

(No Model.)

W. H. AVIS.  
TWINE MAKING MACHINE.

No. 451,424.

Patented Apr. 28, 1891.

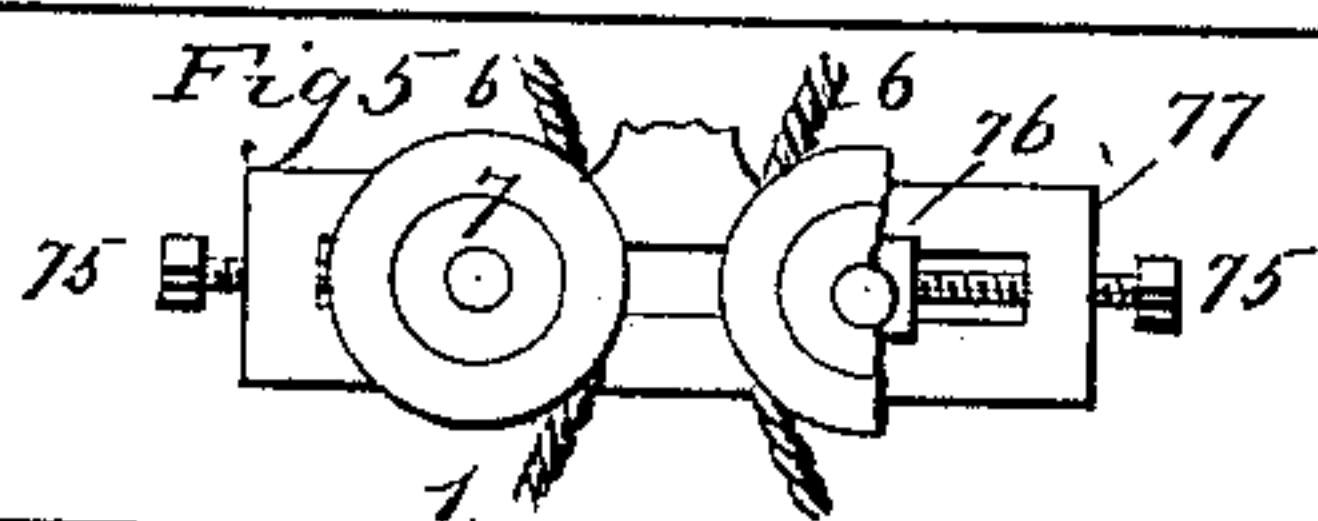
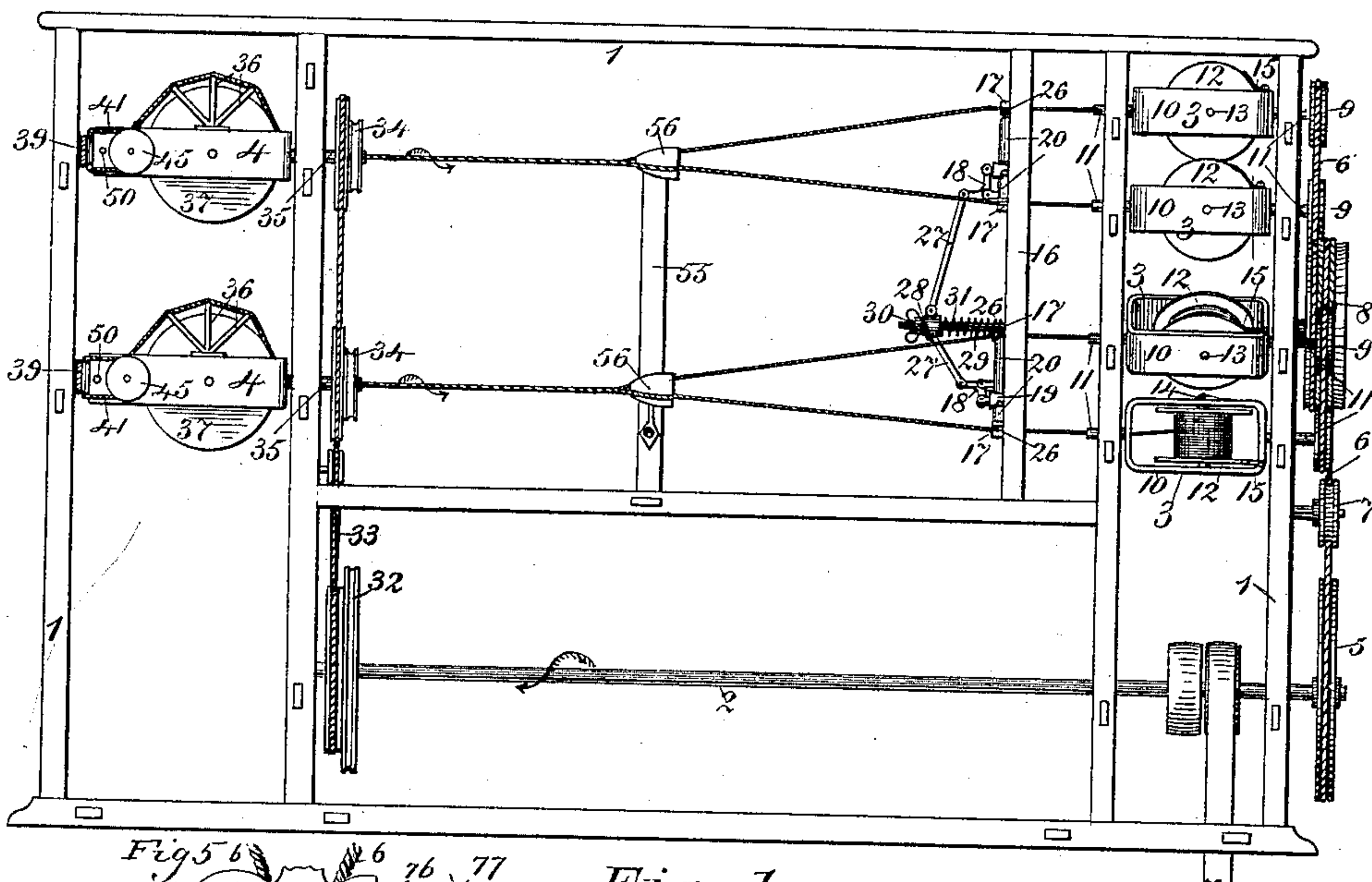


Fig. 1

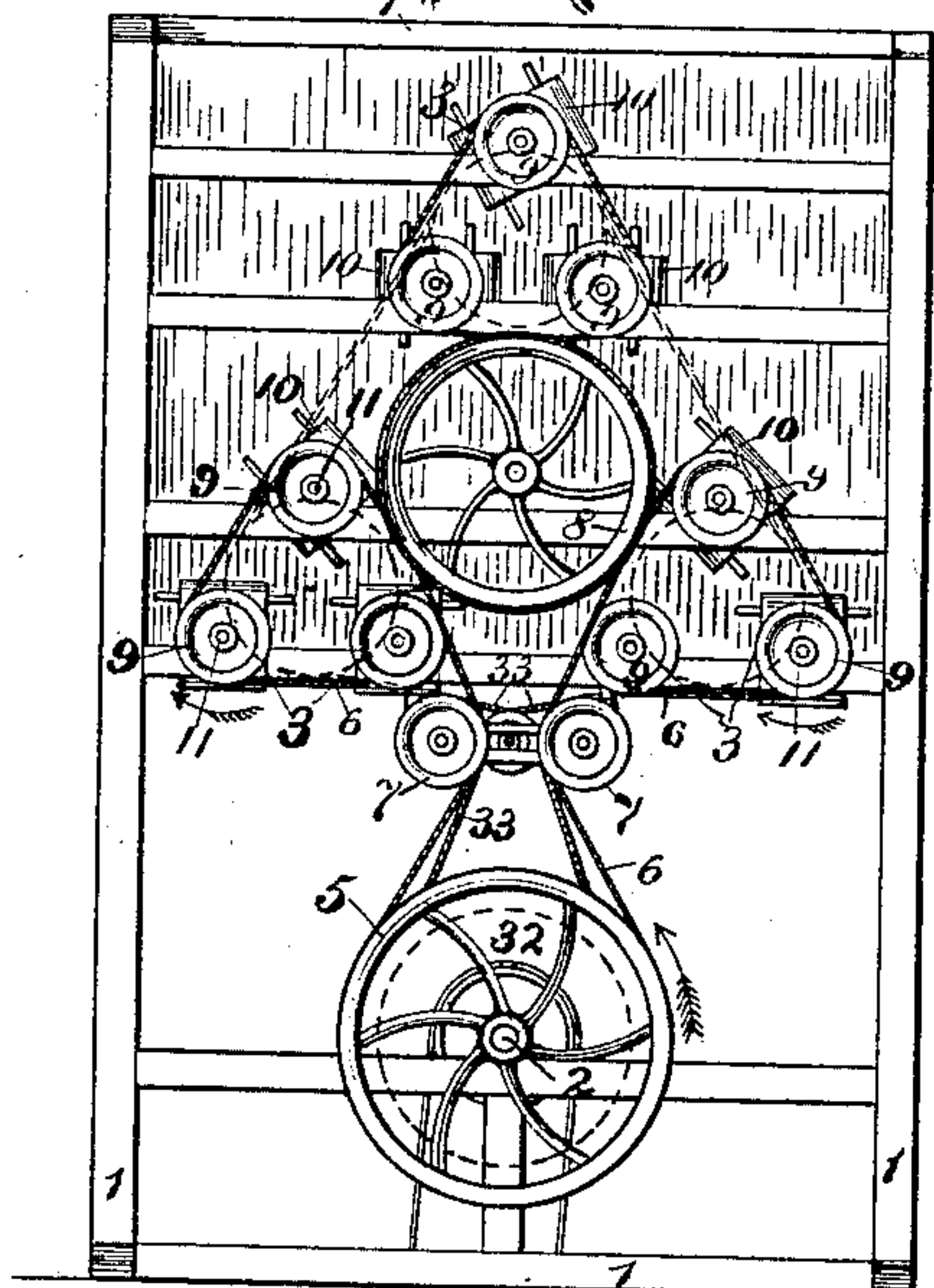


Fig. 2

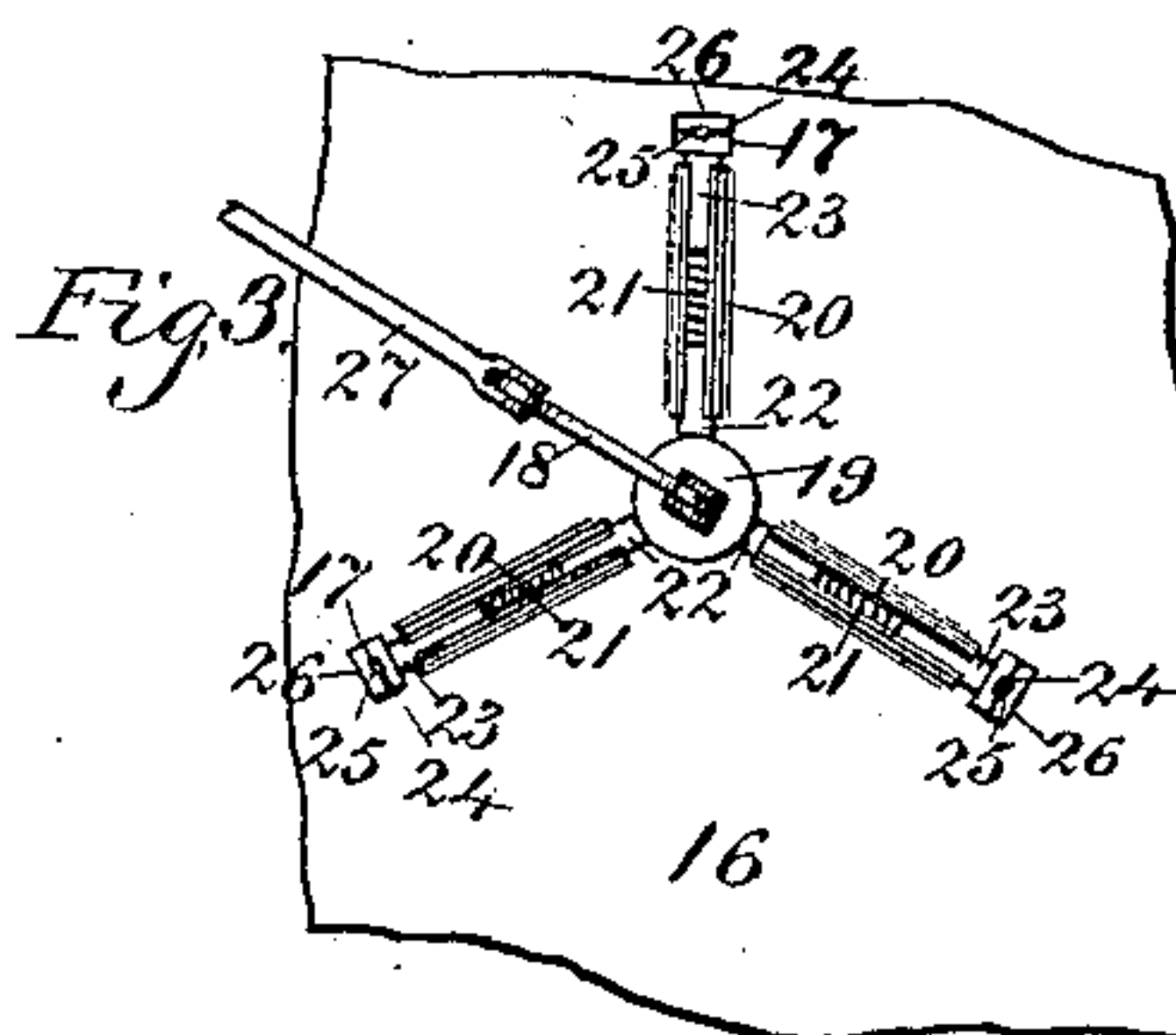


Fig. 3

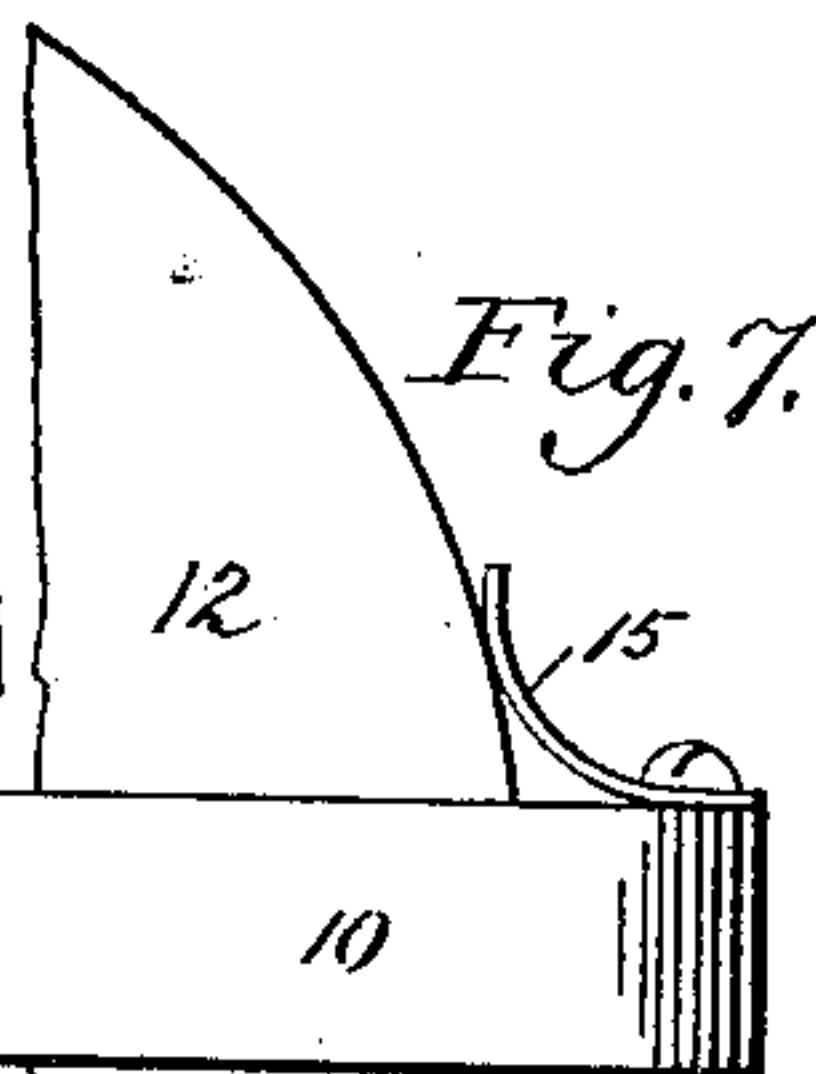


Fig. 7

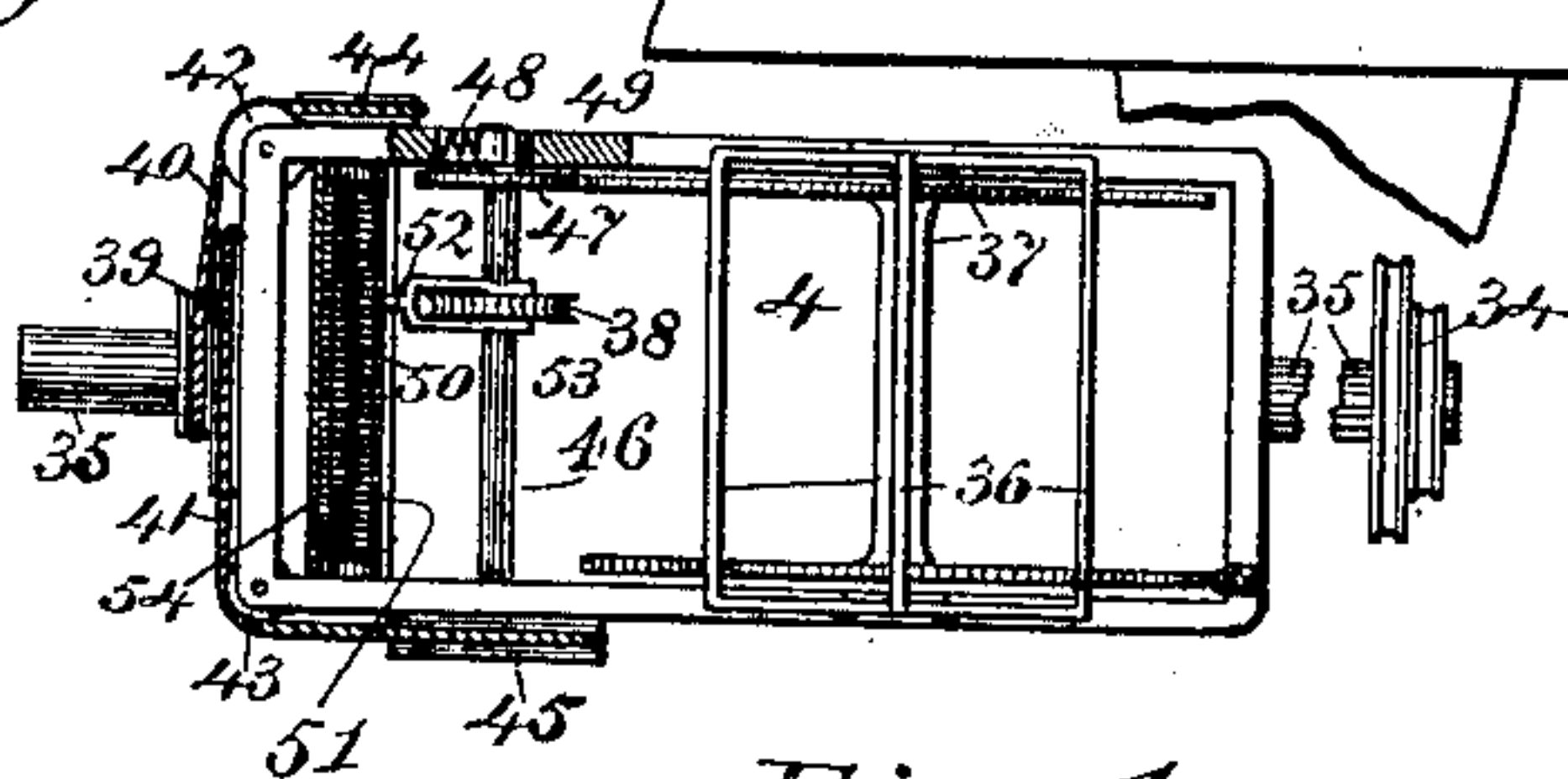


Fig. 4

Witnesses  
H. D. Boyes.  
W. H. Clapp m.w.

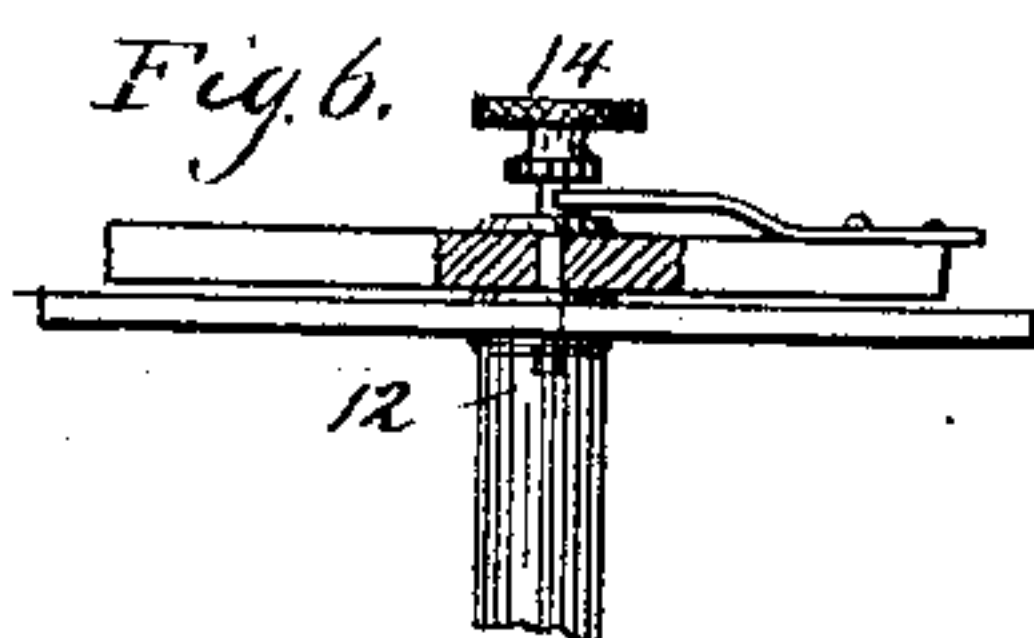


Fig. 6

Inventor  
Walter H. Avis  
Per Graham & Piches  
Attorneys



# UNITED STATES PATENT OFFICE.

WALTER H. AVIS, OF TORONTO, CANADA, ASSIGNOR TO ROBERT CHARLES FISHER, OF SAME PLACE.

## TWINE-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 451,424, dated April 28, 1891.

Application filed March 7, 1890. Serial No. 343,061. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER HERBERT AVIS, a subject of the Queen of Great Britain, residing at Toronto, in the county of York and Province of Ontario, Canada, have invented a new and useful Twine-Making Machine, of which the following is a specification.

The object of my invention is to provide a twine-making machine that can be used in a small or limited space, which I accomplish by a system of storage or carrying the supply rolled on spools and twisting the strands and forming the twine in a short space, instead of drawing out in full lengths and twisting the same as is usual in the present method of manufacture by means of rope-walks.

I attain the above object by means of the mechanism illustrated in the accompanying drawings, in which similar figures refer to similar parts throughout.

Figure 1 represents a side elevation of my improved twine-making machine; Fig. 2, a front end elevation of the same machine; Fig. 3, a detail of the arrangement of the tensions for tubing the strands of the twine; Fig. 4, a detail of one of the similar storage-bobbins for the twisted twine; and Figs. 5, 6, and 7 are detail views of parts hereinafter referred to.

The frame 1 of my improved machine is formed and arranged suitably to hold the mechanism hereinafter explained, and the main shaft 2, which distributes the power to revolve the different fliers, which are divided into the strand-twisting fliers 3 and the twine-twisting fliers 4, the former at the front and the latter at the rear end of the machine. The main shaft 2, extending horizontally along and supported in suitable bearings in the lower portion of said main frame 1, has rigidly secured on its front end the grooved pulley 5, around which a cord or other suitable form of belt 6 passes, and thence passing between or over adjustable tightener-pulleys 7, which are operated by means of set-screws 75 in rear of the axle-blocks 76 of said pulleys 7, operating to move them along a slotted frame 77. (Shown in rear of said pulleys 7, as illustrated in Fig. 5.) The belt 6 then passes round the central pulley 8, and thence round the lower right-hand group of pulleys

9, of which there are three distributed or arranged in the form of an equilateral triangle, the said pulleys being secured on the axles 11 of the strand-twisting fliers 3 in groups of three corresponding to the arrangement of said pulleys 9 in groups of three and equally distributed round the central pulley 8. The belt 6, after passing round the first group of pulleys 9, returns to the central pulley 8 to leave it at the top, where it passes in the same direction round the next group of pulleys 9, occupying the apex of the triangle. Thence it again passes to the central pulley 8 to again leave it to encircle the third group of pulleys 9 on the lower left side in the same direction as before, causing all the three groups of three pulleys 9 each to revolve in the same direction. The belt 6, after passing round the central pulley 8, passes over the left one of the tightener-pulleys 7, and is an endless belt.

The fliers 3 are formed, as shown, with a rectangular band-frame 10, to each end of which is centrally secured the shaft 11, upon which they revolve, and which is at the rear end hollow for the reception of the strand wound on the flier-spool 12, suitably secured in position by means of a stud-pin 13 in one end and a spring-bolt 14 in the other. (See Fig. 6.) To the frame 10 of the flier 3 is secured a spring 15, bearing on the flier-spool 12, (see Fig. 7,) to form a brake on the same to stop the spool 12, when the machine stops and prevents unnecessary unwinding of the strand from off the said spool 12.

The tubing-frame 16, located a short distance in rear of the said strand-twisting fliers 3, is provided with tension-regulating devices 17 in groups of three to correspond to the twisting-fliers 3, the said tension-regulating devices of each group comprising a bell-crank 18, hinging at the angle thereof in a suitable bearing on the frame 16, one arm of said bell-crank lever being pivoted to a conical plunger 19 at right angles thereto, and around which are equally-spaced radial chambers 20, in each of which is placed a spiral spring 21, pressing against a plunger 22, bearing against the said conical plunger 19 at one end, and at the other end of each of the said chambers the spring 21 bears against another plun-



ger 23, having a T-head, in the outside of which is a slightly-rounded groove 24 to match a similar groove 25 formed in the inner side of the tubing-block 26. The said grooves 24 and 25 are for the purpose of engaging and creating a tension in the strand of the twine passing through them. The bell-cranks 18 are operated by rods 27, connecting their vertical arms to the sliding collar 28, secured on a central standard 29 by a nut 30 on the outer threaded end of said standard 29, around which standard a spiral spring 31 is located to press against the collar 28. To increase or decrease the tension on the strands or to adjust for the various sizes of strands, it is only necessary to operate the nut 30 accordingly, which operates the tensions 17 in uniform conjunction by the rods 27 operating the bell-cranks 18, which operate the conical plungers 19, which again operate the tensions 17 through the medium of a spring 21 in each of the radial chambers 20.

On the rear end of the shaft 2 is secured a grooved cone-pulley 32, around which a belt 33 passes to drive the twine-twisting fliers 4, of which there are three, one to each group of three-strand-twisting fliers 3. The belt 33 passes around the pulleys 34 on the ends of the axles 35 of the said twisting-fliers 4 in a manner similar to the winding of the belt 6 round one of the groups of pulleys 3. The front end of the axle 35 of each flier 4 is hollow, through which the twine passes, and thence over the frame 36 on said flier 4 to support it from contact with the spool 37. Thence it passes round a distributing-wheel 38, laying the twine on the said spool 37 in regular layers.

On the frame 1, adjacent to each flier-frame 4, is secured a double pulley 39, over which belts 40 and 41 pass, turning the corners of the flier-frame on rollers 42 and 43, respectively, and pass over the grooved pulleys 44 and 45, respectively, one on each of the opposite sides of the flier-frame 4, the pulley 45 being on the shaft 46, having the distributing-wheel 38 mounted on it, and also having the friction-wheel 47 secured to the other end and maintained in contact with a flange on the spool 37 and operating the spool 37 by means of a spring 48 pressing against a bearing-block on the end of said shaft 46. The belt 40 operates the pulley 44 on the end of shaft 50, having a left and right thread cut in it and in which the shank 52 of the guide 53, sliding on said shaft 46 and carrying between its two links the wheel 38, is engaged and carried back and forth the length of said shaft 50 to distribute the twine in uniform layers. The shaft 50 is inclosed in a casing 54, having a longitudinal opening to admit the shank 52 of the guide 53 to work the extent of the shaft 50.

The spool 37 in the twine-twisting flier 4 may be held in position by a similar stud-pin

and spring-bolt as those securing the spool 12 in the flier 3.

The intermediate frame 55, on which the tops 56 (three in number, to correspond to the number of twines being formed) are secured, is located about midway between the tubing-frame 16 and the twine-twisting fliers 4. The tops 54 are the ordinary three-way tops or to correspond with the number of strands employed in forming the twine.

The operation of my improved machine is briefly as follows: The yarn or material is first placed in the machine by means of the spools 12, on which the yarn has been wound. The strands are then laid through the hollow end of the shaft 11 of each flier 3, thence through the tensions 17 and over the tops 56, and then in rear of said tops 56, tied together or fastened to a string passing on and through the proper course in the twine-twisting fliers 4. On motion being imparted to the main shaft 2 the strand and twine twisting fliers 3 and 4 respectively revolve at the proper speed for each, and the strands are drawn off the spools 12 in the strand-twisting fliers 3, and separately twisted by the spinning motion of said fliers 3 until the tops 56 are passed, where union of the strands into the twine takes place, which is then twisted by the twine-twisting fliers 4. The twine when sufficiently twisted is continuously wound in regular layers, by the mechanism already described, on the spools 37 in the said twine-twisting fliers 4 until they are filled. When the spools, of the strand-twisting fliers 3 become empty they are replaced by new full spools, the ends of the new yarns being fastened to those just running out.

Having now described the mechanism of my improved twine-making machine by my system of storage-fliers, what I claim, and desire to secure by Letters Patent, is—

1. In combination, a number of strand-twisting fliers arranged in groups, twine-twisting fliers corresponding in number with the groups of strand-twisting fliers and each provided with means for rotating a receiving-spool, a twine-guide and means for traversing said guide along the spool, a main shaft, pulleys and belting for communicating motion from said shaft to the strand-twisting fliers and twine-twisting fliers, tension-regulating devices in groups corresponding with the groups of strand-twisting fliers, a central nut and screw, connections whereby the tension-regulating devices of the different groups are simultaneously adjusted, and tops over which the strands pass after leaving the tension-regulating devices, substantially as shown and described.

2. The combination, with a series of strand-twisting fliers arranged in groups disposed symmetrically around a central point and each provided with a driving-pulley, of a centrally-disposed pulley, a driving-pulley, and



an endless belt passing around the driving-pulley, then alternately around the central pulley and the pulleys of each of the groups of fliers, and then returning to the driving-pulley, substantially as shown and described.

3. The combination, with a series of divided tubes arranged in groups, of a series of conical plungers, one of which plungers is placed centrally within each of the said groups, bolts operated upon by the said plungers, springs interposed between the said bolts and the divided tubes, bell-cranks, each having an arm connected to one of the said conical plungers, links jointed to the other arms of the said bell-cranks, a central collar to which said links are pivoted, a threaded standard on which said collar is placed, a spring moving said collar outwardly, and a nut fitted upon the outer end of said standard, substantially as shown and described.

4. In combination, the frame of the twine-twisting flier, having a hollow journal at one

end through which the twine passes, a protecting flier-frame which guards the twine from contact with the receiving-spool and the twine wound thereon, a shaft supporting a traversing guide, and a friction-wheel for driving said spool, a reversely-threaded traverse-shaft engaged by said traversing guide carrying a wheel along said shaft, a pulley on the end of said traverse-shaft, a pulley on the end of the supporting-shaft, guide-pulleys on the flier-frame, fixed pulleys on the machine-frame in which said shaft revolves, and belts passing from said fixed pulleys over the guide-pulleys and around the pulleys on the frame of the flier, substantially as shown and described.

WALTER H. AVIS.

Witnesses:

WM. DAVIDSON,  
*Of Toronto, Barrister.*  
CHARLES H. RICHES.