

**No. 695,791.**

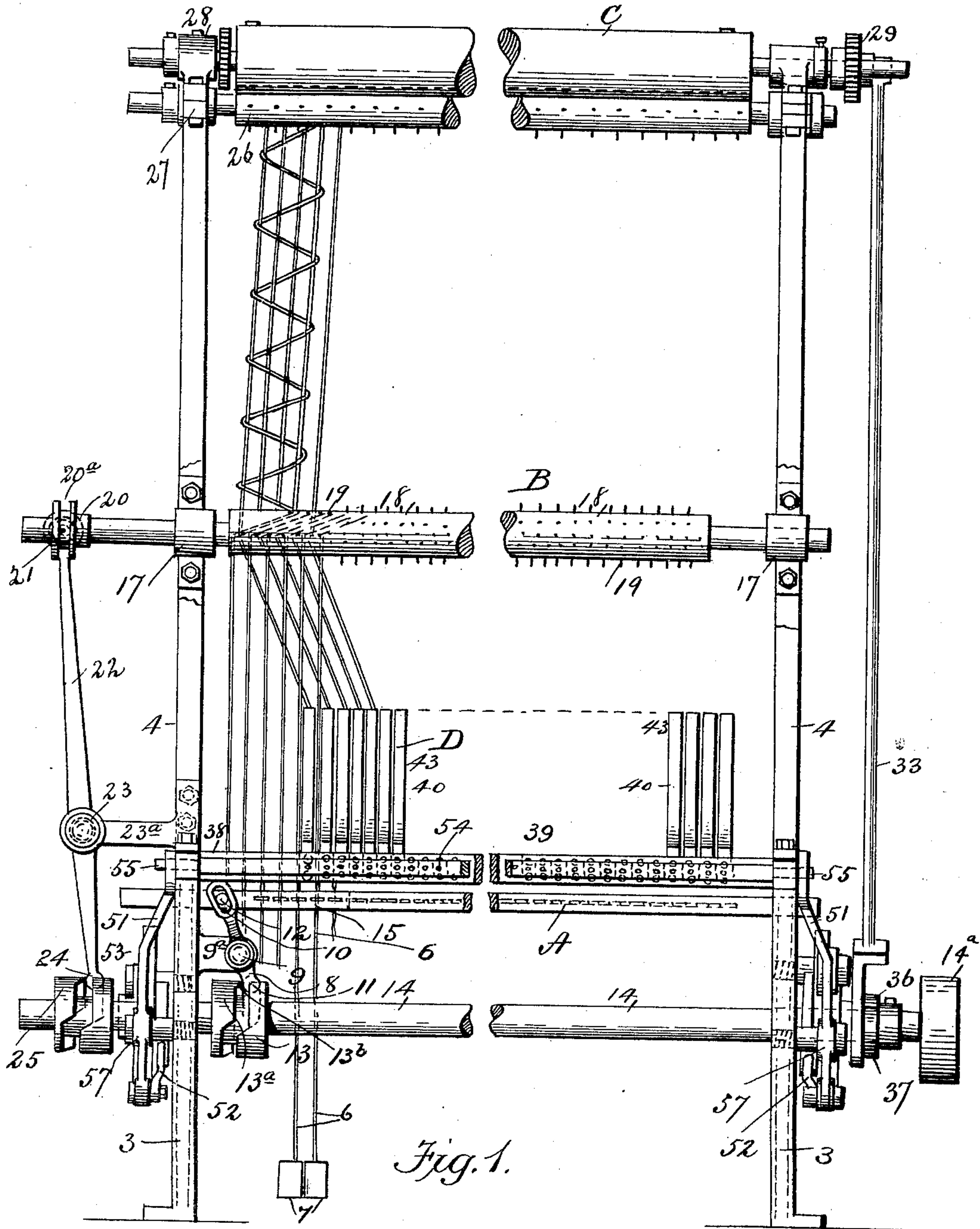
**Patented Mar. 18, 1902.**

**Z. L. CHADBOURNE.**  
**WEAVING MACHINE.**

(Application filed Sept. 12, 1900. Renewed July 1, 1901.)

(No Model.)

**4 Sheets—Sheet 1.**



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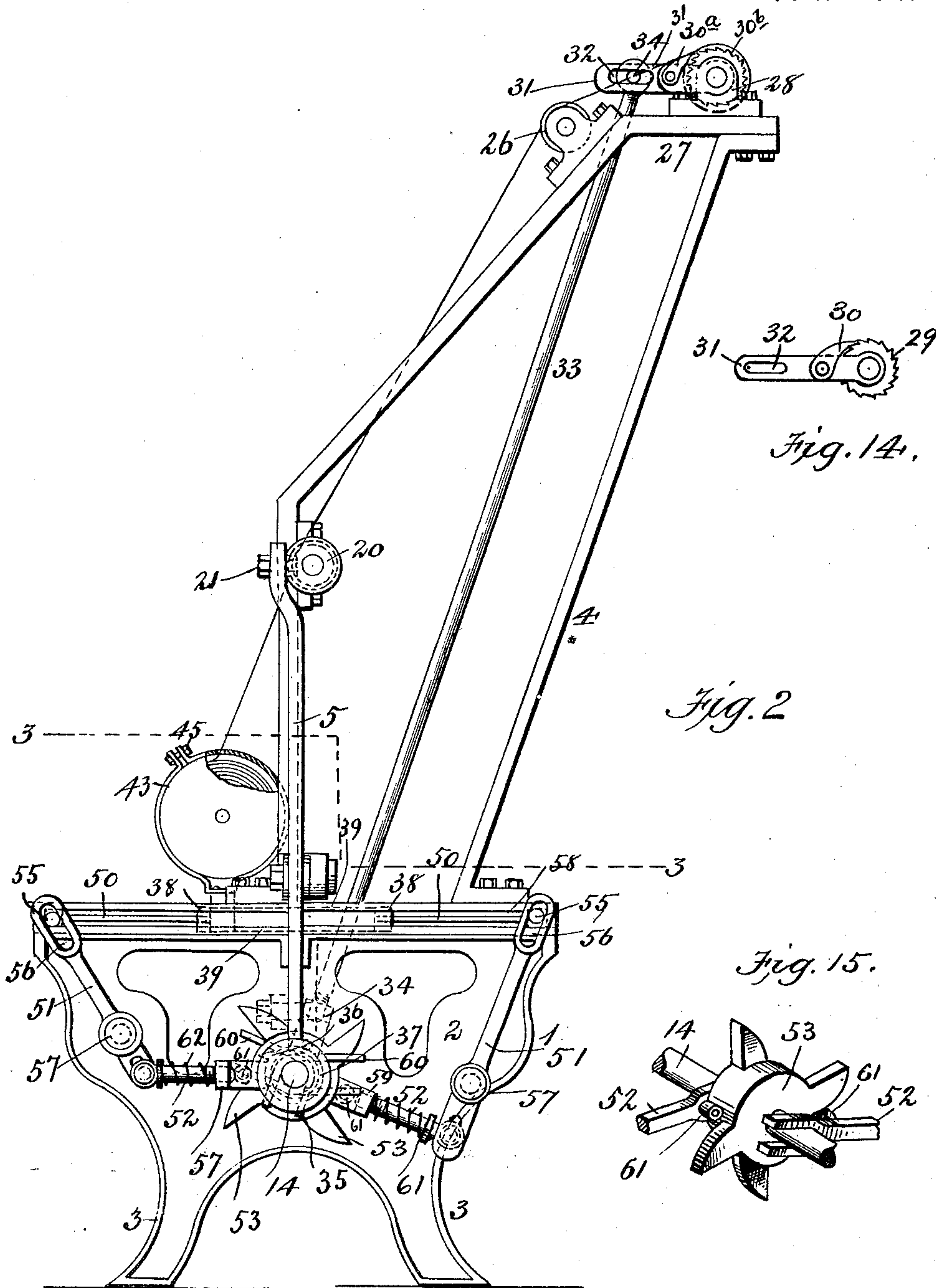
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4 Sheets—Sheet 2.



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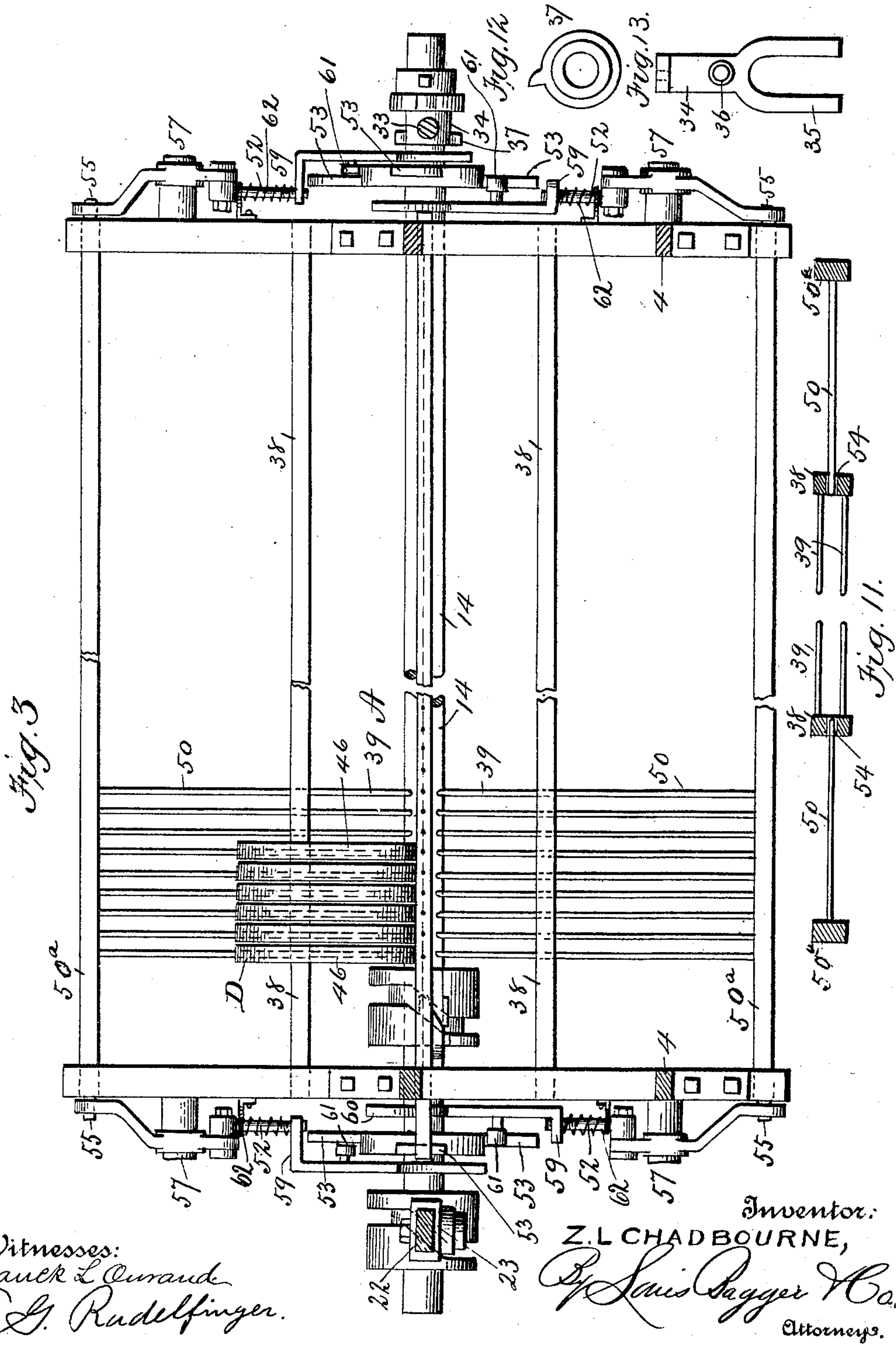
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4 Sheets—Sheet 3.



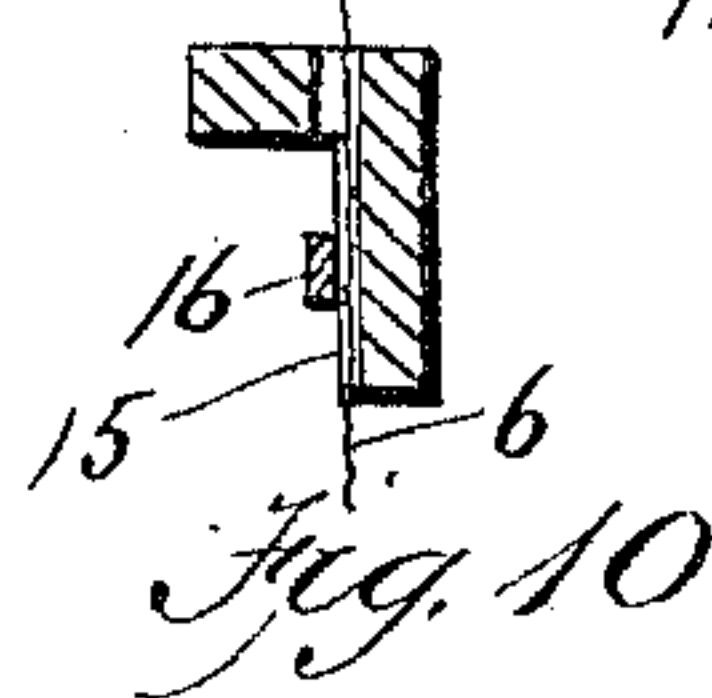
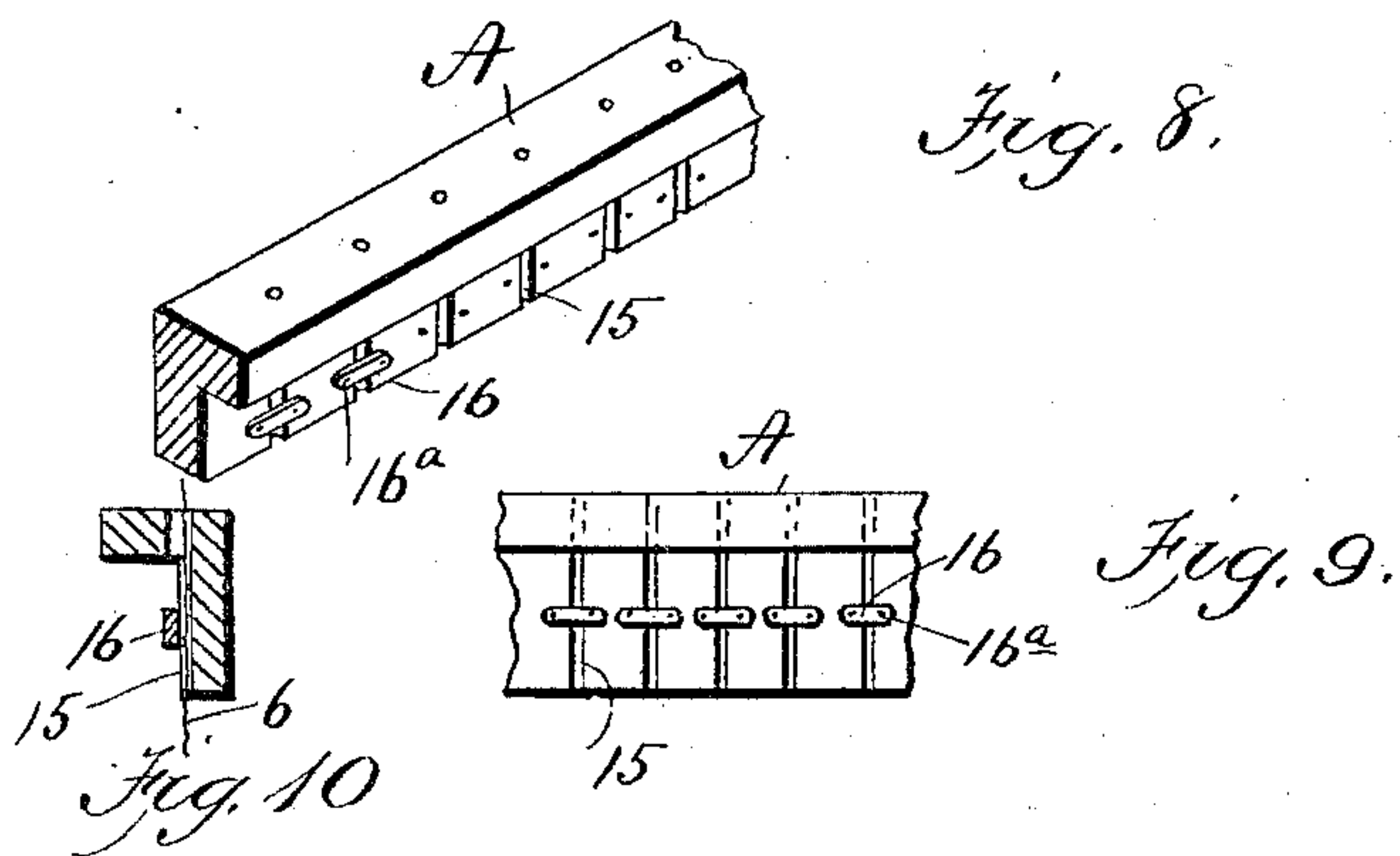
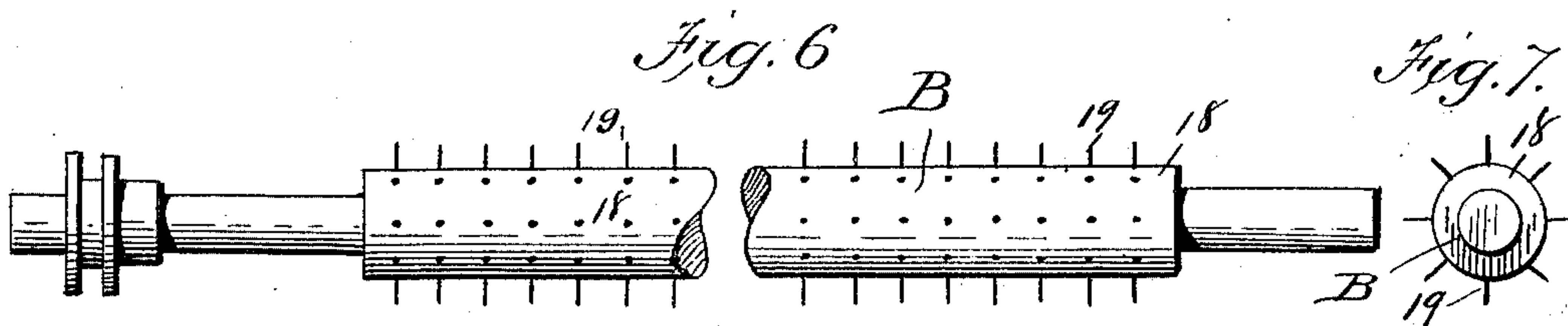
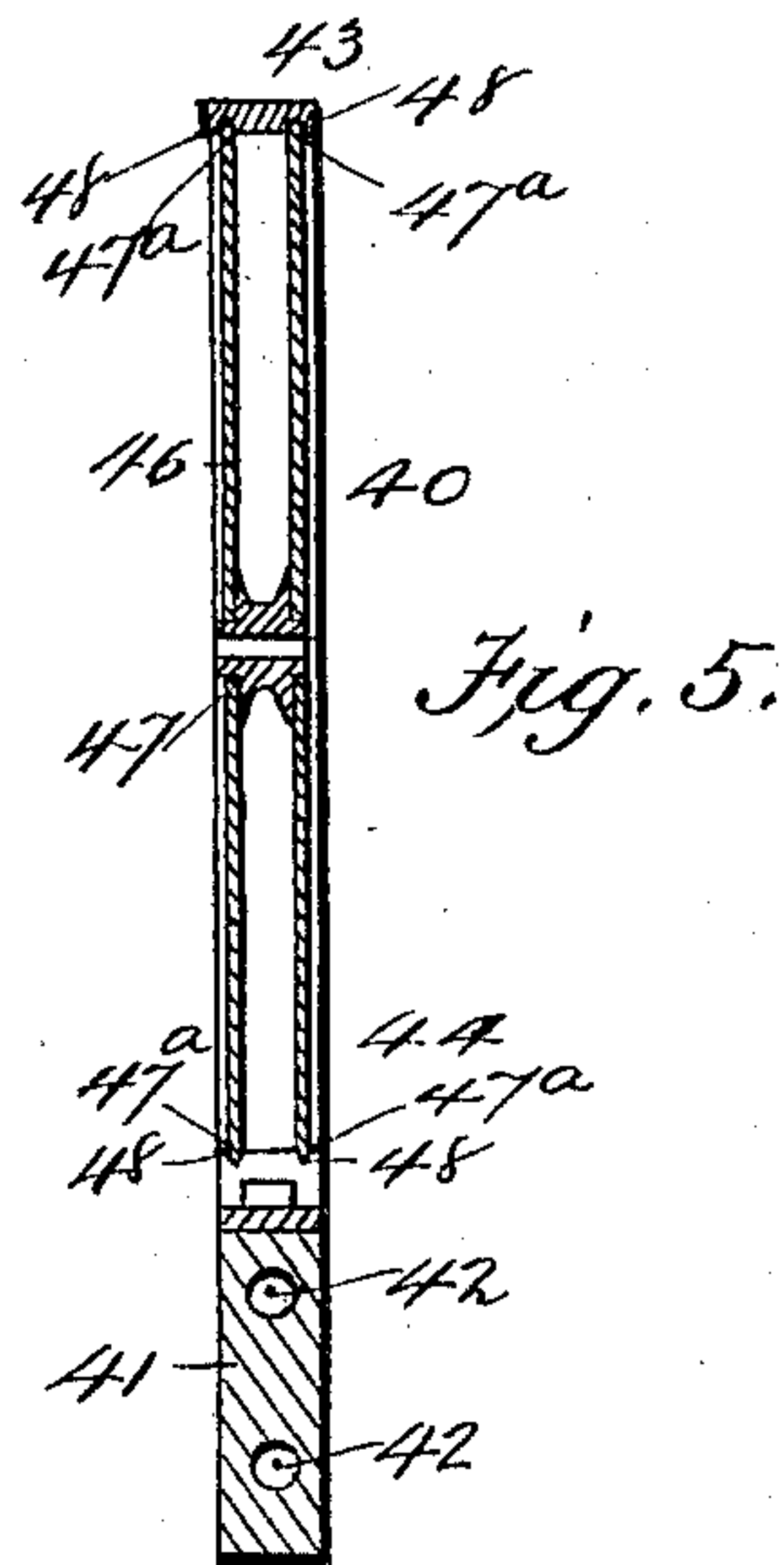
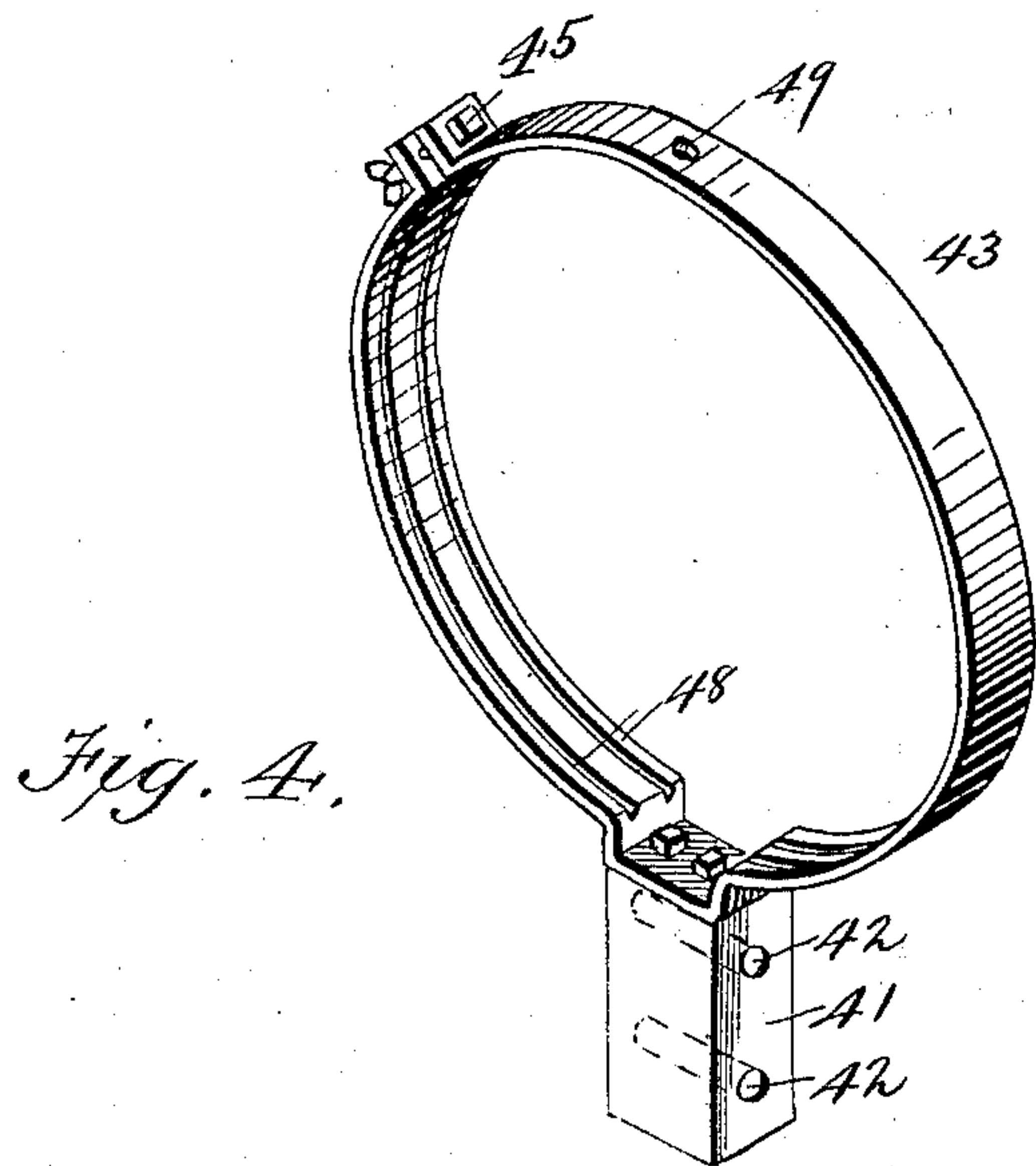


**Z. L. CHADBOURNE.**  
**WEAVING MACHINE.**

(Application filed Sept. 12, 1900. Renewed July 1, 1901.)

(No Model.)

4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

ZEBULON L. CHADBOURNE, OF NEW BRIGHTON, NEW YORK.

## WEAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 695,791, dated March 18, 1902.

Application filed September 12, 1900. Renewed July 1, 1901. Serial No. 66,792. (No model.)

*To all whom it may concern:*

Be it known that I, ZEBULON L. CHADBOURNE, a citizen of the United States, residing at New Brighton, in the county of Richmond and State of New York, have invented new and useful Improvements in Weaving-Machines, of which the following is a specification.

My invention relates to weaving-machines, or, more specifically, to a machine for weaving open meshes, such as are used in hammocks, shawls, and the like.

The object of the same is to produce a loom of this character which will be simple in construction and efficient in operation.

The novel construction designed by me in carrying out my invention is fully described in this specification and claimed, and illustrated in the accompanying drawings, forming a part thereof, in which—

Figure 1 is a rear elevation of my loom. Fig. 2 is an end elevation of the same. Fig. 3 is a plan thereof. Fig. 4 is a detail perspective of a portion of one of the shuttles and its block. Fig. 5 is a transverse section of one of the shuttles. Fig. 6 is an elevation of two fragments of the pin-roller B. Fig. 7 is an end elevation of the same. Fig. 8 is a perspective of a fragment of the tension-board A. Fig. 9 is a side view of a fragment of the same. Fig. 10 is a transverse section of the same. Fig. 11 is a transverse section of the pin-rails and carrier-rails. Fig. 12 is a detail of the cam which operates the drum C. Fig. 13 is a detail of the head and fork which are fitted on the end of the connecting-rod. Fig. 14 is a detail of the arm, pawl, and ratchet which operate the drum C. Fig. 15 is a detail perspective of one of the four-armed cams.

Like characters of reference designate like parts in the different views of the drawings.

In describing my invention I will first take up the warp-operating mechanism, which consists, essentially, of a longitudinally-reciprocating tension-board A, a longitudinally-reciprocating pin-bearing roller B, and an intermittently-operated drum C. The woof mechanisms will then be described, which comprise a series of reciprocating bobbins D, oscillating in plane at right angles to the warp, in combination with the before-men-

tioned pin-roller B and drum C. The operation of the loom during the whole process of weaving will then be set forth.

The numeral 1 designates the framework of my machine, which comprises side frames 2, provided with legs 3 and diagonal braces 4 and 5, bolted to the side frames 2. The warp-threads 6 are supplied to the machine from reels inclosed in cases or boxes 7 of suitable construction in any manner to avoid entangling. The threads 6 first pass to the tension-board A. This tension-board is mounted to slide longitudinally in the frame of the machine. It is reciprocated by means of a lever 8, which is pivoted at 9, slotted at 10, and provided with a ball end 11. The pivot 9 is rigidly secured to a bracket 9<sup>a</sup>, and the slot 10 engages a stud 12, seated in the tension-board A. The ball 11 is engaged by a grooved cam-wheel 13, keyed on a main driving-shaft 14, which is the sole source of power for the machine and may be connected to any source of power by means of pulleys 14<sup>a</sup> and belts. The cam-wheel 13 is traversed by a groove which has alternate portions 13<sup>a</sup> and 13<sup>b</sup> parallel to the plane of rotation of the wheel and diagonal thereto, respectively. There are four diagonal portions 13<sup>b</sup>, so that the width of the wheel 13 is traversed in two distinct movements of the arm, which makes four distinct movements of the arm 8, and therefore of the tension-board, for each revolution of the driving-shaft.

The tension-board A is angular in cross-section and is pierced transversely by apertures 15, which accommodate the threads 6. The tension device is situated just under the overhanging portion and consists of a small strip 16 of resilient metal secured by two screws 16<sup>a</sup>. There is a tension provided for each thread. They pass beneath these strips 16, and the force is regulated by tightening or loosening the screws 16<sup>a</sup>. The warp-threads 6 next pass to the pin-roller B. This roller is journaled in boxes 17, supported on the frame members 5, and is allowed latitude to permit its being reciprocated endwise. An enlarged portion or drum 18 is formed integral therewith and bears upon its convex surface a series of pins 19, rigidly mounted therein in parallel rows and positioned to line up in a direction parallel to the plane of



rotation of the roller. Keyed to the outer end of the roller B is a grooved wheel 20. The groove 20<sup>a</sup> therein extends at right angles to the roller and engages a pin 21, mounted in the upper end of a lever 22. This lever 22 is pivotally supported at 23 on a bracket 23<sup>a</sup> and is provided with a ball-head 24, which engages a cam-wheel 25. This cam-wheel 25 is identical in construction with the cam-wheel 13 and is set to operate the lever 22 in unison with the lever 8. By this arrangement the tension-board A and the pin-roll B are always reciprocated in unison—that is, they are in synchronous accord. The warp-threads 6 next pass onto and over a guide-roller 26, which is journaled in boxes 27, supported on the frame. This roller acts as a guide to hold up the threads, and thereby keeps them from sagging, and is provided with a set of pins equal in number to and arranged identical with the pins on the roller B. From the roller 26 the threads extend to the drum C. This drum C is journaled in boxes 28, supported on the top of the frame, and is designed to exert a pull on the threads and to wind the finished product up. The means for operating this drum C comprises a ratchet-wheel 29, rigidly keyed to the axle of the roller and which operates in combination with a pawl 30, pivotally mounted on an arm 31. The arm 31 is loosely mounted on the axis of the drum and is slotted at 32. A connecting-rod 33 is provided to operate the arm 31, and with that end in view is fitted with a stud-bolt 34, which is adjustably mounted in the slot 32. The slot 32 thereby gives latitude for adjustment of the feed. The connecting-rod 33 extends down and is screwed into a threaded head 34. This head 34 has a fork 35 formed integral therewith, which straddles the main shaft 14. A roller 36 is mounted in this head and serves as a contact for a single cam 37, which is keyed to the main shaft 14. By this combination of the main shaft 14, single cam 37, connecting-rod 33, arm 31, pawl 30, and the ratchet 29 the drum C is intermittently actuated and revolved one or more teeth at every revolution of the main shaft 14 and the work advanced one mesh thereby. In order to prevent the drum C from sagging back, a second pawl 30<sup>a</sup> and ratchet 30<sup>b</sup> are provided. The ratchet 30<sup>b</sup> is keyed to the opposite end of the drum-shaft, and the pawl is mounted on a bracket-arm 30<sup>c</sup>, adjacent thereto. The operation is obvious.

I will next describe the bobbin mechanism D for weaving in the woof. Two metal strips or boards 38 are secured to the frame in the same horizontal plane and are set edgewise and parallel to each other. These boards 38 are provided with a double series of pins 39, rigidly mounted thereon. These pins 39 are arranged in two parallel rows one above the other and extend across the interval separating the two boards 38, but leaving a small space intervening between their heads, which are slightly rounded. Mounted to slide on

the pins 39 are shuttles 40, one shuttle for each pair of pins, situated in the same vertical plane on one of the boards 38. Each shuttle 40 comprises a block 41, pierced by longitudinal apertures 42, and on the top of which is bolted a rim 43, which embraces and holds a spool or bobbin 44. The rim 43 is secured together by a bolt 45, and a small space intervenes between the ends thereof to permit adjustment. The spool 44 consists of two heads 46, mounted on the ends of a spindle 47. The heads are beveled on the periphery to a V-shaped edge 47<sup>a</sup>, and these edges fit corresponding V-shaped grooves 48 in the rim 43. To assemble the shuttle, the spool 44 is first inserted within the rim 43 with the edges 47<sup>a</sup> fitting within the grooves 48 and the bolt 45 tightened up. By this arrangement the tension of thread wound on the bobbin is regulated. The thread passes off the spool and through a perforation 49 in the rim. These shuttles 40 are constructed to be reciprocated on the pins 39, and for that reason the blocks 41 must be long enough to bridge the distance between the heads of the two sets of pins 39. The means for reciprocating the shuttles 40 is provided in the shape of a double series of pushing-rods 50, which are actuated by two pairs of levers 51, connected to pushers 52, operated by four-armed cams 53. The rods 50 are mounted to slide in perforations 54 in the boards 38. These perforations are positioned intermediate the pins of the top and bottom series. The pushers 50 are all mounted in carrier-rails 50<sup>a</sup>, having pins 55, which engage the levers 51. The levers 51 are slotted at 56, fulcrumed at 57, and are connected by their short arms to the pushing-rods 52. The pins 55 fit within the slots 56, and by this arrangement the carrier-rails 50<sup>a</sup> are reciprocated in guideways 58 in the frame. The pushers 52 have threaded heads 59 to give a range for adjustment, and forks 60, formed integral therewith, are provided with rollers 61 to contact with the four-armed cams 53, keyed on the main shaft 14. The arms on the cams 53 are so located that they divide the interval—that is, in such a manner that when one pair of pushers 52 is being actuated the other pair will remain still. By employing four-armed cams the shuttles are thereby reciprocated twice for every revolution of the main shaft 14. Now it has been pointed out that the tension-beam A and the pin-roll are moved intermittently four times by every revolution of the main shaft 14, and it is important now to note that the movements of the shuttles occur in the intervals when the pin-roll and tension-board are at a standstill. A set of springs 62 is provided which surround the rods 52 and serve to return them to their initial position after displacement. After leaving the shuttles 40 the woof-threads pass to the pin-roller B and are interposed between the pins thereon. It has been remarked that the warp-threads 6 occupy the alternate spaces between the pins.



This leaves every alternate space for the woof, so that the threads of the two series alternate. From the pin-roll the woof next goes over the guide-roll 26 and then onto the drum or feed-roll C. It will be understood that the thread must be secured in some manner to the drum C on starting to weave.

The operation of my loom can now be set forth. It will be assumed that the bobbins 44 have all been filled and the woof-threads strung in the alternate spaces between the pins on the roller B and then passed up over and secured to the drum C. The warp-threads are strung through the tension-board A in the alternate spaces between the pins on the roller B and then up around the drum C and secured thereto. Power is then applied to the main shaft 14 and the machine started. The ball ends of levers 8 and 22 will as soon as they reach the diagonal portions 13<sup>b</sup> be actuated, and the tension-board A and pin-roll B will be shifted over a distance equal to four pins or two threads of the warp. The shuttles 40 are then passed through at right angles to the plane of the warp by the action of the pushers 50, actuated by the levers 51 and cam 53. The pin-roller and tension-bar are now shifted two threads more in the same direction and the shuttles again passed through. It will be observed that in this manner the pattern is woven two under and two over. The tension-board A and pin-roll B are next actuated and carried two threads in the reverse direction and the bobbins again passed through, when the pin-roll is shifted back to its initial position and the shuttles passed through into their initial position. In this way the weaving is continued. It will be observed that the warp comes out straight, while the woof is zigzag, going over two threads, under two, then back again over two and under two. I might weave under and over one by regulating the throw of my mechanism. The drum C is intermittently actuated by the pawl and ratchet and feeds the cloth or net the distance of one mesh at each revolution of the main shaft 14.

I do not wish to be limited as to details of construction, as these may be modified in many particulars without departing from the spirit of my invention.

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

1. In a loom, the combination, substantially as described, of a tension-board provided with means for regulating the tension of the warp, a pin-bearing roller, means for intermittently actuating said tension-board and said pin-roll in unison, a drum or feed-roller, and means for intermittently actuating said drum or feed-roller.

2. In a loom, a shuttle, comprising the combination of a rim provided with grooves, a bobbin or spool provided with heads, the

edges of which are constructed to fit said grooves in said rim, and adjustable means for clamping the ends of said rim together to regulate the force necessary to turn said spool in said rim, substantially as described.

3. In a loom, the combination, substantially as described, of a tension-board provided with means for regulating the tension of the warp-threads, a pin-bearing roller, means for intermittently actuating said tension-bar and pin-roller in unison, shuttles constructed to be reciprocated, and means for intermittently actuating said shuttles.

4. In a loom, the combination, substantially as described, of a pin-bearing roller mounted to revolve on its axis and to be reciprocated longitudinally, a tension-board bearing means for regulating the tension of the warp-threads, said board being mounted to be reciprocated longitudinally and means for intermittently reciprocating said pin-roller and tension-board in unison.

5. In a loom, the combination, substantially as described, of a pin-bearing roller mounted to revolve on its axis and to move longitudinally, means for intermittently reciprocating said pin-roller longitudinally, means for regulating the tension of the warp, shuttles, and means for reciprocating said shuttles.

6. In a loom, the combination, substantially as described, of a pin-bearing roll mounted to be rotated and to move longitudinally, a grooved wheel keyed on said roll, a cam-wheel having a groove therein, a lever fulcrumed intermediate its ends and positioned with one arm engaging said grooved wheel on the pin-roll, the other arm engaging the said grooved cam-wheel, means for regulating the tension of the warp, shuttles, and means for reciprocating said shuttles.

7. In a loom, the combination, substantially as described, of a tension-board bearing means for regulating the tension of the thread, and mounted to be longitudinally reciprocated, a stud secured in said board, a grooved cam-wheel mounted to be revolved, a lever fulcrumed intermediate its ends and having a slotted arm, said lever being located with its slotted arm engaging said stud and its other arm engaging said grooved cam-wheel, shuttles, and means for reciprocating said shuttles.

8. In a loom, the combination, substantially as described, of a pin-roller mounted to move longitudinally and to be revolved, means for moving said pin-roller longitudinally and back, the distance in each direction being traversed in two stages, means for regulating the tension of the warp, shuttles, and means for reciprocating said shuttles.

9. In a loom, the combination, substantially as described, of a tension-board constructed to bear the warp-threads, and mounted to move longitudinally, a pin-roller, means for moving said pin-roller longitudinally and back to its initial position, the distance in



each direction being covered by two distinct movements, shuttles and means for reciprocating said shuttles.

10. In a machine of the class described, the  
5 combination of means for holding one end of the weft-threads and the warp-threads stretched taut, means for moving said warp-threads and the said end of the weft-threads transversely the warp, shuttles carrying the  
10 other ends of the weft-threads, means for actuating said shuttles to pass them back and forth through said warp, and means for feeding said warp and weft threads longitudinally, substantially as described.

11. In a machine of the class described, the  
15 combination of means for holding the warp-threads stretched parallel and taut and one end of the weft-threads located intermediate the warp-threads, shuttles for holding the free  
20 ends of the weft-threads, and means for intermittently actuating said shuttles to pass them back and forth through said warp.

12. In a machine of the class described, the  
25 combination of means for holding the warp-threads stretched and parallel and for holding the weft-threads at one point leaving one end free, means for intermittently moving the warp and the secured end of said weft transversely the warp, shuttles carrying the  
30 free end of said weft, means for intermittently actuating said shuttles to pass them back and forth through the warp, means for feeding said warp and weft longitudinally, substantially as described.

35 13. In a machine of the class described, the

combination of means for holding the warp-threads stretched taut and for holding the weft-threads leaving one end of each free, means for intermittently moving the said warp and the held end of said weft trans- 40  
versely the warp going a distance of two threads each movement, progressing four threads in one direction and four threads back, shuttles containing said free ends of the weft-thread, and means for intermittently actuat- 45  
ing said shuttles to pass them back and forth through the warp.

14. In a machine of the class described, the  
combination, of means for holding the warp-threads stretched taut and for holding one 50  
end of the weft-threads leaving the other end free, means for intermittently moving the said warp and the held end of the weft transversely the warp going a distance of two  
55 threads of the warp each movement, progressing four threads in one direction and then four threads back, shuttles carrying the free ends of said weft-threads, means for intermittently actuating said shuttles to pass them  
60 back and forth through the warp, and means for feeding said warp and weft longitudinally, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ZEBULON L. CHADBOURNE.

Witnesses:

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