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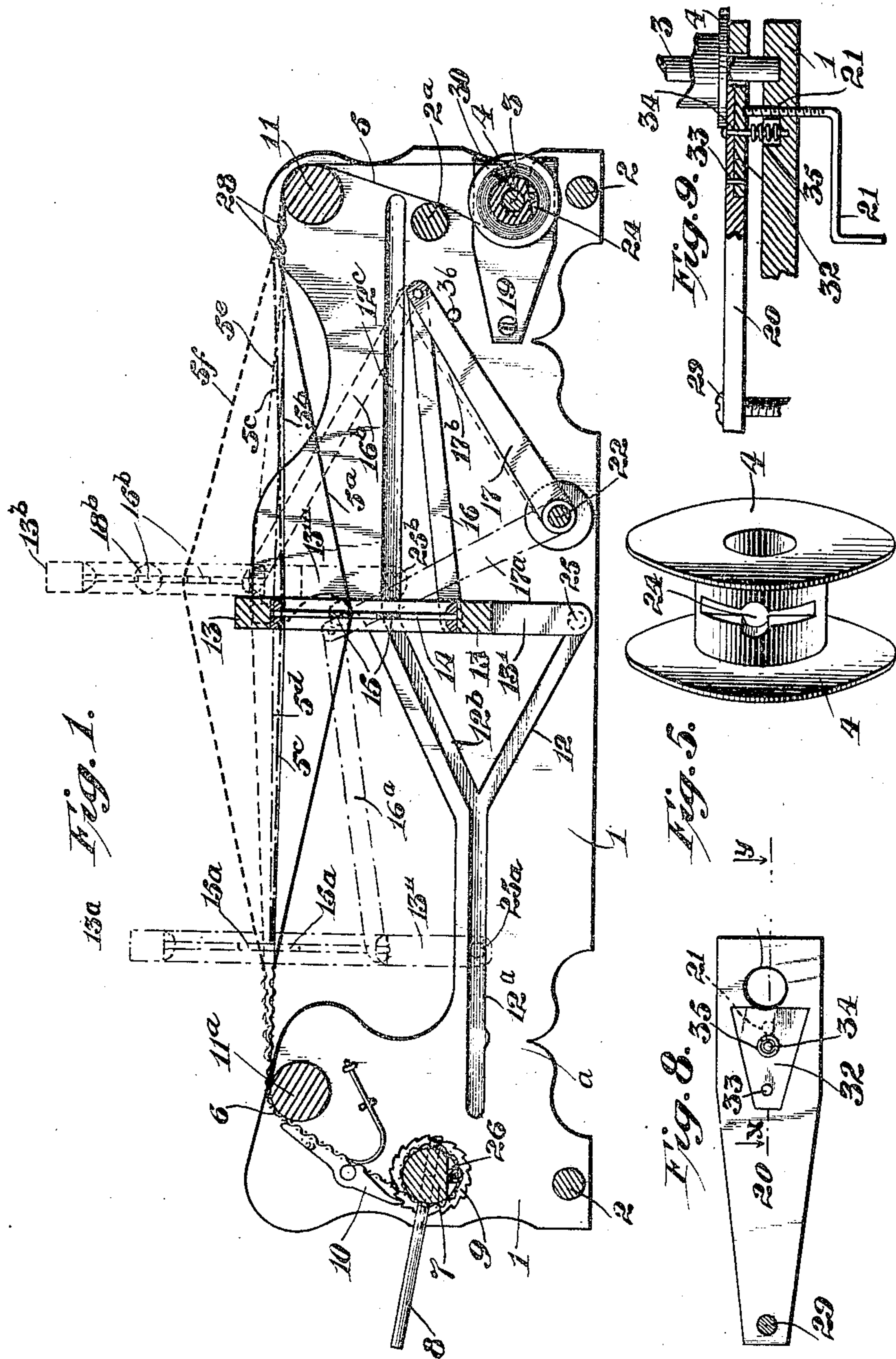
PATENTED NOV. 5, 1907.

G. E. GAY.

LOOM.

APPLICATION FILED NOV. 6, 1905.

4 SHEETS—SHEET 1.



Attest:
Comitchee
J. C. Sands

George E. Gay, Inventor:
by *Reverend. Loveland* Atty

No. 869,892.

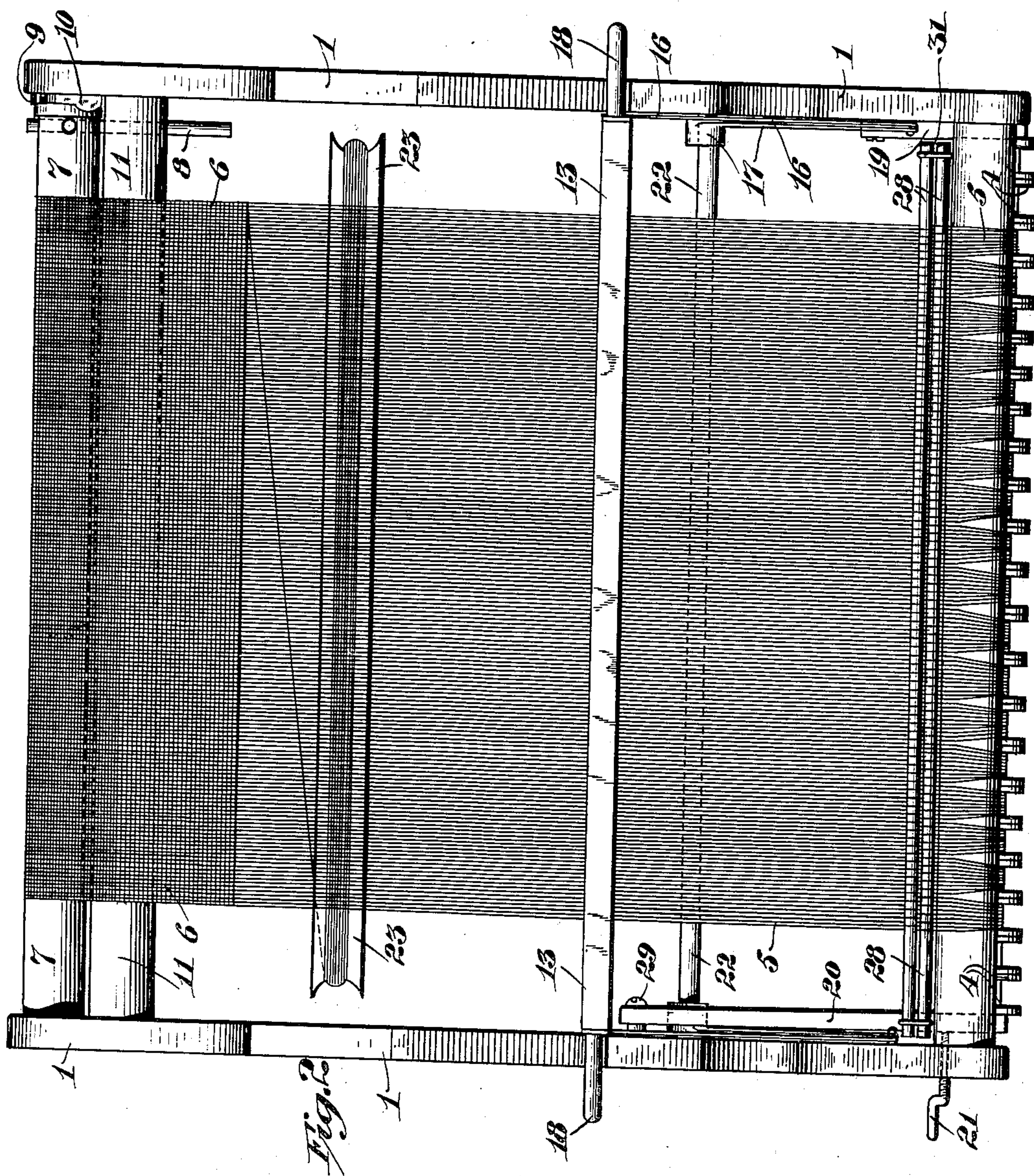
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4 SHEETS—SHEET 2.



Attest:
Comitchee
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No. 869,892.

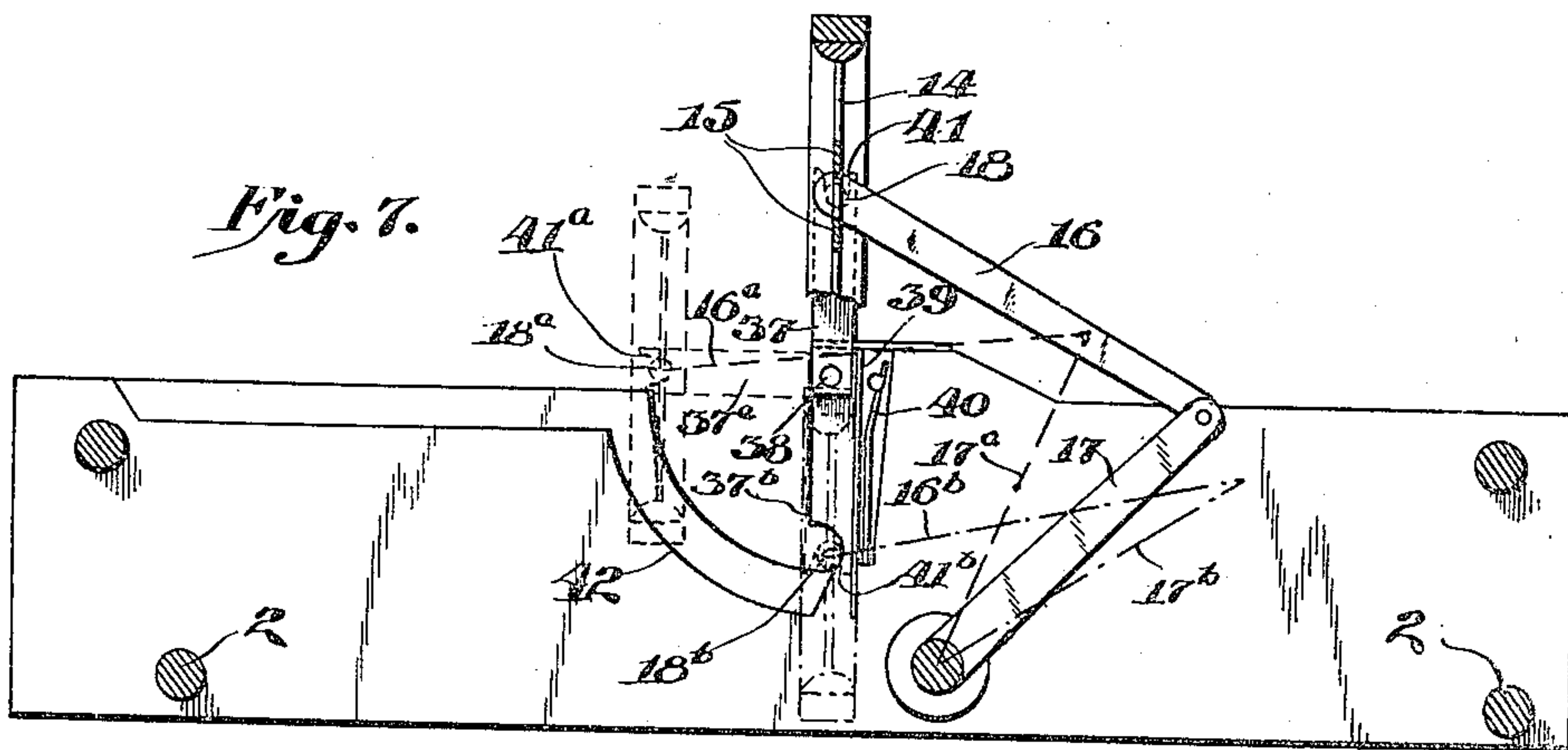
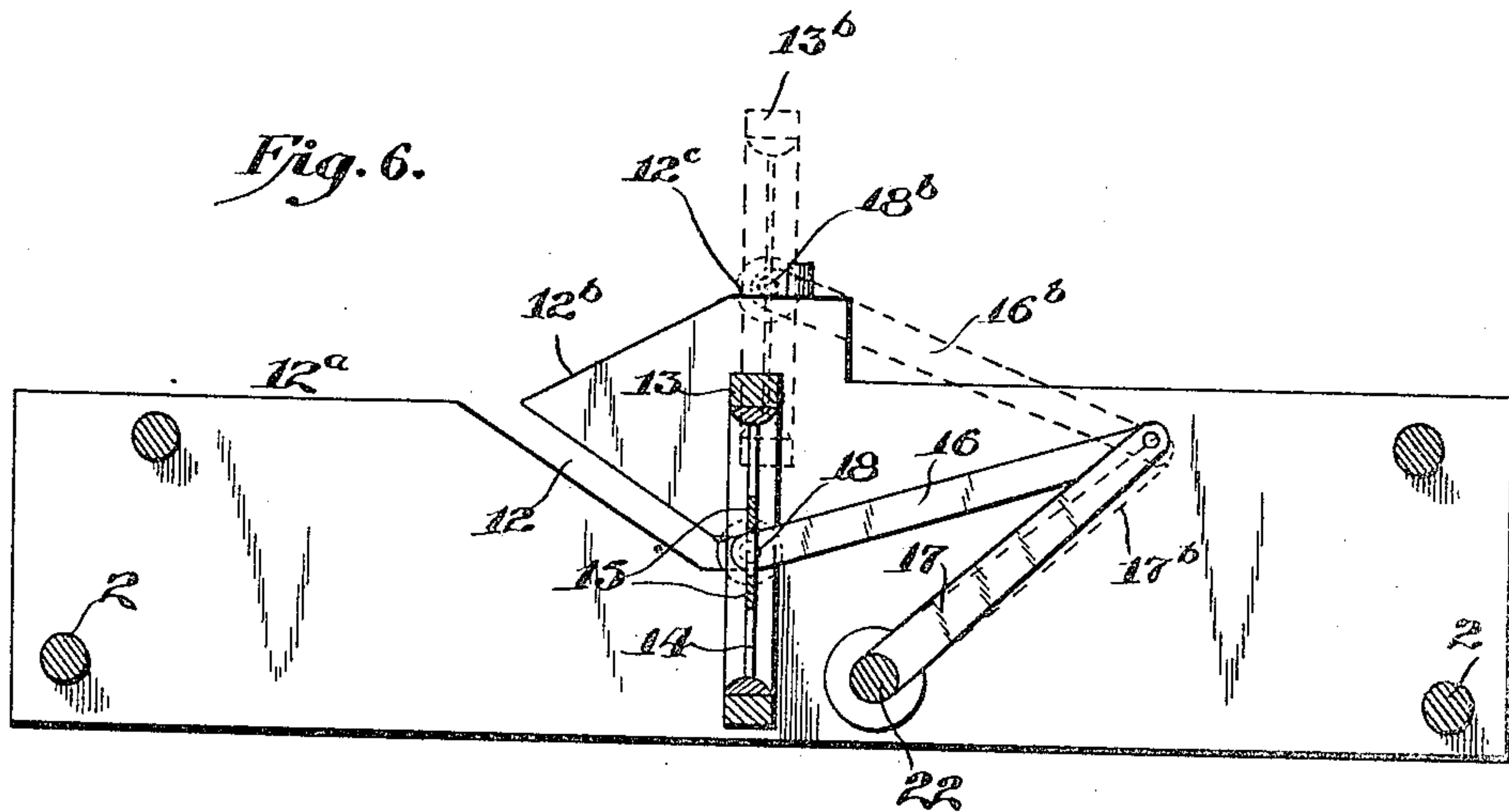
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4 SHEETS—SHEET 4.



Attest:
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UNITED STATES PATENT OFFICE.

GEORGE E. GAY, OF MALDEN, MASSACHUSETTS, ASSIGNOR TO THE LINEN THREAD COMPANY,
OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

LOOM.

No. 869,892.

Specification of Letters Patent.

Patented Nov. 5, 1907.

Application filed November 6, 1905. Serial No. 285,966.

To all whom it may concern:

Be it known that I, GEORGE E. GAY, a citizen of the United States, and resident of and whose post-office address is Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Looms, of which the following is a specification.

My invention relates to looms for weaving textile fabrics, and especially to looms adapted to be operated entirely by hand.

The objects of my invention are to provide a simple, efficient, inexpensive and easily operated hand loom. I attain these objects in and by the devices and construction described hereinafter and illustrated in the accompanying drawings forming a part hereof, in which drawings like numerals of reference refer to like parts throughout the respective views.

Figure 1 is a sectional view of my device taken through the center of Fig. 2, showing the inner side of one side of the frame and the adjacent parts in elevation. Fig. 2 is a plan view of the whole. Fig. 3 is an end elevation taken from the front showing the woven cloth, cloth roller or beam and front tension bar broken away so as to disclose the batten, reed and handle frame. Fig. 4 is a rear end elevation. Fig. 5 is a perspective view of one of the spools or bobbins for holding the warp threads, showing the mortise or cavity for holding the knotted ends of the warp threads. Fig. 6 is a side elevation of the inside of a frame showing a modified form of guide ways for the reed. Fig. 7 is a similar view of still another form of the same. Fig. 8 is an elevation of a detail of the device. Fig. 9 is a plan view partly in section of this detail and adjacent parts.

In the figures, —1— represents the frame or side pieces; 2—2^a— struts or braces separating and securing the sides; 3— the warp beam comprising a shaft loosely mounted in open slots (27, Fig. 4) in the side pieces, upon which the spools —4— containing the warp threads are mounted loosely and oppositely with relation to the winding of the thread thereon, so that the threads from each spool in unwinding turn the spool in a direction opposite to the motion of the next adjacent spool; 5— represents the warp threads; 6— the woven cloth or fabric; 7— the cloth roller or beam; 8— a rod or bar for rotating the same to reel up the finished fabric as it is required; 9— a ratchet wheel mounted on the roller —7— and engaged by the pawl —10—.

11— is a stretcher or tension guide bar over which the warp threads —5— are led from the spools, and —11^a— a similar tension guide bar at the other end of the frame over which the fabric —6— is led to the cloth beam —7—; the material being stretched and guided thereon and therebetween; they also serve to

secure and stiffen the whole structure like the braces —2—2^a— —12—12^a—12^b— and —12^c— are the guide slots in which the pins —25— of the batten-heddle frame slide to perform the shedding and battening operations.

13— is the combined batten and heddle frame, shown in full lines in Figs. 1 and 6 as at its lowest position, having formed the lower shed. 13'— are the legs of the said frame provided with pins —25— which slide in the slot —12—12^a—12^b— and —12^c—; 14— represents the bars or wires of the reed and heddle; 15— represents stops or plugs between the bars —14— of the reed which serve to form heddle eyes for the operation of shedding, as hereinafter more fully set forth.

16—17— are arms of a parallel motion device pivoted at —22— and attached to the frame of the combined batten and heddle, preferably at the lower part of the frame.

18— represents handles of which there are two, one on each side of and attached to the frame of the batten-heddle at any convenient point and by which the latter is adapted to be moved.

19— is a bearing adapted to hold and lock the shaft —3— in the slot —27—, and is pivotally attached to the inner side of the frame —1—, as shown in Fig. 1.

20— is a pressure plate made somewhat longer than —19— and having a capacity for a slight lateral motion along the shaft —3— which passes through it into a cavity in the frame —1—, so as to be pressed upon the end of the row of spools —4— on said shaft —3— by the spring —35— and the screw —21—, as will be further explained hereinafter; this plate —20— being attached at —29— to the opposite inner side of the frame from —19—. The bearing —19— is open at the end so as to receive the shaft —3— by end insertion, but is provided with an overhanging lug —30— to prevent its accidental escape; the vertical motion about the pivot bringing the lug into engagement.

23— is the shuttle; 24— is a mortise or cavity in the spool —4— adapted to receive and retain the knotted ends of the warp threads; 26— similar cavities in the cloth beam —7— for the same purpose.

28—28— are the usual lease rods joined by elastic connections; 36— is a stop or detent to prevent further motion of the arm —17—; 31— are elastic bands or other devices holding the lease rods together under tension; 32— is a plate secured at —33— to —20— which tends to keep the pressure plate —20— pressed at all times against the end of the row of spools —4—; the screw —21— also abuts against this plate —32—.

One of the principal advantages of my invention is that I am enabled to do away with a separate batten, a plurality of heddles, complicated harness, treadles and weights, and am enabled to perform the shedding and

battening of the woof evenly and uniformly by a simple reciprocating motion of one combination batten and heddle, hereafter referred to as the batten-heddle.

Heretofore hand looms have usually required weights and pulleys, treadles and other more or less complicated devices to support and operate the heddles, batten and shuttle race, and to perform the operation of shedding and battening the woof, besides requiring two or more distinct and independent motions or operations; or where in very small looms these have been omitted, the batten-heddle frame has generally been loose and mechanically unsupported, hence liable to get out of position and adjustment, resulting in disarrangement and injury to the warp, irregular and unsatisfactory battening and shedding, and general inconvenience. By my invention also the batten-heddle frame is self-guiding and supporting.

The operation of my device is as follows: The various threads, which are to constitute the warp, are first wound on separate spools —4—, each spool containing an aggregation of a suitable number of threads, the ends of which are first knotted and secured in the cavity —24—, Fig. 5. The required number of spools necessary to furnish sufficient threads for the width of the fabric to be woven are then slid over the shaft —3— (see Fig. 4) and, if the warp is not so wide as the capacity of the loom, then a sufficient number of empty spools may be added so as to fill up the space on the shaft between the bearing —19— and pressure plate —20—, in order that the necessary tension or pressure may be exerted through —20— on the assembled spools by the spring —35—, so as to hold the spools together and by the resulting friction prevent their accidental and individual rotation on the shaft —3—. The screw —21— bearing against the plate —32— on —20— may also lock the beam as a whole, preventing rotary movement, and consequent unwinding. By using separate spools of warp threads the operation of "beaming the warp" as a whole is greatly simplified and made easier. The spools are oppositely mounted on the shaft —3— so that the aggregated threads of each alternate spool are led from the front and those from the adjoining spool from the rear (see Figs. 1 and 4) over the tension guide bar —11—; that is, the aggregation of threads from the first full spool is led either in front or in rear of the shaft —3— while the aggregation of threads from the next is led in the opposite way; the object of this arrangement is that the tension on the threads tending to rotate each spool and thus slacken that portion of the warp, is resisted and neutralized by the tendency of the next adjoining spool to rotate in the opposite direction, the friction of the spools on each other caused by the pressure of the plate —20— (regulated by the spring —35—) on the whole system of spools, assisting to hold them in place, and make the unwinding of the warp uniform and even. The pressure of the screw —21— against this device serves in the same way to positively lock the warp beam elements while weaving or whenever it is desired to prevent unwinding. After passing over the tension bar —11—, the threads of the whole warp are passed over and under the lease rods —28— (see Figs. 1, 2 and 4) as is well understood. The threads are then led through the wires of the heddle-reed, as hereafter described. The heddle-reed itself is formed of wires or bars —14— set in a frame

—13—. Between the wires constituting each alternate pair are placed fixed obstructions or stops —15—, preferably of solder or lead, having the parts which come in contact with the warp threads (as at —5^a—, Fig. 3), preferably concaved and smoothed to avoid injury to the threads. These stops —15— are evenly spaced relatively to each other and to the lateral center line of the whole heddle, thus forming eyes, so that whatever position of the heddle, the threads of the warp in contact with the stops are in the same lateral plane (see —5^a—, Fig. 3) and so form an even shed, as is well known. There are no stops between the other alternate pairs of wires, so that the vertical reciprocations of the whole structure do not materially change the position of the warp threads passing between these wires, which form the other part of the lease. By this construction the one system of wires is made to form a combined heddle and reed equally capable of shedding and battening, as will be more particularly explained hereafter.

After passing the lease-rod —28—, each alternate warp thread is led through the eye of a stopped pair of wires which constitutes the heddle, and every other one through the unobstructed space between the stopped pairs or eyes, all of the wires together constituting the reed (see —5^a— and —5^b—, Fig. 3). The threads are now carried over the tension bar —11^a— and down to the cloth beam —7— where the ends of the several aggregations from the various spools are knotted by themselves and secured in the cavities —26—, corresponding in position to the spools —4— from which the threads come. The usual operation of forming the woof is now commenced and the operation of weaving carried on as follows: Starting with the batten and heddle in the lower position shown by the full lines in Fig. 1,— the shuttle —23— is passed through the shed formed by the drawing down of the threads —5^a—, which are borne against by the lower faces of the upper stops —15—, forming the heddle eye; the other threads of the warp in this position being indicated by the fine line —5^b— (see Fig. 1). By means of the handles —18— the batten-heddle is now drawn forward and, since the pin —25— must move in the inclined slot —12— (Fig. 1), the batten-heddle is necessarily raised till the pin —25— reaches the horizontal part of the slot at —12^a—, when it moves horizontally forward to the second position, indicated by the dash and dot line representation bearing the numerals —25^a— 13^{''}— 15^a— 13^a—, thus beating the woof; the warp threads in this position being indicated by the dash and dot lines —5^c— and —5^d—. The batten-heddle is then moved in the opposite direction and the pin —25— made to pass into the slot —12^b— which is inclined upward. As the motion continues the reed is thus raised to the third position in the horizontal slot —12^c— indicated by the dotted line representation bearing the numerals —25^b— 13^{'''}— 15^b— and 13^b—. On reaching this point the reed has raised the warp threads which are borne against by the upper faces of the lower stops forming the heddle eye as at —15^b—, thus forming a raised shed as shown by the dotted line —5^e—, the other threads of the warp in this position being indicated by the dotted line —5^e—. At this point the shuttle is passed through the shed in the opposite direction as usual. The reed is now again drawn

forward, the pin —25— passing down the slot —12^b— into —12^a— when the operation of beating the woof is repeated. On moving the reed again in the opposite direction it passes down into the slot —12— to its first position, once more forming the lower shed in preparation for the next passage of the shuttle. The operation is thus continuous and the various steps of forming the sheds and battening the woof are necessary incidents of the simple reciprocation of the reed guided by the slots —12—12^a—12^b— and —12^c—. Of course, it will be understood that the parallel motion levers —16—17— have, during these reciprocations, maintained the batten-heddle in even relation to the warp threads as well as to the woven fabric, especially in the act of battening the woof, keeping it parallel to the latter, and keeping it from twisting in the frame.

Referring now to the modification shown in Figs. 6 and 7,— in Fig. 6, instead of attaching the pins —25— to legs —13'— on the lower part of the frame —13— and running them in the slot —12—, I cut the slot —12— entirely through the side of the frame —1— and allow the handle shaft —18— itself to slide in it, the parallel motion lever —16— being also secured at or about this point which is approximately the center of effort and resistance. It will be clear that the operation of the modification is substantially the same as that already described, only that instead of there being a slot or groove —12^a—12^b and 12^c in which the pin —25— slides after leaving —12—, —18— rests entirely upon the upper surface or edge of the sides —1—. This modification has the merit of greater simplicity while retaining nearly the same efficiency. In Fig. 7, I do away with the slots as a means for guiding the batten-heddle in its reciprocations, substituting the mechanism hereafter described. 37— is a rocking lever or arm pivoted at —38— to the frame —1—, (it will be understood that there are two of these; the illustration showing only one side) and notched or provided with jaws as at —41—. This placed at such a point that when it is in its horizontal position —37^a—, the handle shaft —18^a— of the batten-heddle, while still upon the top of the frame —1— (corresponding to the slot or groove —12^a— Fig. 1) will engage with the notch —41—, as shown in dotted line at —37^a—41^a—. The rocking lever is maintained in the horizontal position by the pressure of the spring —39— reinforced by the spring —40— acting upon its flat end. Upon exerting a downward pressure upon the handles —18^a— of the batten-heddle, the rocking lever carrying the same is swung around its pivot —38—, the batten-heddle describing the arc —42—, Fig. 7, and coming to rest at the lowest point of the arc, thus forming a lower shed, as in the first described operation, (see —18^b—37^b—41^b—). At this point also the spring —39— bears against the then vertical long edge of the rocking arm tending to steady it, and the shaft —18^a— is prevented from falling out of the notch —41— after it leaves the horizontal position —41^a— by the edges —42— of the sides. The operation is, of course, the same when the batten-heddle is raised to form the upper shed, as shown in full lines at —37— etc. It is evident that the parallel motion levers —16—17— etc., operate the same as in the previously described constructions.

It will, of course, be understood that I do not limit

myself to any particular kind or size of loom, nor the exact design, form or arrangement of parts that I have shown or described, as I have indicated merely the preferred construction and arrangement. Moreover, this applies as well to the description of the operation of the device, or the order of procedure of preparing it for such operation, as slight changes and modifications therein will not effect the general law of operation of the invention.

What I claim is:

1. In a hand loom, the combination of two parallel sides provided with slots in their inside faces, said slots comprising a horizontal guideway terminating in an upwardly and a downwardly diverging guideway; a combined batten and heddle provided with engaging members adapted to move in said slots; means for reciprocating said batten-heddle longitudinally and means for preserving the alinement of said batten-heddle relative to the threads of the warp.
2. In a hand loom, the combination of two parallel sides provided with slots comprising a horizontal guideway terminating in oppositely diverging guideways; a combined batten and heddle engaging said slots, and means for preserving the alinement of the batten-heddle relative to the threads of the warp.
3. In a hand loom, the combination of a frame provided with slots; said slots comprising a horizontal guideway terminating in oppositely diverging guideways; and a heddle guided by said slots.
4. In a hand loom, the combination of a frame provided with diverging guideways; a combined batten and heddle controlled by said guideways and means for preserving the alinement of said batten-heddle relative to the threads of the warp.
5. In a hand loom, a combined batten-heddle, means for preserving the alinement of the batten-heddle relative to the threads of the warp; an upwardly and downwardly diverging guideway controlling said batten-heddle and adapted to give it a longitudinal and perpendicular motion relative to the warp when the batten-heddle is reciprocated longitudinally.
6. In a hand loom, a combined batten-heddle, and means for giving it an automatic perpendicular motion relative to the warp when reciprocated longitudinally.
7. In a hand loom, a combined batten-heddle; and means for securing automatically a longitudinal and perpendicular motion relative to the warp by each longitudinal reciprocation of the batten-heddle.
8. In a hand loom, a batten-heddle, and means for producing a longitudinal and perpendicular motion of the same relative to the warp at each longitudinal reciprocation of the batten-heddle, consisting of a guideway engaged by the batten-heddle.
9. In a hand loom, a warp beam, a batten-heddle, and means for producing a perpendicular motion of the batten-heddle relative to the warp at each longitudinal reciprocation of the same, consisting of a guideway engaged by the batten-heddle.
10. In a hand loom, a warp beam, a batten-heddle and means for giving the latter automatically a longitudinal and perpendicular motion relative to the warp when reciprocated longitudinally.
11. In a hand loom, a combined batten-heddle and means for supporting and guiding the same, which comprises a guideway substantially parallel to the warp terminating in ascending and descending guideways.
12. In a hand loom, a combined batten-heddle; means for producing a parallel motion thereof secured thereto, and means for giving the batten-heddle automatically a combined perpendicular and longitudinal motion relative to the warp when reciprocated longitudinally.
13. In a hand loom, a combined batten-heddle; diverging guideways engaged by the same and means for reciprocating the batten-heddle in contact with the guideways.
14. In a hand loom, the combination of a frame provided with slots, said slots comprising a horizontal guideway terminating in oppositely diverging guideways, and a batten guided by said slots.

15. In a hand loom, the combination of a frame provided with slots, said slots comprising a horizontal guideway terminating in oppositely diverging guideways and a batten-heddle guided by said slots.
16. In a hand loom, the combination of two parallel sides provided with slots in their inside faces, said slots comprising a horizontal guideway terminating in an upwardly and a downwardly diverging guideway; a batten provided with engaging members adapted to move in said slots; means for reciprocating said batten longitudinally, and means for preserving the alinement of said batten relative to the threads of the warp.
17. In a hand loom, the combination of two parallel sides provided with slots comprising a horizontal guideway terminating in oppositely diverging guideways, a batten engaging said slots, and means for preserving the alinement of the batten relative to the threads of the warp.
18. In a hand loom, the combination of two parallel sides provided with slots comprising a horizontal guideway terminating in oppositely diverging guideways; a heddle engaging said slots, and means for preserving the alinement of the heddle relative to the threads of the warp.
19. In a hand loom, the combination of a frame provided with diverging guideways; a batten controlled by said guideways, and means for preserving the alinement of said batten relative to the threads of the warp.
20. In a hand loom, the combination of a frame provided with diverging guideways; a longitudinally movable heddle controlled by said guideways and means for preserving the alinement of said heddle relative to the threads of the warp.
21. In a hand loom, a batten, means for preserving the alinement of the batten relative to the threads of the warp; an upwardly and downwardly diverging guideway controlling said batten and adapted to give it a longitudinal and perpendicular motion relative to the warp when the batten is reciprocated longitudinally.
22. In a hand loom, a heddle, means for preserving the alinement of the heddle relative to the threads of the warp; an upwardly and downwardly diverging guideway controlling said heddle and adapted to give it a longitudinal and perpendicular motion relative to the warp when the heddle is reciprocated longitudinally.
23. In a hand loom, a batten, and means to give it automatically a perpendicular motion relative to the warp when reciprocated longitudinally.
24. In a hand loom, a heddle, and means to give it automatically a perpendicular motion relative to the warp when reciprocated longitudinally.
25. In a hand loom, a batten, means for producing a longitudinal and perpendicular motion of the same relative to the warp at each longitudinal reciprocation of the batten, consisting of a guideway engaged by the batten.
26. In a hand loom, a heddle, and means for producing a longitudinal and perpendicular motion of the same relative to the warp at each longitudinal reciprocation of the heddle, consisting of a guideway engaged by the heddle.
27. In a hand loom, a warp beam, a batten, and means for producing automatically a perpendicular motion of the batten relative to the warp at each longitudinal reciprocation of the same.
28. In a hand loom, a warp beam, a heddle; and means for producing automatically a perpendicular motion of the heddle relative to the warp at each longitudinal reciprocation of the same.
29. In a hand loom, a warp beam, a batten, and means for automatically giving it a longitudinal and perpendicular motion relative to the warp when reciprocated longitudinally.
30. In a hand loom, a warp beam, a heddle and means for automatically giving it a longitudinal and perpendicular motion relative to the warp when reciprocated longitudinally.
31. In a hand loom, a batten and means for supporting and guiding the same, which comprises a guideway substantially parallel to the warp terminating in ascending and descending guideways.
32. In a hand loom, a heddle and means for supporting and guiding the same, which comprises a guideway substantially parallel to the warp terminating in ascending and descending guideways.
33. In a hand loom, a batten; means for producing a parallel motion thereof secured thereto, and means for automatically giving the batten a perpendicular and longitudinal motion relative to the warp when reciprocated longitudinally.
34. In a hand loom, a heddle; means for producing a parallel motion thereof secured thereto, and means for automatically giving the heddle a perpendicular and longitudinal motion relative to the warp when reciprocated longitudinally.
35. In a hand loom, a batten; diverging guideways engaged by the same and means for reciprocating the batten in contact with the guideways.
36. In a hand loom, a longitudinally movable heddle, diverging guideways engaged by the same and means for reciprocating the heddle in contact with the guideways.
37. In a hand loom, the combination of two parallel sides provided with slots in their inside faces, said slots comprising a horizontal guideway terminating in an upwardly and a downwardly diverging guideway; a heddle provided with engaging members adapted to move in said slots; means for reciprocating said heddle longitudinally, and means for preserving the alinement of said heddle relative to the threads of the warp.

Signed at Malden in the county of Middlesex and State of Massachusetts this second day of November A. D., 1905.
GEORGE E. GAY.

Witnesses:

CHARLES E. DENNETT,
ELLA M. HYDE.