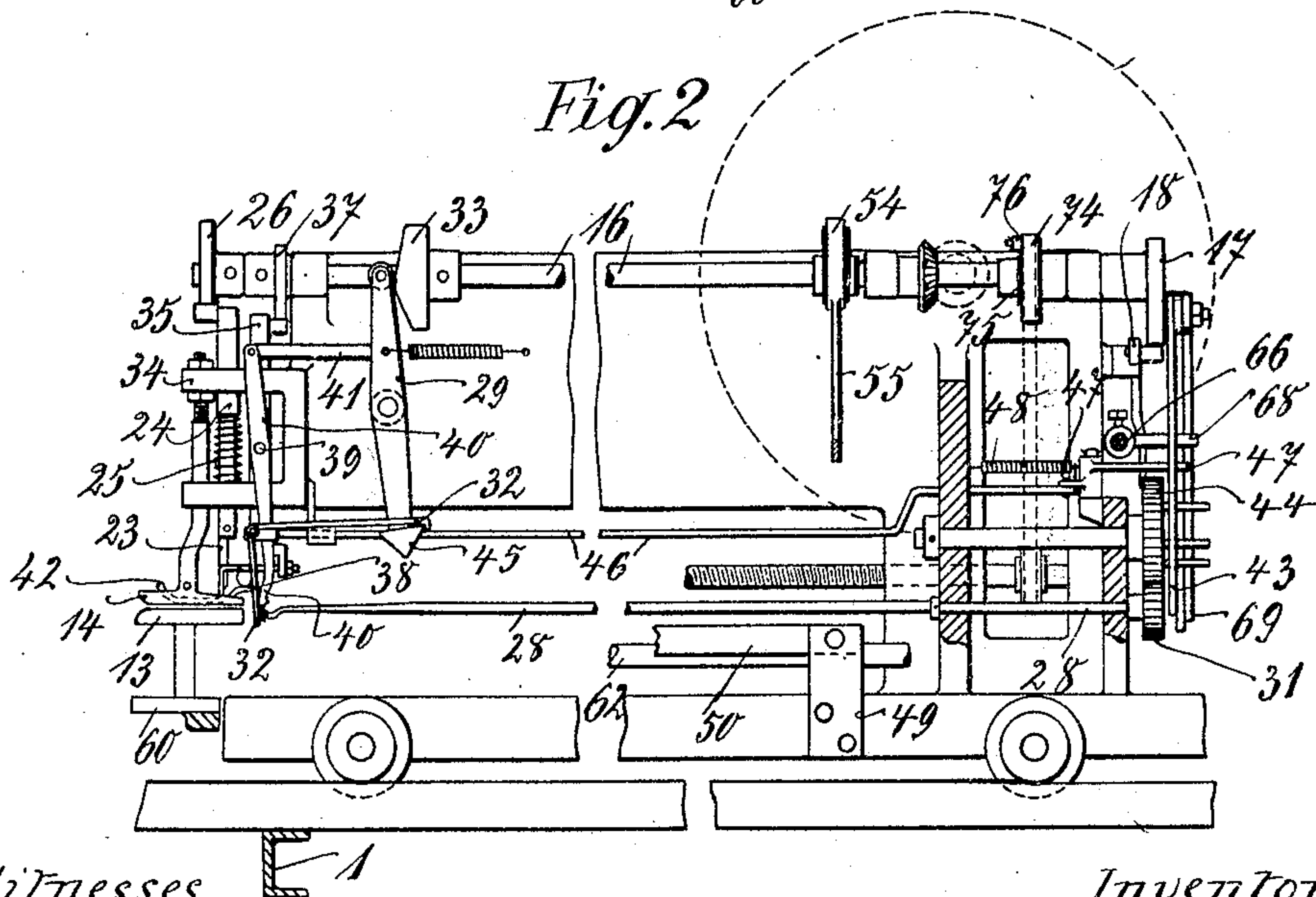
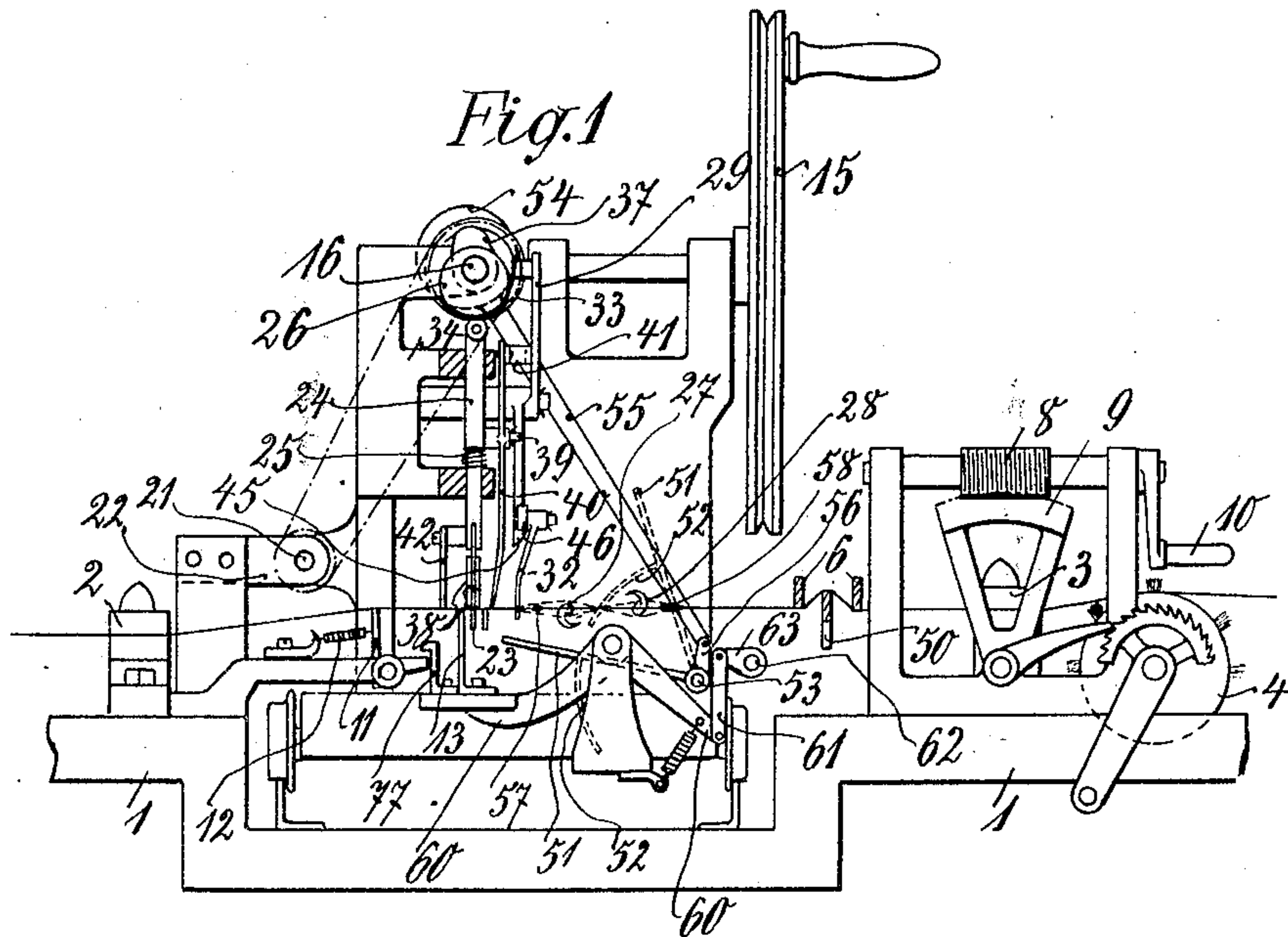


O. FISCHER.  
WARP LEASING APPARATUS.  
APPLICATION FILED APR. 6, 1907.

914,401.

Patented Mar. 9, 1909.

4 SHEETS—SHEET 1.



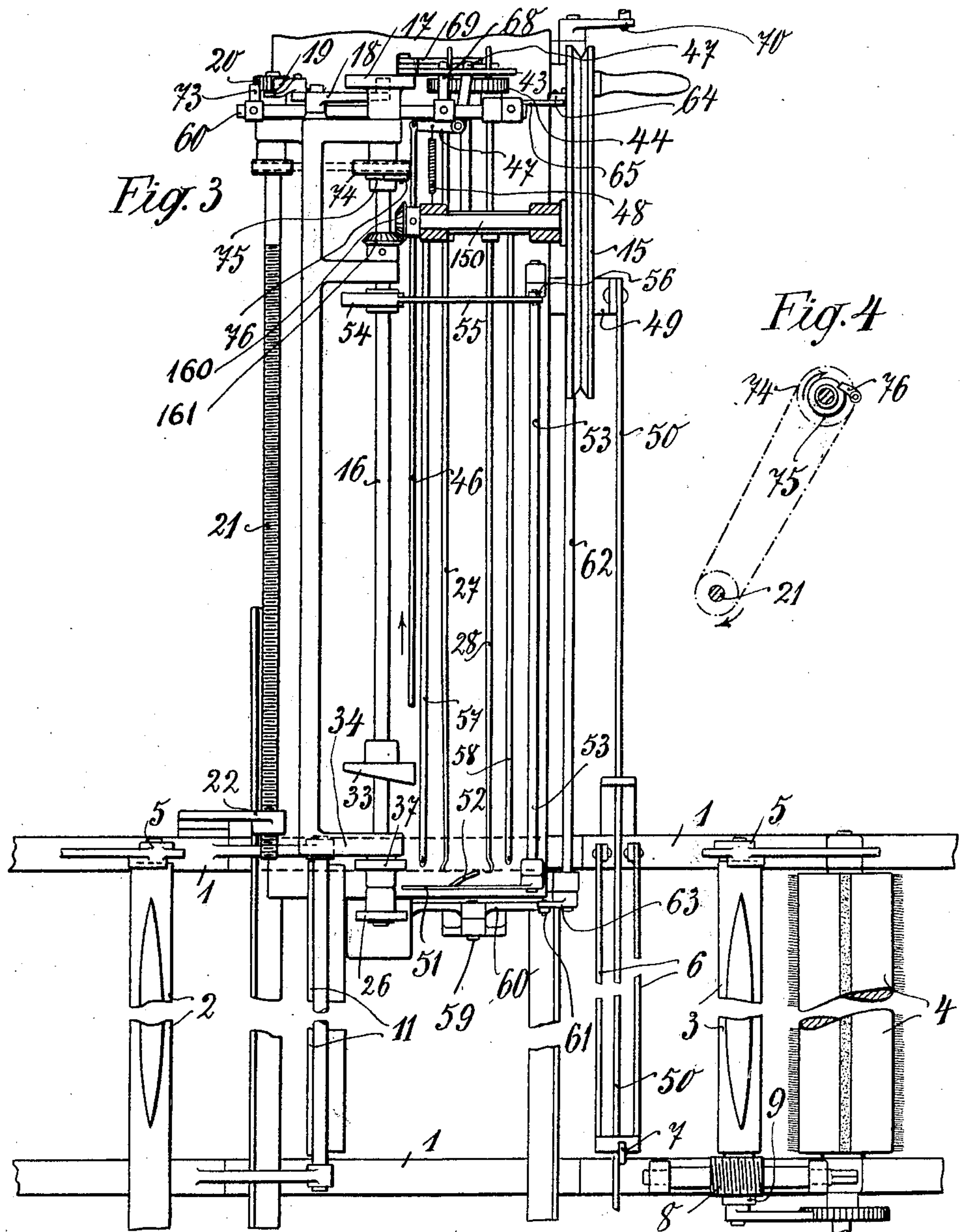
Witnesses  
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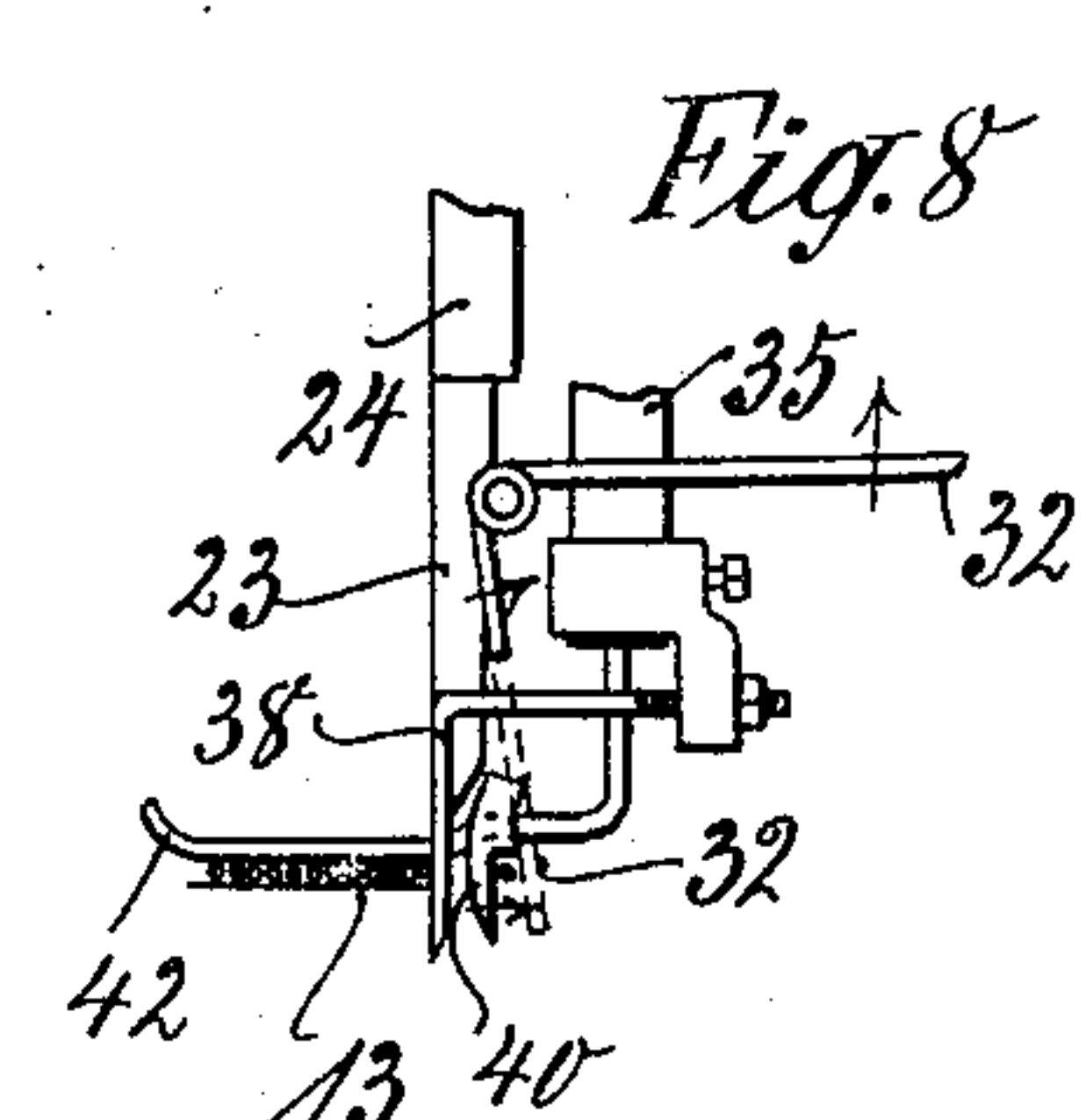
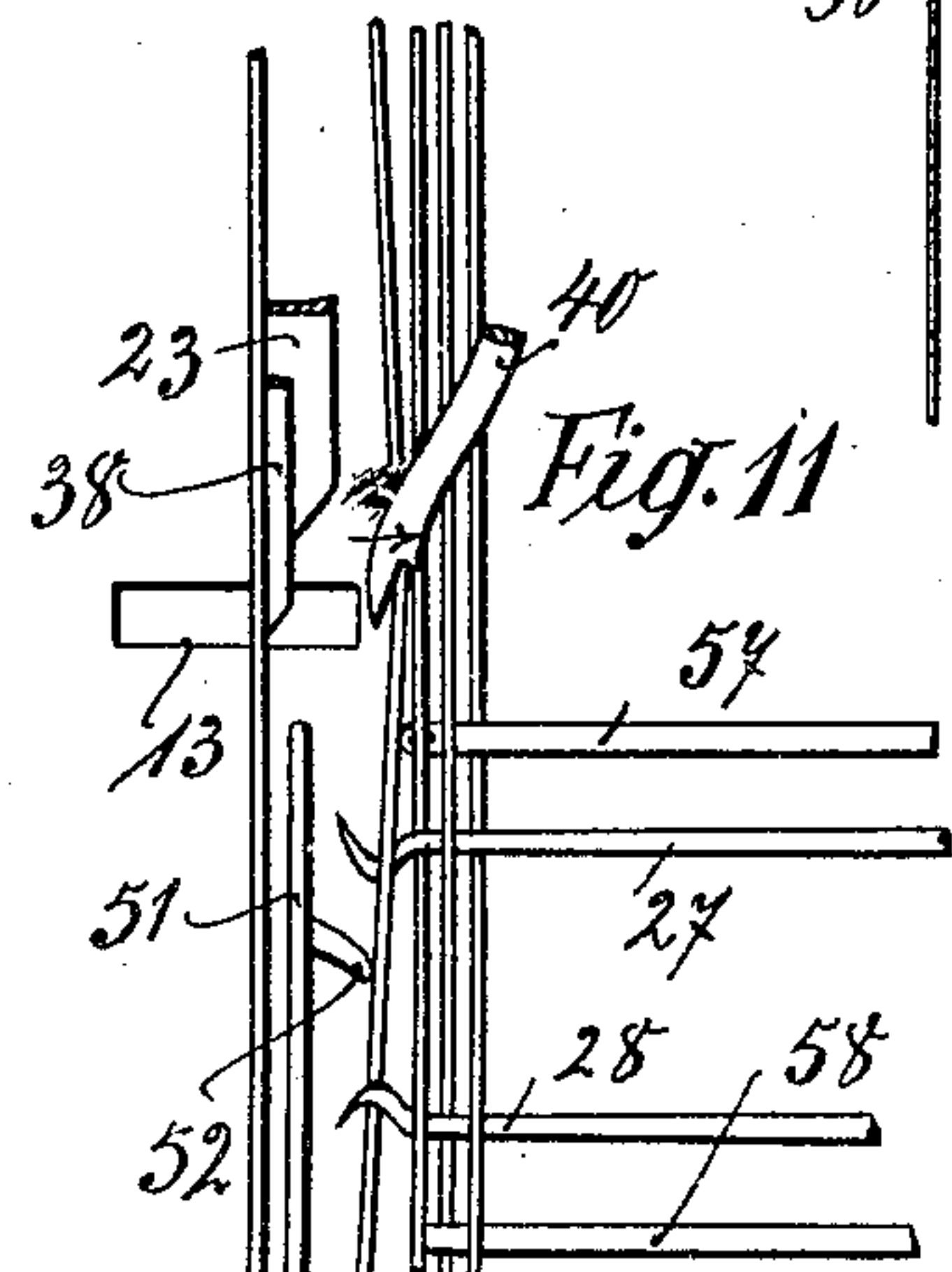
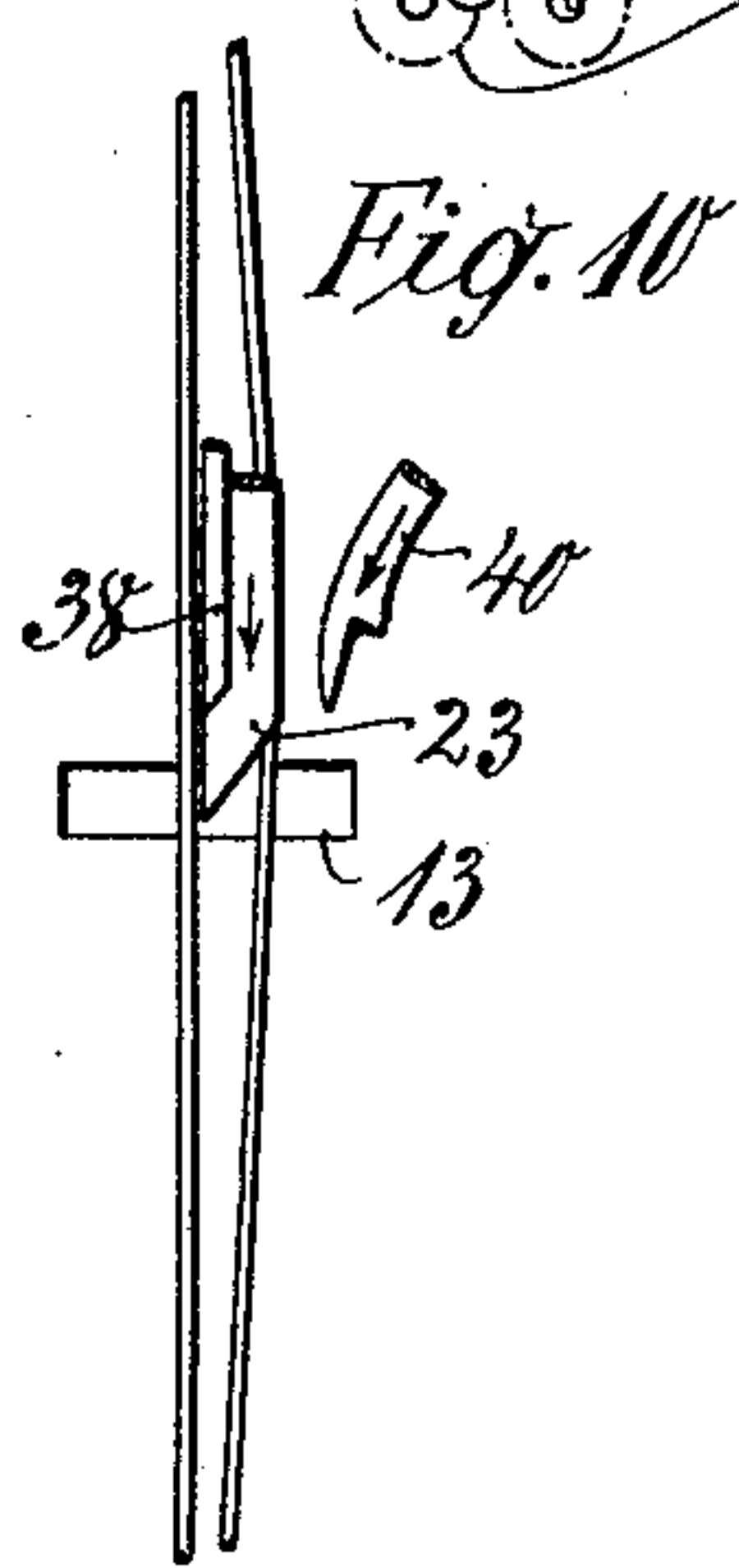
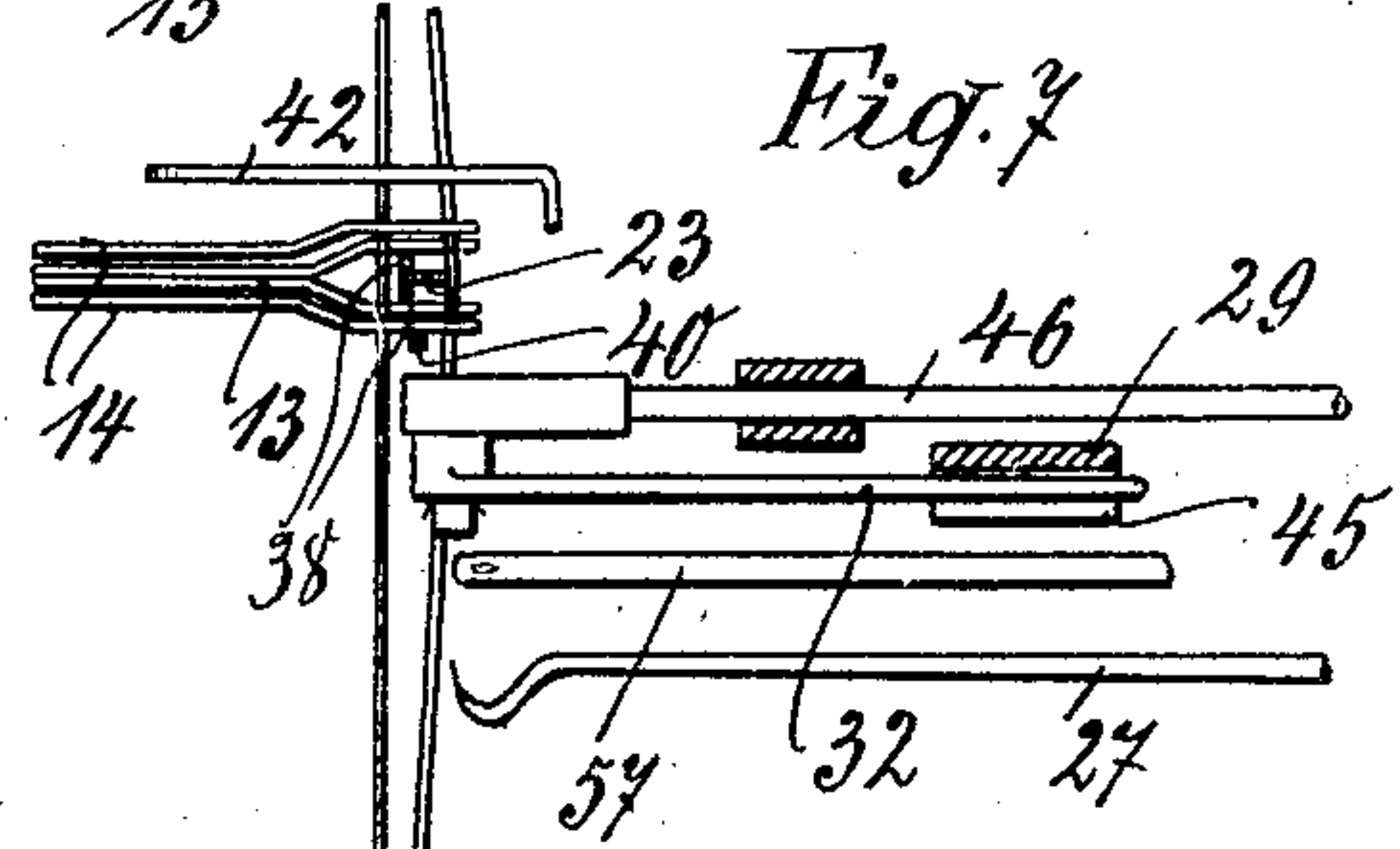
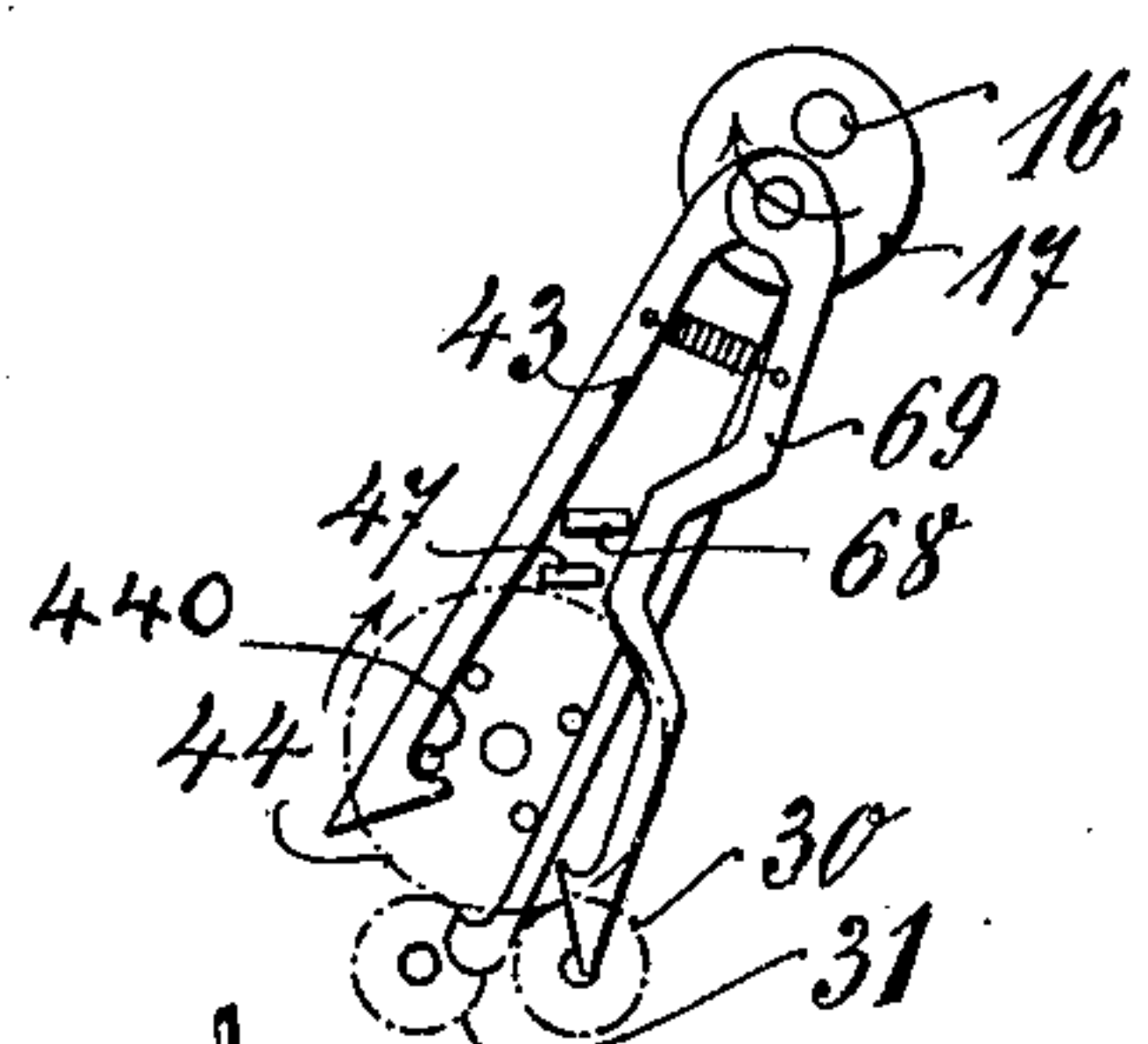
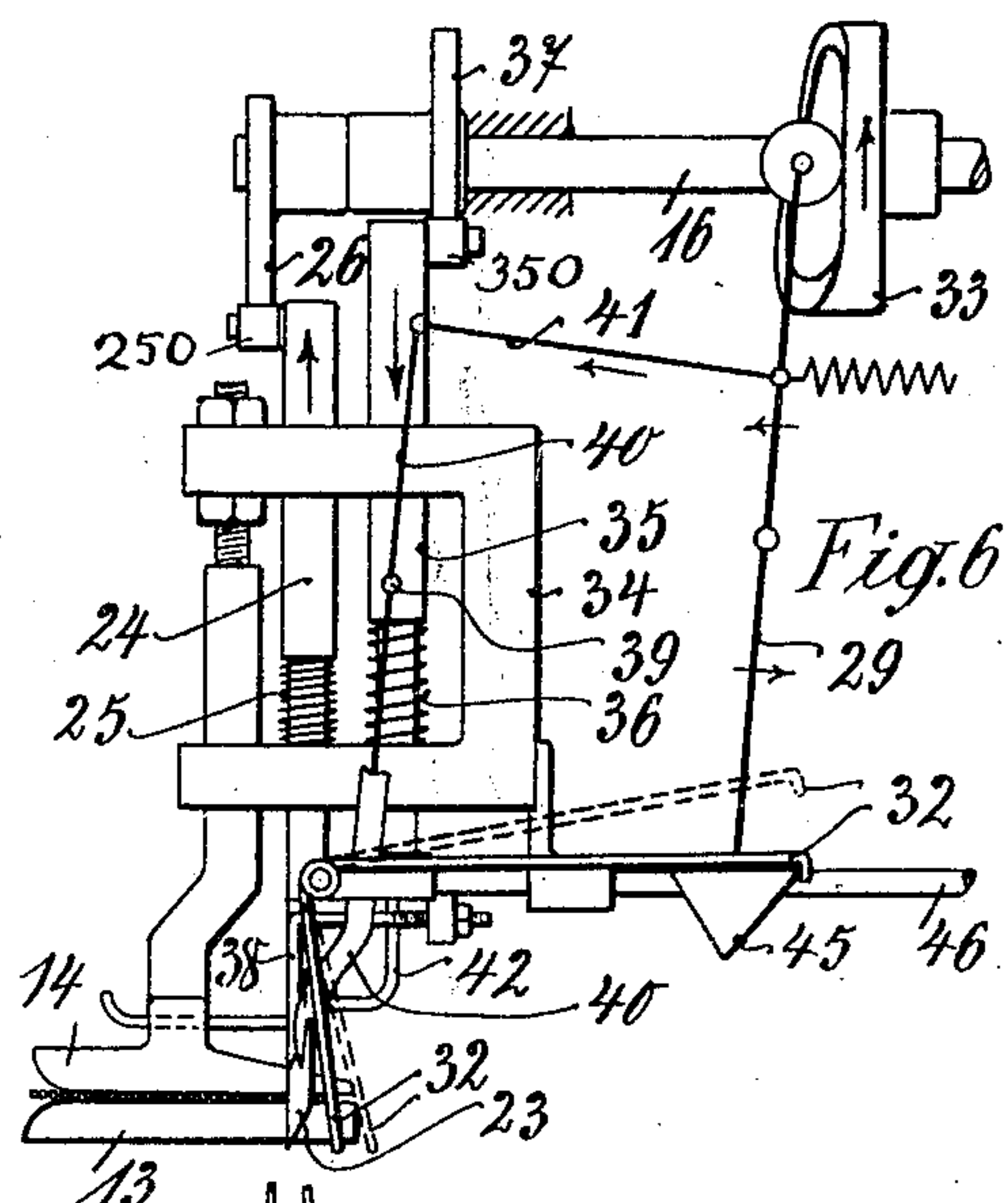
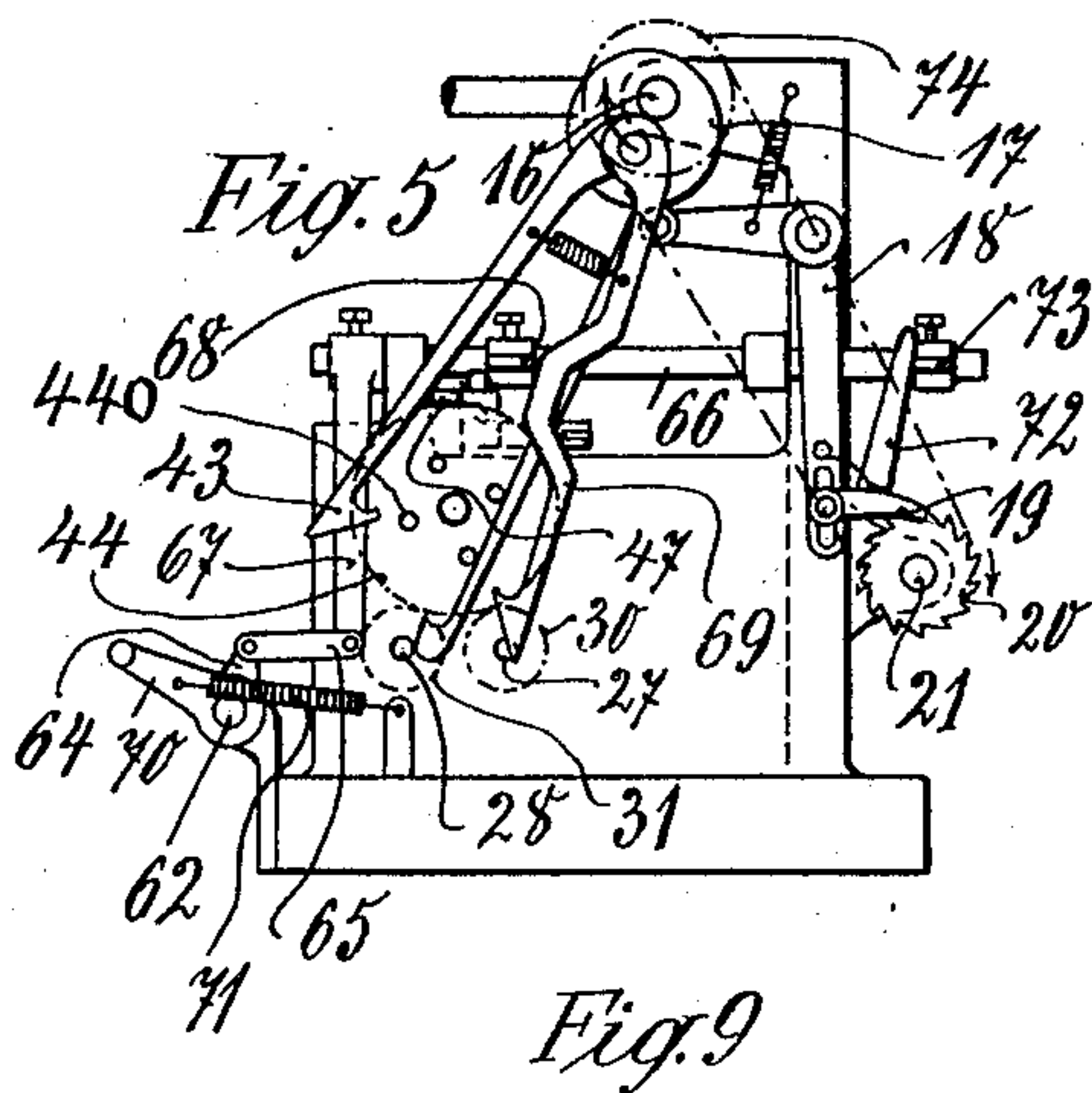
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4 SHEETS—SHEET 3.



Witnesses  
S. Lord  
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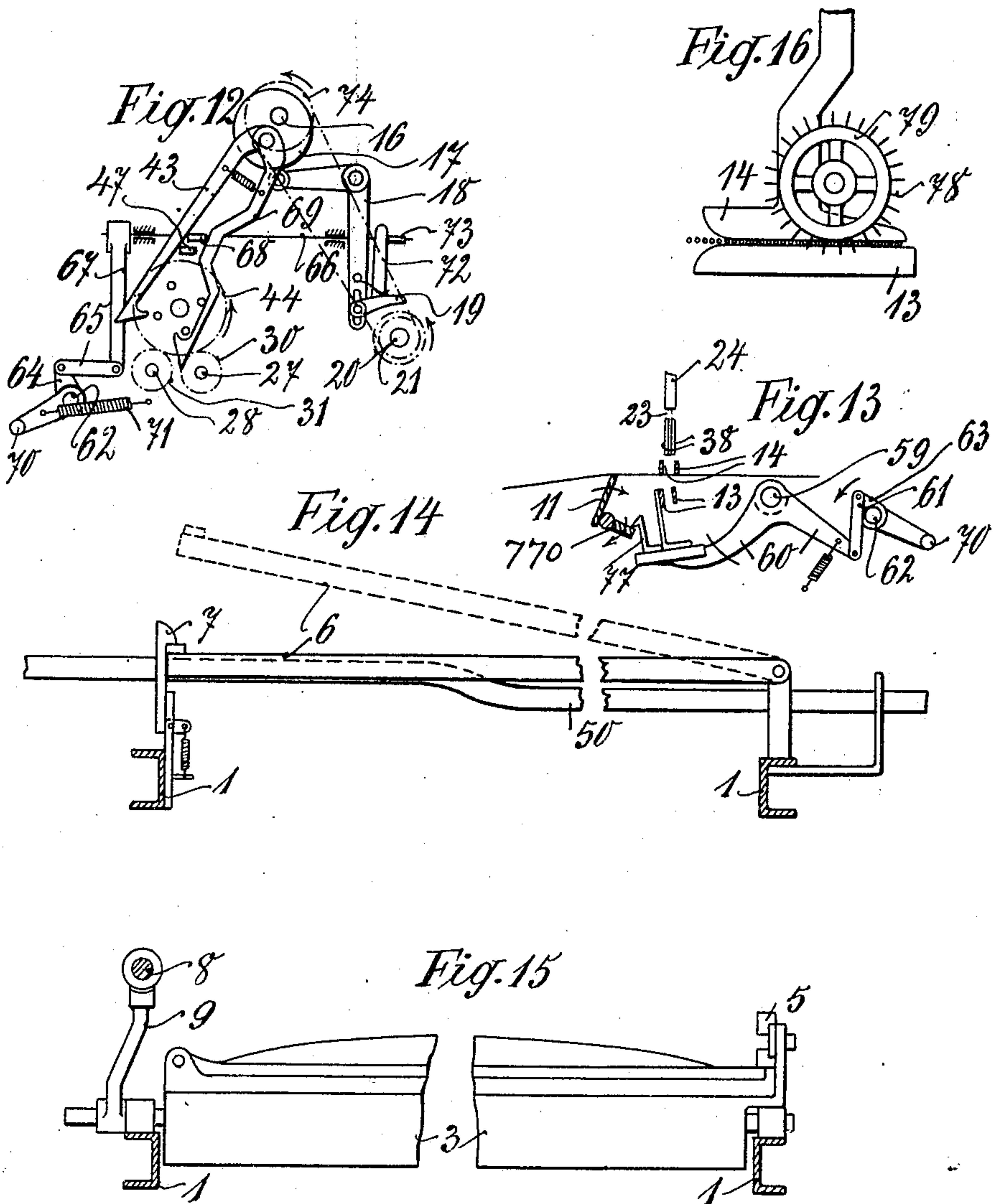


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4 SHEETS—SHEET 4.



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# UNITED STATES PATENT OFFICE.

OTTO FISCHER, OF PLAUE, GERMANY.

## WARP-LEASING APPARATUS.

No. 914,401.

Specification of Letters Patent.

Patented March 9, 1909.

Application filed April 6, 1907. Serial No. 366,730.

*To all whom it may concern:*

Be it known that I, OTTO FISCHER, a subject of the King of Saxony, and residing at Plauen-in-Vogtland, Germany, have invented a Warp-Leasing Apparatus, of which the following is a specification.

This invention relates to a warping machine in which the tension of the beamed warp is regulated according to the position of the leasing spindles, that is to say the tension of the warp is strongest where the leasing takes place. The warp laid to form a lease behind the leasing tools is relieved of tension.

Another advantage of the leasing device lies in the fact that the driving mechanism of the leasing spindles is thrown out of gear when no thread is taken up by the separating or dividing device, so that there is greater reliability that the separated threads will be alternately leased; and not two successive threads laid over the needles in the same way.

A machine embodying the invention is shown in the annexed drawing; in this machine the leasing device moves from the right to the left.

Figure 1 is a front view, Fig. 2 a side view, and Fig. 3 a plan view of the machine as a whole. Fig. 4 shows the connection between the main shaft and the worm spindle, Fig. 5 is a rear view of the leasing device, and Fig. 6 a side view of the separating or dividing and uncoupling device on a somewhat larger scale. Fig. 7 is a partial plan view of Fig. 6, Fig. 8 a side view of the separating or dividing device with the divider raised and the thread-spreader in action, Fig. 9 shows the mechanism for driving the spindles with the actuating hook engaged, Figs. 10 and 11 illustrate the action for separating and taking up the warp, Fig. 12 shows the spindle driving mechanism adjusted for reversal, and Fig. 13 illustrates the position of the warp-tension and guide at the reversal. Fig. 14 is a side view of the tensioning and untensioning device, Fig. 15 a side view of the tensioning gripper, and Fig. 16 a side view of the warp guide with dividing and brake-wheel.

The tensioning device for the warp mainly consists of a frame 1 at the sides of which are arranged the tensioning grippers 2 and 3 adapted to be closed by means of eccentric-levers 5 or other mechanism. The warp to be wound on the warp beam is first passed

through the open gripper 2, along the frame 1 to the gripper 3 and to the usual brush roller 4.

For improving the laying of the warps and providing means for reducing the strain thereon, as will be described hereinafter, two bars 6 are placed across the warp and engaged by hooks 7 (Fig. 14) before the gripper 3 is closed. To give the warp the desired tension the gripper 3 is pivotally supported and adjustable by use of a hand crank and worm gear 8 and 9 (Figs. 1 and 15). At approximately the level at which the cross-threads are to be drawn in, i. e. at which the leasing apparatus moves, there is arranged horizontally below the warp a bar 11 (Figs. 1 and 13) rotatable into vertical position, which serves as a support, so that during the separating or pricking off and leasing operations the threads cannot yield, and so that they lie side by side and not one upon the other. A spring 12 holds the bar 11 in the vertical tensioning position, in which it tensions the warp so that the drawing in of the cross-threads can commence.

To allow of separately leasing the threads the leasing apparatus must perform a slow, intermittent movement, so that it is stationary during the pricking off and leasing and thereupon moves through a distance approximately equal to the distance between the axes of two threads. This movement is produced by the following mechanism. Rotation of the driving wheel 15 and shaft 150 by hand, produces rotation of the shaft 16 by means of bevel gear 160, 161, and cam disk 17 on the shaft 16 imparts rocking movement to a bell-crank-lever 18. To the lever 18 is connected a pawl 19 which is caused by its movement in one direction to engage a ratchet-wheel 20, so that each revolution of the driving wheel 15 rotates the ratchet-wheel through an angle corresponding to one tooth-space. The ratchet-wheel 20 is fixed to the long worm spindle 21, which rotates in the screw-threaded eye 22 of the frame 1 and is connected to the leasing apparatus, so that the latter is slowly and intermittently moved or traversed. The pricking off needle 23 is fixed to a rod 24 which is pressed by a spring 25 so that its roller 250 rides against a cam 26 fixed to the shaft 16 (Figs. 1 and 6), so that during each revolution of the cam the rod 24 is lifted and lowered. During the downward



movement of the rod 24 the needle 23 separates a thread from the warp and thrusts it by means of its inclined surface toward the right (Figs. 6 and 7), so that the thread can be taken by a feeder 40 (Fig. 10) hereinafter described, and moved farther toward the right (Fig. 11), until the two spindles 27 and 28 can engage it with their ends bent in opposite directions. The spindles 27 and 28 are mounted to revolve each on its axis and are moved by action of the hook 43 (Figs. 5, 9 and 12), which is lifted and lowered by the cam disk 17 already referred to, this hook being adapted to rotate a wheel 44 toothed at its circumference and provided with laterally projecting pins 440, for example four. The wheel 44 meshes with toothed wheels 30 and 31 fixed to the spindles 27 and 28. Each time the hook 43 engages one of the pins 440, of the wheel 44 and gives a partial turn to the wheel 44 the two spindles are rotated through 180 degrees about their axes. When the feeder 40 has drawn a thread toward the spindles 27 and 28 so that the latter can engage it, the actual leasing operation begins, the end of one spindle, say of the spindle 27, being turned below the thread, and the end of the other spindle being turned above the thread. Each of the spindles then makes half a revolution, as above mentioned and the warp thread then lies above the spindle 27 and below the spindle 28. Meanwhile another thread has been pricked off and moved toward the spindles. The end of the spindle 27 is now above this thread and the end of the spindle 28 below it, and on a further half revolution of the two spindles this warp thread will remain below the spindle 27 and above the spindle 28. For the next thread the first operation is repeated, and so on. In this manner the warp is leased in the entire width. For properly carrying out this operation without failure, auxiliary devices are required, which will now be described.

In addition to the rod 24 there is slidable in the head 34 a rod 35, which is pressed by a spring 36 so that its roller 350 rides against a cam 37 fixed to the shaft 16 (Figs. 1, 2 and 6). To the lower end of the rod 35 there are fixed two bent pins 38 located one at each side of the pricking-off needle 23. A double-armed lever 40 is fulcrumed at 39 on the rod 35. The lower end of this lever forms a gripper and the upper end thereof is connected by a rod 41 to the lever 29. The relative positions of the cams 37 and 26 are such that the rod 35 is moved downward before the needle 23 is moved upward. Since the feeder 40, acting as a feeder for the spindles, is thus indirectly connected to the rod 35, together with the pins 38, it is lowered into the warp with the pins (Fig. 8). Immediately thereafter the lever 29 is rocked toward the left by the cam 33, so that the feeder be-

tween the separated thread and the warp rocks to the right (Figs. 8 and 11) and moves the separated thread into reach of the spindles (Fig. 11). Meanwhile the rod 35 has remained in its lower position, so that the pins 38 remain in front of the remainder of the warp and prevent the dragging over of the next thread. A similar purpose is fulfilled by a yoke 42 (Figs. 6, 7 and 8) which is connected to the rod 35 and abuts against the warp behind the guides 13 and 14, between which passes that part of the warp which is within reach of the separating device. The guide 14 is fixed, but the guide 13 is yieldable and can be put out of action, as will be explained hereinafter.

Frequently warp-threads lie so closely together that there is a risk of two threads being pricked off together, so that faults arise from two threads being in the same position with regard to the lease. It is therefore in practice essential that the movement of the entire separating device between the pricking off of two threads should be slightly shorter than the distance between the centers of two threads. If the movement of the spindles is restricted in this manner the needle fails to reach a thread when a certain number of threads, say fifteen or twenty, have been pricked off. In order that no fault should arise from this fact the arrangement is made that the spindles remain at rest when a thread is missed. For this purpose the hook 43 (Figs. 5, 9 and 12), which is normally operated by the crank-disk 17 for rotating the wheel 44 and the toothed wheels 30 and 31 of the spindles, is so controlled that it does not engage the wheel 44 unless a thread is pricked off. A bell-crank-lever 32 (Figs. 1, 2, 6 and 8) is arranged adjacent the needle, so that each thread pricked off comes into contact with the vertical arm of the said lever and rocks it toward the right (Figs. 6 and 8). By this means the hook-shaped arm of the bell-crank-lever is lifted and disengaged from the abutment 45 fixed to the lever 29, so that the bell-crank-lever does not take part in the movement of the latter. If, however, no thread is pricked off the bell-crank-lever is not rotated and therefore remains in engagement with the abutment 45. The bell-crank-lever 32 is pivotally connected to the front end of the rod 46, the other end of which is connected to the bell-crank-lever 47 (Figs. 2 and 3). A spring 48 thrusts the rod 46 toward the machine head. The free arm of the lever 47 is located at the inner side of the hook 43 in such a position that when the lever 32 is moved aside while the rod 46 is in its raised, forward position, the hook 43 is disengaged from the free arm of the lever 47, so that the wheel 44 is rotated. If, however, no thread is pricked off, so that the lever 32 is not disengaged from the abutment 45, the lever 32 and rod 46 are moved by the



movement of the lever 29, and the bell-crank-lever 47 is rocked toward the right (Fig. 3) against the action of the spring 48, and the hook 43 is moved out of the path of the pins fixed to the wheel 44, so that the spindles are not actuated. There is, therefore, no risk of a plurality of consecutive warp-threads being drawn on to the needles in the same direction.

By the entrance of the spindles between the warp threads the tension of the warp between the grippers 2 and 3 is considerably increased, so that resistance is opposed to the rotation of the driving wheel 15. The warp is, therefore, loosened in proportion as the spindles advance, and this is preferably effected by means of a bent or beveled bar 50 placed under the warp between the grippers, and by adjusting this bar the path of the warp is shortened, so that the tension is reduced. The bar 50 (Figs. 1, 2, 3 and 14) can be operated by hand or by the slide. In Figs. 1 and 14 the bar 50 is between the fixed bars 6 already referred to and is moved toward the left by an arm 49, screwed to the apparatus (Figs. 3 and 14). Whereas, therefore, the threads on the left hand side of the bend are tensioned, owing to the fact that they have to traverse a longer path, the threads on the right hand side are sufficiently slack to allow the feeder to enter without difficulty.

In the case of warps the threads of which are interlocked by fibers, *i. e.* in the case of woolen warps, a single separating device does not very satisfactorily move the threads so far apart that there is sufficient clearance between them while within reach of the spindles. It is, therefore, desirable to provide another separating device, preferably arranged between the two spindles. This device may be identical with or similar to the pricking-off needles.

In the construction shown in Figs. 1, 2 and 11 this device comprises a rocker 51 with a laterally projecting arm 52. The rocker is fixed to a shaft 53 which is rotated alternately in both directions by the main shaft 16, eccentric 54, rod 55, and arm 56. The rotation of the shaft 53 causes the thread separated by the needle 23 to be engaged by the rocker and moved clear of the remainder of the warp, and the arm 52 presses the said thread toward the spindles and drawing-in needles 57 and 58; the latter carry the threads for under-binding the thread-cross. When the crank is reversed, after the thread has been read in to all the warps, the hook 43 is of course disengaged, since it actuates the spindles 27 and 28 by means of the toothed wheels 30 and 31 during the forward movement of the apparatus. Another hook 69 is brought into action during the reverse movement, to rotate the wheel 44 in the opposite direction. During the reverse movement it

is of advantage to use, for rotating the worm spindle 21, mechanism which allows of more rapid movement than the pawl 19 and ratchet wheel 20. The guide 13 is carried by a bell-crank-lever 60 fulcrumed at 59; one arm of this lever is connected by a link 61 to an arm 63 fixed to the shaft 62 (Figs. 1 and 13). To the rear end of the shaft 62 is fixed an arm 64 connected by a link 65 to a lever 67 fixed to a shaft 66 (Figs. 5 and 12). The shaft 66 is provided with an abutment 68 which moves between the hooks 43 and 69 (Figs. 5 and 12). When the guide 13 is in its upper position the abutment 68 is within reach of the hook 69 and prevents the engagement of the latter with the wheel 44. When the abutment 68 is in this position a spring 71 bearing against the hand crank 70 of the shaft 62 holds the latter thrust toward the right (Fig. 5). When the crank is rotated downward it is also held in this position by the spring 71 and at the same time the shaft 66 with the abutment 68 is moved by the lever 64, link 65 and lever 67 so far to the left (Fig. 12) that the abutment is removed from the hook 69, and the latter comes into action during the reverse movement of the wheel 15 and rotates the spindles in the reverse direction. By the displacement of the shaft 66 the pawl 19 is disengaged (Fig. 12), the abutment 73 on the shaft 66 having been previously removed from the arm 72 of this pawl. This disengagement is necessary, since the reverse movement of the worm-spindle 21 is effected by means of a chain and sprocket-wheel 74 (Fig. 4), the latter being driven by means of pawl and ratchet gear 75, 76 when the main shaft is reversed. During the normal rotation of the main shaft the ratchet wheel rotates without actuating the pawl. The bell-crank-lever 60 is provided with a hook 77 which engages the lug 770 of the tensioning bar 11 and rocks the latter aside (Fig. 13) in order to relieve the warp when the guide 13 moves downward. If the warp is exceptionally close a wheel 79 provided with pins 78 (Fig. 16) is arranged adjacent the upper guide 14, this wheel being rotated very slowly for the purpose of holding the threads at proper distance.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a warp leasing machine, the combination of a leasing device movable transversely to the warp, means for giving intermittent movement to the leasing device, thread separating finger movable to intersect the plane of the threads, means for operating the same on each movement of the leasing device to separate a thread from the other threads, grippers for stretching the threads, a feed device for engaging and moving the separated thread, two bent ended



spindles for receiving the separated thread, and means for rotating these spindles through 180 degrees to form the cross-shed.

2. In a warp leasing machine, the combination of means for holding the warp threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread and means for rotating these spindles through 180 degrees to form the cross-shed, comprising toothed pinions carrying said spindles, a toothed wheel meshing with said pinions, pins on said toothed wheel, two hooks for engaging said pins and giving partial rotation to said toothed wheel in one or other direction and means for placing either hook out of action.

3. In a warp leasing machine, the combination of means for holding the warp threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread and means for rotating these spindles through 180 degrees to form the cross-shed, said means comprising a hook, and disabling means for throwing the hook temporarily out of action operated in the absence of a separated thread.

4. In a warp leasing machine, the combination of a leasing device movable transversely to the warp, means for giving intermittent movement to the leasing device, a downwardly movable finger, means for operating the same on each movement of the leasing device to separate a thread from the other threads, grippers for stretching the threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread, means for rotating these spindles through 180 degrees to form the cross-shed, and guides above and below the warp threads in proximity to the thread separator.

5. In a warp leasing machine, the combination of a leasing device movable transversely to the warp, means for giving intermittent movement to the leasing device, a downwardly movable finger, means for operating the same on each movement of the leasing device to separate a thread from the other threads, grippers for stretching the

threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread, means for rotating these spindles through 180 degrees to form the cross-shed, guides above and below the warp threads in proximity to the thread separator, means for lowering the lower guide, a warp tensioner, and connection between the latter and the lower guide.

6. In a warp leasing machine, the combination of means for holding the warp threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread and means for rotating these spindles through 180 degrees to form the cross-shed, comprising toothed pinions carrying said spindles, a toothed wheel meshing with said pinions, pins on said toothed wheel, two hooks for engaging said pins and giving partial rotation to said toothed wheel in one or other direction, means operative for placing the forward driving hook out of action, and allowing the rearward driving hook to operate, and a speeded driving mechanism for the latter hook.

7. In a warp leasing machine, the combination of a leasing device movable transversely to the warp, means for giving intermittent movement to the leasing device, a downwardly movable finger, means for operating the same on each movement of the leasing device to separate a thread from the other threads, grippers for stretching the threads, a feed device for moving the separated thread, two bent ended spindles for receiving the separated thread, means for rotating these spindles through 180 degrees to form the cross-shed, guides above and below the warp threads in proximity to the thread separator, and a pin wheel adjacent to the upper guide.

In witness whereof I have signed this specification in the presence of two witnesses.

OTTO FISCHER.

Witnesses:

OSKAR FISCHER,  
ADOLF GEORGE.