

No. 641,279.

Patented Jan. 16, 1900.

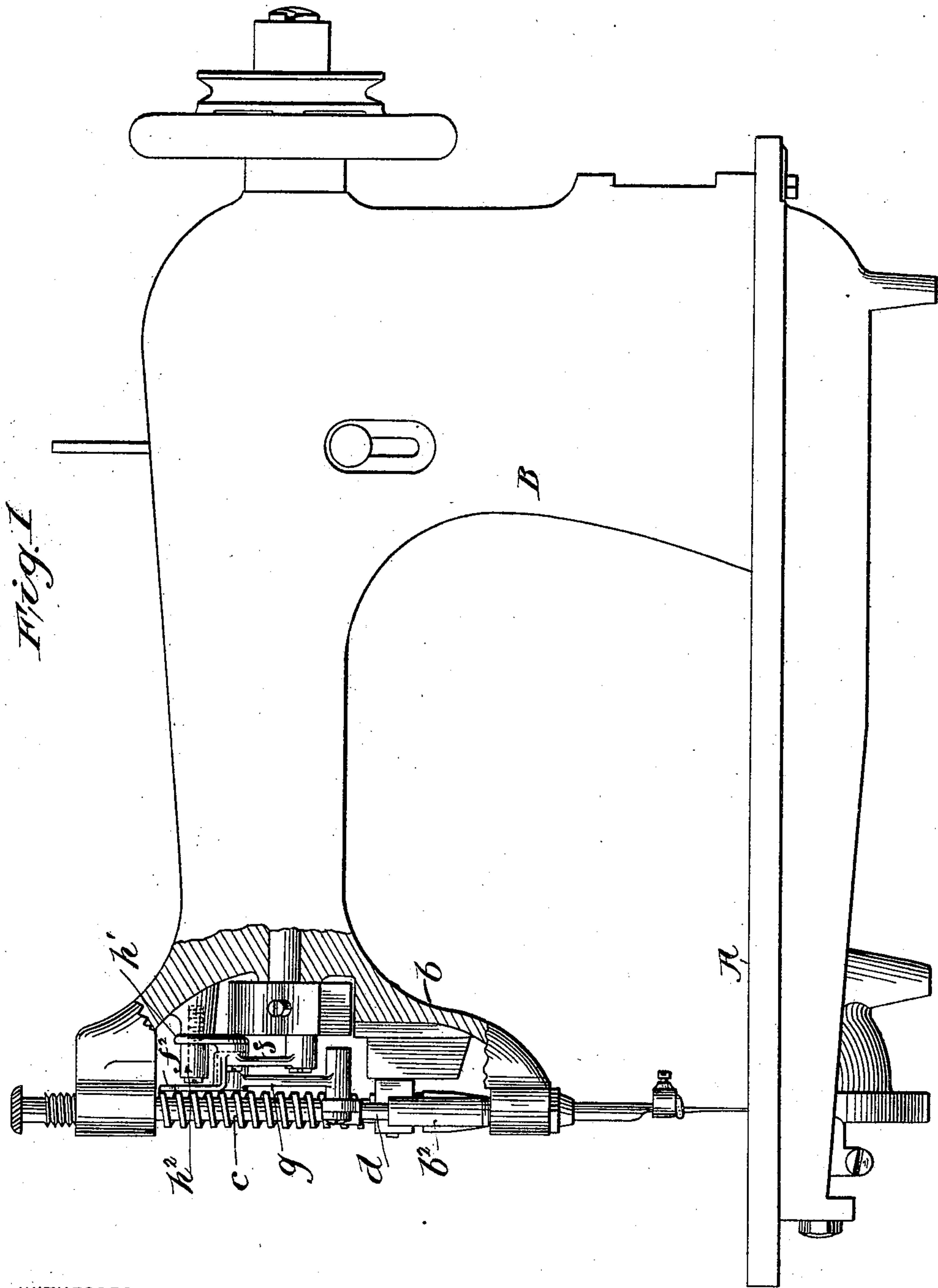
P. DIEHL.

NEEDLE BAR MECHANISM FOR SEWING MACHINES.

(Application filed Sept. 20, 1898.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

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3 Sheets—Sheet 2.

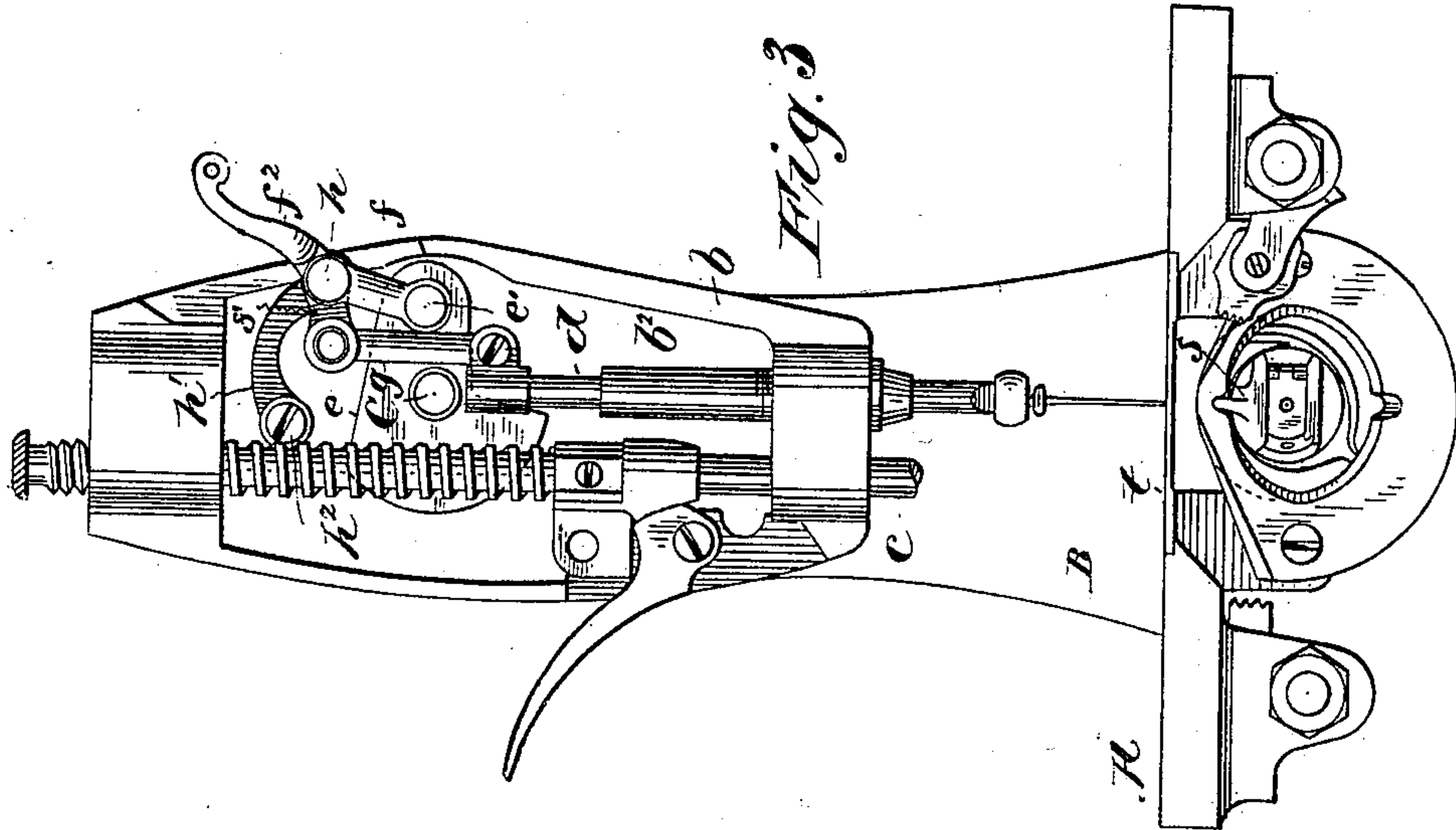


Fig. 6

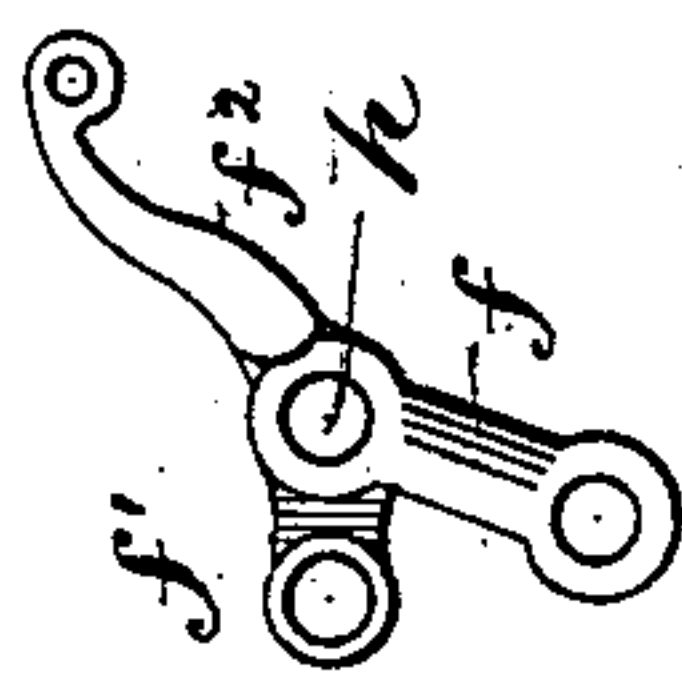


Fig. 7

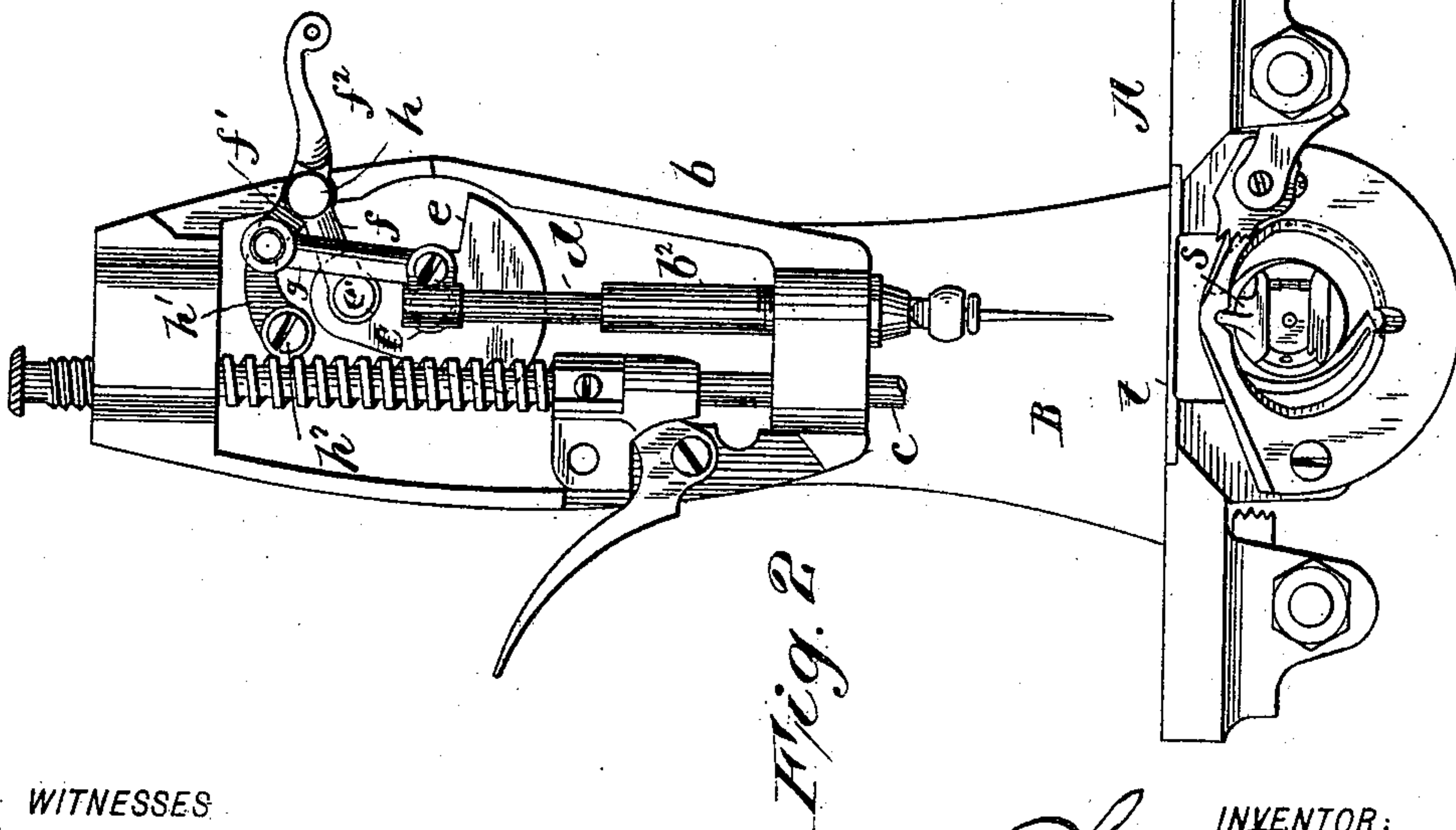
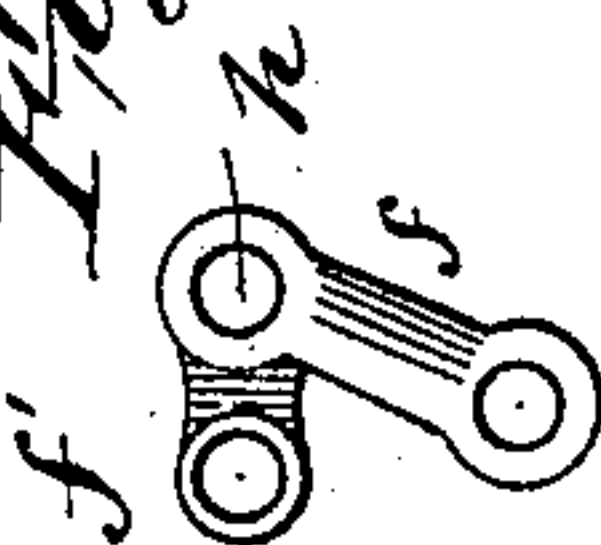


Fig. 2

WITNESSES

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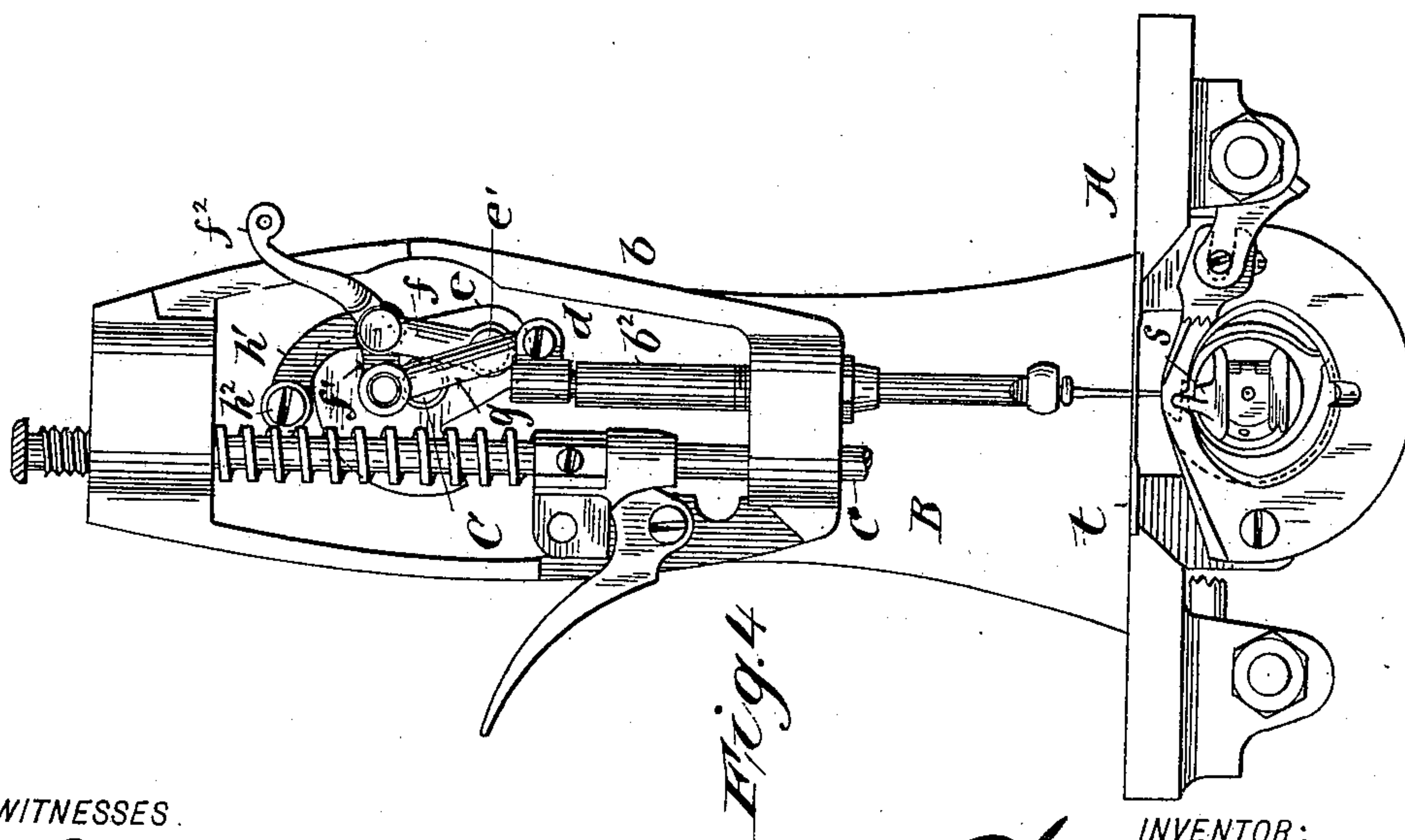
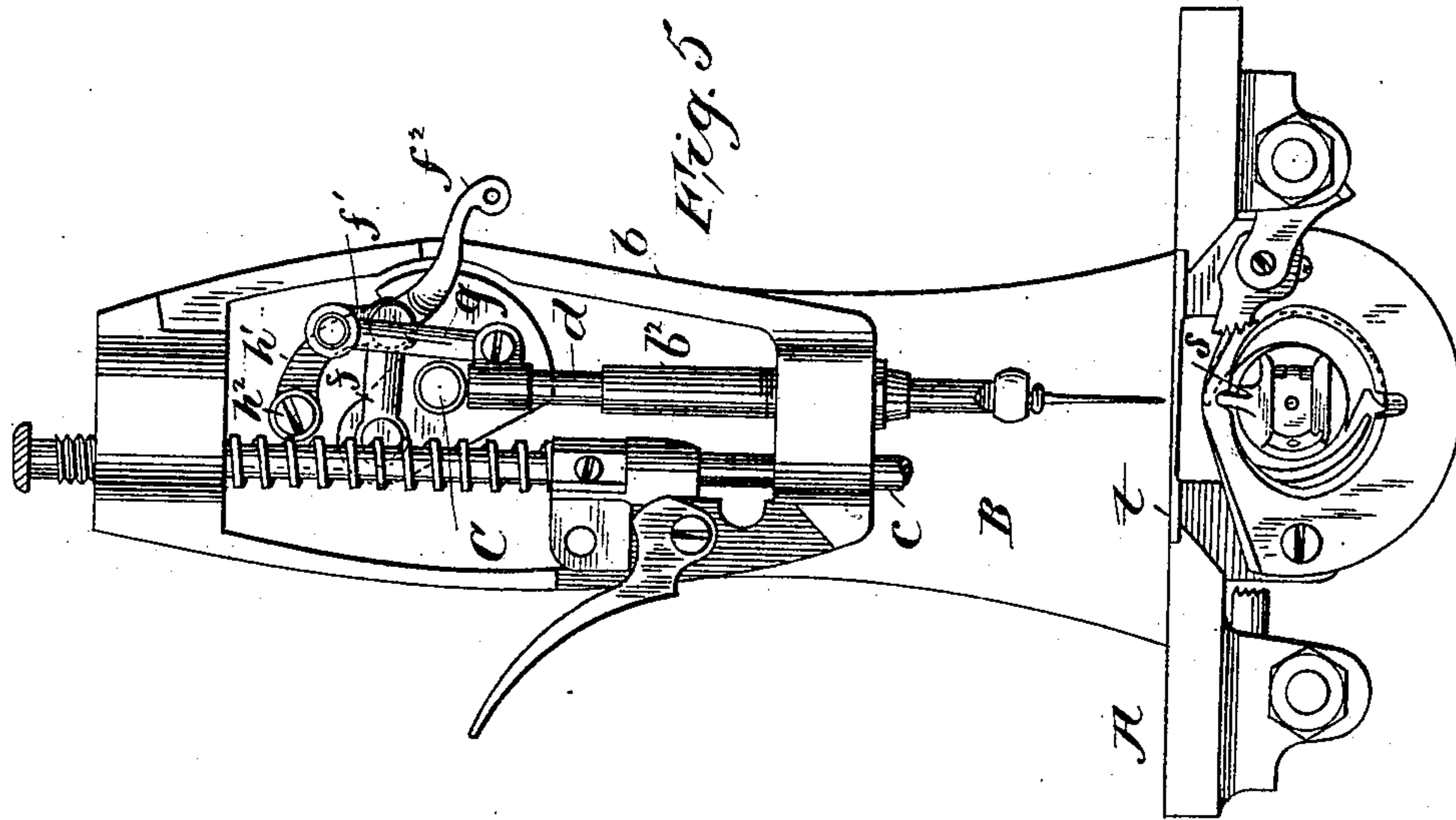
**P. DIEHL.**

# NEEDLE BAR MECHANISM FOR SEWING MACHINES.

(Application filed Sept. 20, 1898.)

(No Model.)

**3 Sheets—Sheet 3.**



**WITNESSES**

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# UNITED STATES PATENT OFFICE.

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## NEEDLE-BAR MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 641,279, dated January 16, 1900.

Application filed September 20, 1898. Serial No. 691,452. (No model.)

*To all whom it may concern:*

Be it known that I, PHILIP DIEHL, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Needle-Bar Mechanisms for Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention has for its object to provide a simple mechanism by means of which a sewing-machine needle-bar can be operated from a "regular-motion" crank in such a manner that the needle will perform the first part  
15 of its upward movement so slowly that sufficient needle-thread may be drawn down by the shuttle for the passage of the latter through the needle-thread loop before the eye of the needle in ascending reaches the level of the  
20 upper side of the throat-plate. Thus the invention is especially adapted for use in machines for sewing leather and other hard goods in working on which it is objectionable, owing to liability of breaking thread, to draw  
25 down needle-thread when the eye of the needle is in the work. In one style of lock-stitch machine heretofore in use the objection of drawing down needle-thread when the eye of the needle was in the goods was avoided by  
30 providing the shuttle with a long beak, as set forth in United States Patent No. 208,838, dated October 8, 1878. A long-beaked shuttle of this kind is, however, not adapted for use in connection with a stationary bobbin-  
35 case and bobbin adapted to hold a relatively large quantity of shuttle-thread and centrally located with relation to the axis of motion of an oscillating or rotating shuttle, for the reason that too much time would be re-  
40 quired to pass the shuttle through the loops of needle-thread to allow sufficient time in the rotation of the driving-shaft for the proper operation of the feed and take-up. To secure a proper timing of the needle for leather-work  
45 in the "central-bobbin" style of machines just referred to, the needle-bars have been provided with cam cross-heads, in which the regular-motion crank-pins or roller-studs worked; but this cam construction is objec-  
50 tionable for the reason that it is not adapted

for high-speed machines, owing to the great friction and wear incidental to the use thereof.

The purpose of this invention is to secure from a regular-motion crank the same timing of the needle-bar heretofore secured by the  
55 needle-bar cams just referred to, and this result is effected by indirectly connecting the needle-bar pitman to the regular-motion crank-pin of the driving-shaft through a bell-  
60 crank or elbow lever or rocking device jointed to the said crank-pin and to the needle-bar pitman and having its fulcrum or axis at the free end of a swinging link or arm pivoted at its other end to a stationary part of the ma-  
65 chine, and thus adapted to have a bodily up-and-down movement. The said swinging link is preferably of such length and is so arranged that when the said crank-pin is in its lowest position the fulcrum or axis of the said  
70 elbow-lever or rocking device or rocker will be brought down nearly, but not quite, to the line of the axis of the said driving-shaft, and the pivotal connection of the said needle-bar  
75 pitman with the said elbow-lever or rocker is located comparatively close to the axis or fulcrum of the latter, so that the said pivotal connection may be moved partly around said ful-  
80 crum or axis during the time when the slow upward movement of the needle-bar is to occur and during which time the fulcrum or axis of said lever or rocker is practically stationary  
and while said lever or rocker has little or no movement excepting a turning or rocking  
85 movement on its axis. The pivotal connection of the elbow-lever or rocker with the rotating crank-pin is preferably at a greater distance from the fulcrum or axis of the said  
90 lever or rocker than the said pivotal connection of the latter with the needle-bar pitman is, and to secure this result the arms of the elbow-lever preferably employed are of dif-  
95 ferent lengths, the longer arm of said lever being connected to the crank-pin and the shorter arm being connected to the needle-bar pitman. In this preferred construction, with the parts arranged and proportioned as  
described, the pivotal connection of the elbow-lever or rocker with the needle-bar pitman  
will in the operation of the invention always  
100 be above the level of the longitudinal axis of



the driving-shaft. By means of this operating mechanism an irregular or differential motion is imparted to the needle-bar from the regular-motion or regularly-rotating crank, so that the needle-bar will be caused to descend quickly to its lowest point, but will perform the first part (approximately the first half) of its upward movement comparatively slowly, thus permitting the shuttle to enter the loop of needle-thread and draw down sufficient thread for the passage of the shuttle before, in the upward movement of the needle, the eye of the latter reaches the level of the upper side of the throat-plate or enters the work, thereby obviating the necessity of drawing any thread through the needle's eye when the latter is in the goods.

The bell-crank or elbow lever or rocker referred to forming the connection between the crank-pin and the needle-bar pitman is preferably also utilized as a take-up lever, operating as set forth in my United States Patent, No. 462,398, issued November 3, 1891.

In the accompanying drawings, Figure 1 is a side view, with the frame partly broken away, of a Singer oscillating-shuttle central-bobbin sewing-machine embodying the invention; and Figs. 2, 3, 4, and 5 are front views of the same with the parts in different positions in the different figures, the face-plate being removed and the presser-bar being partly broken away in all of the side views. Fig. 6 is a detail view of the bell-crank or angular lever forming part of the needle-bar mechanism provided with a take-up arm, and Fig. 7 a detail view of the said lever with the take-up arm omitted.

Referring to the drawings, A denotes the work-plate, and B the bracket-arm, of the machine, said arm having at its front end the usual head *b*, affording bearings for the presser-bar *c* and needle-bar *d*.

C is the driving-shaft, journaled in the upper part of the arm B and carrying at its front end the crank *e*, having the crank pin or stud *e'*, to which is jointed the lower arm *f* of a bell-crank or elbow lever or rocker, to an upper and preferably shorter arm *f'* of which the upper end of the needle-bar-operating pitman *g* is pivotally attached, the said bell-crank or elbow lever being preferably provided with a take-up arm *f*<sup>2</sup>. The fulcrum or axis of the bell-crank or elbow lever *f f'* *f*<sup>2</sup> is at *h* at the free end of a swinging link or arm *h'*, pivotally attached to the frame or stationary part of the machine, as by a fixed stud or screw *h*<sup>2</sup>, this fulcrum or axis being, as herein shown, at the elbow or apex of said lever.

In the preferred construction of the invention shown in the accompanying drawings the needle-bar pitman is connected at its lower end to the needle-bar, while the upper part of said pitman is jointed to the shorter upper arm of the bell-crank or elbow lever, the said lever comprising the arms *f* and *f'* of unequal length.

In the preferred form of the invention herein shown the needle-bar *d* is made short for lightness, and the collar by which the needle-bar pitman *g* is connected to said bar is attached to the upper end of the latter. In order to properly steady this comparatively short needle-bar in its single bearing in the lower part of the head *b*, the latter is provided with the sleeve *b*<sup>2</sup>, forming an extended bearing for said bar and which extended steady-bearing is not so liable to wear away in use as a shorter bearing would be. Moreover, as said sleeve is formed separate from the head *b* it is adapted to be removed to be replaced by a new sleeve should it become worn so that there is any looseness of the needle-bar bearing.

In the operation of the machine the needle-bar descends quickly from its highest position (shown in Fig. 2) to its lowest position, (shown in Fig. 4,) this descent being accomplished during about or slightly less than one-third of a revolution of the driving-shaft C and with but a very slight turning movement of the bell-crank or elbow lever or rocker on its fulcrum pivot or axis. As the needle-bar begins to rise the relative positions of the crank-pin *e'* and elbow-lever are such that said lever is now caused to turn rapidly on its fulcrum-pivot without being moved bodily upward, and consequently only a very slow upward movement is imparted to the needle-bar during the next one-third revolution of the driving-shaft, this result being due to the pivotal connection of the needle-bar pitman to the short arm of the said lever and to the fact that the latter during this time is merely turning on its fulcrum or axis substantially without bodily upward movement. From this it results that the shuttle *s*, the point or beak of which is just approaching the needle when the latter is in its lowest position, will have time to fully enter the needle-loop and draw down all the thread required for the passage of the shuttle before the eye of the needle reaches the level of the top of the throat-plate *t*, and consequently no thread need be drawn through the said eye while the latter is passing upward through the work. This slow upward movement of the needle-bar is due to the indirect connection of the needle-bar pitman with its operating-crank through the bell-crank or elbow lever or rocker carried at the free end of the swinging arm or link *h'*, so that said lever or rocker has, as above stated, little or no movement excepting the turning movement on its fulcrum during the time the needle-bar is performing the first part of its upward stroke. By the time the needle has risen above the throat-plate to the position shown in Fig. 5 the shuttle will have fully passed through the loop of needle-thread and the thread-eye of the take-up arm *f*<sup>2</sup>, which, during the greater part of the downward movement of the needle, and also during the first part of the upward movement thereof, had been descending and yielding thread to



the needle and shuttle, now moves quickly upward, owing to the bodily upward movement of the bell-crank lever and to the turning of the latter on its fulcrum at the free end of the arm  $h'$ , the upward movement of the take-up eye to finally tighten the stitch continuing until after the needle-bar has again commenced to descend. This operation of the take-up is essentially the same as that of my Patent No. 462,398, before referred to. From the position shown in Fig. 5 upward to the position shown in Fig. 1 and then again downward to the position shown in Fig. 3 the needle-bar is moving quickly, this entire upward and downward travel of said bar being accomplished during about one-third of a revolution of the driving-shaft.

In the preferred form of the invention herein shown the parts are so arranged and proportioned that when the needle-bar and needle are in their lowest positions the center of the pivotal point  $h^2$  of the swinging arm or link  $h'$  and the centers of the pivotal points or joints of the pitman  $g$  with the arm  $f'$  of the bell-crank or elbow lever and with the collar on the needle-bar are substantially in line with each other, (see Fig. 4,) and as the needle-bar begins to rise the center of the pivotal point or joint of the pitman  $g$  with the arm  $f'$  of the elbow-lever passes to the left, Figs. 2, 3, 4, and 5, of the line referred to and then re-passes this line in traveling to the right toward the position shown in Fig. 5. The swinging arm or link  $h'$  is also preferably of such length that the fulcrum or axis of the elbow-lever  $f'$  at the free end thereof may be brought down near to the line of the center of the driving-shaft  $C$  during the time that the needle-bar is performing the first or comparatively slow part of its upward movement and while the said elbow-lever is turning on its fulcrum without performing much, if any, bodily upward movement.

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

1. In a sewing-machine, the combination with a rotating crank and a needle-bar, of a needle-bar pitman, a bell-crank or elbow lever one arm of which is connected to said crank and the other arm of which is jointed to said pitman, and a swinging arm or link one end of which is pivotally attached to the frame of the machine and at the free end of which the said lever is fulcrumed at its elbow.

2. In a sewing-machine, the combination with a rotating crank and a needle-bar, of a needle-bar pitman, a bell-crank or elbow lever one arm of which is connected to said crank and the other arm of which is jointed to said pitman, and a swinging arm or link one end of which is pivotally attached to the frame of the machine and at the free end of which the said lever is fulcrumed at its elbow, the said bell-crank lever being provided with a take-up arm.

3. In a sewing-machine, the combination

with a rotating shaft provided with a crank, of a needle-bar, a pitman connected at one end to said needle-bar, a bell-crank or elbow lever one arm of which is jointed to said crank and the other arm of which is jointed to the other end of said pitman, and a swinging arm or link one end of which is pivotally attached to the frame of the machine and at the free end of which said bell-crank or elbow lever is fulcrumed, said parts being so arranged and proportioned that when said needle-bar is at its lowest point the centers of the pivotal points or joints of said pitman and the fixed pivotal point of said swinging arm or link are brought into line with each other, or approximately so.

4. In a sewing-machine, the combination with a rotating shaft provided with a crank, of a needle-bar, a pitman connected at one end to said needle-bar, a bell-crank or elbow lever one arm of which is jointed to said crank and the other arm of which is jointed to the other end of said pitman, and a swinging arm or link one end of which is pivotally attached to the frame of the machine and at the free end of which said bell-crank or elbow lever is fulcrumed, said parts being so arranged and proportioned that when said needle-bar is at its lowest point the centers of the pivotal points or joints of said pitman and the fixed pivotal point of said swinging arm or link are brought into line with each other, or approximately so, said lever being provided with a take-up arm.

5. In a sewing-machine, the combination with a rotating crank and a needle-bar, of a needle-bar pitman, a swinging arm or link one end of which is pivoted to the frame of the machine, and a rocking device having its axis or fulcrum at the free end of said swinging arm or link and pivotally connected with said crank and pitman, said parts being so arranged and proportioned that when said needle-bar is at its lowest point the centers of the pivotal points or joints of said pitman and the fixed pivotal point of said swinging arm or link are brought into line with each other, or approximately so.

6. In a sewing-machine, the combination with a rotating crank and a needle-bar, of a needle-bar pitman, a swinging arm or link one end of which is pivoted to the frame of the machine, and a rocking device provided with a take-up arm and having its axis or fulcrum at the free end of said swinging arm or link and pivotally connected with said crank and pitman, said parts being so arranged and proportioned that when said needle-bar is at its lowest point the centers of the pivotal points or joints of said pitman and the fixed pivotal point of said swinging arm or link are brought into line with each other, or approximately so.

7. In a sewing-machine, the combination with a rotating crank and a needle-bar, of a needle-bar pitman, a swinging arm or link one end of which is pivoted to the frame of



the machine, and a rocking device having its axis or fulcrum at the free end of said swinging arm or link and pivotally connected with said crank and pitman, the pivotal connection  
5 of the said pitman with the said rocking device being nearer to the axis or fulcrum of the latter than the pivotal connection of the said rocking device with the said crank is; whereby a differential movement will be im-  
10 parted to said needle-bar so that the said bar will be caused to perform its downward movements quickly and a part of its upward movements slowly, substantially as set forth.

8. In a sewing-machine, the combination  
15 with a rotating crank and a needle-bar, of a needle-bar pitman, a swinging arm or link one end of which is pivoted to the frame of the machine, and a rocking device provided with a take-up arm and having its axis or ful-  
20 crum at the free end of said swinging arm or link and pivotally connected with said crank and pitman, the pivotal connection of the said pitman with the said rocking device being nearer to the axis or fulcrum of the latter  
25 than the pivotal connection of the said rocking device with the said crank is; whereby a differential movement will be imparted to said needle-bar so that the said bar will be

caused to perform its downward movements quickly and a part of its upward movements 30 slowly, substantially as set forth.

9. In a sewing-machine, the combination, with a rotating crank and a needle-bar, of a needle-bar pitman, a rocking device or rocker pivotally connected with said crank and 35 needle-bar pitman and having a fulcrum movable toward and from the axis of rotation of said crank, and means for controlling the path of movement of the fulcrum of said rock-  
40 ing device or rocker during the rotation of the said crank, said parts being so proportioned and arranged that said crank is caused to move the rocker bodily downwardly in the descending portion of its rotation, to then turn said rocker in one direction upon its ful- 45 crum while said fulcrum is substantially stationary, and to finally turn said rocker backward upon its fulcrum and simultaneously move the said rocker bodily upward into its initial position. 50

In testimony whereof I affix my signature in the presence of two witnesses.

PHILIP DIEHL.

Witnesses:

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JOSEPH F. JAQUITH.