No. 637,675. Patented Nov. 21, 1899.

S. SEWALL.

WARP STOP MOTION MECHANISM FOR LOOMS.

(No Model.) (Application filed Apr. 22, 1897.) 5 Sheets—Sheet 1.

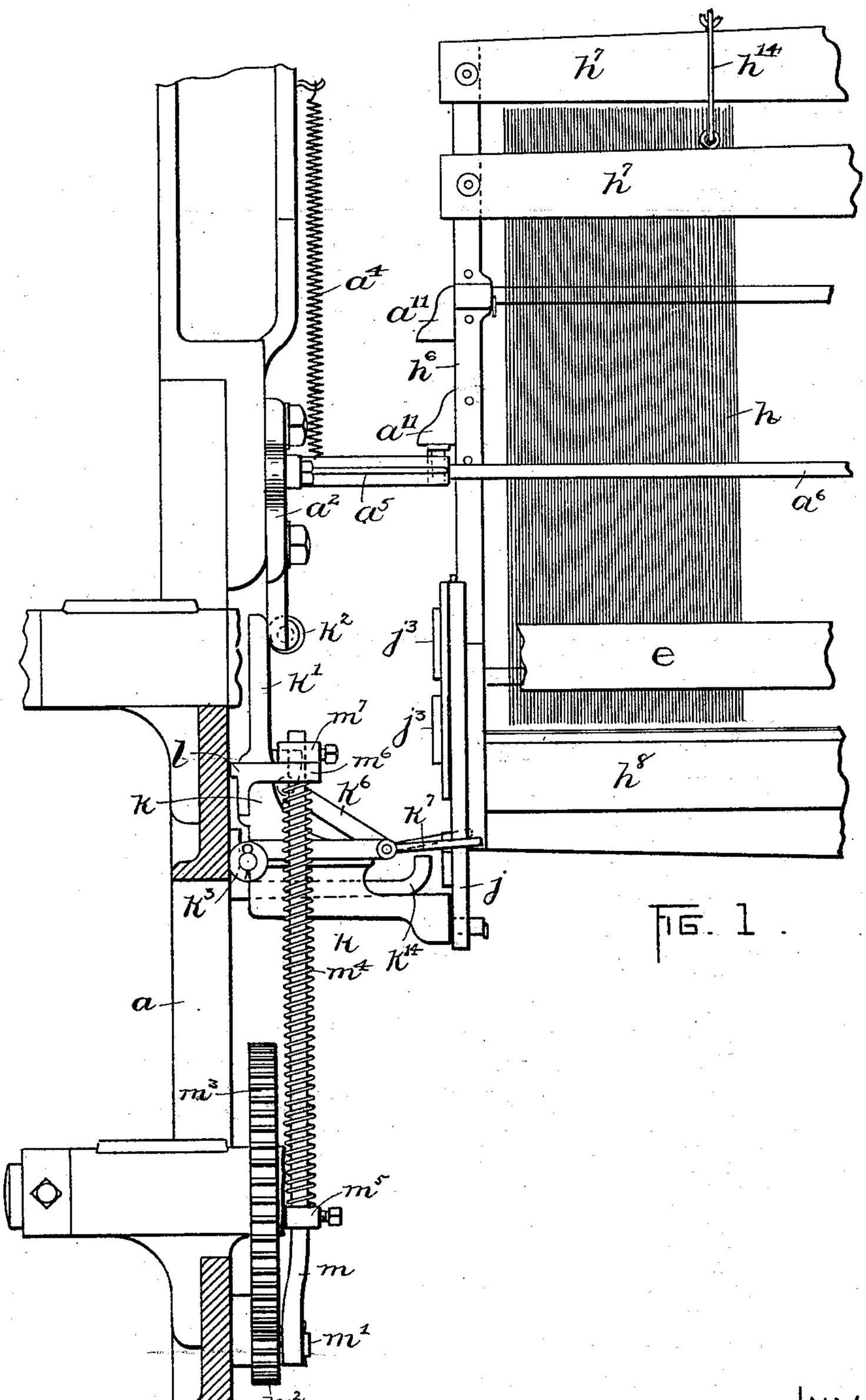

FIG. 1.

WITNESSES:
A. D. Harrison.
P. W. Pezzetti.

INVENTOR:
Samuel Sewall
by Wright Brown & Quinby
Attys.

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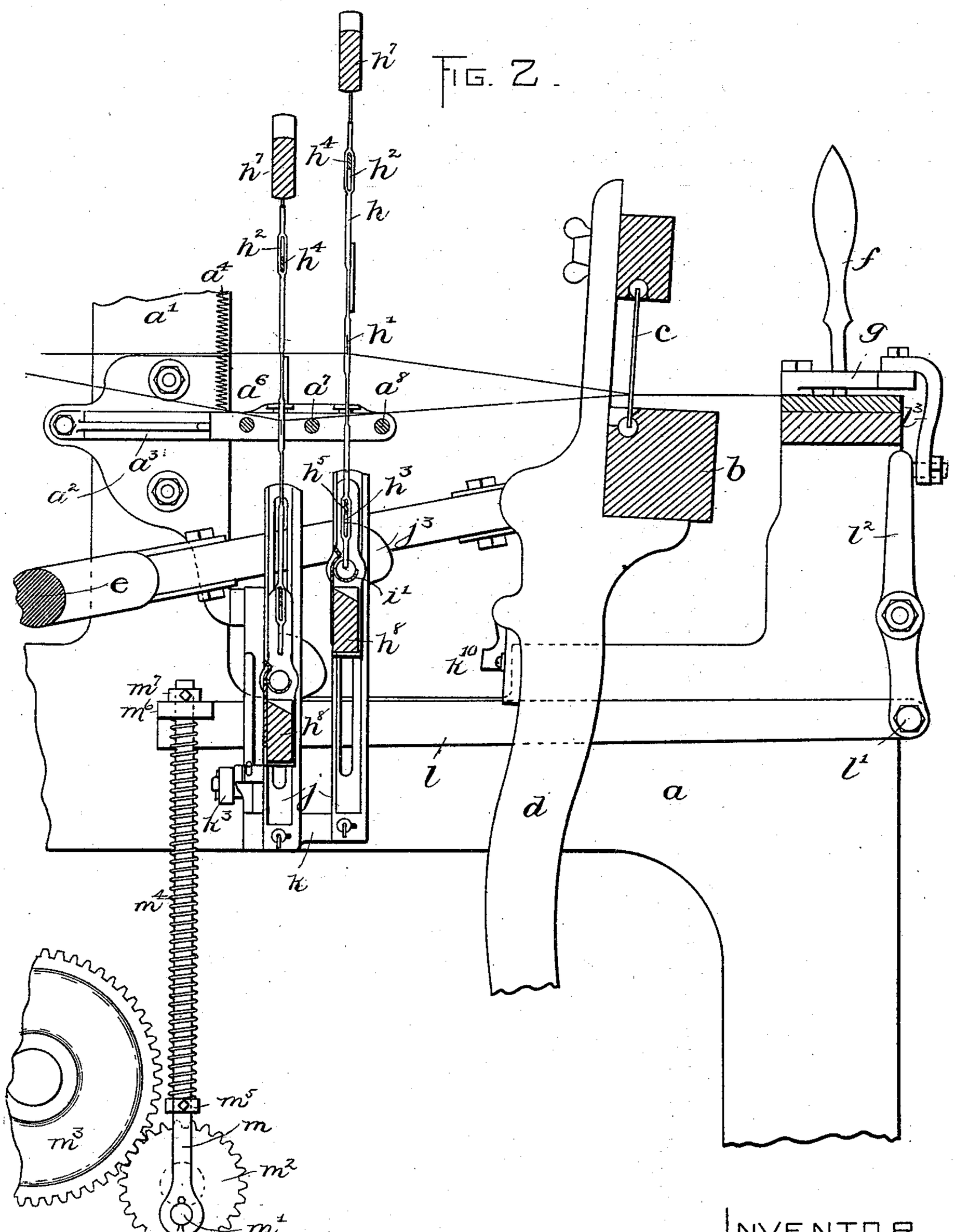
WARP STOP MOTION MECHANISM FOR LOOMS.

(No Model.) (Application filed Apr. 22, 1897.) 5 Sheets—Sheet 2.

FIG. 2.



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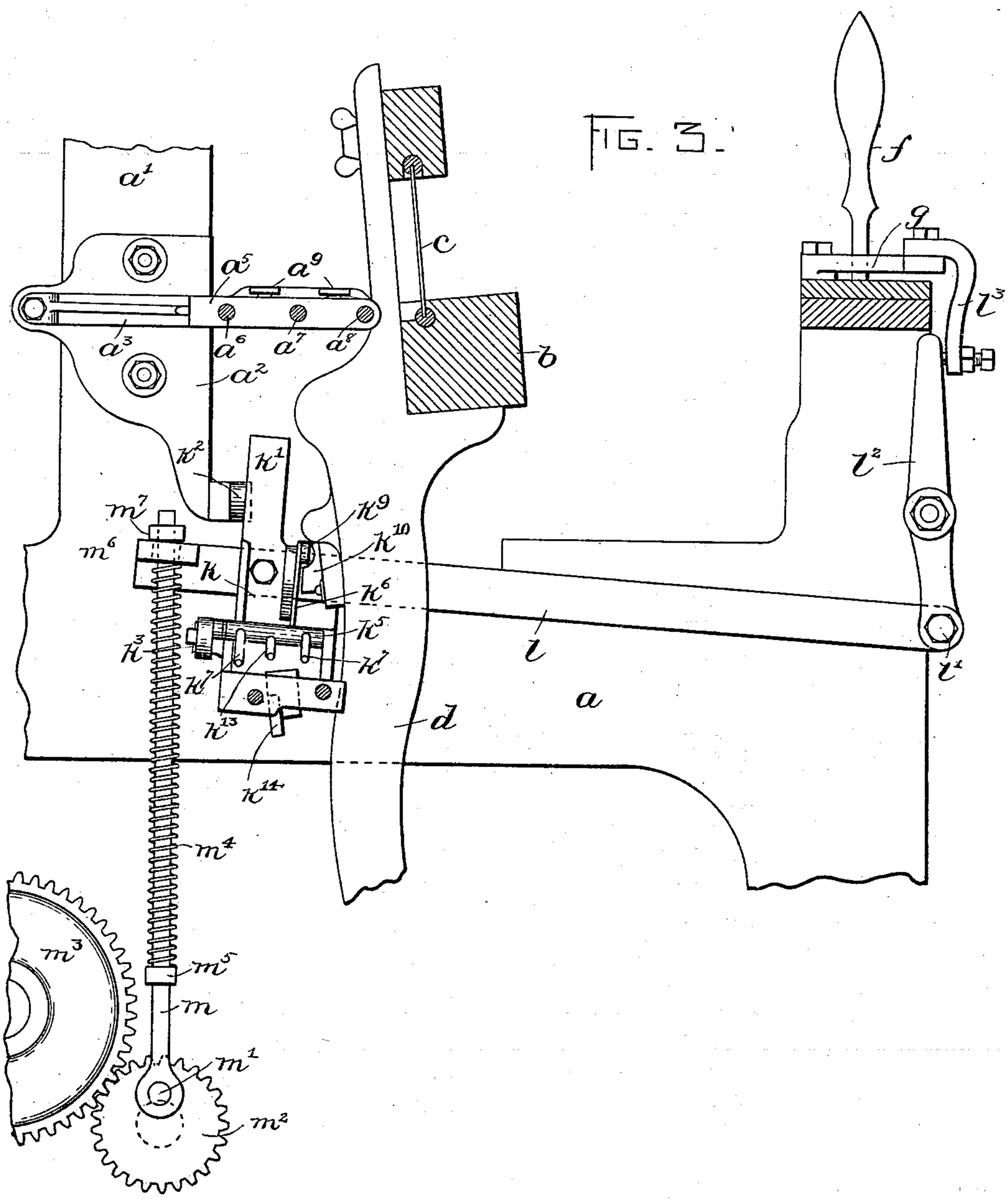
5 Sheets—Sheet 3.

FIG. 3.



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(No Model.) 5 Sheets—Sheet 4.

FIG. 8.

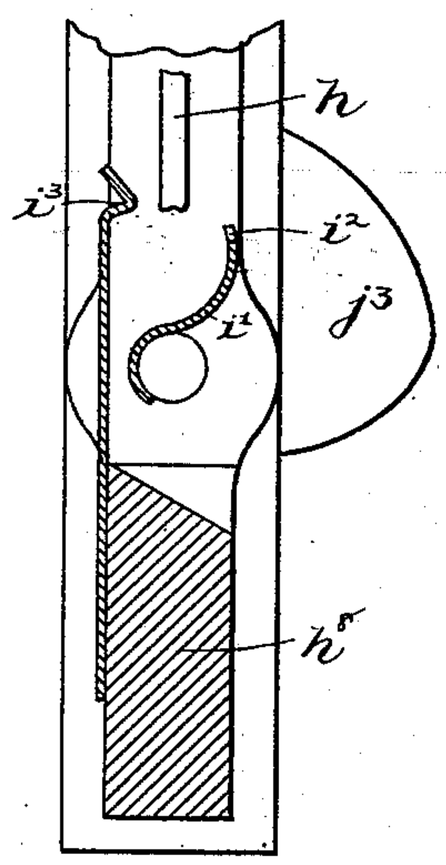

FIG. 4.

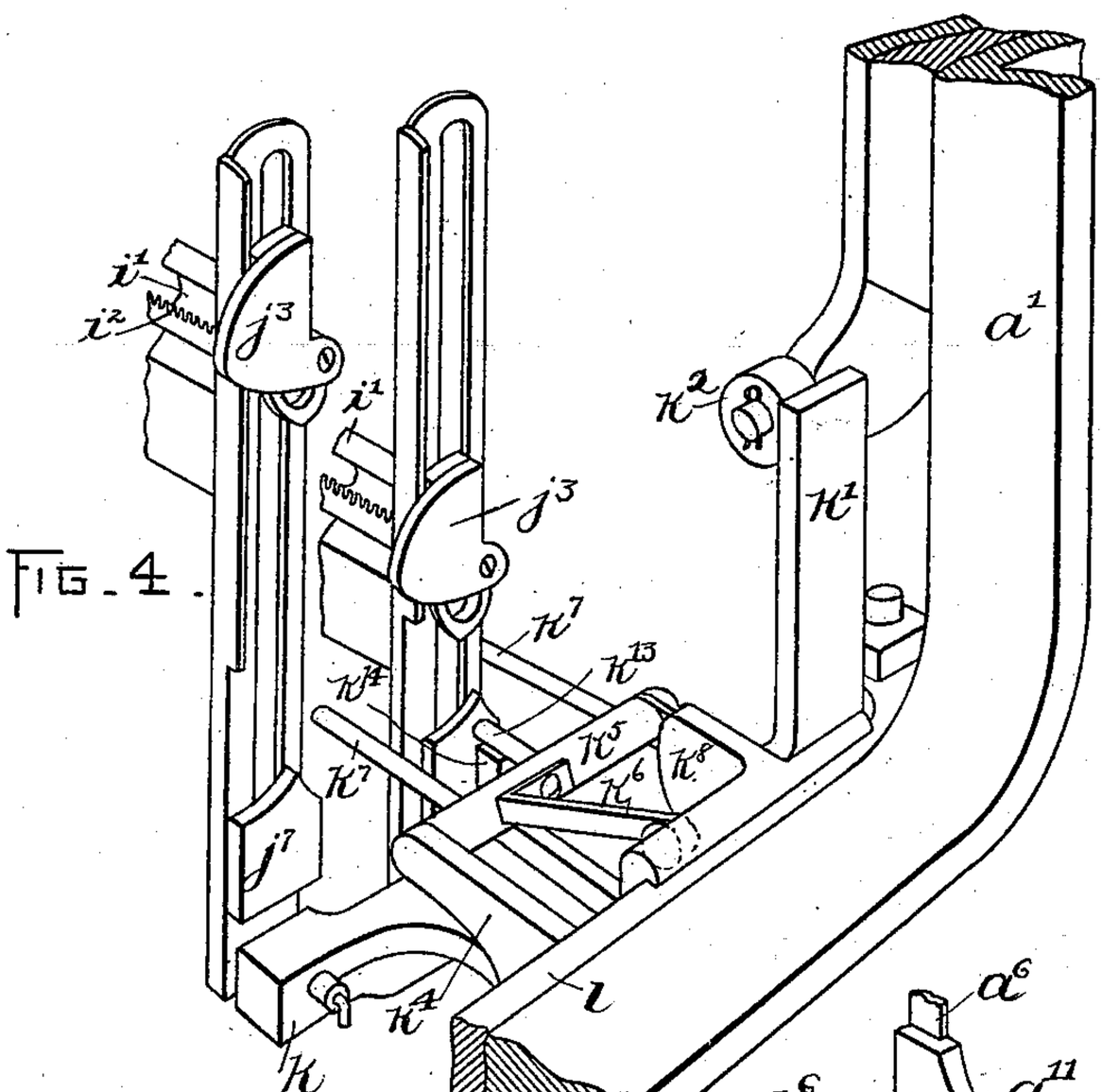

FIG. 6.

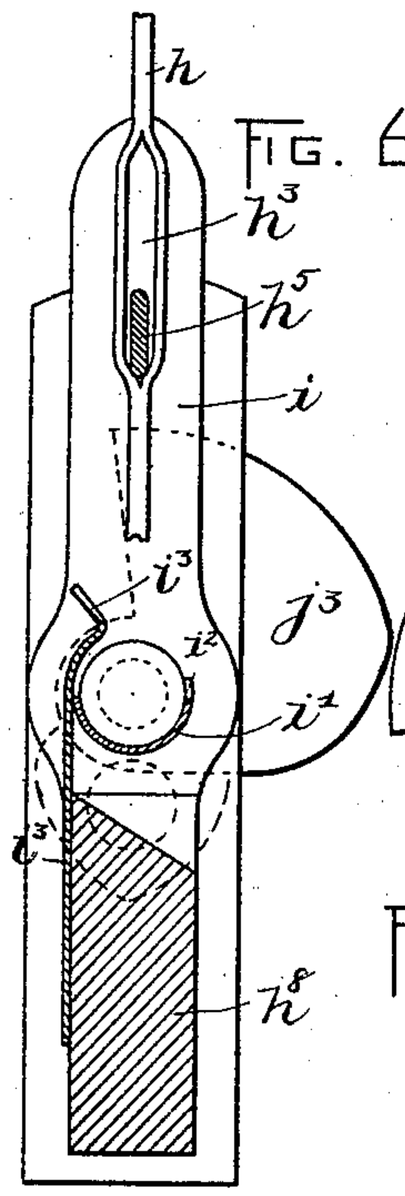

FIG. 7.

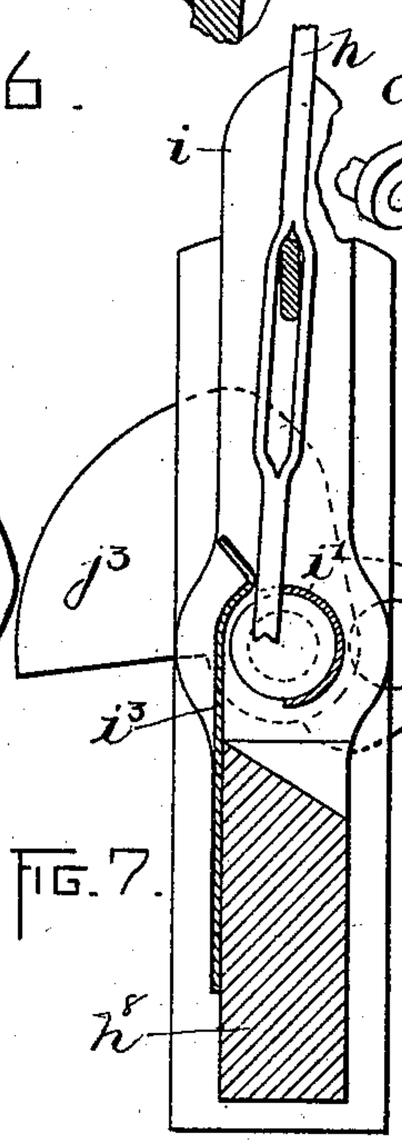

FIG. 5.

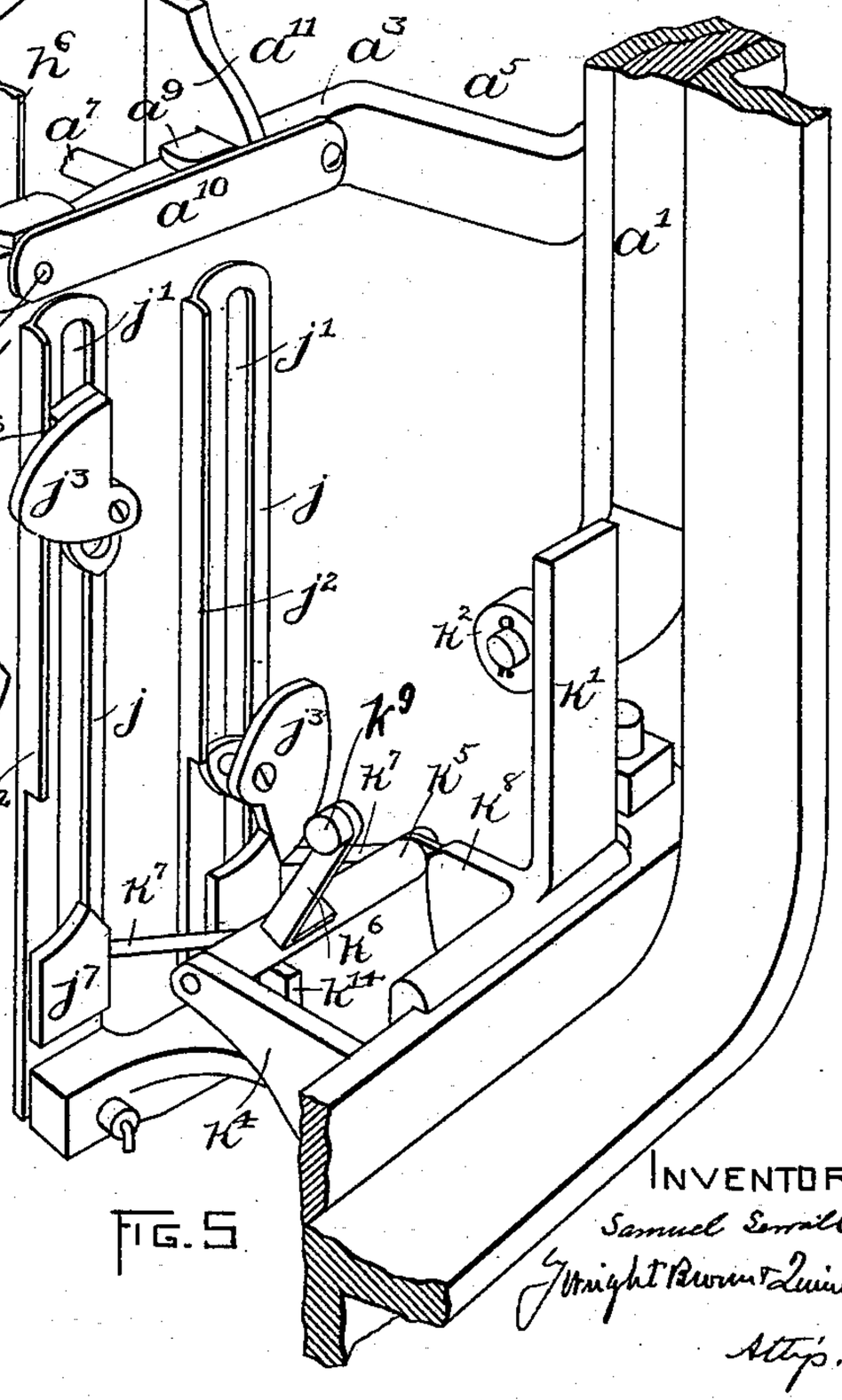

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FIG. 9

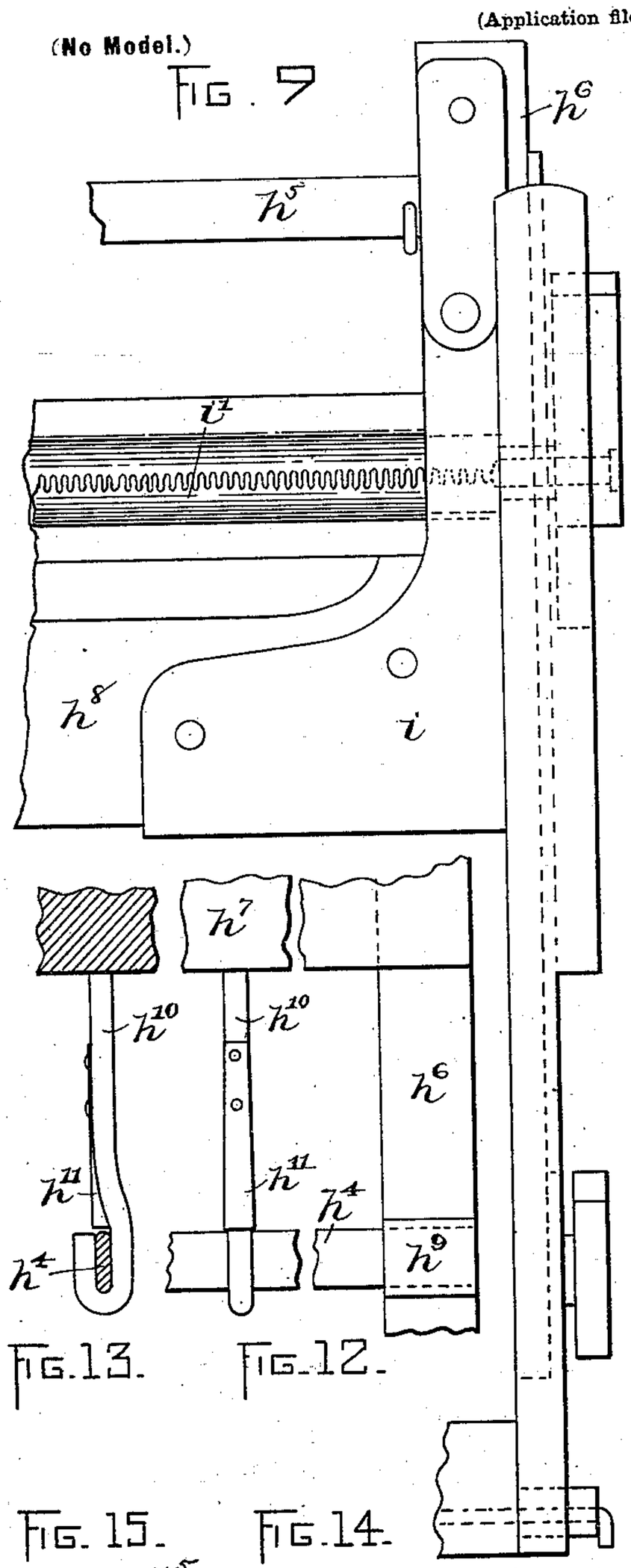


FIG. 13. FIG. 12.

FIG. 15. FIG. 14.

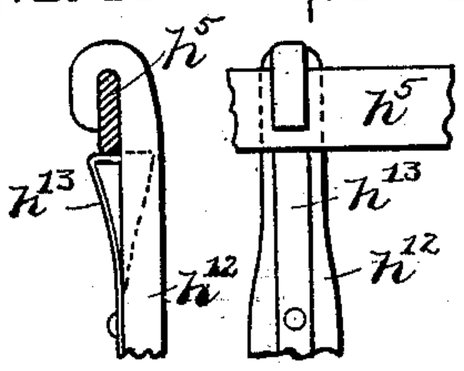


FIG. 10.

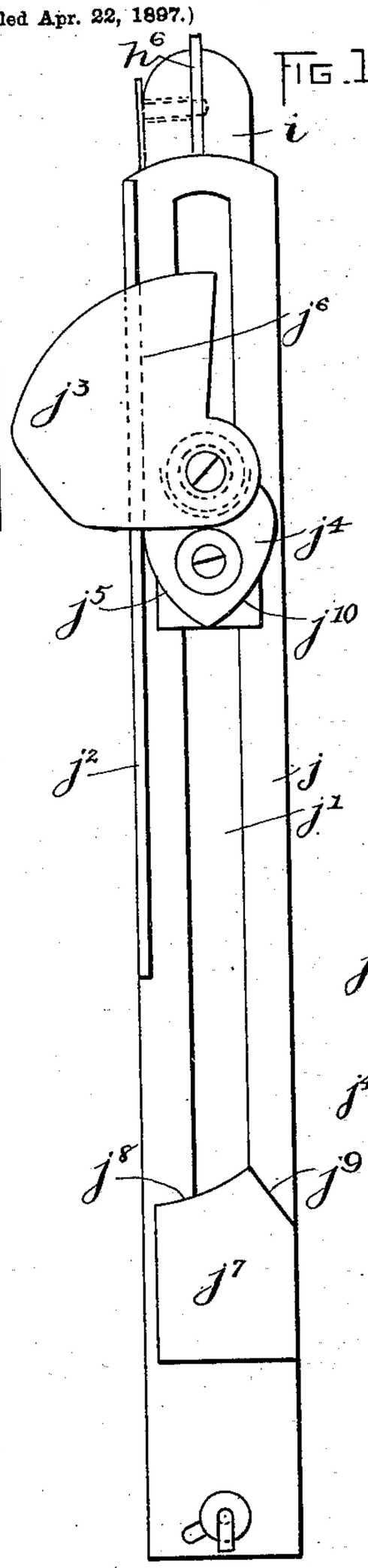
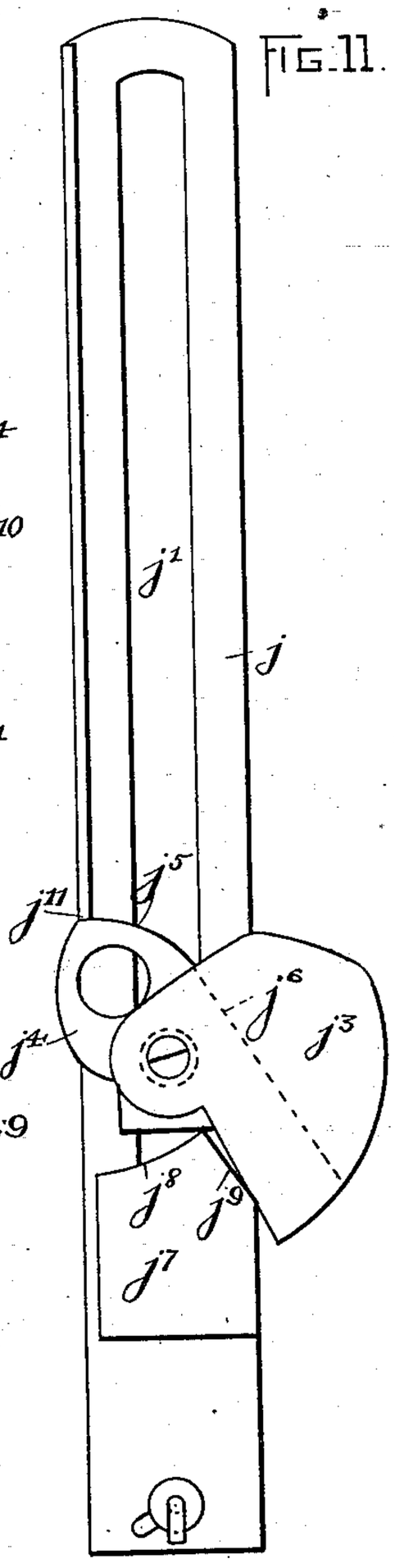


FIG. 11.



WITNESSES:
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INVENTOR:
Samuel Sewall
by Wright Brown & Quinby
Attys.

UNITED STATES PATENT OFFICE.

SAMUEL SEWALL, OF TEWKSBURY, MASSACHUSETTS, ASSIGNOR TO THE SEWALL STEEL HEDDLE COMPANY, OF SAME PLACE.

WARP-STOP-MOTION MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 637,675, dated November 21, 1899.

Application filed April 22, 1897. Serial No. 633,229. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL SEWALL, of Tewksbury, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Warp-Stop-Motion Mechanism for Looms, of which the following is a specification.

The object of this invention is to provide certain improvements in looms of the class in which the heddles are employed for automatically stopping the loom when one of the warp-threads breaks.

In that form of my invention which I have elected to illustrate the heddles consist of thin metallic strips, each having, in addition to the warp-receiving eye, one or more elongated eyes, through which cross-bars pass, said cross-bars being relatively narrow and being connected to a part of the harness-frame, so that when a warp-thread which is sustaining one of the heddles in its raised position is dropped or broken the heddle is allowed to drop, whereupon it coöperates with certain other instrumentalities for operating the shipper and stopping the loom. Each harness-frame is arranged to slide in a vertical guide and is provided with a vibrator or feeler which, when the harness-frame is in its lowest position, is free to swing and through certain parts attached thereto operate a tilting lever, extending normally into the path of a moving part of the loom, so as to prevent the shipper from being operated. The lower ends of the heddles, when the warp-threads are intact and unbroken, are all held out of the path of the vibrator or feeler; but when one of the threads breaks, its heddle is allowed to drop to prevent the vibrator from completing its movement, whereupon the tilting lever remains in the path of the moving part of the loom and the shipper is actuated to stop the loom. In addition to these features I provide means for preventing the heddles through which the unbroken threads pass from dropping down into the path of the vibrator when one of the warp-threads is loose, the said means consisting of yieldingly-supported rods or bars extending across the loom from side to side and arranged to arrest the loose warp-threads in the bottom plane of the shed. The said bars are three in number and are arranged one between the two sets of heddles and one on either side thereof, and they are mounted upon a yielding frame which is slightly depressed by each of the harnesses, so as to lie slightly below the plane of the bottom of the shed and prevent the loose warp-threads from dropping the heddles into the path of the vibrator or feeler and at the same time to prevent the threads from being forced against the tops of the eyes and being severed.

In order that the heddles, which, as stated, are of relatively thin metal, may be prevented from being bent or twisted when engaged by the vibrator, the latter is formed with serrations or notches, into which the ends of the heddles project, and, if desired, the guide or guard for the heddles which is in proximity to the vibrator may be also serrated or formed with notches; but I find that for general purposes it is fully as operative when its edge is smooth and unbroken.

The vibrator is not driven positively, but is operated for a short distance by it engagement with its guide, and I employ devices for increasing its momentum so as to operate the tilting lever with a sufficient degree of force, and at the same time when one of the heddles is dropped to prevent the vibrator from engaging it so forcibly as to bend it. Moreover, each vibrator is held from operation while its harness-frame is raised and is operated when the said frame has reached its lowermost position by contact of a portion of the guide therewith, all as I shall hereinafter explain.

Reference is to be had to the accompanying drawings, and to the letters marked thereon, forming a part of this specification, the same letters designating the same parts or features, as the case may be, wherever they occur.

Of the drawings, Figure 1 represents, partially in front elevation and partially in section, a portion of a loom equipped with my improvements. Fig. 2 represents a vertical longitudinal section through the same. Fig. 3 represents a sectional view of the loom with the heddles and guides removed. Fig. 4 is a perspective view of the guides, the vibrators, and the tilting lever and its support, the heddles being in the act of moving from their

raised and lowered positions, respectively. Fig. 5 is a similar view showing the tilting lever as having been moved out of the way by the operation of the vibrator. Figs. 6 and 7 are enlarged cross-sections showing the operation of the vibrator in connection with the heddles. Fig. 8 illustrates a slightly-modified form of vibrator. Fig. 9 represents a partial front elevation of one of the heddle-frames and the guide. Figs. 10 and 11 illustrate the guides with the vibrator raised and lowered, respectively. Figs. 12 and 13 represent one of the upper flat cross-rods and its intermediate supports. Figs. 14 and 15 represent one of the lower flat cross-rods and its supports.

Referring to the drawings, the frame a, the lay b, having the reed c and mounted upon the swords d, the crank-shaft e, the shipper-lever f, and the shipper-arm g may all be of the ordinary construction.

The heddles consist of flat metallic strips h, each of which is provided with an eye h' to receive a warp-thread and with elongated eyes h^2 h^3 at their upper and lower ends, respectively, to receive flat cross-rods h^4 h^5, which extend between the side bars h^6 of the heddle-frames. The elongated eyes h^2 are greater in length than the depth of the flat rods h^4 h^5, so that the said heddles are capable of a limited sliding movement relatively to the said rods upon which they are loosely threaded.

Each harness-frame has in addition to the side bars h^6, which are formed of comparatively resilient metallic strips, a top bar h^7 and a bottom bar h^8, which last-mentioned bars are preferably formed of wood and which form, with the side bars h^6, quadrilateral frames. The said flat rods h^4 are passed through eyes h^9 on the said bars h^6 and are sustained between the said bars h^6 by supporting-hooks h^{10}, each having a spring h^{11}, which normally projects above the bar h^4 to retain it in place. The lower flat bar h^5 is likewise maintained in place by eyes or brackets in the said bars h^6 and by supporting-hooks h^{12}, having springs h^{13}, which prevent the rod from getting loose from the hooks. The said hooks h^{10} h^{12} are suitably secured at suitable distances apart in the top h^7 and the bottom bar h^8. The harness-frames are raised and lowered by strips h^{14}. (Indicated conventionally in Fig. 1.)

To the uprights a' of the frame are secured brackets a^2, to which are pivoted bars a^3, normally held raised by a spring or springs a^4. The said bars project inwardly, as at a^5, across the loom and then forward parallel to the warp-threads to provide bearings for the reception of two or more resting or supporting devices, illustrated as bars a^6, a^7, and a^8, respectively, the bar a^7 being arranged between the harness-frames and the bars a^6 a^8 on either side thereof to permit the frames to move between them.

The bars or rods a^6 a^7 a^8 and the bars a^3 constitute a frame to check the downward movement of the lower loose threads of the shed and hold them substantially in alinement for the passage of the shuttle to prevent any relatively loose but unbroken warp-thread from lowering its heddle into the line of the vibrator, to be described.

Upon each bar a^3 are secured adjustable large-headed screws a^9, having the sides of their heads flattened, so as to be held against rotation by a spring a^{10}, pivoted at a^{12} to the bar a^3, and upon one of the side bars of each heddle-frame is secured an abutment a^{11}, said abutments alternately engaging one of the screws a^9 just as its frame completes its downward movement, so as to slightly lower the warp-supporting frame.

Heretofore it has been proposed to employ non-yielding rods to support the loose rods, upon which the lower threads of the shed rested; but I have found that by this arrangement the threads were forced against the upper ends of the eyes and were liable to be cut thereby, whereas by employing the yielding bars or frame the threads are not brought into contact therewith except when one of them is loose, and hence there is no tendency to strip them of their sizing or cause their breakage.

Secured upon the ends of the bottom bars h^8 of the harness-frame are metallic angle pieces or brackets i, which project upwardly beyond the side bars, as shown in Fig. 9, and to which the lower ends of the said bars may be secured. The brackets on each frame are formed with bearings to receive the journals at the ends of an oscillatory feeler or vibrator i'. Each vibrator is grooved or semi-cylindrical in shape, as shown in Figs. 2 and 6, but may be curved, as shown in Fig. 8, and is arranged to have its serrated or notched edge i^2 vibrate beneath the lower ends of the heddles h when the latter are raised, as shown in Fig. 6, but to engage the end of one of the said heddles in case its supporting warp-thread is broken and it is allowed to drop in the path thereof, as illustrated in Fig. 7. The vibrator may be likewise described as "slotted," since by reason of its shape it forms a groove or slot to receive the heddles.

Attached to the cross-bar h^8 of each harness-frame is a guide or guard i^3, which coöperates with the lower end of the heddle in preventing a complete movement of the vibrator and which is out of the way of the vibrator under normal conditions. The corner-pieces at one end of the harness-frames each slide in a guideway in an upright guide j, pivoted at its lower end to a bracket k, secured to a vibrating bar l. The bracket is substantially L-shaped in side elevation and is raised and lowered by said bar l, having an upwardly-projecting guide or extension k' bearing against an antifriction-roller k^2, journaled on the bracket a^2, and also having an antifriction-roller k^3 bearing against the inner side of one of the side frames of the loom. Each

of the upright guides has a longitudinal slot j' and a guiding-flange j^2, the latter projecting outwardly and extending partially the length of each guide, as indicated in Figs. 4 and 5. The journal of each vibrator or feeler i' projects through one of the slots j' and has rigidly secured to it a weight j^3, formed or secured to a cam j^4, which is partially heart-shaped, with its edge j^5, extended as at j^6, to bear against the guide flange or rib j^2, as shown in Fig. 10. The straight edge j^6 of the cam projects from a point above the journal of the vibrator to a point below it, so that when the harness-frame is raised the said edge is in contact with the flange or rib j^2 and the vibrator is prevented from oscillating. When the harness-frame is descending and the journal of the vibrator has passed the end of the flange or web j^3, the vibrator is free to oscillate, as will be readily understood. Normally the weight j^6 lies substantially on that side of the vertical plane through the journal of the vibrator on which the web or flange j^2 lies, so that when the harness-frame has been lowered it is necessary to throw the weight far enough to the other side of the vertical plane to cause it, by its own momentum, to complete the oscillation of the vibrator. For accomplishing this purpose a stationary cam j^7 is secured to each guide, having a curved cam edge j^8 and a straight edge j^9, which is at an angle to the edge j^8; the apex of the angle thus formed being on one side of the vertical plane through the angle of the cam j^4, so that in descending the side or edge j^{10} of the cam j^4 strikes against the curved edge j^8 of the stationary cam j^7, and the weight j^3 is thrown over far enough until it falls and strikes against the edge j^9 of the stationary cam j^7, as shown in Fig. 11. When the harness-frame is elevated, the edge j^5 of the cam j^4 strikes against the end j^{11} of the flange j^2 and throws the weight over again to its normal raised position. Thus it will be seen that the vibrator is unable to oscillate at all except when its harness-frame is at or near the lower extreme of its movement. These parts are employed for preventing the operation of the shipper except when one of the warp-threads is broken.

Projecting outward from the bracket k, which, as has been previously stated, is attached to the vibrating rod l, are two arms k^4, in which is journaled a rocking shaft k^5, having an arm k^6 extending outward therefrom and two pins k^7 projecting in the opposite direction therefrom, each of the latter being arranged in proximity to one of the guides j. The pins k^7 and arm k^6 constitute a rocking or tilting lever adapted to be operated by either of the weights j^3, so as to be depressed each time one of the weights is tripped and drops downward. The arm k^6 projects normally past a web k^8 on the bracket k and is provided with an extension k^9 on the end thereof adapted to be engaged by a detent k^{10}, mounted on one of the swords of the lay. When the shaft k^5 is rocked by one of the pins k^7 being thrust downward by the weight j^3, the arm k^6 is thrown out of the path of the detent, as will be understood by examining Fig. 3.

To prevent the failure of the rocking lever to return to its normal position by its own weight after it has been tilted, I provide means for positively returning it. The means comprises an inclined pin k^{13}, projecting inward from the rocking shaft k^5 between the pins k^7 k^7, and a finger k^{14}, mounted on the frame of the loom and against which the end of the pin strikes when the bracket k is depressed to throw the rocking lever to its normal position, as will be readily understood.

The vibrating lever l, before referred to, is pivoted at l' to a lever l^2, fulcrumed on the frame of the loom and having its upper end bearing against a finger l^3, projecting downward from an arm g, adapted to cause the operation of the shipper. Hence if the arm k^6 be allowed to remain in the path of the detent k^{10} it will be engaged by said detent, and it and the vibrating lever l will be forced longitudinally of the warp-thread, so as to operate the shipper-lever, moving the shipper-handle out of its usual retaining-notch, and stop the loom; but when the arm k^6 is out of the path of the detent the movement of the detent will have no effect upon the said vibrating lever l. The said lever l is vibrated vertically by a connecting-rod m, reciprocated by a crank-pin m' on a pinion m^2, in mesh with a gear-wheel m^3 on the picker-shaft m^{10}. A spring m^4, bearing against a collar m^5 on the rod m, also bears against a lug m^6 on the end of the lever l, and a nut m^7 is threaded on the end of the rod m, so as to confine the lug m^6 between it and the spring m^4. The gear-wheel m^3 is rotated once for each two reciprocations of the lay, while the pinion m^2 is rotated once for each reciprocation, so that the lever l is also vibrated once for each reciprocation of the lay and for each shift of the harness-frames, said lever being moved downward positively and upward yieldingly by the spring m^4.

In operating the loom, when the shuttle has passed through the shed, the harness-frames are shifted in the usual manner to reverse the threads of the shed, and upon the descending frame reaching the lowest limit of its movement the lever l is raised yieldingly so as to carry with it the bracket which is provided with the guides, as before stated, and as the guide is raised the edge j^8 of the cam j^7 strikes against the heart-shaped cam j^4 and rocks the weight j^6 and the vibrator completely underneath the ends of the heddles. The weight in falling strikes against one of the arms k^7 of the tilting lever and tilts the end k^9 thereof up, so that when the lay moves forward prior to the shuttle being again passed through the shed the detent on the lay does not strike against the said tilting lever—that is, in case none of the warp-

threads are broken. In descending the stop a^{11} on the harness-frame bears against the movable frame, which includes the bars a^6 a^7 a^8, and slightly lowers the same, so that the warp-threads just escape the said bars. Then after the shuttle has passed through the shed the harness-frames are reversed and the other one is lowered, and the vibrator, which is mounted thereon, is swung beneath the ends of its heddles, and the tilting lever is moved out of the way of the detent k^{10} on the lay. If, however, one of the warp-threads is broken upon the heddle-frame being lowered, its heddle drops down into the path of the vibrator, so that when the bracket k is raised and the weight on the vibrator is swung over the movement of the vibrator is stopped and the tilting lever is not raised, and hence upon the continued movement of the lay the detent k^{10} strikes against the end k^9 of the tilting lever and forces it and the bracket k, together with the lever l, longitudinally of the loom a sufficient distance to operate the shipper and cause the stoppage of the loom.

One of the most essential features of this invention is that the vibrator is not vibrated positively, so as to strike against the ends of the heddles with any great degree of force, so as to bend or otherwise injure them. On the contrary the vibrator is moved positively only far enough for the weight to throw it against the ends of the heddles, and inasmuch as the movement of the vibrator is very slight before it engages the said heddle the force of its engagement is very slight.

Having thus explained the nature of the invention and described a way of constructing and using the same, though without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. The combination with heddle-frames, having heddles movable relatively thereto, of yielding cross-bars extending across the warps below the horizontal planes thereof at the shed, to receive and maintain the loose warp-threads and means for depressing said bars so as to lie slightly below the horizontal planes of the lowest threads of the shed.

2. In combination, heddle-frames having independently-movable heddles, cross-bars supported yieldingly below the warp in proximity to the heddle-frames, and arranged transversely of said warp, and means operated by the heddle-frames for depressing said bars to clear the taut threads.

3. In combination, heddle-frames having independently-movable heddles, cross-bars supported yieldingly below the warp in proximity to the heddle-frames, and arranged transversely of said warp, and stops carried by the heddle-frames for depressing the said bars to clear the taut warp-threads.

4. In combination, heddle-frames having independently-movable heddles, a pivoted yielding frame provided with a cross-bar arranged between the heddle-frames and a cross-bar on the outside of said frames, said bars passing beneath the lowest threads of the shed, and means for depressing said frame at each descent of a heddle-frame.

5. The combination with heddle-frames, having heddles movable relatively thereto, of yielding cross-bars extending across the warp below the horizontal planes thereof at the shed, to receive and maintain the loose warp-threads means for depressing said bars so as to lie slightly below the horizontal planes of the lowest threads of the shed, and a stop-motion mechanism coöperating with any one of the heddles to stop the loom upon said heddle dropping by reason of the breakage of its thread.

6. In combination, a heddle-frame having a cross-rod, a series of metallic heddles having elongated slots and strung thereon, a vibrator mounted on the heddle-frame, and adapted to engage a dropped heddle, and means to rock the vibrator when the heddle-frame reciprocates.

7. In combination, a heddle-frame having a cross-rod, a series of metallic holders having elongated slots, and strung thereon, a vibrator having a notched edge, said vibrator being mounted on the heddle-frame and adapted to engage a dropped heddle, and means to actuate the vibrator when the heddle-frame reciprocates.

8. In combination, a heddle-frame having a cross-rod, a series of metallic heddles having elongated slots, and strung thereon, a vibrator, said vibrator consisting of a slotted tube with notches in one of its longitudinal edges, and means to actuate the vibrator when the heddle-frame reciprocates.

9. In combination, a heddle-frame having a cross-rod, a series of metallic heddles having elongated slots and strung thereon, a rocking vibrator mounted on the heddle-frame and adapted to engage a dropped heddle, and means to rock the vibrator when the heddle-frame reciprocates.

10. In combination, a heddle-frame having a cross-rod, a series of metallic heddles having elongated slots and strung thereon, a rocking slotted vibrator mounted on the heddle-frame and adapted to engage a dropped heddle, and means to rock the vibrator when the heddle-frame reciprocates.

11. In combination, a heddle-frame having a cross-rod, a series of metallic heddles having elongated slots and strung thereon, a vibrator on the heddle-frame a shipper-lever, means to release it, and a tilting lever coacting with the vibrator to cause the actuation of said means when a heddle is dropped.

12. In combination, shedding mechanism, a series of stop-motion-actuating detectors moved into actuating operative position by failure or undue slackening of the warp-threads, a longitudinally-slotted vibrator mounted on the heddle-frame below and to receive a dropped detector, means to normally rock the vibrator when the shed is changed,

and means coacting with the vibrator for stopping the loom when one of the stop-motion-actuating detectors is moved into operative position.

13. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread and a stop-motion mechanism including a vibrator mounted upon said heddle-frame and operated by gravity to coact with the edge of a heddle when dropped to cause the stoppage of the loom.

14. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread, and a stop-motion mechanism comprising a weighted vibrator, mounted on the heddle-frame and means for overbalancing said vibrator at regular intervals to cause it to coact with a dropped heddle to stop the loom.

15. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread, and a stop-motion mechanism comprising a weighted vibrator, mounted on the heddle-frame and a tilting lever operated by the vibrator except when one of the heddles is dropped.

16. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread and a stop-motion mechanism comprising a weighted vibrator mounted on the heddle-frame adapted to coact with a dropped heddle and means for holding the vibrator against movement when the heddle-frame is raised.

17. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable and independently of the others and being provided with an eye for a warp-thread, and a stop-motion mechanism comprising a weighted vibrator mounted on the heddle-frame adapted to coact with a dropped heddle, means for holding the vibrator against movement when the heddle-frame is raised, and means for overbalancing the vibrator to cause its operation when the heddle-frame is lowered.

18. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread and a stop-motion mechanism comprising a weighted vibrator mounted on the heddle-frame adapted to coact with a dropped heddle, means for overbalancing the vibrator to cause its operation when the heddle-frame is lowered, and a tilting lever operated by the vibrator except when a heddle is dropped.

19. In combination, a heddle-frame having a cross-rod, a series of heddles having elongated slots and strung thereon, each heddle being vertically movable independently of the others and being provided with an eye for a warp-thread and a stop-motion mechanism comprising a weighted vibrator mounted on the heddle-frame adapted to coact with a dropped heddle, and a vertically-operated guide for causing the operation of the vibrator at a predetermined time.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 5th day of April, A. D. 1897.

SAMUEL SEWALL.

Witnesses:
M. B. MAY,
C. F. BROWN.

Correction in Letters Patent No. 637,675.

It is hereby certified that the residence of the assignee in Letters Patent No. 637,675, granted November 21, 1899, upon the application of Samuel Sewall, Tewksbury, Massachusetts, for an improvement in "Warp-Stop-Motion Mechanism for Looms," was erroneously written and printed "of same place" (*i. e.*, Tewksbury, Massachusetts), whereas said residence should have been written and printed *Lowell, Massachusetts;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 5th day of December, A. D., 1899.

[SEAL.]

WEBSTER DAVIS,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.