No. 773,704. PATENTED NOV. 1, 1904.

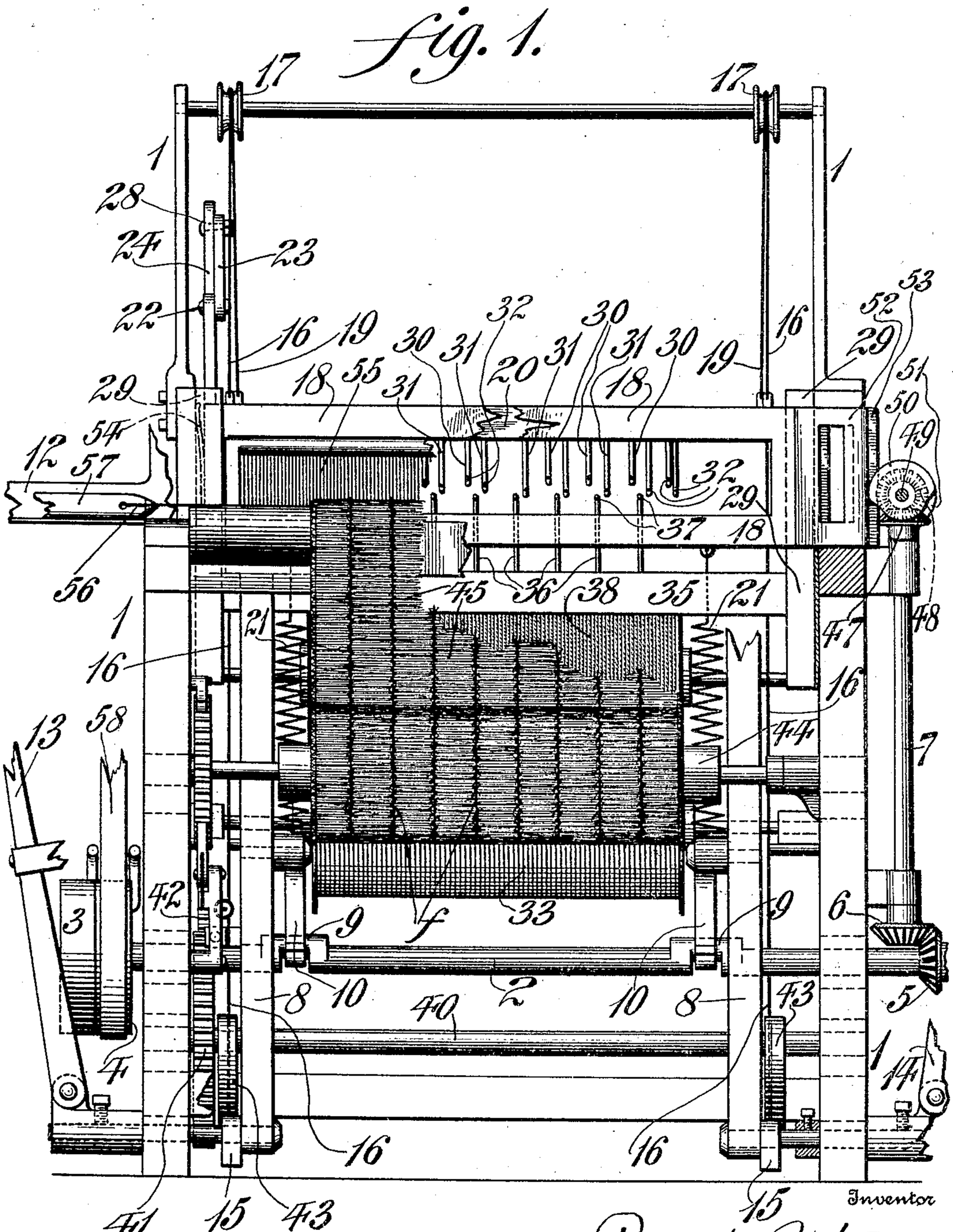
R. BATES.

LOOM FOR CROSS WEAVING.

APPLICATION FILED JAN. 22, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 3 SHEETS—SHEET 2.

fig. 3.

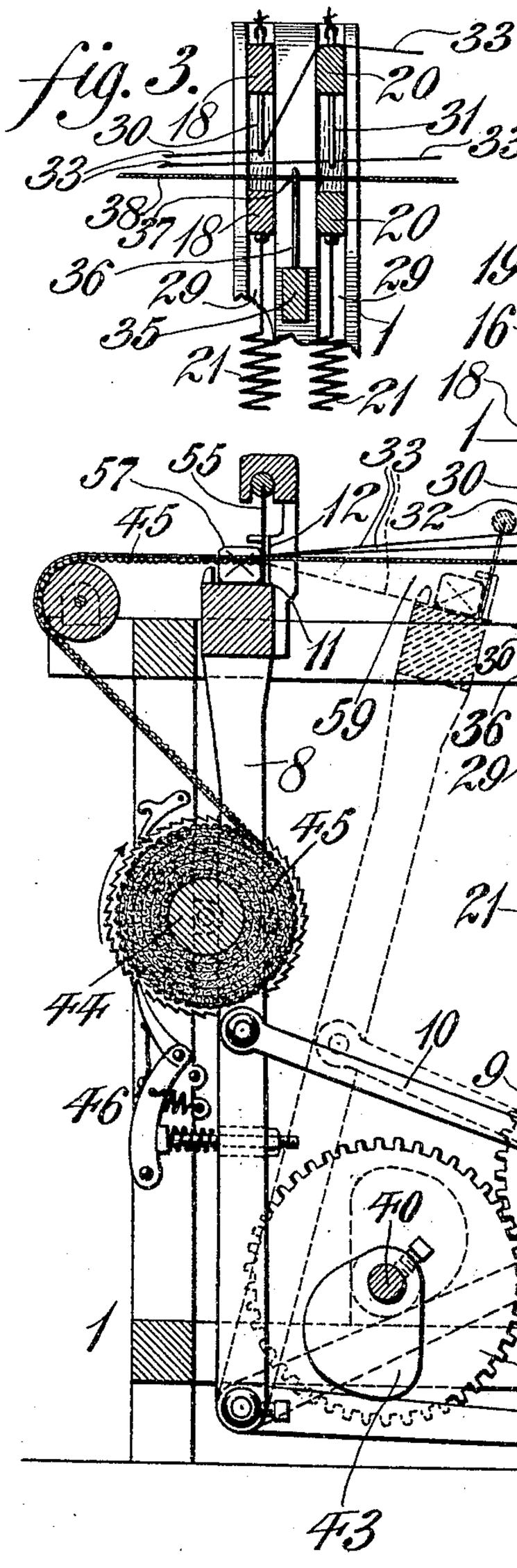

fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

fig. 4.

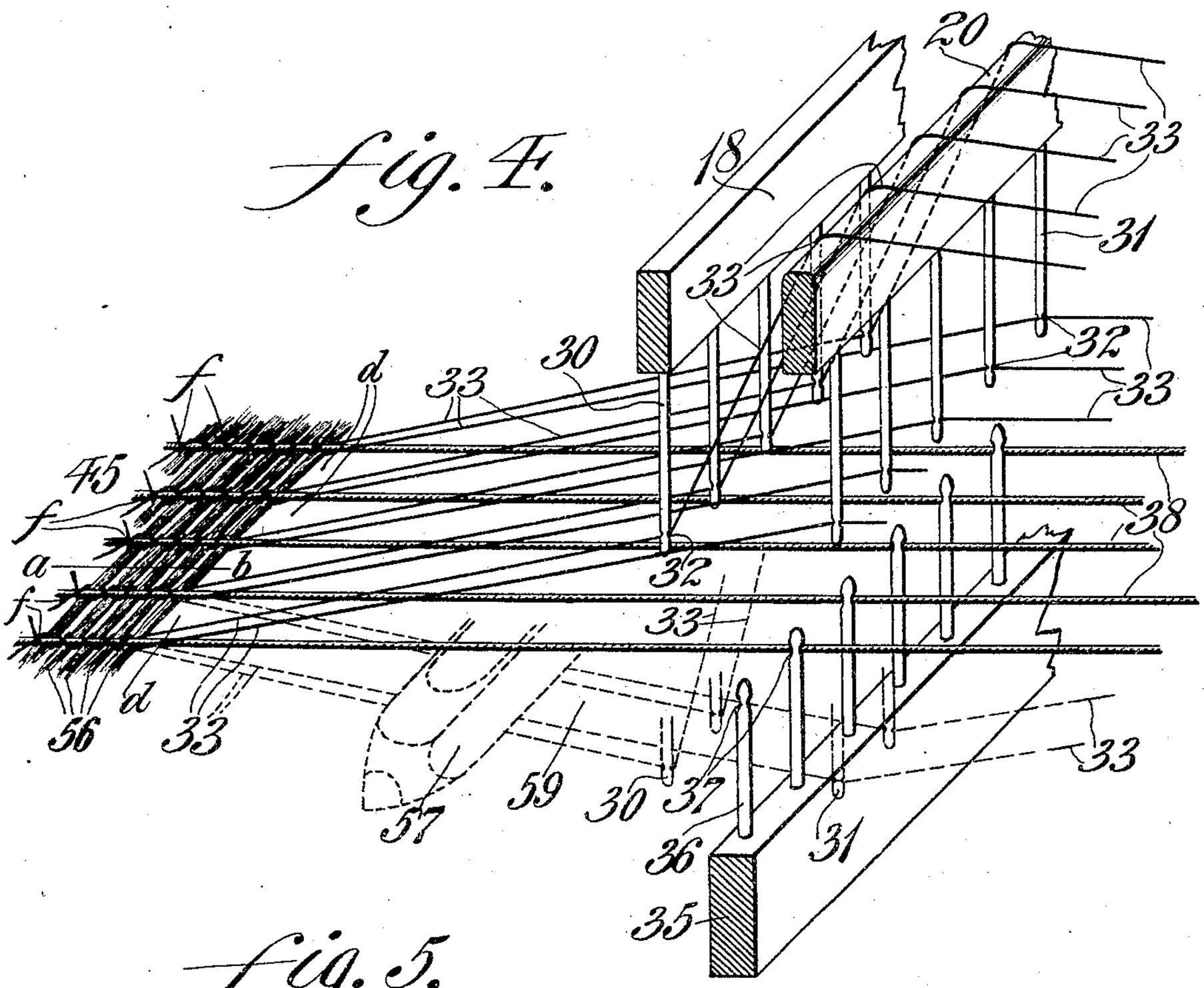


fig. 5.

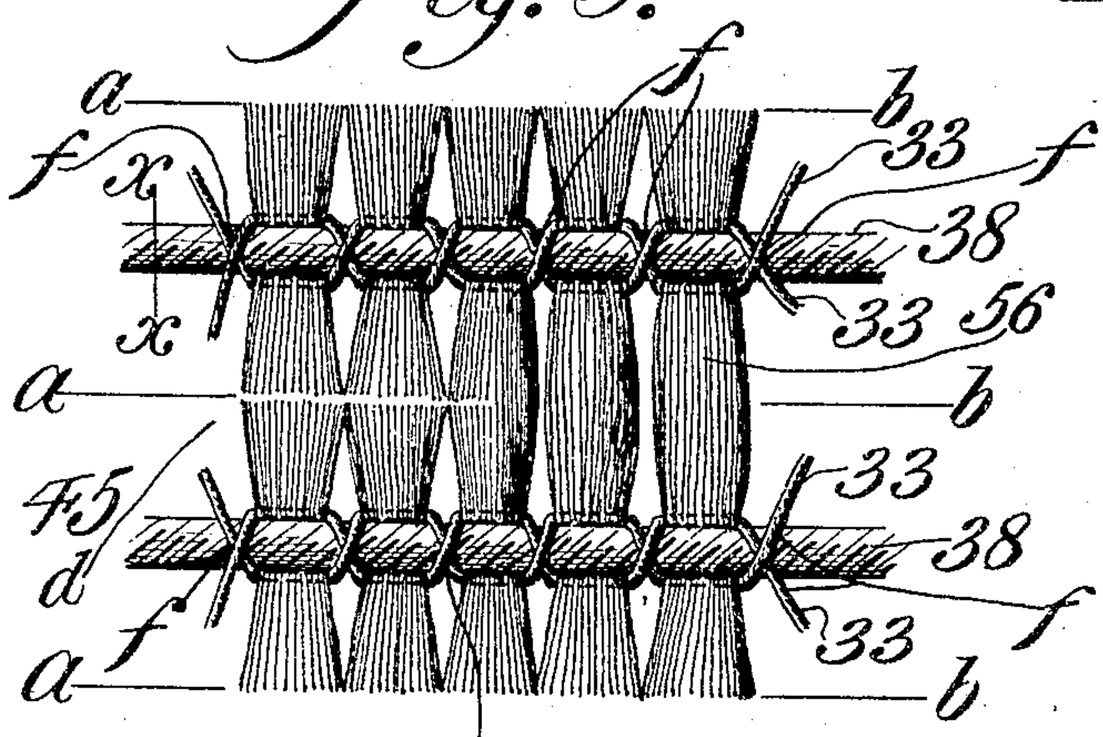
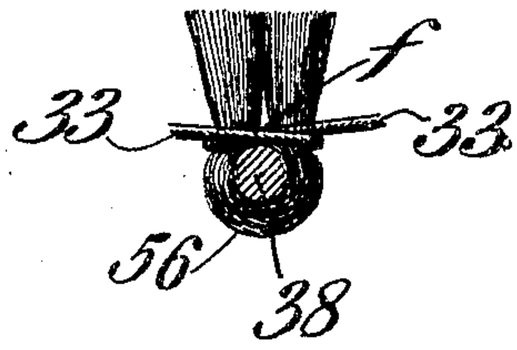


fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT BATES, OF PHILADELPHIA, PENNSYLVANIA.

LOOM FOR CROSS-WEAVING.

SPECIFICATION forming part of Letters Patent No. 773,704, dated November 1, 1904.

Application filed January 22, 1903. Serial No. 140,065. (No model.)

To all whom it may concern:

Be it known that I, ROBERT BATES, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Looms for Cross-Weaving, of which the following is a specification.

My invention relates to improvements in looms for cross-weaving; and it consists of means for causing certain of the warps to cross each other during the process of weaving, so as to produce a fabric which when cut at certain intervals and in the direction of the length of the fabric produces a chenille-weft which may be employed as "weft" or "filling" in the manufacture of pile rugs and carpets.

Figure 1 represents a front elevation of a portion of a loom embodying my invention. Fig. 2 represents a partial side elevation and partial vertical section of the loom seen in Fig. 1. Fig. 3 represents a partial side elevation and partial vertical section of certain of the parts seen in Fig. 2. Fig. 4 represents a perspective view of certain detached portions of the loom and illustrates the method of weaving the fabric. Fig. 5 represents a plan view of a portion of the fabric as woven by the loom illustrated in the accompanying drawings. Fig. 6 represents a vertical section on line *x x* in Fig. 5.

Similar characters of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates the frame of the loom, in which is journaled the crank-shaft 2, provided with the loose and fixed pulleys 3 and 4, respectively, it being noted that said shaft 2 has secured thereon a bevel gear-wheel 5, which meshes with a bevel gear-wheel 6, secured to the shaft 7, which is journaled in the frame 1, as seen in Fig. 1, and the object of which is hereinafter described.

Journaled in the frame 1 are the lay-arms 8, which have pivoted thereto the connecting-rods 10, which latter are also connected to the cranks 9 of the shaft 2. The lay-arms 8 support the shuttle-race 11 and shuttle-boxes 12.

13 and 14 designate picking-sticks, which may be operated in any well-known manner.

Journaled in the frame 1 are the treadles 15, each of which has connected therewith one end of a cord 16, which are passed partly around the pulleys 17 and are secured to the heddle-frame 18, it being noted that the cords 19 also are secured to the cords 16, so as to move in unison therewith, and are secured to the heddle-frame 20, it being noted that the heddle-frames 18 and 20 have secured thereto the springs 21, which latter are also secured to the frame 1 and exert a downward pull upon said heddle-frames 18 and 20. The connection of the springs 21 to the heddle-frames 18 and 20 is illustrated in Fig. 3.

The heddle-frame 20 has pivoted thereto, as at 22, one end of a link 23, whose opposite end is pivoted to a lever 24, fulcrumed at 25 in the frame 1, and is adapted to oscillate the easing-bar 26, journaled in the frame 1, as seen in Fig. 2 and for a purpose hereinafter described. It will be noted that the lever 25 is provided with a slot 27, which permits the point of connection 28 of the link 23 and lever 24 to be adjusted so as to either increase or diminish the throw of said lever 24, and consequently the degree of oscillation of the easing-bar 26.

The heddle-frames 18 and 20 are guided in grooves or ways 29 in the frame 1.

The heddle-frames 18 and 20 are provided with needles 30 and 31, respectively, and through the eyes 32 of which are passed the tying-warps 33, it being noted that said tying-warps 33 are drawn from a beam 34, supported in the frame 1.

Secured in the frame 1 is a stationary cross-bar 35, provided with needles 36 and through the eyes 37 of which are passed the warps 38, drawn from the beam 39, supported in the frame 1.

Journaled in the frame 1 is a shaft 40, provided with a gear-wheel 41, which meshes with the gear-wheel 42 on the shaft 2, it being noted that said shaft 40 has secured thereon the cams or tappets 43, which latter engage with the treadles 15, so as to impart motion thereto, and consequently to the cords 16 and 19 and heddle-frames 18 and 20.

Journaled in the frame 1 is a cloth-beam 44, upon which the woven fabric 45 is wound, it

being understood that the "take-up" of the cloth-beam 44 may be accomplished by any well-known mechanism and in the present instance by that indicated at 46 in Fig. 2.

Secured to the shaft 7 is a bevel gear-wheel 47, which meshes with a bevel gear-wheel 48 on the shaft 49, it being noted that said shaft 49 has secured thereon the cams 50 and 51, (see right-hand side of Fig. 1,) it being noted that the cam 50 bears against a plate or frame 52, which is placed between said cam 50 and the heddle-frame 18, while the cam 51 bears against a plate or frame 53, which is placed between said cam 51 and heddle-frame 20, it being further noted that in the present instance a spring 54 is placed between the heddle-frame 18 and the frame 1, as seen in dotted lines on the left-hand side of said heddle-frame 18, and it is to be understood that the heddle-frame 20 is acted upon by a spring similar to the spring 54 and for a purpose hereinafter described.

The operation is as follows: The warp 38 is led from the beam 39 to and through the eyes 37 of the needles 36 (see Figs. 2, 3, and 4) and from thence to the cloth-beam 44. The tying-warp 33 is divided into two sets, one of which is led from the beam 34 to and through the eyes 32 of the needles 31 and from thence to the cloth-beam 44, while the other set of warp 33 is led from the beam 34 to and over the easing-bar 26, and then over the top rail of the heddle-frame 20, and from thence through the eyes 32 of the needles 30, and finally to the cloth-beam 44, it being understood that one warp 38 and two warps 33 adjacent thereto are passed through the space between two adjacent dents in the reed 55 and that a predetermined number of said dents are left unused—that is to say, they have no warp passed between them, thereby producing the spaces *d* in the direction of the length of the fabric 45 or at a right angle to the weft 56, which is devoid of warp, as seen in Figs. 4 and 5. The loom is put in operation by shifting the belt 58 from the loose pulley 3 to the fixed pulley 4, and assuming the several parts of the loom to be in the positions seen in full lines in Fig. 2 it will be noted that the lay 8 has completed its forward stroke and that the reed 55 has "beaten-up" into the fabric 45 the weft 56 as supplied thereto by the shuttle 57 before the lay 8 moved into the position seen in full lines in said Fig. 2. On the return movement of the lay 8, which is effected by the rotation of the crank-shaft 2 and which causes said lay to move from the position seen in full lines to that seen in dotted lines, the heddle-frames 18 and 20 are lowered, due to the rotation of the shaft 40 and cams or tappets 43 thereon, which is accomplished by the intermeshing of the gear-wheels 41 and 42, it being noted that when the cam or tappet 43 is in the position seen in dotted lines in Fig. 2 the treadles 15 have moved from their positions seen in full lines to those seen in dotted lines, due to the downward pull exerted on the heddle-frames 18 and 20 by the contraction of the springs 21, which causes said heddle-frames to move downwardly, so as to bring the needles 30 and 31 therein into the positions seen in dotted lines in Figs. 2 and 4, whereupon a shed 59 is produced and through which the shuttle 57 is shot by the picker-arm 13, so as to supply the fabric 45 with weft or filling 56, the shuttle 57 then entering a shuttle-box similar to and opposite the box 12. (Seen in Fig. 1.) The rotation of the shaft 40 and cam 43 then returns the treadles 15 into the position seen in full lines in Fig. 2, whereupon the heddle-frames 18 and 20, and consequently the needles 30 and 31, are brought into the positions seen in full lines in Figs. 2, 3, and 4, it being noted that the lower extremities of said needles 30 and 31 are above the warp 38 and that when in these positions the heddle-frame 18 is moved transversely of the loom by the cam 50, which causes the needles 30 and the tying-warp 33 therein to cross the warp 38 in one direction, while the heddle-frame 20 and needles 31 and the tying-warp 33 in the latter are caused to cross the warp 18 in an opposite direction by the expansion of a spring similar to the spring 54, which bears against the heddle-frame 20, the position of the cam 51 permitting said heddle-frame 20 to move transversely of the loom, whereupon the tying-warp 33 is crossed at points above the weft 56 and warp 38, as at *f* in Figs. 1, 4, and 5, after which the tying-warp 33 is again lowered to produce a subsequent shed 59 for the reception of the weft or filling 56, after which said tying-warp 33 is again drawn up by the heddle-frames 18 and 20, as hereinbefore described, after which said tying-warp 33 is again crossed above the warp 38 and weft 56 to be again lowered to produce a shed 59, it being understood that the reed 55 beats up the weft 56 after each pick and that the cloth-beam 44 takes up the woven fabric 45 and also draws the warp 33 and 38 from their respective beams. When the heddle-frame 20 is lowered, it causes the lever 24, and consequently the easing-bar 26, to move from the positions seen in full lines in Fig. 2 to the positions seen in dotted lines in said figure, whereupon the tying-warps 33 which are passed through the eyes of the needles 30 are brought into the position seen in dotted lines on the right-hand side of Fig. 2, it being apparent that when the heddle-frame 20 is drawn up, as hereinbefore described, the lever 24 and the easing-bar 26 are brought into the positions seen in full lines, whereupon the said tying-warp 33 is slackened sufficiently to permit the same to be drawn across the warp 38 without an undue strain upon either the needles 30 or the tying-warp 33, while the

top rail of the heddle-frame 20, which supports the said tying-warp, is moving in a direction opposite to that in which the heddle-frame 18 is moving when the tying-warps 33 are crossing each other. The needles 36 are rigid, and therefore retain the warp 38 in substantially a horizontal position, while at the same time permitting said warp to move freely through the eyes 37 of said needles 36 when drawn from the beam 39 during the process of weaving. When a sufficient quantity of fabric 45 is woven, the same is cut in the direction of the length of the fabric and midway between the warps—as, for instance, along the lines *a b* in Figs. 4 and 5—thereby producing the chenille-weft seen in Fig. 6 and which may be employed as weft or filling for rugs and carpets.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a loom for cross-weaving, the combination of stationary warp-supporting devices, a pair of heddle-frames carrying needles adapted to engage tying warp-threads, one of the said pair of heddle-frames being arranged at each side of the stationary warp-supporting devices, and means for simultaneously raising and lowering the said heddle-frames to carry the tying warp-threads above and below the plane of the stationary warp.

2. In a loom for cross-weaving, the combination of stationary warp-supporting devices, a pair of heddle-frames carrying needles adapted to engage tying warp-threads, one of the said pair of heddle-frames being arranged at each side of the stationary warp-supporting devices, and means for simultaneously raising and lowering the said heddle-frames to carry the tying warp-threads above and below the plane of the stationary warp, and means for independently moving said heddle-frames transversely to carry the tying warp-threads transversely past the stationary warp-threads.

3. In a loom, stationary needles adapted to carry stationary warps, a pair of heddle-frames, needles carried thereby and adapted to carry tying-warps, means for imparting a lateral reciprocating motion to said heddles, and means for raising and lowering said heddle-frames whereby the tie-warps tie each weft separate with the stationary warp.

4. In a loom, stationary needles adapted to carry stationary warps, a plurality of sets of movable needles adapted to carry tying-warps, means for reciprocating said plurality of sets of needles in opposite directions with respect to each other, and means for raising or lowering said needles at the same time, whereby said tying-warps will cross each other and said stationary warp.

5. In a loom, a stationary set of needles adapted to carry stationary warps, a plurality of sets of needles which are movable said movable set of needles adapted to carry tying-warps and a tension device for one set of said tying-warps.

6. In a loom, a set of stationary needles, a pair of heddle-frames, needles carried by each of said heddle-frames, means for raising and lowering said heddle-frames, cams adapted to be operated and contacting with one end of each of said heddles, and means for returning said heddle-frames to their normal position after contact with said cams.

7. In a loom, a set of stationary needles, a pair of heddle-frames, a set of needles carried by each of said heddle-frames, a lever suitably connected with said heddle-frames, cams for raising and lowering said needles, a spring connected with each of said heddle-frames, a cam for each of said heddle-frames adapted to be operated, and a spring bearing against each of said heddle-frames for returning the same to their normal position after operation by each of said cams.

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