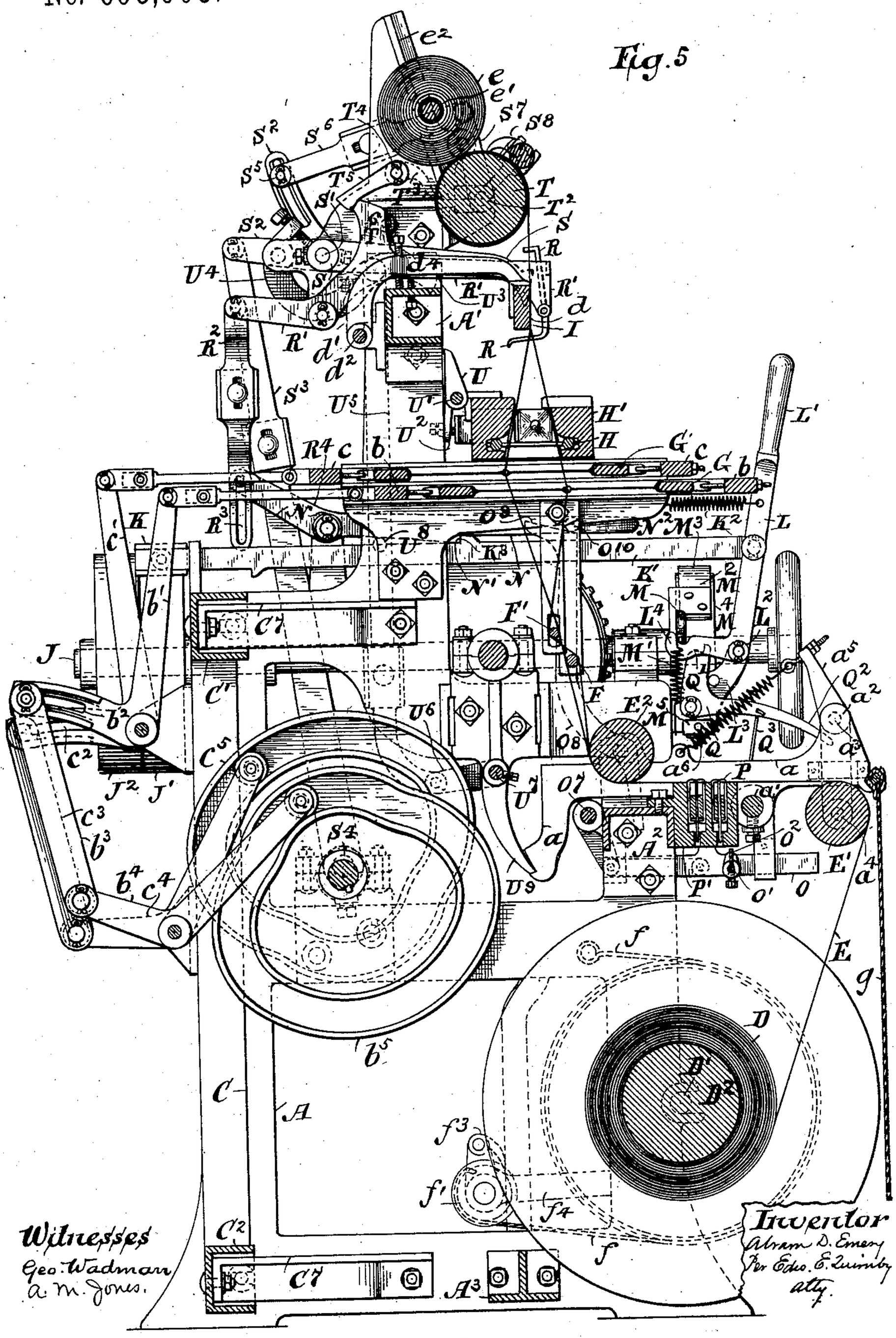

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Fig. 6

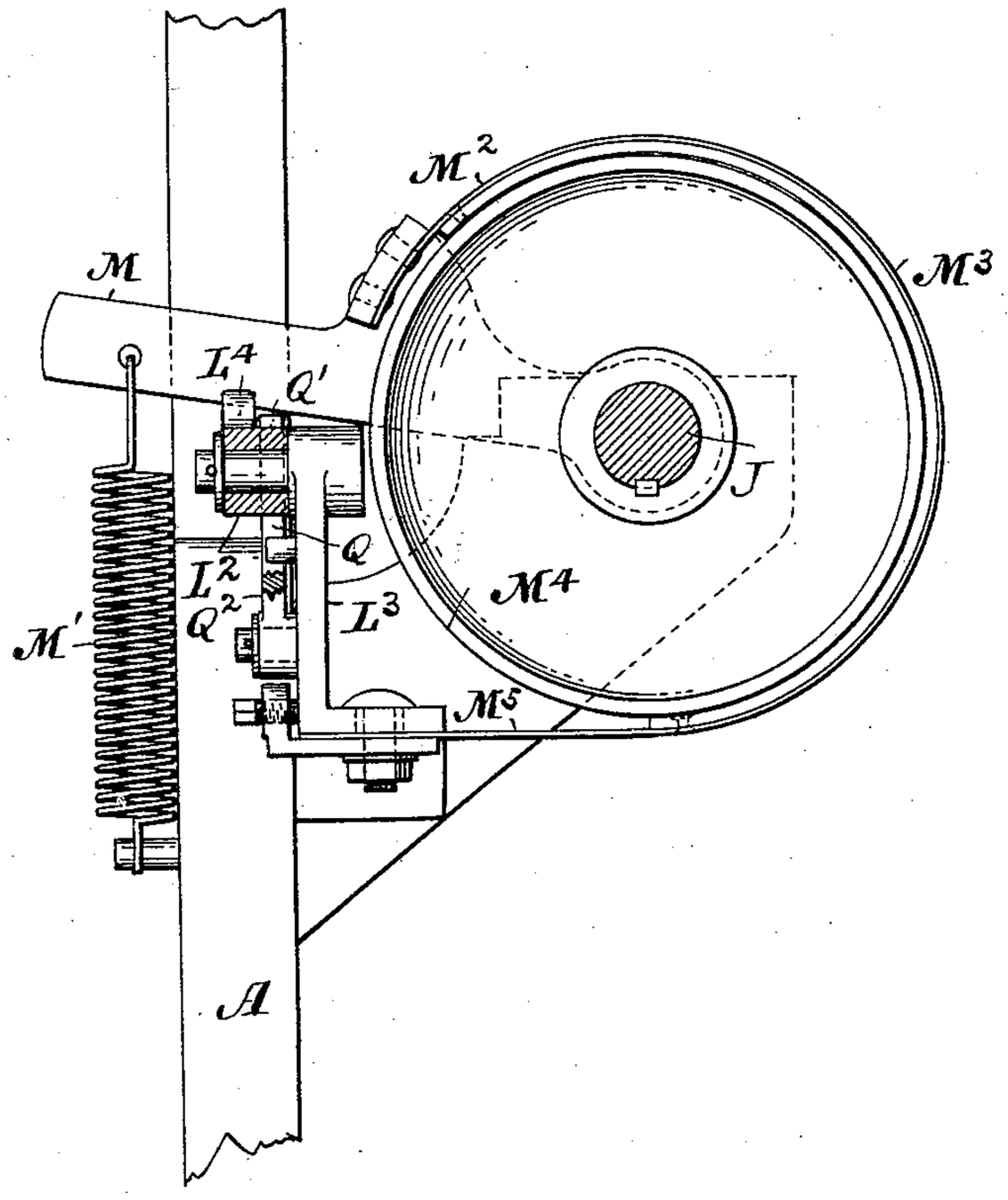

Fig. 7

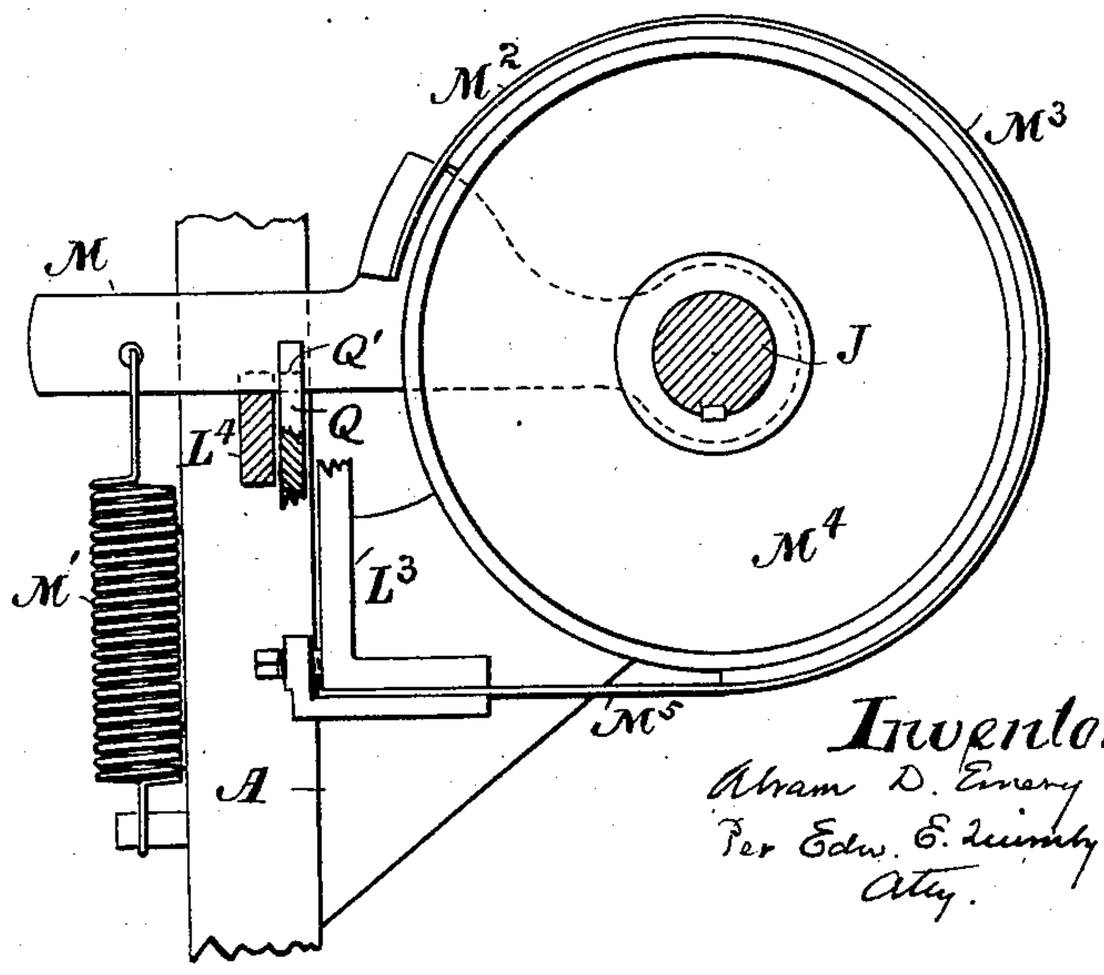

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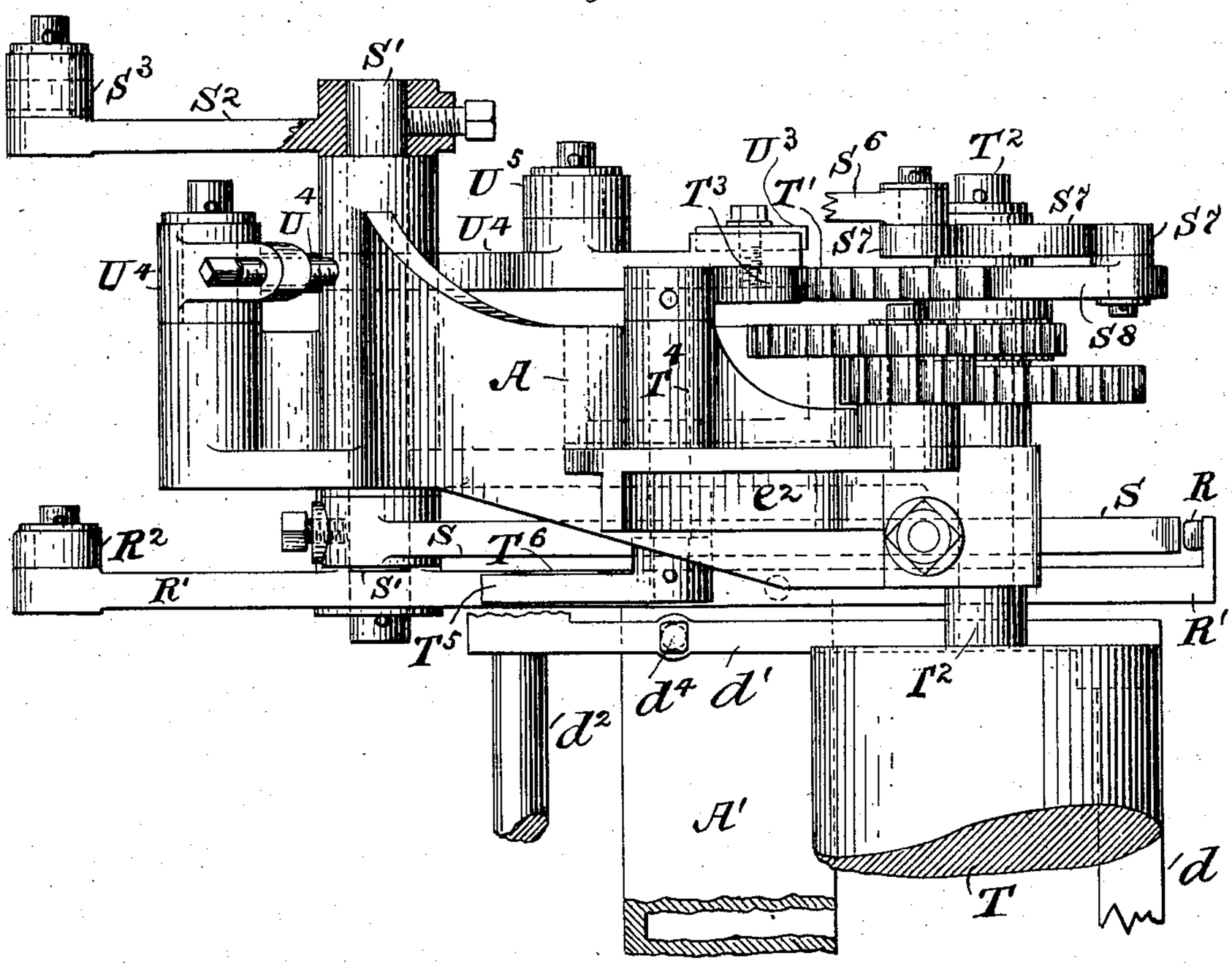
Fig. 8



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UNITED STATES PATENT OFFICE.

ABRAM D. EMERY, OF TAUNTON, MASSACHUSETTS, ASSIGNOR TO THE UNIVERSAL LOOM COMPANY, OF NEW YORK, N. Y.

LOOM.

SPECIFICATION forming part of Letters Patent No. 605,603, dated June 14, 1898.

Application filed July 3, 1897. Serial No. 643,320. (No model.)

To all whom it may concern:

Be it known that I, ABRAM D. EMERY, of Taunton, Massachusetts, have invented certain Improvements in Looms, of which the following is a specification.

These improvements, which are susceptible of being independently used, are herein shown and described as associated in a single upright loom, which by reason of its organization is especially compact, occupies but a small area of floor-space, and affords unusual freedom of access not only to all its operative parts, but also to the entire length of warp extending from the beam to the weaving-line. The warp-roll is arranged near the bottom and the take-up roll near the top on the front side of the loom, with no portion of the mechanism in front of the warp except the front bars of the harness-frames and the front rail of the lay.

The cloth-roll rests upon the take-up roll, bearing thereon along a line a little in the rear of the vertical plane of the axis of the take-up roll. The trunnions of the cloth-roll core are supported upon guide-rails which are steeply inclined and project upwardly a sufficient distance to permit the collection upon the cloth-roll core of twelve hundred yards of cloth or more, according to the quantity of warp furnished by the warp-roll. The cloth-roll is easily removed by being rolled over the take-up roll toward the front of the loom.

The weaving of a single piece of cloth of twelve hundred yards or more in length is of especial advantage when the cloth is to be printed, because it saves the loss which otherwise ensues from the necessity of sewing together end to end the smaller rolls of cloth which are commonly produced. Ordinary looms produce print-cloths in rolls of ninety yards in length, and it will be seen that fourteen of these require to be sewed together end to end to furnish a twelve-hundred-and-sixty-yard length.

The loom is furnished with a yielding breast-beam, which yields in an upward direction if the shuttle be in the shed during the beat. This device permits the fell to be unusually near the take-up and affords three advantages—to wit, first, it lessens the narrowing of the cloth; second, it prevents the bellying of the cloth, and, third, it unifies the tension of the warp-threads.

The front side of the warp-roll is shielded by a curtain, which is hung upon the outer ends of the arms of a whip-roller, hereinafter described. The required amount of tension is imposed upon the warp-roll by the usual rope fastened at one end to the frame of the loom, extending therefrom around the hub of the warp-roll, and having its opposite or free end connected with an adjustably-weighted lever. In the present case the free end of said rope is fastened to a drum, loosely mounted upon the shaft of which is an adjustably-weighted lever having a pawl-and-ratchet connection with the drum for the purpose of winding or unwinding the said rope, and thereby compensating for considerable variations in the length of the rope due to changes in the hygrometric conditions of the atmosphere.

The harnesses are driven from the rear of the loom by motions transmitted from the cam-shaft through connections susceptible of adjustment in such wise as to vary the length of throw of the harnesses as may be desired.

The loom is provided with a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and with this stopping instrumentality there are combined one or more stop-motions for automatically tripping said stopping instrumentality into action at a predetermined stage or stages in the revolution of the lay-driving shaft, whereby the loom is stopped with its operating parts in prescribed positions, according to which one of the several stop-motions is brought into operation. Thus if a warp-thread breaks the warp stop-motion performs its tripping function at such a stage in the revolution of the lay-driving shaft as will result in causing the loom to stop with the shed closed, which is the most convenient position for tying up the broken ends.

If the weft-thread breaks or gives out, the weft stop-motion performs its tripping function at such a stage in the revolution of the

lay-driving shaft as will result in stopping the loom with the shed open and with the shuttle in the off box, which is the most convenient position for supplying a new bobbin to the shuttle and readjusting the weft-thread preparatory to restarting the loom. Similarly when the shuttle falls a little short of getting fully home in the box the shuttle stop-motion performs its tripping function at such a stage in the revolution of the lay-driving shaft as results in causing the loom to stop with the shed open; but if the shuttle stops in the shed the loom will be made to come to rest just after the lay has commenced to descend. With the shuttle stop-motion there is combined a whip-roller which normally holds the warp under tension, but which is tripped when the shuttle stop-motion is brought into action, and thereby slacks the warp so extensively that even if the shuttle should be in the shed while the loom is coming to rest there would be no breaking of the warp-threads. These three stop-motions are respectively the subjects of pending applications, Serial Nos. 614,421, 624,113, and 624,384; but they are herein shown and to the necessary extent described because of their common connection with the progressively-acting stopping instrumentality referred to, as the result of which when the loom is automatically stopped its operative parts are in each case brought to rest in the best attainable position for correcting the cause of the stoppage and restarting the loom. There are also some incidental features of usefulness which will be more conveniently pointed out in the subjoined detailed description.

The accompanying drawings of an upright loom embodying an illustration of the invention are as follows:

Figure 1 is a front elevation. Fig. 2 is a rear elevation. Fig. 3 is a right-hand end elevation. Fig. 4 is a left-hand end elevation. Fig. 5 is a transverse vertical section taken through the plane indicated by the dotted line $x\,x$ on Fig. 1. Fig. 6 is a side elevation of the brake-wheel and adjacent parts, showing the brake-strap out of action. Fig. 7 is a similar elevation showing the brake-strap in action. Fig. 8 is a top view of parts of the take-up and weft stop mechanisms.

The drawings represent an upright loom having its operative parts erected upon two end standards A and B, united to each other by the girders A′, A^2, and A^3 and by the rear standard C. The standard C is composed of two horizontal members C′ and C^2 and four vertical members C^3, C^4, C^5, and C^6. The extremities of the horizontal members C′ and C^2 are bolted to the standards A and B, respectively. Great rigidity is imparted to the frame as a whole by means of four diagonal braces C^7 C^7 C^7 C^7, bolted, respectively, to the horizontal members C′ and C^2 of the rear standard and to the adjacent parts of the standards A and B. The said diagonal braces are all indicated in dotted lines in Fig. 2, and some of them are shown in solid lines in Figs. 1 and 5.

The warp-roll D is provided with the trunnions D′, adapted to be seated in the notched bearings D^2, formed in the front edges of the lower parts of the standards A and B. The warp E is led upwardly from the warp-roll around the front side and over the top of the whip-roller E′, thence rearwardly under the bottom and around the rear side of the whip-roller E^2, thence upwardly across the lease-rods F F′, through the harnesses G G′ and the reed H of the vertically-reciprocating lay H′ to the weaving-line I.

The loom is driven by the transverse shaft J, provided with the fixed pulley J′ and the loose pulley J^2. The position of the driving-belt with relation to the said pulleys J′ and J^2 is governed by the belt-shifter K, which suitably engages the belt and is connected to the rear end of the horizontal shifter-bar K′, the front end of which is pivoted to the starting-lever L. A contracting spiral spring K^2 is secured at one end to the starting-lever L and at its opposite end to the frame of the loom. The starting-lever L has at its upper end the handle L′ and at its lower end the hub L^2, which is pivotally supported upon the bracket L^3, affixed to the loom-frame. A lifting-toe L^4, projecting radially from the hub L^2, engages the free end of a radius-arm M, which is normally held under a downward strain by the contracting spiral spring M′, connected at its lower end to the frame of the loom.

The radius-arm M is loosely mounted on the driving-shaft J and has connected to it the movable end M^2 of the brake-strap M^3, which surrounds about three-quarters of the periphery of the brake-wheel M^4, affixed to the driving-shaft J, and has its opposite end M^5 secured to the frame of the loom. When the starting-lever L is thrown outward into the position in which it is represented in Fig. 5, the radius-arm M is swung upward, and the brake-strap M^3 is thereby held clear of the brake-wheel M^4.

The parts are maintained in running position by means of the master trip-lever N, which is pivoted to the frame of the loom and provided upon the under edge of its longer arm with the shoulder N′, adapted to catch against a similar shoulder K^3, formed upon the top of the shifter-bar K′. When thus caught, the longer end of the master trip-lever N acts as a strut which holds the belt-shifter in its forward position.

The master trip-lever N is provided at the forward end of its longer arm with a handle N^2, by means of which it may be manually swung upward out of engagement with the shifter-bar, thereby releasing the shifter to the influence of the spring K^2, which by pulling the starting-lever L backward operates to shift the driving-belt from the fixed pulley J′ to the loose pulley J^2 and concurrently releases the brake-strap M^3 to the influence of

the contracting spring M′. Whenever the master trip-lever is tripped, the brake-strap M^3 is tightened around the brake-wheel M^4, in part by the pull of the contracting spring M′ and in part by the frictional influence upon the brake-strap of the periphery of the brake-wheel, which when the loom is running rotates in such direction as to make that frictional influence, when the brake-strap is in contact with the brake-wheel, tend to pull the brake-strap away from its fixed end M^5. The brake-strap is therefore self-tightening and is so effective that by suitably adjusting the tension of its spring M′ it can be depended upon in every case to bring the operating parts of the loom to rest without any jam solely by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and hence to bring the loom to rest with the operative parts in different positions, according to the stage in the revolution of the lay-driving shaft at which the master trip-lever is tripped. The warp stop-motion shown embraces a horizontally-reciprocating frame O, in which is loosely mounted a horizontal shaft O′, carrying a feeler-blade O^2, which is normally held in an upright position by the gravity of a weighted arm O^3, affixed to one end of the shaft O′. The upper extremity O^4 of the weighted arm O^3 is adapted to engage a notch in the heavier end O^5 of the dog O^6, pivotally mounted upon one side of the frame O.

The frame O is reciprocated by means of crank-and-pitman connections with the rock-shaft O^7, having a constant rocking movement imparted to it by crank-and-pitman connections with the cam-shaft of the loom, which, as is usual, rotates at one-half the speed of the lay-driving shaft.

Warp stop-pins P are suspended, respectively, upon the threads of the section of warp extending from the whip-roller E′ to the whip-roller E^2.

During the reciprocating movement of the frame O, when the loom is running normally, the upper edge of the feeler-blade O^2 traverses a horizontal plane immediately beneath the pin guide-bar P′, which is affixed to the frame of the loom and is provided with appropriate perforations to serve as guides for the warp-pins. If a warp-thread breaks, its pin drops down, so that its lower end intersects the path of movement of the feeler-blade and by collision therewith rocks the shaft O′, and thereby disengages the upper extremity O^4 of the weighted arm O^3 from the heavier end O^5 of the dog O^6, whereupon the heavier end O^5 falls and the dog O^6 is swung upward, so that during the next backward excursion of the frame O it will be carried into collision with the lower arm of the bell-crank lever O^8, pivoted to the frame of the loom. By such collision upward movement is imparted to the upper extremity O^9 of the bell-crank lever, which by bearing upon the under side of the pin O^{10}, affixed to the master trip-lever N, operates to trip the master trip-lever N and thus stop the loom.

The parts are so timed that a collision of the dog O^6 with the lower arm of the bell-crank lever O^8 can only take place when the lay is half-way down, and as the brake operates to stop the loom during the next ensuing half-revolution of the lay-driving shaft it results that the parts come to rest with the lay half-way up and the shed closed.

Provision is made for holding the brake out of action in case it be desired to work the loom by hand. This is effected by means of the manually-operated bell-crank lever Q, pivoted to the frame. A portion Q′ of the upper end of the shorter arm of the bell-crank lever is cam-shaped, so that when the handle Q^2 of the bell-crank lever is raised it will push upward the free end of the radius-arm M, to which the loose end of the brake-strap is attached.

Preparatory to starting the loom the dog O^6 must be restored to its normal position. This is conveniently effected by means of a link Q^3, connecting the handle Q^2 with the heavier end O^5 of the dog O^6. Hence when the handle Q^2 is lifted the shaft O′ is permitted to rock into its normal position under the influence of the weighted arm O^3, the upper extremity O^4 of which thereupon seats itself in the notch on the under edge of the heavier end O^5, and thus resumes its normal function of holding the dog O^6 out of operative position.

The weft stop-motion shown embraces the weft-fork R, carried upon the front end of a lever R′, pivotally mounted upon the frame and having its rear extremity pivotally connected with a pitman R^2, the lower part of which is provided with a slot R^3, engaging a pin projecting laterally from the end of the inclined shorter arm R^4 of the master trip-lever N. Adjacent to the lever R′ is another lever S, which is secured to one end of a rock-shaft S′, having its bearing in a bracket affixed to the standard A of the loom. At its opposite end the rock-shaft S′ has affixed to it a bell-crank lever S^2, and the lever S is constantly vibrated by means of a pitman S^3, connecting one arm of the bell-crank lever S^2 with the crank-pin S^4, projecting outwardly from the face of one of the picker driving-cams.

If a weft-thread is absent when the lay ascends, the weft-fork is permitted to remain in such position that its hooked upper extremity catches upon the forward end of the constantly-vibrating lever S, as a result of which the front end of the lever R′ is lifted and its rear end depressed. The downward motion of the rear end of the lever R′ is communicated by the pitman R^2 to the extremity of the shorter arm R^4 of the master trip-lever N, which is thereby tripped. The timing of the parts in this case is such that the loom is brought to rest with the shed open and with the shuttle in the off box of the lay.

Motion to operate the take-up roll is de-

rived from the bell-crank lever S^2, one of the arms of which is slotted for the purpose of carrying a radially-adjustable pin S^5 for connection with one end of the pitman S^6, the opposite end of which is pivoted to the longer arm of a bell-crank lever S^7, loosely mounted upon the shaft of the take-up roll T. The shorter arm of said bell-crank lever carries a driving-pawl S^8, which during its acting stroke engages the teeth of a ratchet-wheel T', affixed to the shaft T^2 of the take-up roll. The take-up roll is normally prevented from turning backward by a stop-pawl T^3, affixed to a rock-shaft T^4, provided with a gravity-arm T^5, the weight of which tends to keep the stap-pawl in engagement with the ratchet-wheel T'. When the lever R' is brought into operation to stop the loom, an arm T^6, projecting outwardly therefrom, lifts the said gravity-arm T^5, and thereby disengages the stop-pawl T^3 from the ratchet-wheel T', and thus leaves the take-up roll free to turn backward during the reverse stroke of the driving-pawl S^8.

The shuttle stop-motion embraces the dagger U, affixed to and projecting upwardly from the rock-shaft U', mounted upon the rear side of the lay. A torsion-spring applied to the shaft U' tends to swing the upper extremity of the dagger backward. The rear wall of each box is provided with a yielding check-piece which, if the shuttle boxes properly, presses outwardly against an adjacent radius-arm U^2, projecting downwardly from the dagger rock-shaft U', and thereby rocks the upper end of the dagger forward.

If the shuttle fails to reach its place in either of the boxes, the dagger rock-shaft is not thus rocked, and the dagger U then inclines so far backward that during the latter part of the upward excursion of the lay the dagger catches under the shoulder U^3 near the free end of the lever U^4, the opposite end of which is pivotally mounted upon the frame. The lever U^4 has pivotally connected with it the upper end of the pitman U^5, the lower end of which is pivoted to the radius-arm U^6, affixed to the horizontal rock-shaft U^7, provided with suitable bearings in the frame of the loom. A pin U^8, projecting laterally from the pitman U^5, extends under and operates to trip the master trip-lever N whenever the dagger U pushes up the lever U^4.

The rock-shaft U^7 has affixed to it near each end a radially-projecting tooth U^9, the extremity of which normally bears against a shoulder formed upon the rear end of the adjacent side arm a of the whip-roller frame. The said frame is composed of two parallel arms $a\ a$, extending transversely across and affixed to the rock-shaft a', having its bearings in the frame of the loom. The forward ends of the arms $a\ a$ are provided with standards $a^2\ a^2$, having studs $a^3\ a^3$, which afford the bearings for levers $a^1\ a^1$. The lower ends of the levers $a^1\ a^1$ afford the bearings for the whip-roller E'. The upper ends $a^5\ a^5$ of the levers $a^1\ a^1$ are connected by means of contracting spiral springs $a^6\ a^6$ with rearward parts of the whip-roller frame. The rearward portions of the side arms $a\ a$ afford the bearings for the whip-roller E^2.

The effect of the contracting spiral springs $a^6\ a^6$ is to administer a moderate yielding tension to the section of warp between the two whip-rollers. Whenever the shuttle stop-motion is brought into operation, the teeth U^9 are tripped out of engagement with the rear ends of the side arms a of the whip-roller frame, and the whip-roller frame is thus freed, so that its rear end can rock upwardly and its forward end downwardly, which so extensively slackens the warp that there will be no breaking of the warp-threads even if the shuttle be in the shed at the instant when the beat takes place.

The harness-frames b and c are reciprocated, respectively, by their link connections with the longer arms of the bell-crank levers $b'\ c'$. The shorter arms of these levers are provided with the slots b^2 and c^2, as shown, to permit of radial adjustment of the pivot, by which they are respectively connected to the upper ends of the links $b^3\ c^3$, the lower ends of which are pivotally connected to the shorter arms of the bell-crank levers $b^4\ c^4$, the longer arms of which carry the cam-pins for engaging the cam-grooves in the harness-cams $b^5\ c^5$, respectively. It will be perceived that there are thus incorporated in the connections between the harness-cams and the harness-frames devices for varying the ranges of throw of the harnesses, which may sometimes be required.

The breast-beam d is carried upon the free ends of suitably-curved arms $d'\ d'$, which are affixed to the rock-shaft d^2, having its bearings in boxes affixed to the rear side of the girder A'.

A torsion-spring d^3 is so applied to the rock-shaft d^2 as to press the breast-beam downward as far as is permitted by the adjusting-bolts d^4, which are inserted vertically through the arms $d'\ d'$. This device allows the breast-beam to yield in an upward direction if the shuttle is caught and permits the weaving-line to be in unusually close proximity to the take-up roll.

The cloth-roll e is chiefly supported upon the take-up roll, its bearing thereon being along a line parallel with and slightly in the rear of the vertical plane of the axis of the take-up roll. The trunnions e' of the cloth-roll bear upon the front faces of the steeply-inclined elongated guide-rails $e^2\ e^2$, which are erected upon the top of the loom-frame and are of unusual length in order to permit the formation of a cloth-roll containing twelve hundred yards or more of cloth. Such cloth-roll, notwithstanding its unusually large size, occupies a position in which it is entirely out of the way of the operator of the loom and

from which it can easily be removed by being rolled forward over the top of the take-up roll.

The rope *f* for administering friction to the let-off has one end fastened to the frame and is wound around the hub of the warp-roll in the usual way and has its other end fastened to and adapted to be wound around a drum *f'*. A ratchet-wheel f^2 is affixed to the drum and is engaged by a pawl f^3, pivoted upon the upper end of the shorter arm of a bell-crank lever f^4, loosely mounted upon the shaft of the drum *f'*. The longer arm of the said bell-crank lever is notched upon its upper surface to provide for the radial adjustment thereon of the weight f^5, by which tension is administered to the friction-rope *f*.

By means of the pawl-and-ratchet connection of the bell-crank lever f^4 with the drum considerable variations in the length of the rope *f*, such as may arise from different hygrometric conditions, can readily be compensated for by appropriately operating the bell-crank lever so as to either take up or slack off the rope *f*, as the case may require, and leave the longer arm of the bell-crank lever occupying such a position as will suitably hold the weight f^5 above the floor.

The outer side of the warp-roll is shielded by the curtain *g*, which is suspended from the front of the whip-roller frame, as shown.

What is claimed as the invention is—

1. In a loom, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, in combination with a stop-motion for automatically tripping said stopping instrumentality into action at a predetermined stage in the revolution of said lay-driving shaft, whereby the loom is stopped with its operating parts in prescribed positions.

2. An upright loom having a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and a stop-motion adapted to trip said stopping instrumentality into action at a predetermined stage in the revolution of said lay-driving shaft, whereby the loom is stopped with its operating parts in prescribed positions.

3. In a loom, a plurality of stop-motions, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and connections common to all of said stop-motions for tripping said stopping instrumentality into action at predetermined stages in the revolution of said lay-driving shaft.

4. In a loom, a warp stop-motion, a weft stop-motion, a shuttle stop-motion and warp-slacking mechanism controlled by said shuttle stop-motion, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and connections common to said warp stop, shuttle stop and weft stop motions, whereby the said stopping instrumentality is automatically tripped into action at predetermined stages in the revolution of said lay-driving shaft, as and for the purposes set forth.

5. In a loom, a warp stop-motion, a shuttle stop-motion, warp-slacking mechanism controlled by said shuttle stop-motion, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and connections common to said warp stop and shuttle stop motions, whereby the said stopping instrumentality is automatically tripped into action at predetermined stages in the revolution of said lay-driving shaft, as and for the purposes set forth.

6. In a loom, a warp stop-motion and a weft stop-motion, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and connections common to said warp stop and weft stop motions, whereby the said stopping instrumentality is automatically tripped into action at predetermined stages in the revolution of said lay-driving shaft, as and for the purposes set forth.

7. In a loom, a shuttle stop-motion, warp-slacking mechanism controlled by said shuttle stop-motion, and a weft stop-motion, a progressively-acting spring-actuated stopping instrumentality adapted to bring the operating parts of the loom to rest by its progressive action during a prescribed part of a single revolution of the lay-driving shaft, and connections common to said shuttle stop and weft stop motions, whereby the said stopping instrumentality is automatically tripped into action at predetermined stages in the revolution of said lay-driving shaft, as and for the purposes set forth.

8. In a loom, a lay and a yielding breast-beam adapted to be moved in the direction of the beat-up.

9. In a loom, a lay, a yielding breast-beam adapted to be moved in the direction of the beat-up, and means for limiting the range of movement of the said breast-beam toward the lay.

10. In a loom employing a warp stop-motion and a self-tightening spring-actuated brake-strap, substantially such as described; a manually-operative lever for releasing said brake-strap from the brake-wheel; a link connecting said lever with a part of said warp stop-

motion, whereby when the said lever is lifted to release the brake-strap, the warp stop-motion is concurrently adjusted in position to be brought into operation if a warp-thread breaks after the loom has been again started.

11. In a loom, in combination with the warp-roll, a rope secured at one end to the frame and wound around the hub of the warp-roll; a windlass to which the other end of said rope is affixed, and an adjustably-weighted lever having a pawl-and-ratchet connection with said windlass, as and for the purposes set forth.

ABRAM D. EMERY.

Witnesses:
W. R. BURNHAM,
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