

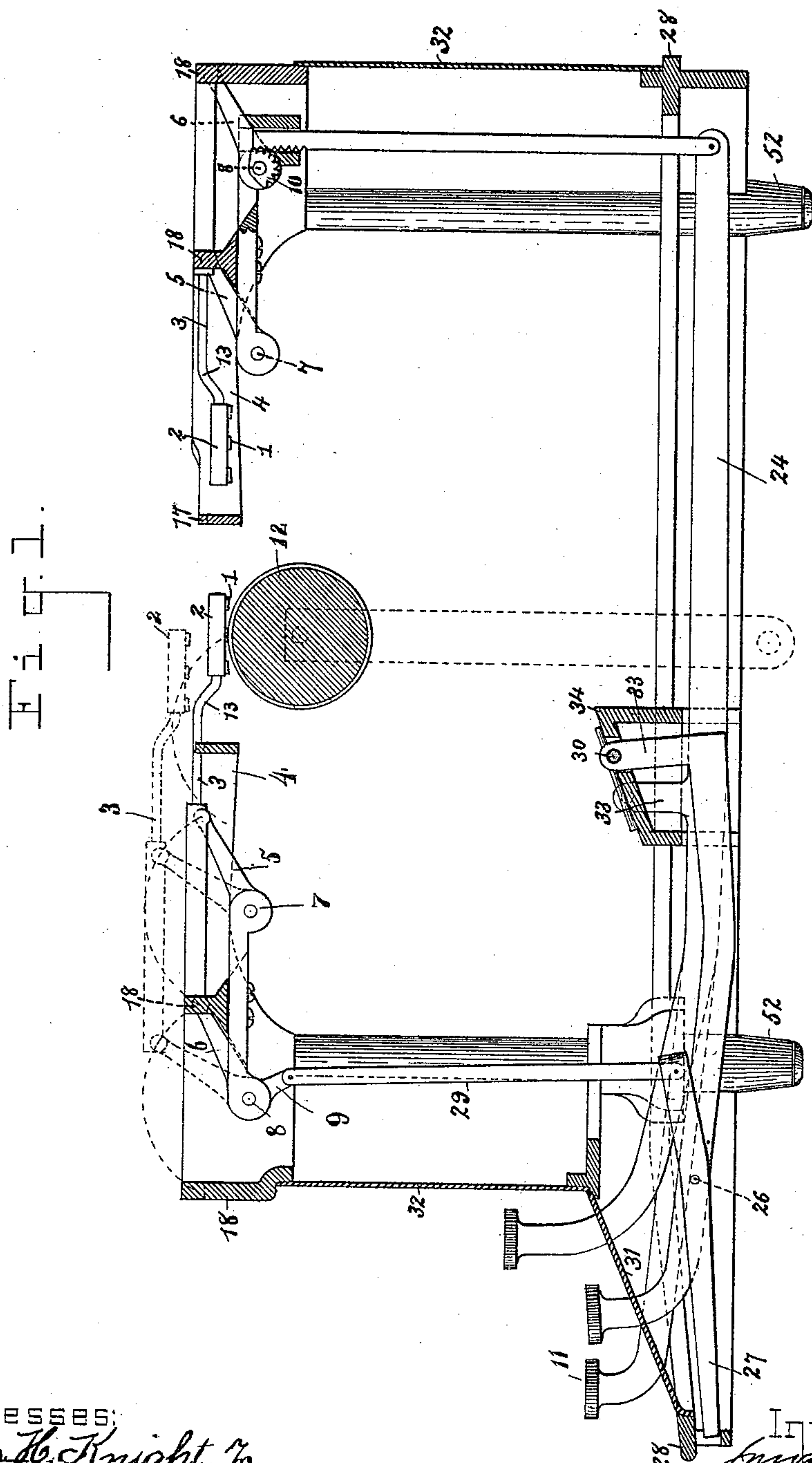
(No Model.)

7 Sheets—Sheet 1.

J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

Patented Dec. 16, 1890.



Witnesses:

Geo. H. Knight, Jr.
Killicama

Inventory:

by straight ways

(No Model.)

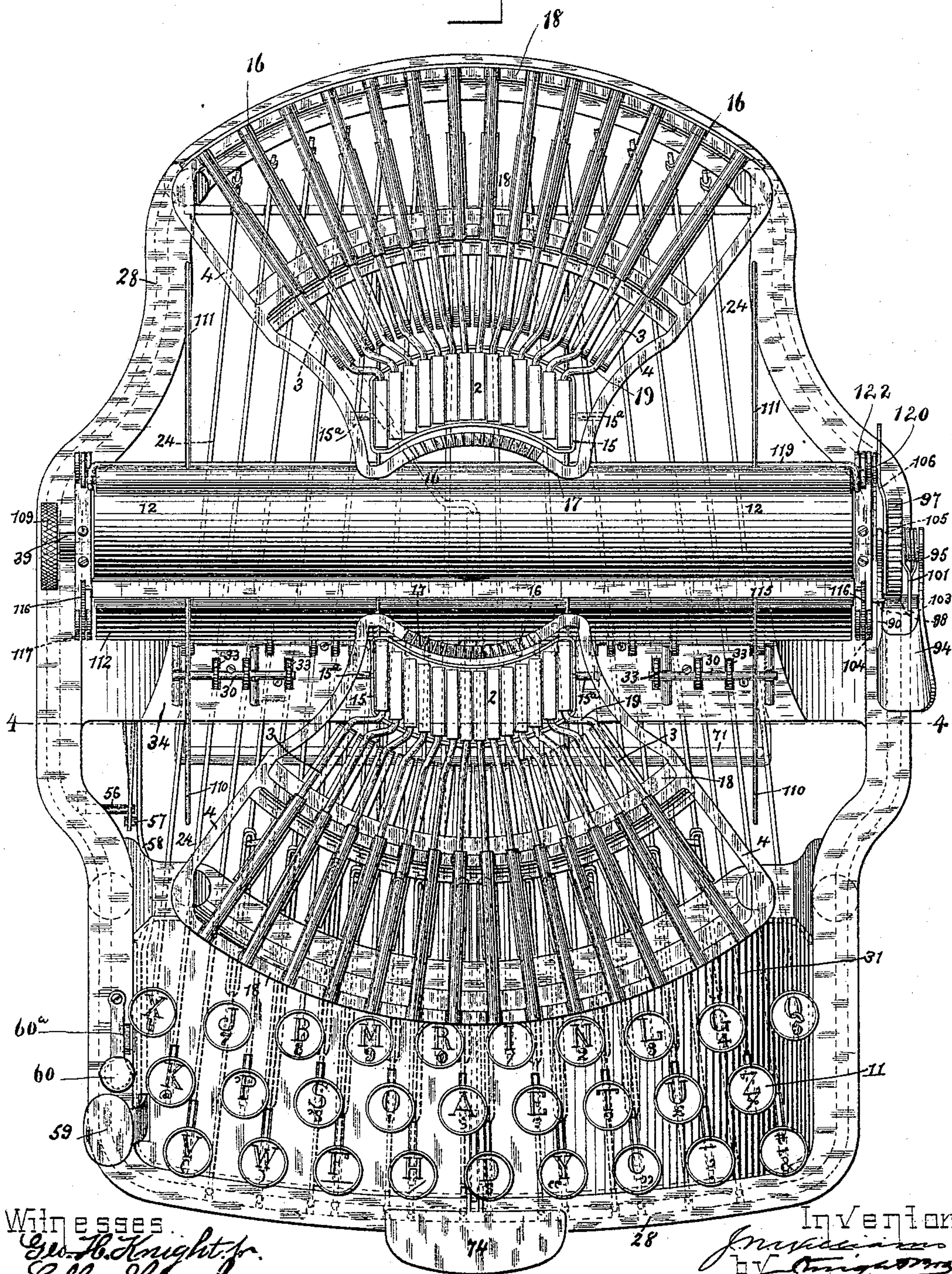
7 Sheets—Sheet 2.

J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

Patented Dec. 16, 1890.

Fig. 2.



Witnesses
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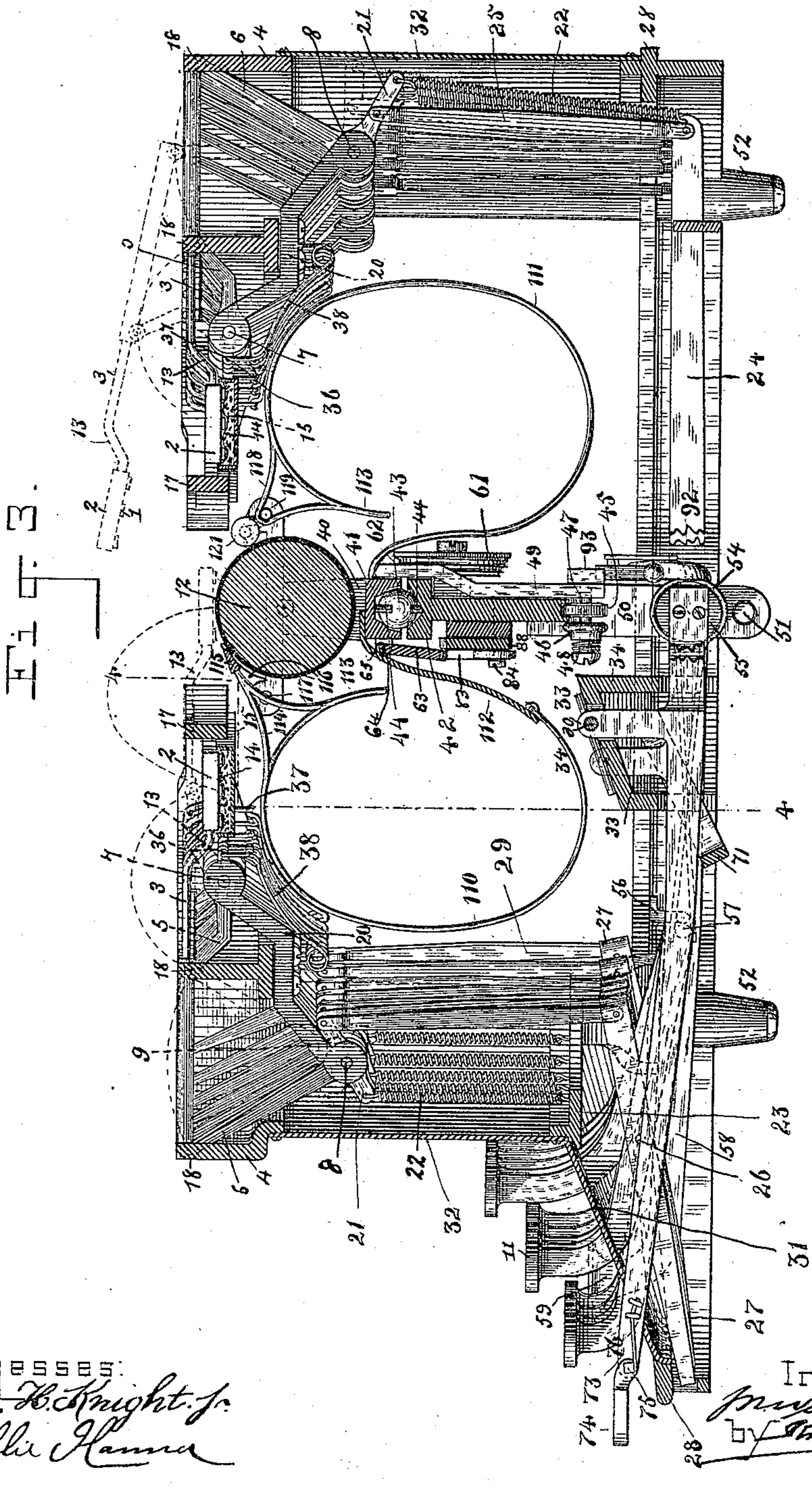
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J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

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(No Model.)

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J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

Patented Dec. 16, 1890.

Fig. 4.

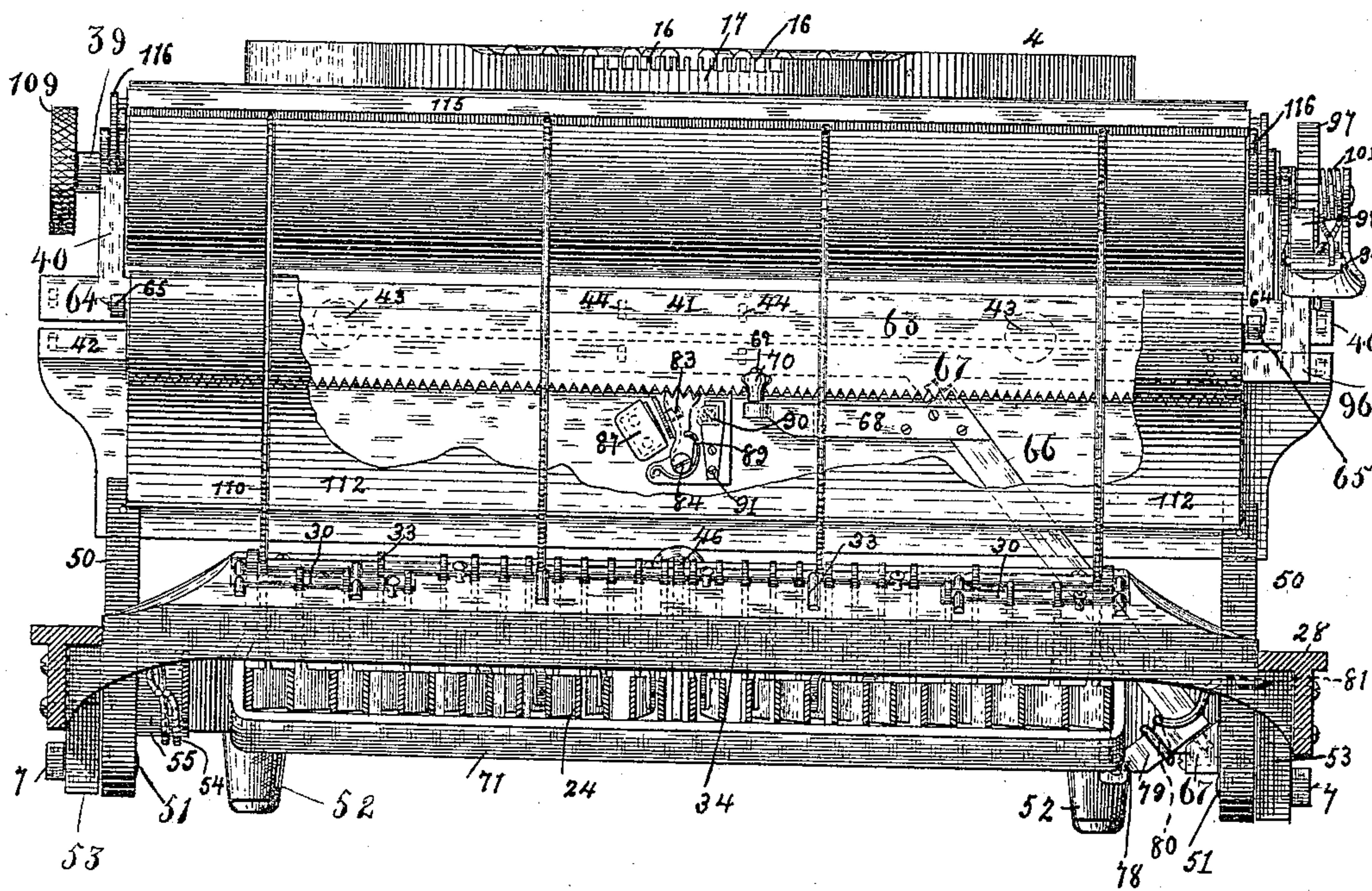
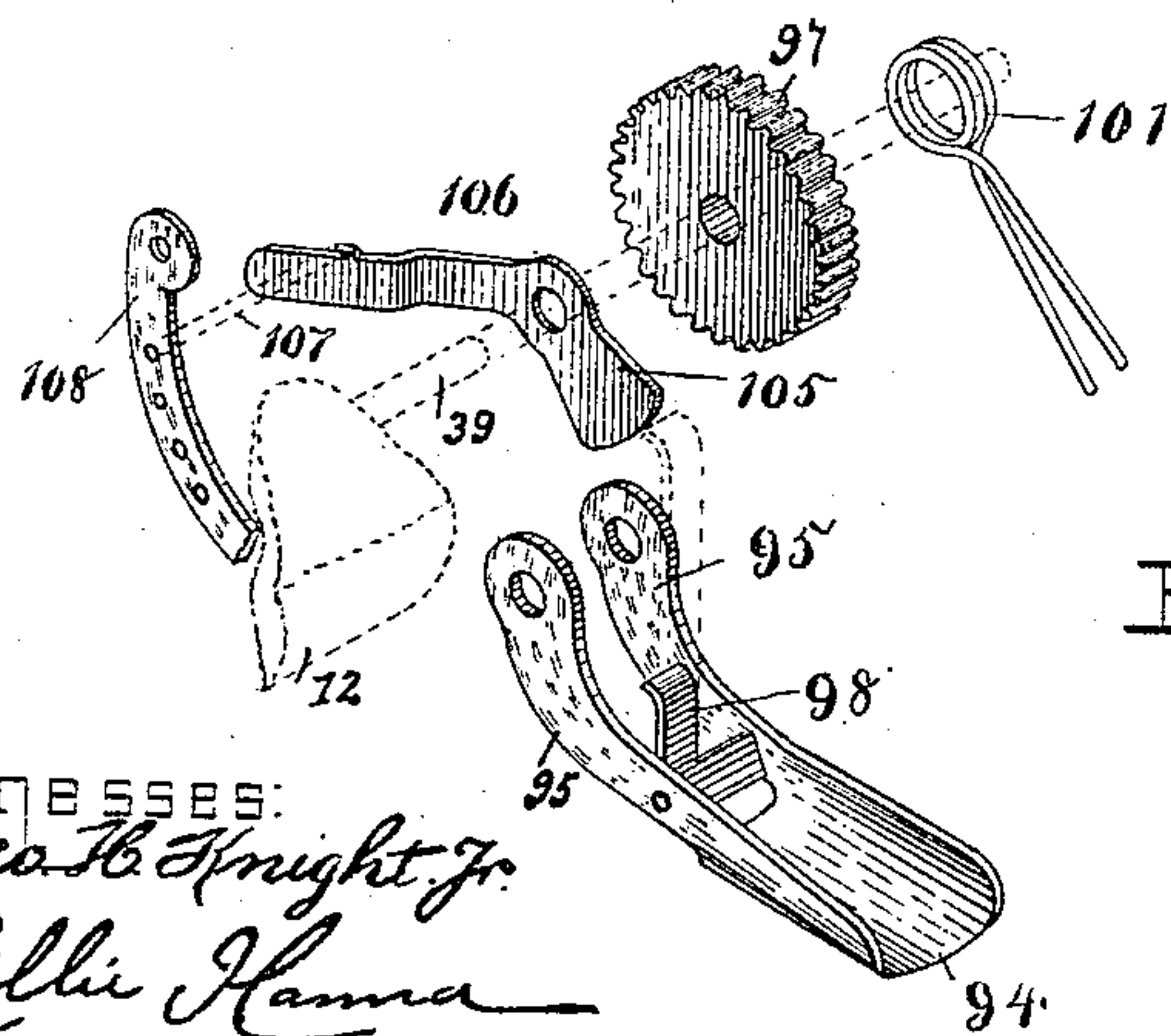


Fig. 6.



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Fig. 5.

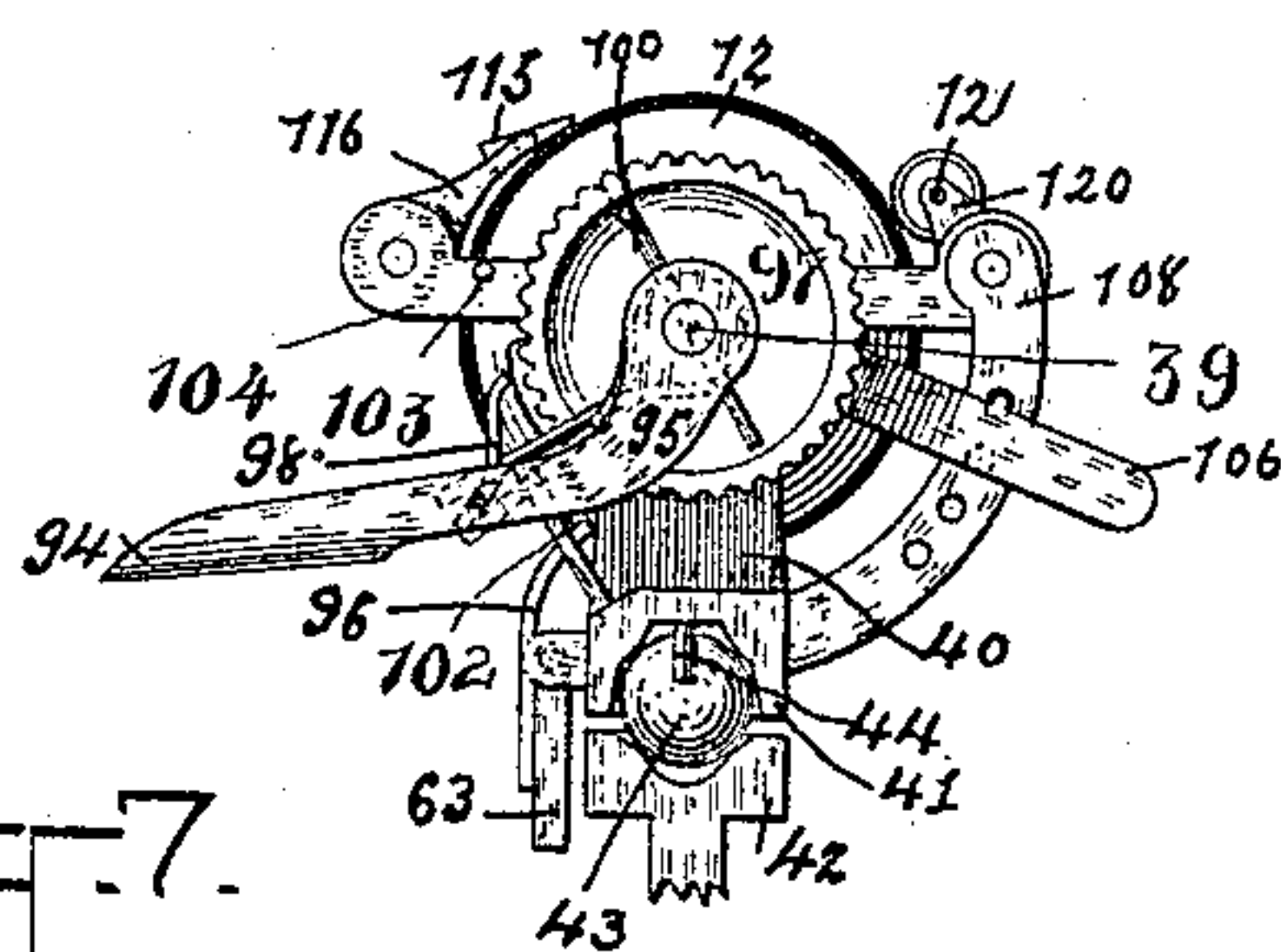
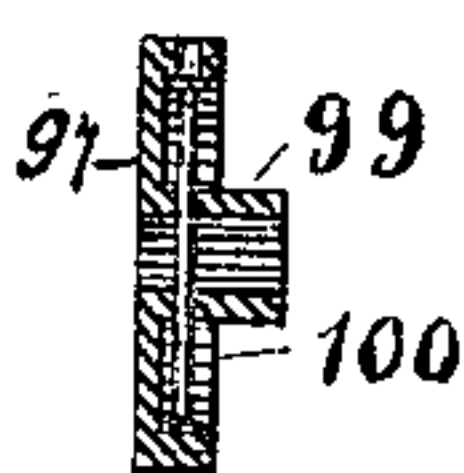


Fig. 7.



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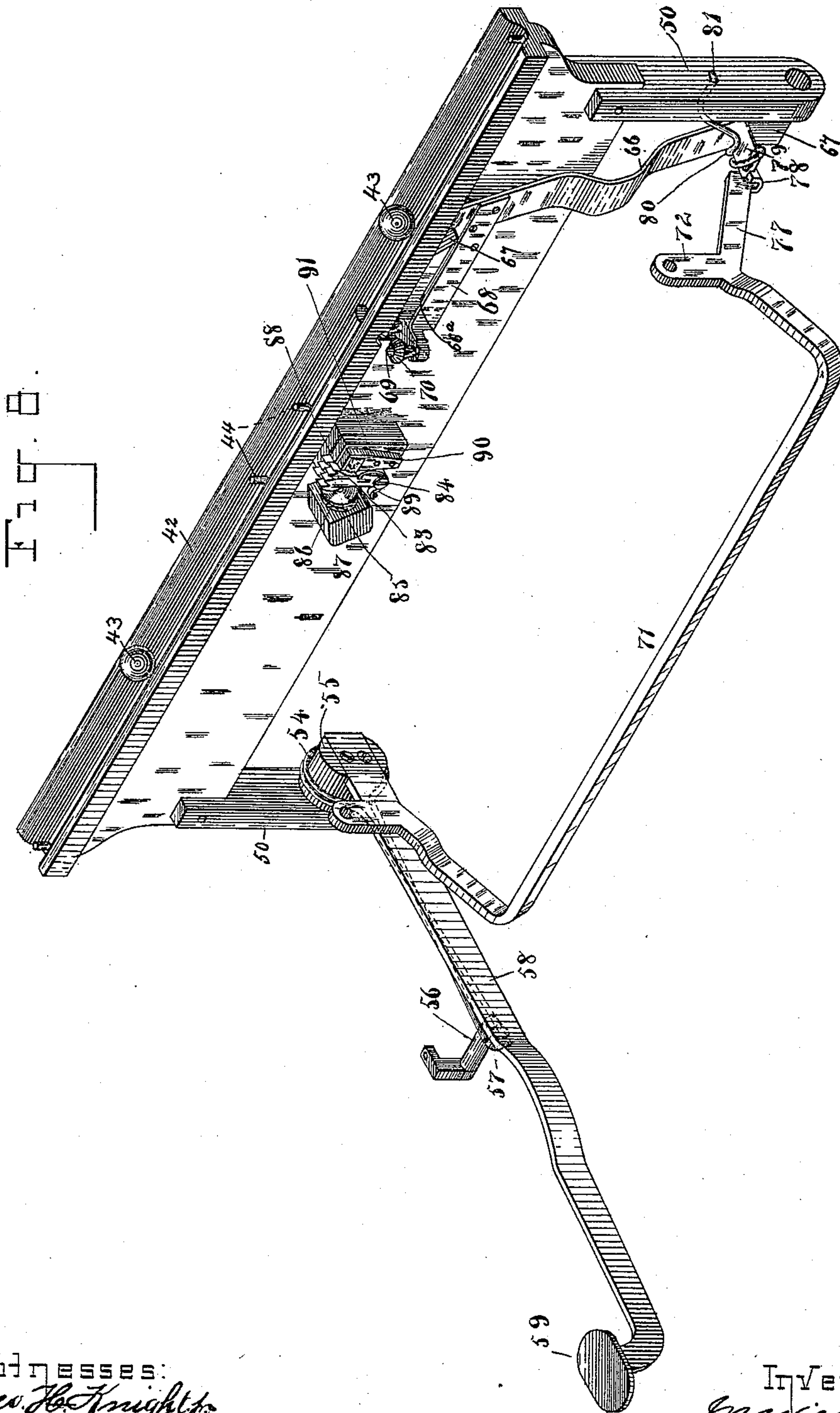
(No Model.)

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J. N. WILLIAMS.
TYPE WRITING MACHINE.

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(No Model.)

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J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

Patented Dec. 16, 1890.

Fig. 9.

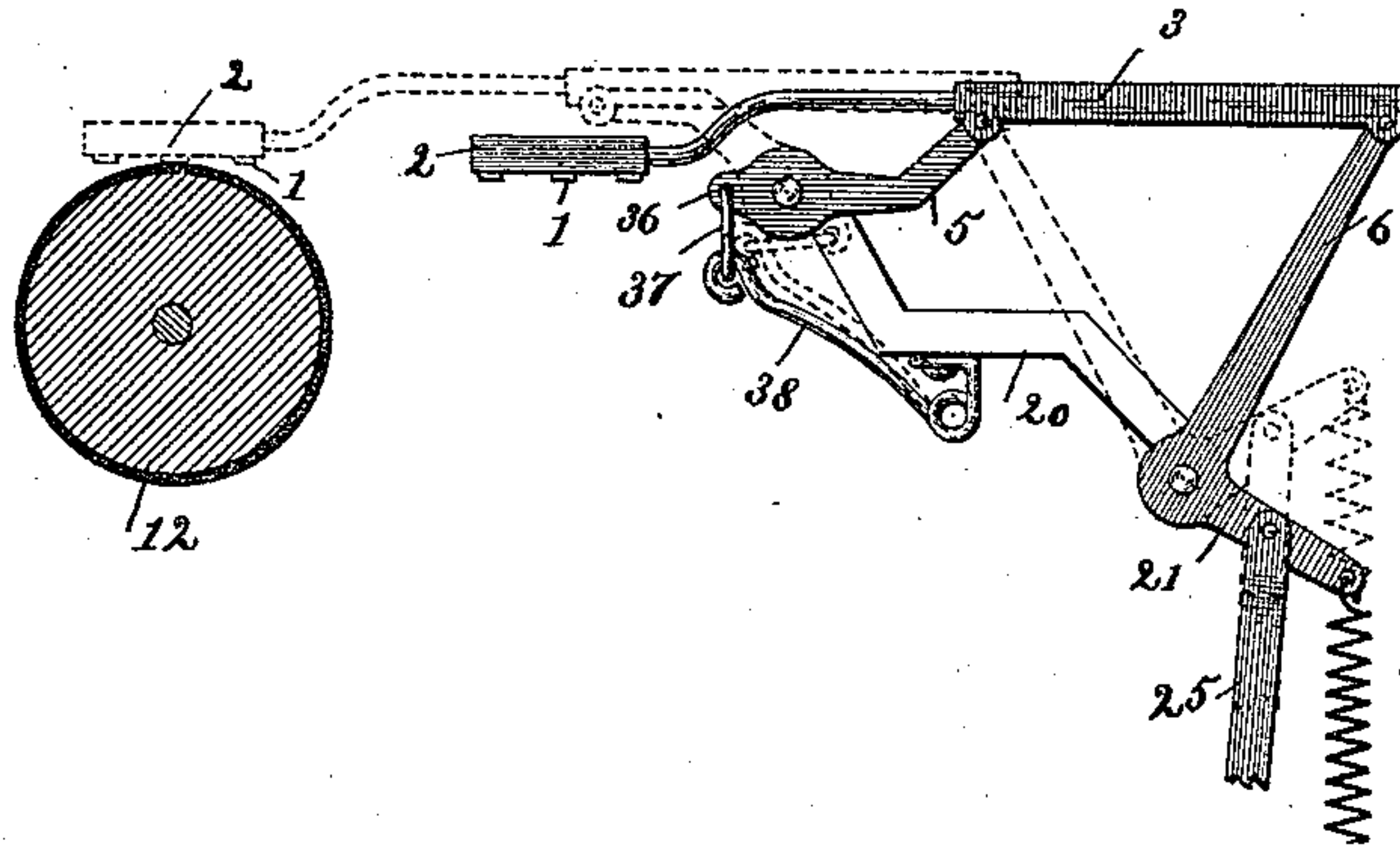


Fig. 10.

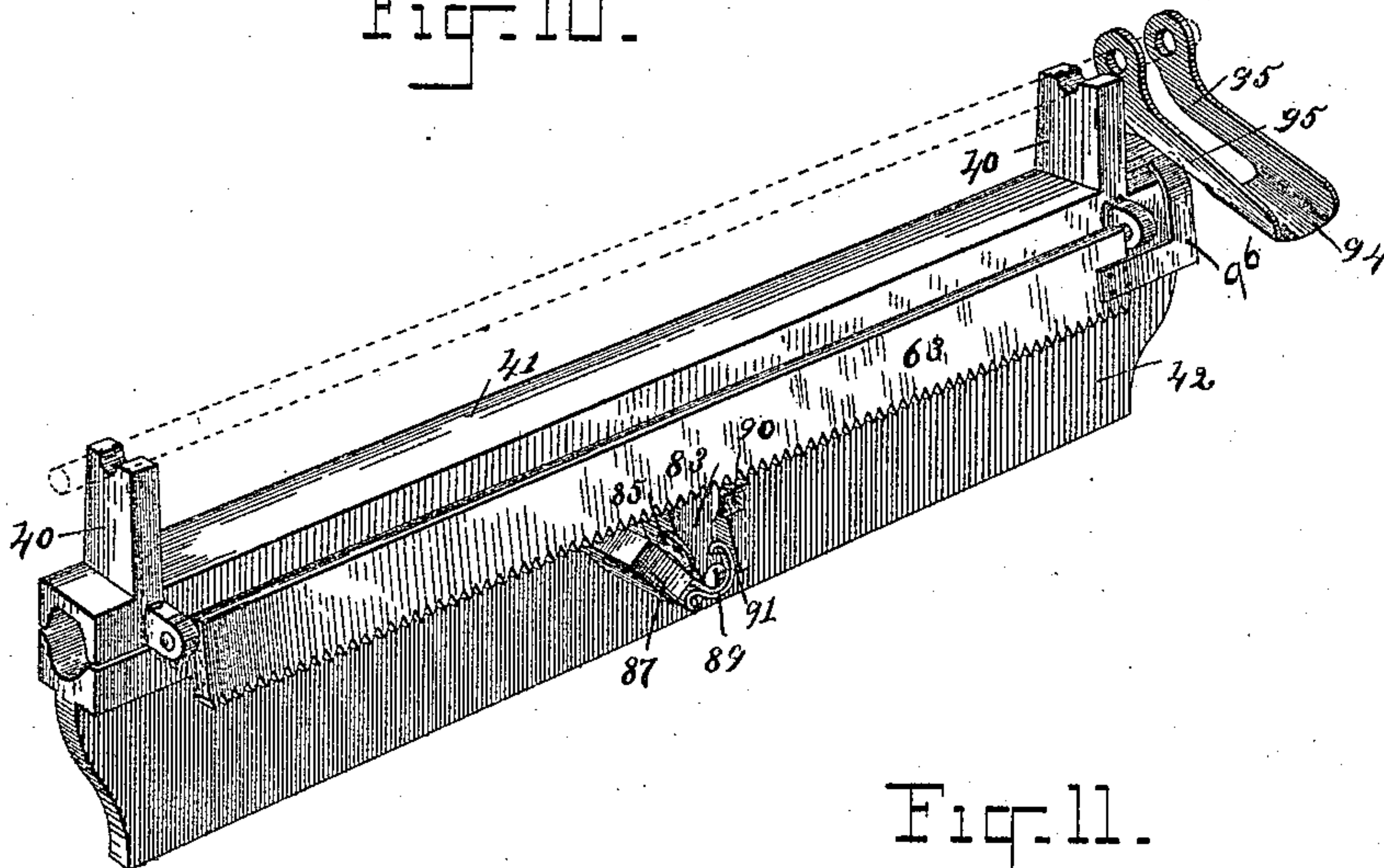
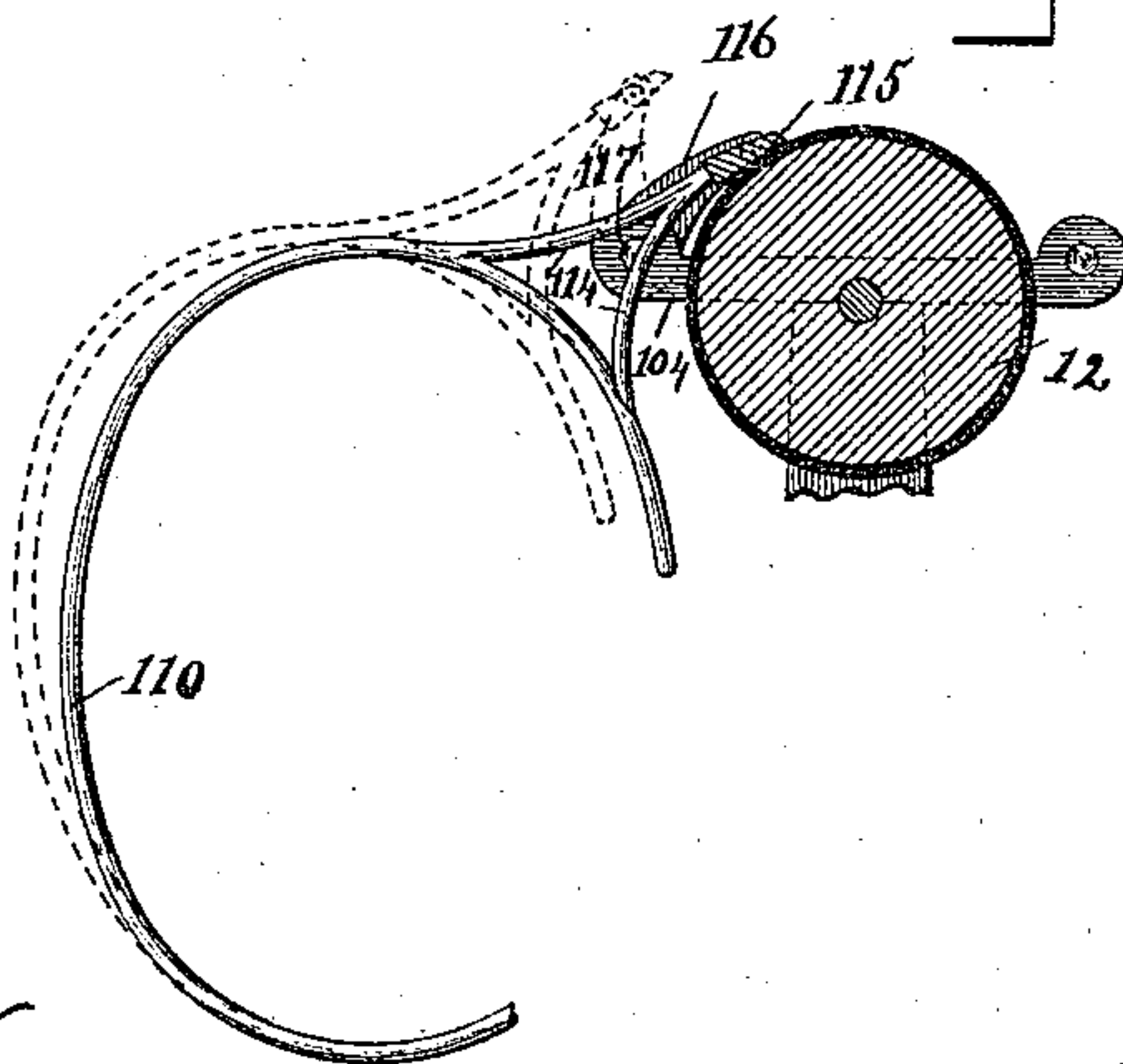


Fig. 11.



Witnesses

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(No Model.)

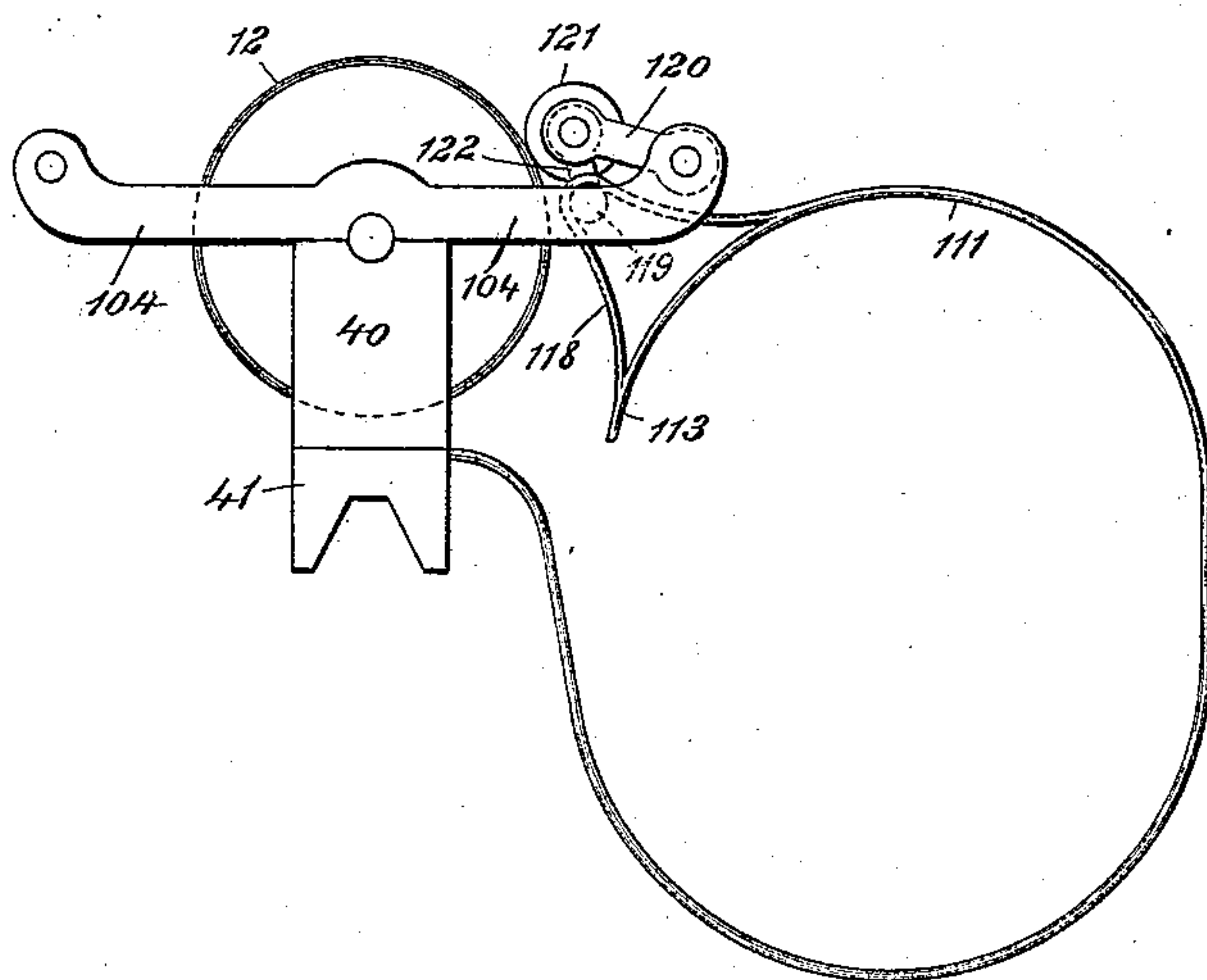
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J. N. WILLIAMS.
TYPE WRITING MACHINE.

No. 442,697.

Patented Dec. 16, 1890.

FIG. 12.



Attest:

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Walter Allen

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Atty.

UNITED STATES PATENT OFFICE.

JOHN N. WILLIAMS, OF BROOKLYN, NEW YORK.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 442,697, dated December 16, 1890.

Application filed July 3, 1889. Serial No. 316,398. (No model.)

To all whom it may concern:

Be it known that I, JOHN NEWTON WILLIAMS, a citizen of the United States, residing at Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My invention relates to a type-writing machine of the style in which the writing or impression is produced on top of the platen, constantly exposed to the inspection of the operator, and the forms of type-carrier and paper-carriage movements, which are the principal features of my invention, are especially useful in such machines, because they lend themselves to the prime object—that of leaving the platen open and unobscured.

My invention consists in certain improvements, first, on the type-carrier mechanism, and, second, on the paper supporting and shifting devices.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a central vertical section of a typical form of my machine, omitting all parts except the type-carriers and those parts necessary to their operation. Fig. 2 is a plan view of the entire machine in its improved form. Fig. 3 is a vertical central section of the same. Fig. 4 is a vertical transverse sectional view in the plane indicated by the lines 4 4, Figs. 2 and 3. Fig. 5 is an end view of the platen and associated parts. Fig. 6 is a perspective view of certain of the same parts disassociated. Fig. 7 is an axial sectional view of the line-feed ratchet-wheel. Fig. 8 is a perspective view of the paper-carriage-carrying frame and associated parts, the paper-carriage and step-by-step feed-rack being omitted. Fig. 9 is a sectional detail view of a single type-bar and associated mechanism with a specific view, showing the action of the counterbalance-spring. Fig. 10 is a perspective view of the feed-rack and associated parts. Fig. 11 is a sectional view of the front paper-holding cage and pressure-bar and platen. Fig. 12 is a detail view of the platen and rear paper-holding devices.

For the type-carrier mechanism I employ in the typical form of machine (shown in Fig. 1) the parallel-ruler movement, and in the im-

proved and preferred form (shown in Figs. 2 and 3) a modified form of that movement.

Referring to Fig. 1, it will be seen that the type 1 (preferably three on the under side of each block 2) are carried on the ends of bars 3, which normally rest in a horizontal plane on the fixed frame 4 of the machine. The details of the frame will be described farther on.

Each type bar or carrier 3 is pivoted or hung upon two links or arms 5 6, which at 7 8 are respectively hinged to the fixed frame. An arm 9, as shown at the left of Fig. 1, or a toothed segment 10, as shown at the right of said figure, is formed rigid with link 6 and is connected to the finger-keys 11.

In operating the machine depression of the key will cause the arm 9 or segment 10 to be turned and will lift the type-bar, keeping it horizontal all the while, and carry it from its position of rest on the frame up and then down to a position where the type will rest on the platen 12. A reverse movement will bring it back to rest on the frame. The position at rest is shown on the right of Fig. 1, the projected position on the left of said figure in full lines, and an intermediate position, also, on the left in dotted lines. The type-block will describe approximately a half-circle, as shown by the dotted curve. It will be seen that such a movement will lift the type from a position sufficiently remote from the platen to leave the latter clearly in view, project it out toward the platen as it rises, and then bring it down onto the platen with a substantially vertical stroke, enabling the blow to be given with sufficient force and without any such sidewise or endwise movement as might blur the impression. The movement illustrated in Fig. 1 is susceptible of some important practical improvements with the object of lessening the movement of the key-levers and increasing the directness of the downward stroke on the platen. Such improvements are embodied in the machine illustrated in the remaining figures, which I will now describe.

The type-carriers 3 (see Fig. 3) have preferably a downward bend at 13, so as to bring the types somewhat below the top of the frame of the machine when the types are in the projected position. This enables the pro-

jected type-bar to lie diagonally across and above the type-blocks, remaining in normal position on the ink-pad.

The link 6—the one farther from the type—is made longer than link 5. The object of this is readily seen. It is unnecessary that the outer end of bar 3 have any other than a longitudinal or front and rear movement; but in order to clear the frame and paper and impart the proper blow the inner or type end should have as well an upward and downward movement as nearly vertical as possible. By lengthening the link 6 relatively to the link 5 I am enabled to give as great a longitudinal blow to the type-carrier with a less movement of the link 6 around its pivot, and consequently a less depression of key, and at the same time the directness and force of the downward blow of the type is increased. This is well shown by the dotted curves at the left of Fig. 3, the arc described by link 6 being quite flat, the arc of link 5 much more arcuate, (nearly a half-circle,) and the arc of the type still more arcuate—about one-half of an ellipse.

There are two groups of type-blocks, one in front and one in rear of the platen, each resting normally on a horizontal ink-pad 14, placed in a flat curved pan 15, supported on the frame by pivots 15^a. The type-blocks of each group are arranged parallel and close together and their several type-bars radiate from a common center over the platen. The type-bars have a varying horizontal bend at 19, (see Fig. 2,) increasing from the center outward to bring all to the proper radial position. Seats 16 in concentric cross-bars 17 18 of the frame hold and steady the type-bars or carriers in both normal and projected positions. To maintain alignment in striking the platen, it is preferred that the seats 16 on the inner cross-bar 17 be of such depth as to arrest the type-bar just as or before the type touches the platen, so that the arch formed by link 5, type-bar 3, and type-block 2, (see Fig. 1,) being supported at its center, will not flatten under the stress of the blow. The inner links 5 are preferably bent somewhat, as shown, so that they will clear the ink-pad and adjoining type-blocks when the type-carriers are in projected position.

The horizontally-arranged ink-pad, against the top of which the type returns after each impression, is a feature which is of considerable practical importance and one which is rendered possible by the peculiar type-carrier movement employed. The ink-pan, being closed at bottom, is adapted to receive a supply of ink which will be long retained. The type are always inked in readiness for the impression and are so moved to and from the pad that the latter offers no frictional resistance. The type print directly from their face, so insuring a clear-cut clean impression. The pivoting of the ink-pad enables the type to always find a seat upon it. It may be readily removed and renewed.

In the present case the supports for the pivots 7 8 of the links 5 6 consist of bent bars 20, fixed under one of the curved bars 18. Rigid with the links 6 are arms 21, which are attached to the upper ends of tension-springs 22. The lower ends of the springs are, as shown at the left of Fig. 3, fixed to the rigid bar 23 of the frame, or, as shown at the right of the same figure, to the extreme rear ends of the key-levers 24. It will be seen that the first method of attachment of the springs is appropriate for those in the front of the machine and the second for those in the rear of the machine. Those key-levers which run to the rear of the machine are connected to the rear links 6 by push-rods 25, hinged to the same arms 21, which carry upper ends of springs 22. Other key-levers 24 only extend part way to the rear of the machine and are hinged at 26 to floating levers 27. Normally the levers 27 bear upward loosely at their front ends against the under side of base-piece 28 of the frame, and at their rear ends are hung on pull-rods 29, hinged to arms 9 of links 6.

The left of Fig. 1 shows the parts in the position they assume when a key is depressed.

The arms 9 are so arranged as to be approximately horizontal when at rest, so as to start with little resistance. The key-levers pass through slots in an inclined face-plate 31, which, with the bent shields 32, hides the mechanism of the machine from view. (This matter is the subject of claim, and is more fully illustrated in my application filed November 20, 1890, Serial No. 372,119.) All of the key-levers have lugs 33 projecting up through slots in a cross-bar or girder 34, and rods 30, passing through the upper ends of lugs 33, serve as pivots for the latter and for their respective key-levers.

The practical necessity which exists of arranging the keys in a bank of several rows the different lengths of the key-levers necessary for actuating front and rear type-carriers and the different methods employed for connecting the key-levers and the type-carriers at front and rear of the machine render it desirable that some latitude be allowed in the location of the key-lever pivots, so that leverage exerted and the "touch" of the keys shall be substantially equal. With this end in view the bar or girder is made wide enough from front to rear to receive two or more series of bearings for the lugs 33, and the latter are hung therein at a forward or rear point governed by the above-stated considerations.

Depression of any of the keys connected with the front group of the type-carriers will force down the corresponding floating lever 27, the latter being allowed at its forward end under the frame 28 the slight freedom to slide which may be necessary. This draws down rod 29 and projects the proper type-bar in the manner already described. The spring 22 resists this action, and on the release of

the key returns all parts to normal positions. The same spring at all times maintains the parts under tension, its strain being so exerted as to prevent any backlash or loose movement of the parts. Thus depression of the key is felt instantaneously and without loose movement of the type. The operation of one of the rear type-carriers is similar, the parts being kept under tension by the spring 22, which is elongated by the rising of the outer end of arm 21.

The links or arms 5 have projecting beyond their pivots short arms 36, Fig. 3, from which hang links 37, hinged at their lower ends to free ends of wire counteracting-springs 38, whose other ends are fastened to the frame. The springs 38 are so bent as to exert a constant downward pull on the arms 36; but it will be observed that this pull only becomes effective when the arms 36 are about in horizontal position at one or the other end of their movement—that is to say, when their stress becomes important in overcoming the gravity and toggle action of the links. By this means the softness of the touch is found to be very materially improved.

The paper-carriage of my improved type-writer moves on a single track. The platen 12 is a wooden or metal rubber-covered roller of cylindrical or approximately cylindrical shape. Its trunnions 39 are mounted in the vertical arms 40 of a supporting and guide bar 41.

42 is the track-rail, arranged immediately under the bar 41. The adjacent faces of bar 41 and rail 42 have V-shaped or equivalent grooves to receive anti-friction balls 43, preferably two in number, and so separated by pins 44 that both ends of the platen will be sure of support at all times. The shape of the grooves is such that the gravity of the carriage will bring it always to central position, and yet it will rest on each ball at but two points and so move with but little friction. The track or rail 42 is of girder form, of such depth as to give a bearing for the steadying-rollers 45 46, separated from the balls 43. Strain and friction are thus avoided. The roller 45 runs in a groove in the bottom of rail 42 and is carried by the same pin 47 as the roller 46, which is so held up to the side of the rail by spring 48 as to yield slightly to sidewise movement. The pin 47 is carried by the lower end of an arm 49, pendent from and rigid with the bar 41. It will be seen that the weight of the carriage is all upon the balls 43, as well as the principal guiding action, the rollers 45 46 serving simply to steady the movement and prevent accidental displacement of the carriage from its track.

As, in order to lessen the number of keys, two or preferably three types are carried by each type-block, it is necessary to provide for the relative shifting of type-blocks and platen, to bring one or other of the types on each block into play. This may be done by shifting either the type-carriers or the platen.

In another application I shall describe means for shifting the type-carriers. In the present application a preferred method of shifting the platen is shown, and will now be described. The rail 42 is supported at its ends on standards 50. (See especially Figs. 4 and 8.) These standards oscillate on pivots 51. In order to maintain the top of the platen as much as possible in the same horizontal plane, so that the type may always strike it squarely with the same force, it is important that the pivots 51 be placed as low as possible. The frame 28, which completely surrounds the machine, is supported on legs 52, and the lugs 53, hanging from the frame and carrying the pivots 51, extend nearly to the level of the bottom of said legs. It is desirable that the majority of impressions shall be given to the platen when it is vertically over the pivots 51, so the types most used (which are the lower-case alphabet) are placed in the middle of the type-blocks.

Capitals and other signs or abbreviations, as may be desired, occupy the two ends of the type-blocks.

It may be remarked in passing that, as shown by the accompanying drawings, my machine is capable of having in perfectly convenient and operative space eighty-four characters with the employment of but twenty-eight keys. So that to the upper and lower case alphabet and the customary punctuation-marks and figures may be added such useful characters as £, ¢, %, /, @, —, or any others which may be found convenient for special use.

The use of two keys additional to the twenty-six necessary for the alphabet enables the comma and hyphen to be mounted in the same part of the type-block as the lower-case letters, thus avoiding the most frequent cause for employing the shifting-key. The keys are so arranged on the board as to bring those most used in the center and those most often associated into such relation as to be conveniently operated. The types are also arranged in one or the other group on opposite sides of the platen, according to the frequency of their use, the intention being to have one group used as much as the other. The type-blocks are made removable from their carriers, so that they can readily be replaced by others which may be newer or of a different font. The end types 1 of each type-block 2 are preferably arranged at opposite inclinations to the intermediate type to make up for the slight difference in angle of the platen when it is oscillated under the same. The result of this inclination is that each type will strike the platen fairly on its face. Strictly the faces of the three types on each block should lie in a circle struck from the pivots 97 of the paper-carriage; but in order to avoid possible striking of one type of the block accidentally when another type of the same block is brought against the platen the types are made to project sub-

stantially equal distances downward from the type-block, the printing-faces of the end type being, however, at suitable inclination to that of the central type. The platen is held normally with its supports vertically over their pivots. It is returned automatically to that position by a centering-spring 54, which is wound on a lug or drum 55, fixed to one of the standards 50. The two ends of the spring pass forward on opposite sides of two lugs 56 57, the first fixed to frame 28 and the other to a lever 58, which extends forward to the key-board, where it has a key or finger-piece 59. Depression of key 59 will thus tilt the platen forward against the action of one end of spring 54, while elevation of the same key above its normal position will tilt back the platen against the action of the other end of spring 54, and the release of the key will in either case bring the platen and its supports back to the upright medial position. A button 60, Fig. 2, pivoted to the frame 28 may be swung, with its lug 60^a, under or over the key 59 to hold it in elevated or depressed position as long as desired; but any desired device may be substituted for accomplishing the purpose of this button.

Besides the oscillatory movement with its supports just described, the platen has two other movements—one a step-by-step movement transverse of the machine on the balls 43 to properly space the characters and words of a line, the other a rotary movement on its trunnions to shift the paper from line to line. The first of these two movements is imparted by a spring wound in customary manner in drum 61, which has a cord, strap, or other means of connection 62 with the bar 41 of the paper-carriage. This spring exerts, as is customary in such machines, a constant pull to the left on the paper-carriage, and the latter is released by an escapement controlled by the keys. This escapement will now be described.

63 is a rack hanging loosely from pivots 64, carried by lugs 65 on the bar 41 of the paper-carriage.

66 is a rock shaft or bar pivoted in inclined bearings at 67 67 on one oscillating standard 50 and rail 42, respectively. At its upper end the inclined rock shaft or bar 66 has a horizontal spring-arm 68, carrying two studs 69 69, one on each side of rack 63 and both preferably bearing anti-friction rollers 70 70, which closely hold the rack 63 while allowing it to run between them. A rigid projection 66^a on said rock shaft or bar 66 strengthens the spring-arm 68 and renders its normal action in shifting the rack prompt and positive, while not interfering with the forward movement of the rack against the action of the spring-arm 68 when it is desired to disengage the said rack from both of its pawls 83 88.

71 is the spacer-bar or yoke, having lugs 72 pivoted on cross-bar or girder 34 along with the key-levers. It is of U form and crosses

the machine immediately under all of the type-moving key-levers and sufficiently forward its pivots to afford an efficient leverage.

In addition to the key-levers 24, connected with the type-carriers, a lever 73 is employed, also pivoted on cross-bar 34 and overhanging the spacer-bar or yoke 71. This lever is preferably arranged in the middle of the series of levers, so that its key 74 may be placed in front of the middle of the key-board, so as to be capable of operation readily by either hand.

To shorten the machine for transportation, the key 74 is preferably hinged to its lever 73 and has a square-ended pintle 75, adapted to be engaged by spring 76, and so hold the key in extended or folded position.

The spacer-bar 71 has a rearward-projecting arm 77, Fig. 8, on which is a lip 78 in front of an arm 79 of rock shaft or bar 66. A spring 80, fixed at one end 81 to oscillating standard 50 of the paper-carriage, has its other end fixed to arm 79 of rock shaft or bar 66. This spring presses constantly forward the outer ends of arms 68 and 79 of the rock shaft or bar 66, and thereby keeps the rack 63 normally tilted forward and the spacer-bar 71 normally up close under the key-levers, while depression of the spacing-key 74 or any of the keys 11 will force down the spacer-bar against the action of spring 80 and, rocking the shaft or bar 66, shift or tilt the rack 63 to the rear. Normally the rack, being tilted or inclined forward, has its teeth engaged by those of segmental pawl 83, which is pivoted at 84 on a screw or pin fixed to the rail 42. The pawl 83 is arrested by its plate 85, impacting on a sound-deadening pad or stop 86, preferably of cork, carried by a chambered lug 87 on rail 42. When moved to the rear by the depression of a key, the rack leaves the teeth of pawl 83 and engages those of a pawl 88, fixed to the rail 42, immediately in rear of movable pawl 83, and with its teeth in register with those of the latter. The pawl 83, freed from the rack, is forced to the right past one or two or more teeth of the rack by a spring 89 until arrested by a stop 90 at such a point that its teeth will be again in register with those of the rack. The stop 90 is preferably of a sound-deadening material, such as cork, mounted in a chambered lug 91, fixed to the pawl 88 or directly to the rail 42. The pawl 83 is now ready to again receive the rack 63 as it is moved forward on the rising of the key, and as soon as the rack leaves the fixed pawl it is carried to the left with the paper-carriage until arrested and held by impingement of pawl 83 on stop 86. The sound-deadeners of cork are especially useful, that material changing but slightly under light pressure, and when compressed in the chambered lug, as shown, lasting a long time without necessity for adjustment. The paper-carriage is moved step by step to the left by the mechanism just described until a line is about

completed, when the hammer of a gong 92 is operated by a projection 93 from the pendent arm 49.

For moving the carriage back again to the right in order to commence a new line of writing, the handle or thumb-piece 94 is used. This thumb-piece has a rounded bowl to receive the thumb and arms 95, turned up on the sides thereof. It is hung from the right-hand trunnion of platen 12 by these arms. The rack 63 has an arm 96, projecting to the right and then upward under thumb-piece 94. When, therefore, the thumb is placed on thumb-piece 94 and the latter is slightly depressed, the arm 96 will be pressed to the rear and the rack 63 forward, freeing the rack from both of the pawls 83 88 and allowing the paper-carriage to be moved freely to right or left by pressure applied sidewise to thumb-piece 94. A round-toothed wheel 97 is keyed to the trunnion 39 between the arms 95 of the thumb-piece 94. A pawl 98, pivoted to the arms 95, bears on the toothed wheel 97. By placing the forefinger under piece 94 and raising it the wheel 97 is turned and the platen rotated to feed forward the paper from line to line for any desired distance. The wheel 97 has a neck 99, Fig. 7, through which is passed the key 100, which fixes it to the trunnion 39. Upon this neck and between the wheel 97 and one of the arms 95 of the thumb-piece is coiled a spring 101, whose projecting ends pass on both sides of the flattened horizontal portion of pawl 98 and so hold it against the wheel 97. A pin 102, Fig. 5, projecting from any portion of the frame of the paper-carriage, has its end lying between the free ends of spring 101, so that one or the other end of the spring will always abut against said pin when the thumb-piece is raised or depressed, thus returning the thumb-piece to its normal central position. Another pin or stud 103 on the horizontal arm 104 of the paper-carriage frame arrests the upward motion of the thumb-piece always at a fixed point. It will thereupon be observed that the amount of rotation of the platen with each upward movement of the thumb-piece may be adjusted by causing the pawl 98 to engage with the toothed wheel 97 sooner or later in its upward movement. To this end a flat cam 105 is pivoted on the trunnion 39, close to wheel 97. It projects slightly beyond the periphery of wheel 97 and lifts the pawl 98 from the teeth thereof for such portion of the movement of the thumb-piece as may be desired. The cam has a spring-metal finger-piece 106, carrying a pin 107, adapted to enter any one of a series of holes in a segment 108, fixed to the carriage-frame. While the pawl 98 will engage with the rounded teeth of wheel 97, so as to turn the platen when the thumb-piece 94 is raised, it will not when the thumb-piece is in normal position obstruct movement of the wheel in either direction. A hand-wheel 109 on the trunnion 39 on the left of

the platen may therefore be used for rotating the platen at will when, either for inserting the paper or to shift it back or forth, the regularly intermittent movement afforded by the thumb-piece 94 is not desirable; or the toothed wheel may be used as a hand-wheel.

The paper-holder is most clearly shown in Figs. 3 and 4. It consists, mainly, of two bent spring-wire cages 110 111, fixed, respectively, to the front and rear of the paper-carriage. The cage 110 is hung on the bottom of a guide-plate 112, whose upper edge is fixed to the bar 41. This plate extends from side to side of the carriage, and serves to effectually direct the paper to its curved or rolled position in the cage. The upper part of the cage 110 has downward extensions 113 and upwardly-extending arms 114, to which is hinged a graduated pressure-bar 115. Links or arms 116 are fixed to the ends of pressure-bar 115, and pivoted at 117 on horizontal arms 104 of the paper-carriage, said bar being given a pressure toward the platen by the contractile tension of the spring-wire cage. When the pressure-bar is raised to open the cage, the links or arms pass over or just beyond their center, and the line of pressure or tension being now immediately over or a little in front of the pivoted point the bar is held open by the spring action of the cage. The cage 111 at the rear of the platen is hung from bar 41 of the paper-carriage. It has downwardly-extending arms 113, similar to those on cage 110, and, like the latter, so disposed as to leave room for the paper to enter.

121 is a rear paper-holding roller having its end pivots held by links 120, pivoted on arms 104. (See Fig. 12.) From the pivots of the roller 120 a bar 119 (immediately in rear of the platen) is pendent by arms 122. From this bar the cage 111 hangs by loops 118. The spring-pressure of the cage is constantly downward, and it thus holds the roller 121 against the platen. The paper may be inserted on raising the bar 115 till the links 116 stand immediately over or just beyond their center. The spring-wires of the cage will now hold the cage open, the downward pressure on links 116 being over or in front of their pivots 117. Sufficient space is thus provided between the bar 115 and the platen to enable the paper to enter, and it is accordingly slipped into this space, the side to be written on being toward the operator. The guide 112 causes the paper to roll itself into position in the cage. The top of the paper is laid over the platen, face up, its edge inserted under roller 121, and the bar 115 snapped down to hold it on the platen. The paper may now be written on, shifted, and removed by means which have already been fully described.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a type-writing machine, the combination of pivoted type bars or carriers moving

in vertical planes, having a series of parallel type-blocks lying in substantially one plane, and suitable operating devices for moving said type-blocks to a common center, each type-block bearing a plurality of characters, substantially as set forth.

2. The combination, with a transversely-moving paper-carriage bearing a platen and paper-cages in front and rear of said platen, of a type-carrier frame and operating mechanism surrounding said paper-carriage except for a space at top for the insertion of paper, and comprising operating-levers under the carriage, front and rear supports at suitable distances from the carriage, and type-carrier-supporting frames projecting from said supports toward but not to each other and overhanging the paper-cages, substantially as set forth.

3. The combination of the transversely-moving platen with paper-cages in front and rear thereof, key-levers extending under the same, and two sets of type-carriers connected to said levers, arranged substantially in one horizontal plane, one set on each side of the platen, and projecting over the paper-cages and supported at sufficient distance therefrom to allow free transverse movement of the cages under the type-carriers.

4. The combination of the transversely-moving rotary-platen carriage, the two paper-cages, supported one in front and one in rear thereof, two series of substantially horizontal type-carriers, and two frames whereon said carriers are supported, the said frames being arranged one in rear and one in front of the platen, with space between for the insertion of paper, and supported from the base and projecting toward each other over the paper-cages.

5. In a type-writing machine, the combination of the stationary frame having on its upper surface a series of radially-arranged seats, guides, or bearings, a series of substantially horizontal type-carrying bars arranged in said guides or bearings on top of the frame, two series of links, pivoted one forward of the other to said type-carrying bars, and means for operating said bars, whereby they are moved over their supporting-links, first up and away from their seats or bearings in the frame, then forward and downward to other seats in the same radial lines, and the type is brought against the platen, substantially as set forth.

6. In a type-writing machine, the combination of a centrally-arranged transversely-moving rotary platen and paper-cages, two horizontal stationary frames, one before and one in the rear of said platen, and having a space between them of sufficient width for the insertion of the paper and under them and between their supports for the movement of two paper-cages, said frames having their upper surfaces radially grooved from a common point over said platen, and two series of ra-

dially-arranged type-carrying bars guided in said grooves and each mounted on two links which have a movement on their pivots in the same direction, substantially as set forth.

7. In a type-writing machine, the combination of the series of type-bars radially arranged about a common point and each having means of independent operation, the series of parallel type-blocks lying in substantially one plane and carried by the said bars and each having a plurality of characters, and means for shifting the platen and type-blocks one relatively to the other, substantially as set forth.

8. In a type-writing machine, the combination of the series of parallel type-blocks, all in one plane, the series of radial type-bars having downturned ends connected to said type-blocks and horizontal bends of greater sharpness from the central to the side bars of the series, each bar being carried by two links mounted one forward of the other on the stationary frame, a transversely-moving rotary platen, and a horizontal ink-pad in substantially the same plane as the top of the platen.

9. The combination of the transversely-moving rotary platen, horizontal ink-pads on both sides thereof, two series of parallel type-blocks resting in the same plane on said ink-pads, each having a plurality of characters, two series of radiating type-bars connected to said blocks, each bar being carried by two links adapted to move in the same direction and having means of operation substantially as described, and means for shifting the platen and type-blocks one relatively to the other.

10. The combination, with a type-bar, of two links pivoted to said bar and to the stationary frame so as to move in the same direction, a type-block carried by said bar and forming therewith and with the nearer link an arch, a platen, and a cross-bar having a guide or bearing for said type-bar at such depth as to support the center of the arch when the type-block is against the platen, substantially as set forth.

11. The combination of the ink-pad and the type bars or carriers carried by two links, the inner of said links being bent to clear the adjoining type-block, substantially as set forth.

12. The combination of the stationary frame and the horizontal parallel type-blocks, ink-pad, and pan, the latter having pivots, one at each end, whereby the pad adjusts itself automatically to parallelism with the types, substantially as set forth.

13. The combination of the type-carriers, the links for operating the same, arms thereon, key-levers and springs, and rods, both connected to said arms and to the ends of said key-levers, substantially as shown and described.

14. The combination of the key-lever, type-carrier-operating arm, rod, pivoted to both arm and key-lever, said arm projecting beyond the pivot of rod thereon and

having attached to its outer end one end of a spring whose other end is attached to the key-lever, substantially as set forth.

15. The combination of the spring-retracted link 6, having arm 9, rod 29 hung therefrom, key-levers 24, and floating levers 27, pivoted to both the rods 29 and key-levers 24 and fulcrumed against the stationary frame, substantially as set forth.

16. The combination of the stationary frame, the transverse girder or cross-bar 34, having slots and grooves, as described, and the key-levers having lugs projecting through said slots and pins supporting them therein, substantially as set forth.

17. The combination of a type-carrier, a link connected thereto, and a spring connected thereto so as to overcome the inertia and toggle action of the link at each extremity of its movement.

18. In a type-writing machine, in combination with a type-carrier, a type-carrier-operating lever, and a main retracting-spring, a counteracting-spring connected with the type-carrier and opposing the action of the main spring at one extremity of the movement of the type-carrier and assisting it at the other extremity of the said movement.

19. The combination of a single vertical girder or rail having a single centering groove in its upper surface, a platen-carriage having a corresponding groove on its under surface, anti-friction rollers in said grooves carrying and guiding said carriage, and means for steadying said carriage over said vertical girder, substantially as set forth.

20. The combination of a single track or girder, the carriage supported by loose ball-bearing thereon, the said balls running in opposite grooves in the track and carriage and holding the carriage to rectilinear movement, and an arm pendent from said carriage, having a projection under said track or girder, whereby the carriage is held down upon said balls, substantially as set forth.

21. The combination of the track or girder 42 and the paper-carriage thereon, the arm 49, pendent from said paper-carriage, the roller 45, and spring-roller 46, carried by said arm 49 and engaging the lower edge of said track or girder, substantially as set forth.

22. The combination of a series of movable type-blocks, each having a plurality of type, and a platen arranged to oscillate over fixed pivots and under said type-blocks, so as to bring one or other of the types thereon into operation.

23. The combination of the paper-carriage, the oscillating standards or supports 50, whereon it is mounted, the key for oscillating said paper-carriage, and the series of horizontal type carriers and blocks having type on their under faces, with keys and levers for operating said type-carriers, substantially as set forth.

24. The combination of the paper-carriage,

the transverse pendent rack pivoted thereon, a fixed and a movable pawl carried by the support of the paper-carriage, an inclined rock shaft or bar pivoted on said support, an arm at the upper end of said rock shaft or bar, parallel to and having means of engagement with said rack, an arm at the lower end of said rock shaft or bar, a series of key-levers, and a pivoted U-shaped spacer-bar arranged under said key-levers and adapted to operate the lower arm of said rock shaft or bar, substantially as set forth.

25. The combination of the pivotal escapement-rack, the rock-shaft, the spacing-bar connected to said rock-shaft and the spring-arm carried by said rock-shaft and having projections engaging with the lateral faces of said pivotal rack, whereby said rack may be oscillated on its pivots, the construction of the spring-arm being such as to yield laterally to enable the rack to be entirely disconnected from its pawls.

26. The combination of the escapement-rack, the rock-shaft having connection with the spacing-bar, a rigid projection at the upper end of said rock-shaft, and a spring-arm 68 on said rock-shaft in front of said rigid projection and adapted to engage the escapement-rack, substantially as set forth.

27. The combination of the pivotal carriage-feed rack, the slanting rock shaft or bar 66, an arm 68 on said shaft parallel to and engaging with the said rack, an arm 79 on the lower end of said shaft, a pivoted spacing-bar having an arm engaging with the said arm 79, a series of key-levers arranged over said spacing-bar, and a spring for holding the pivotal feed-rack in normal position, substantially as set forth.

28. The combination of a paper-carriage, the feed-rack 63, the spring-pawl 83, the plate 85, carried thereby, the cork sound-deadening stop 86, and the chambered lug 87 therefor, substantially as set forth.

29. The combination of the platen having toothed wheel 97 on one trunnion thereof, thumb-piece 94, hung on said trunnion and having a pawl engaging with said wheel, a fixed stop, and a centering-spring for supporting said thumb-piece, having its ends projecting on opposite sides of the fixed stop and a projection or portion of the thumb-piece, whereby said thumb-piece may be either raised or lowered against the action of said spring, and the platen thereby rotated or the carriage released, substantially as set forth.

30. The combination of the paper-carriage, escapement therefor, an arm 96, connected with said escapement and thumb-piece 94, a toothed wheel 97, and a pawl 98, the whole being so constructed and arranged that a depression of said thumb-piece will free the carriage from escapement and elevation thereof will rotate the platen, substantially as set forth.

31. The combination of the toothed wheel

97, thumb-piece 94, pawl 98, centering-spring 101, and pin 102, the said spring holding said pawl against its wheel and said thumb-piece in central position, substantially as set forth.

5 32. A paper-pressure bar 115, supported on links or arms 116, having fixed pivots on the paper-carriage frame, in combination with a downward-pressing spring, whereby said bar is sprung and held either against or away
10 from the platen when the said links or arms pass over their centers.

33. The combination of the platen, the spring-wire cage, pressure-bar 115, connected thereto, and the links or arms 116, whereby
15 said bar is supported from the paper-carriage

and sprung and held either against or away from the platen when the said links or arms pass over their centers, substantially as set forth.

34. The combination of the paper-carriage 20 having the platen and the rear spring-wire cage 111, and rear paper-pressure roller connected to the paper-carriage by links and pressed against the platen by the spring of the cage, substantially as set forth.

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Witnesses:

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