

No. 763,906.

PATENTED JUNE 28, 1904.

O. C. KAVLE.
TYPE WRITING MACHINE.
APPLICATION FILED APR. 9, 1904.

NO MODEL.

5 SHEETS—SHEET 1.

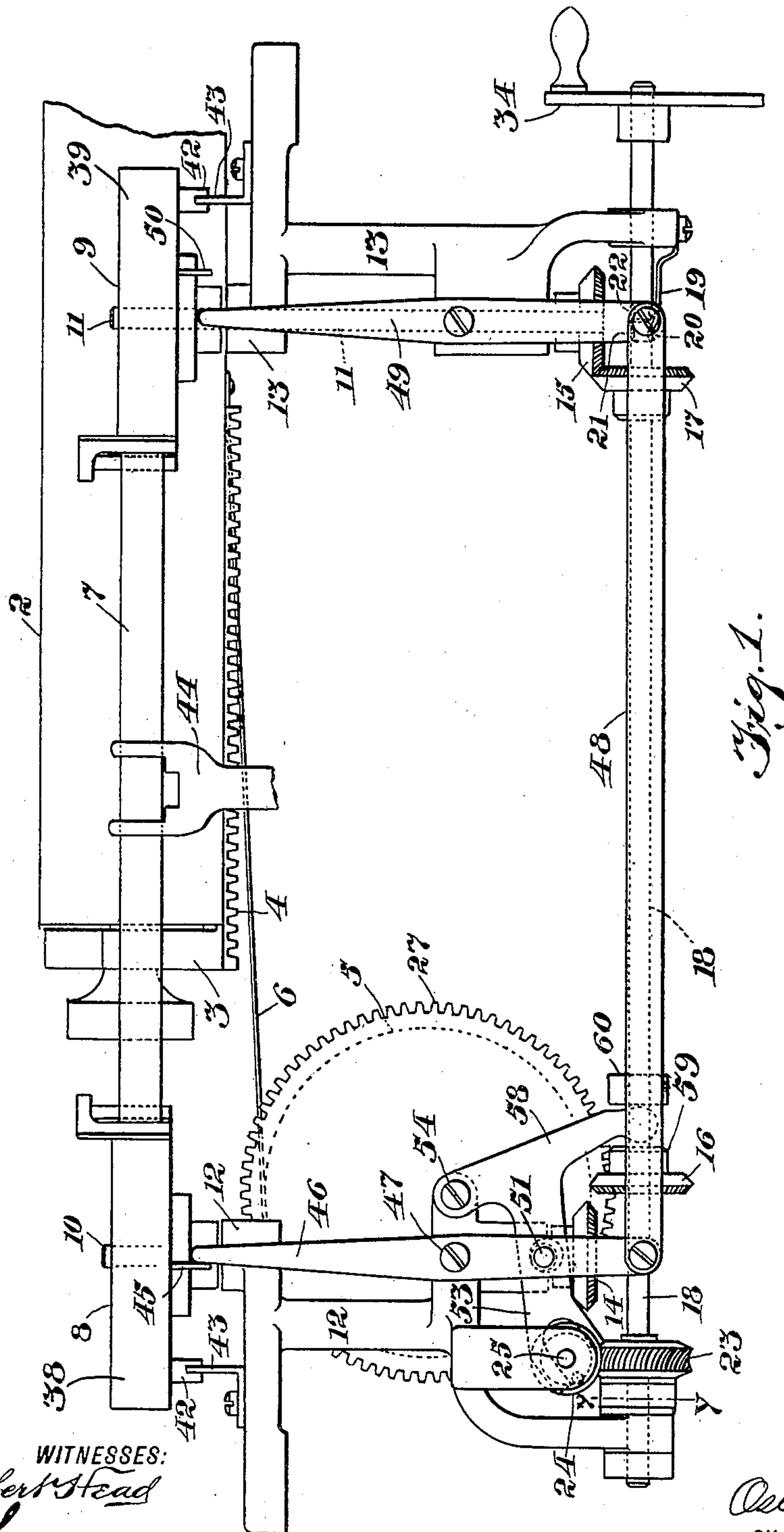


Fig. 1.

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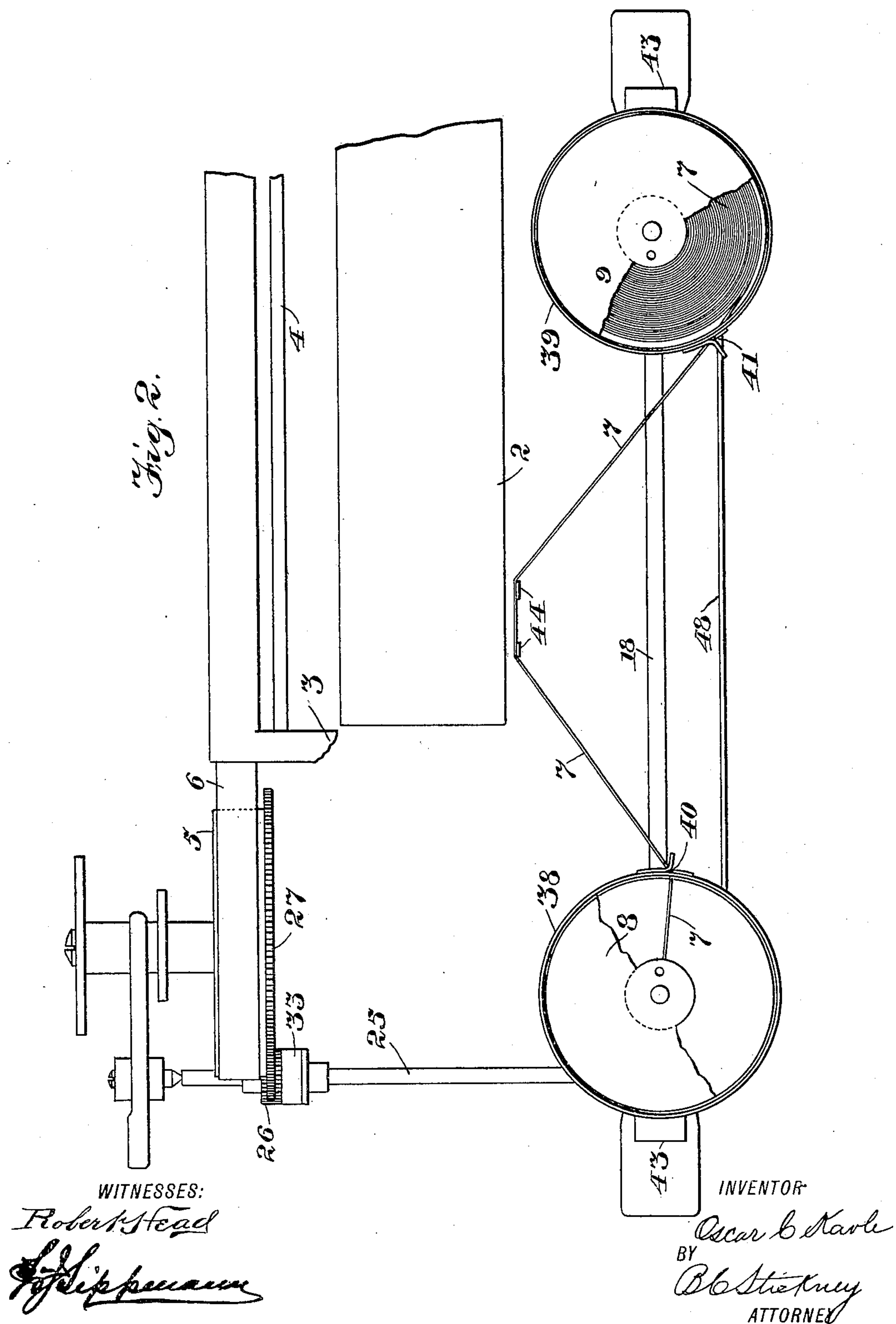
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5 SHEETS—SHEET 3.

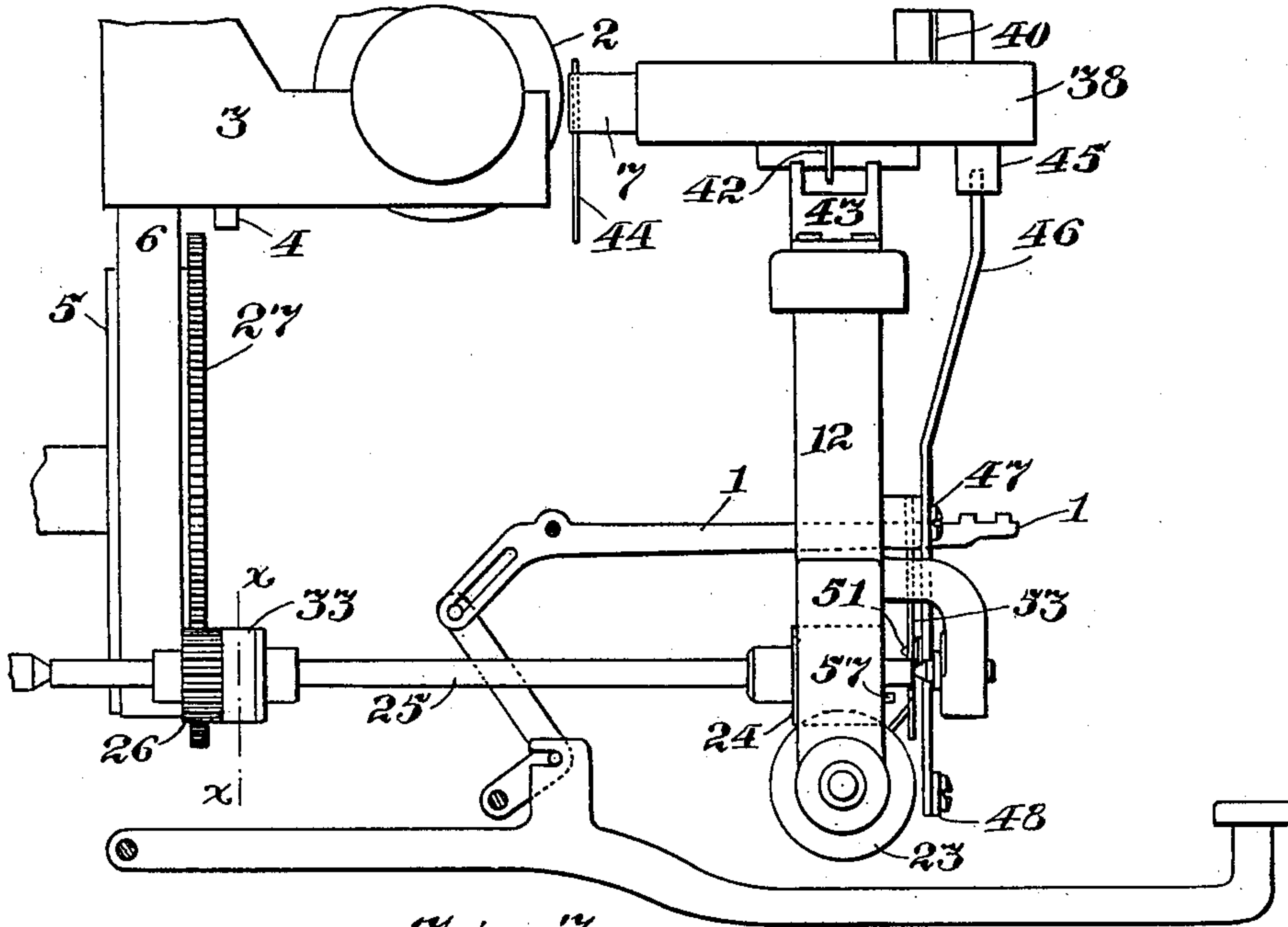


Fig. 3.

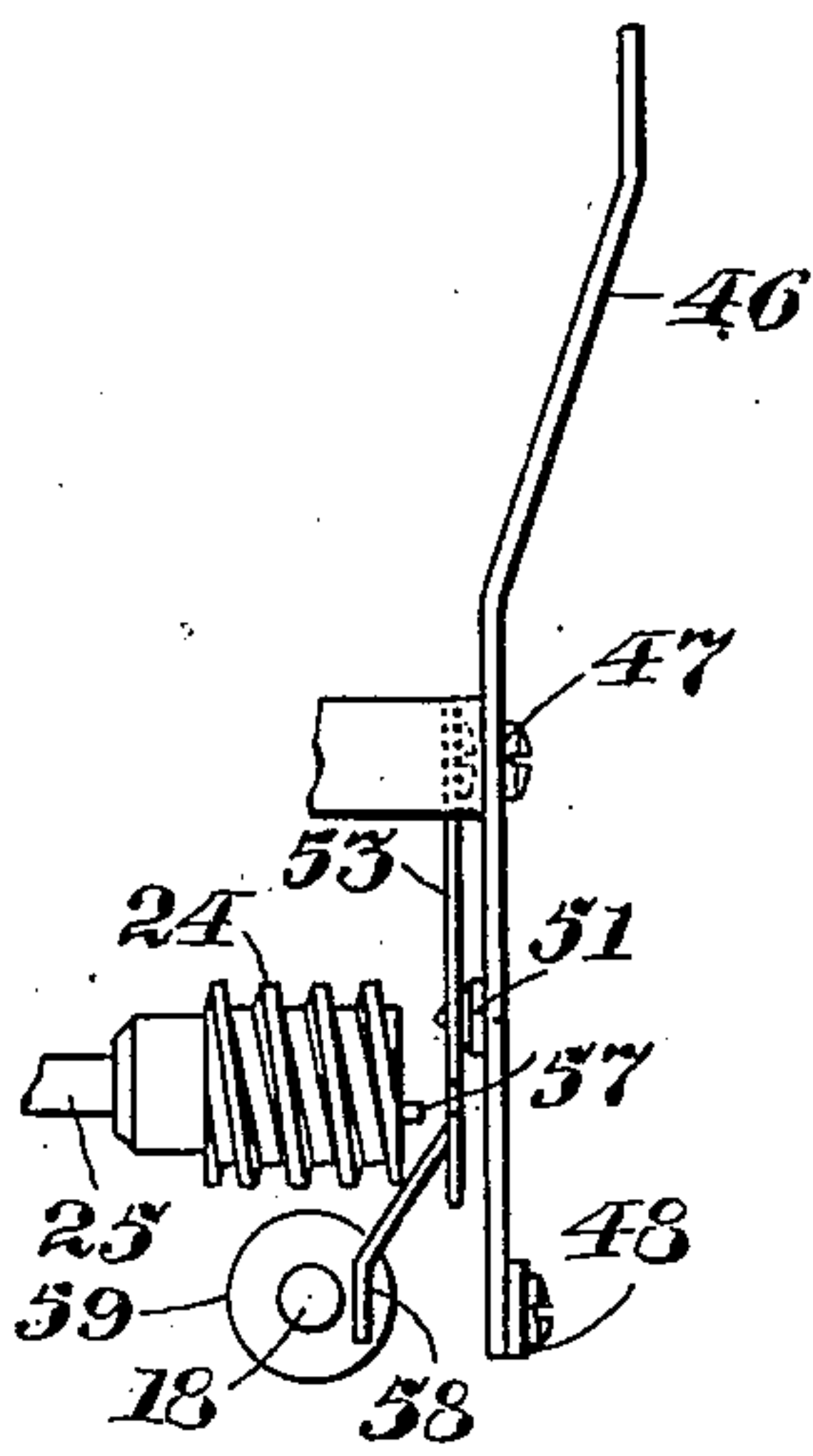


Fig. 4.

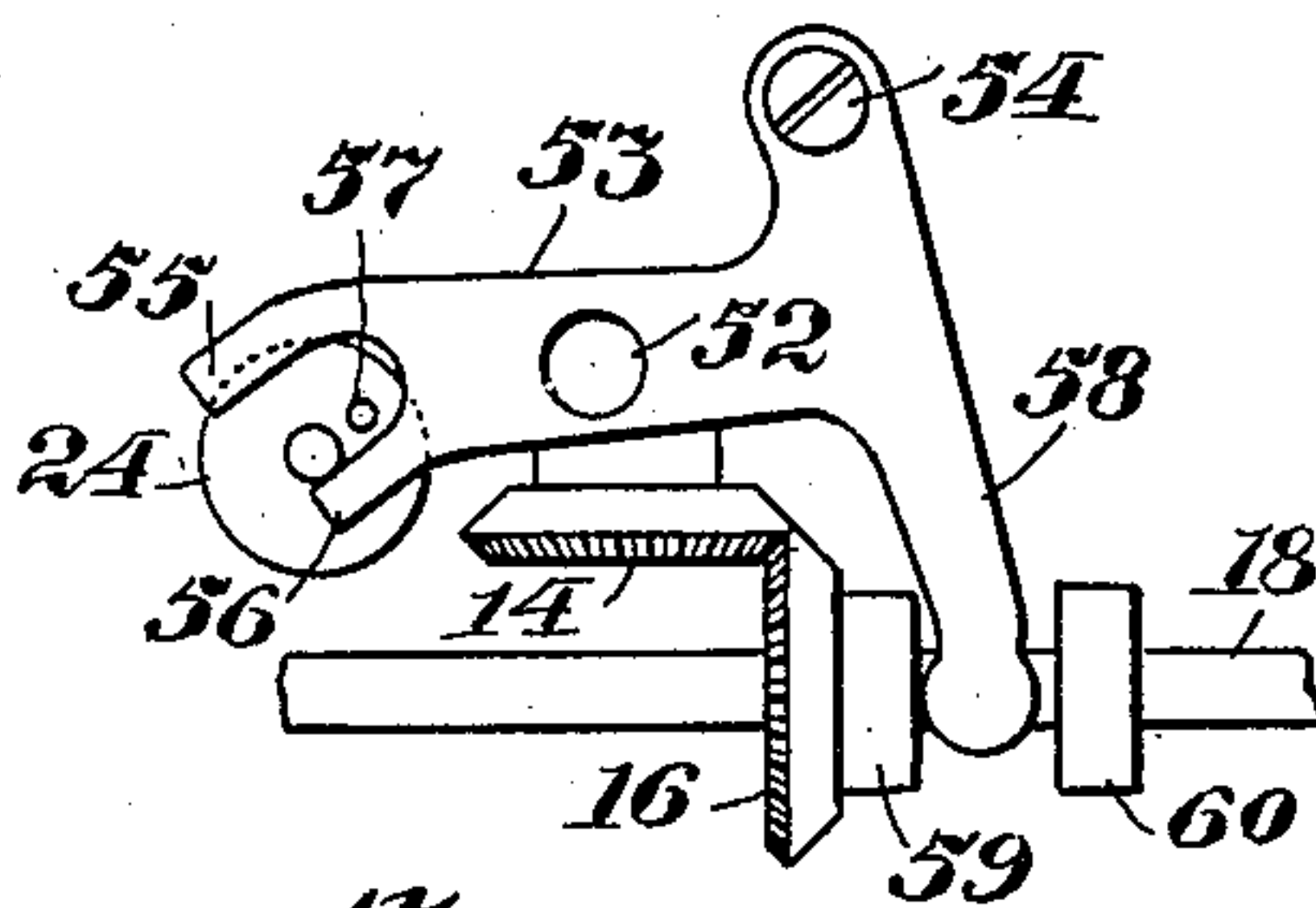


Fig. 5.

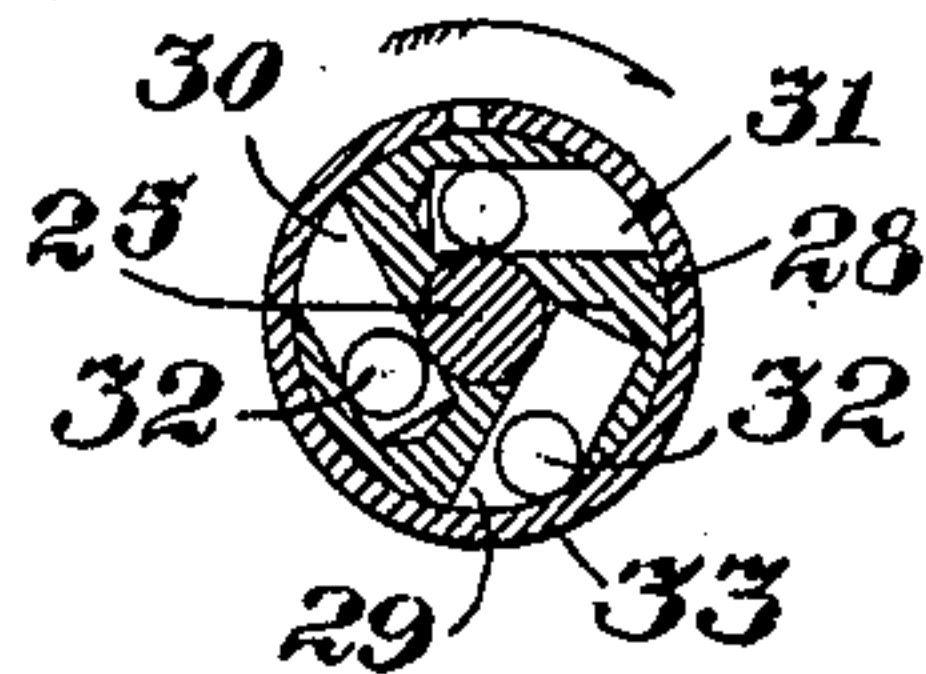


Fig. 6.

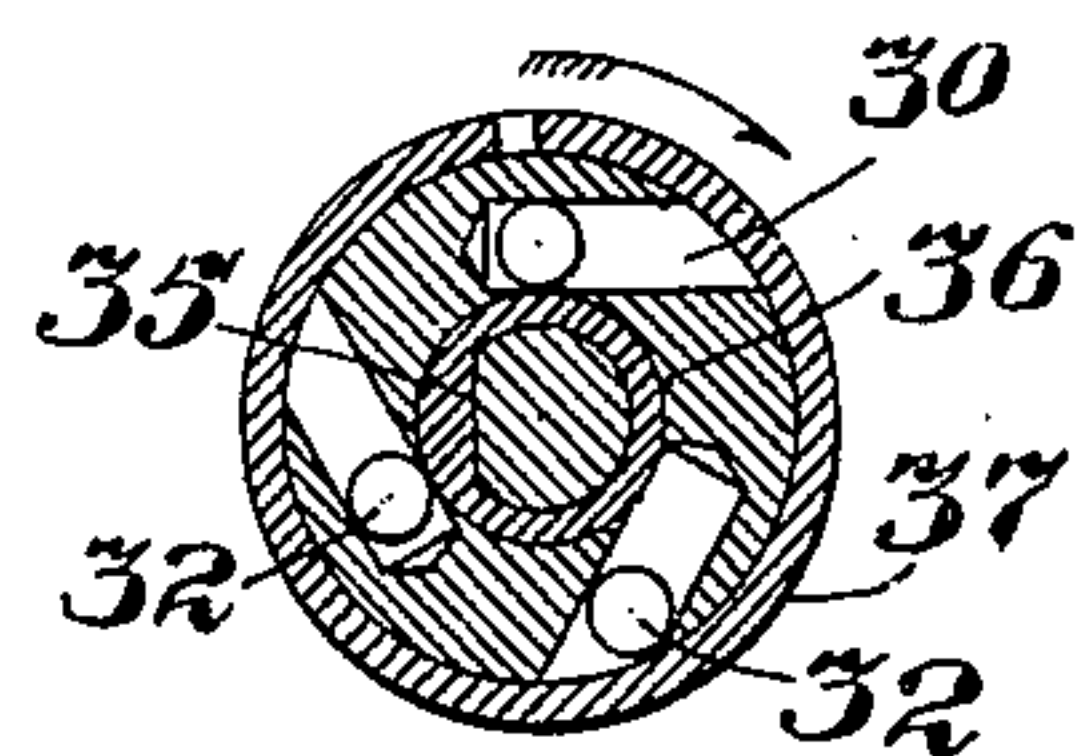


Fig. 7.

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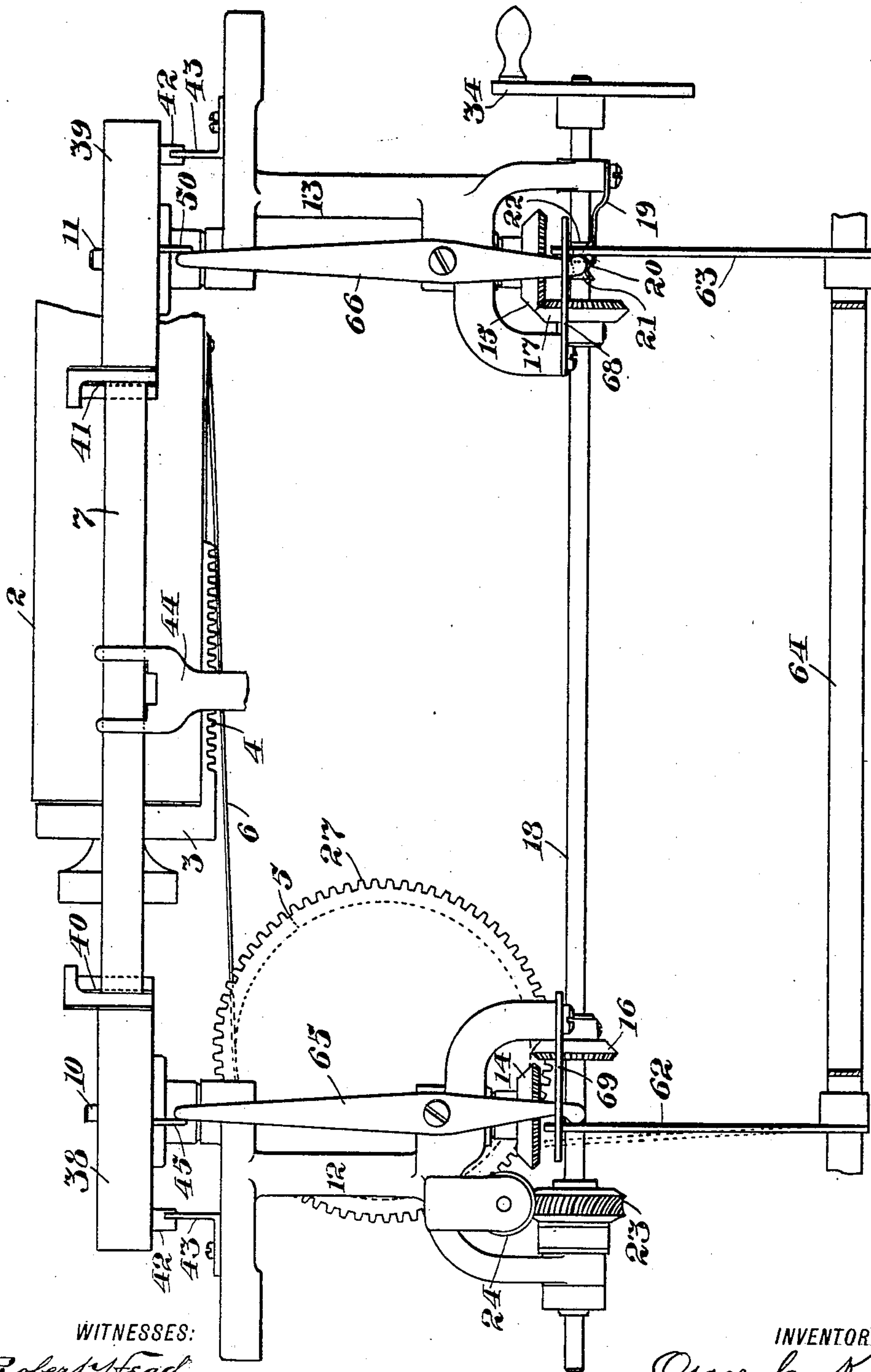


Fig. 8.

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5 SHEETS—SHEET 5.

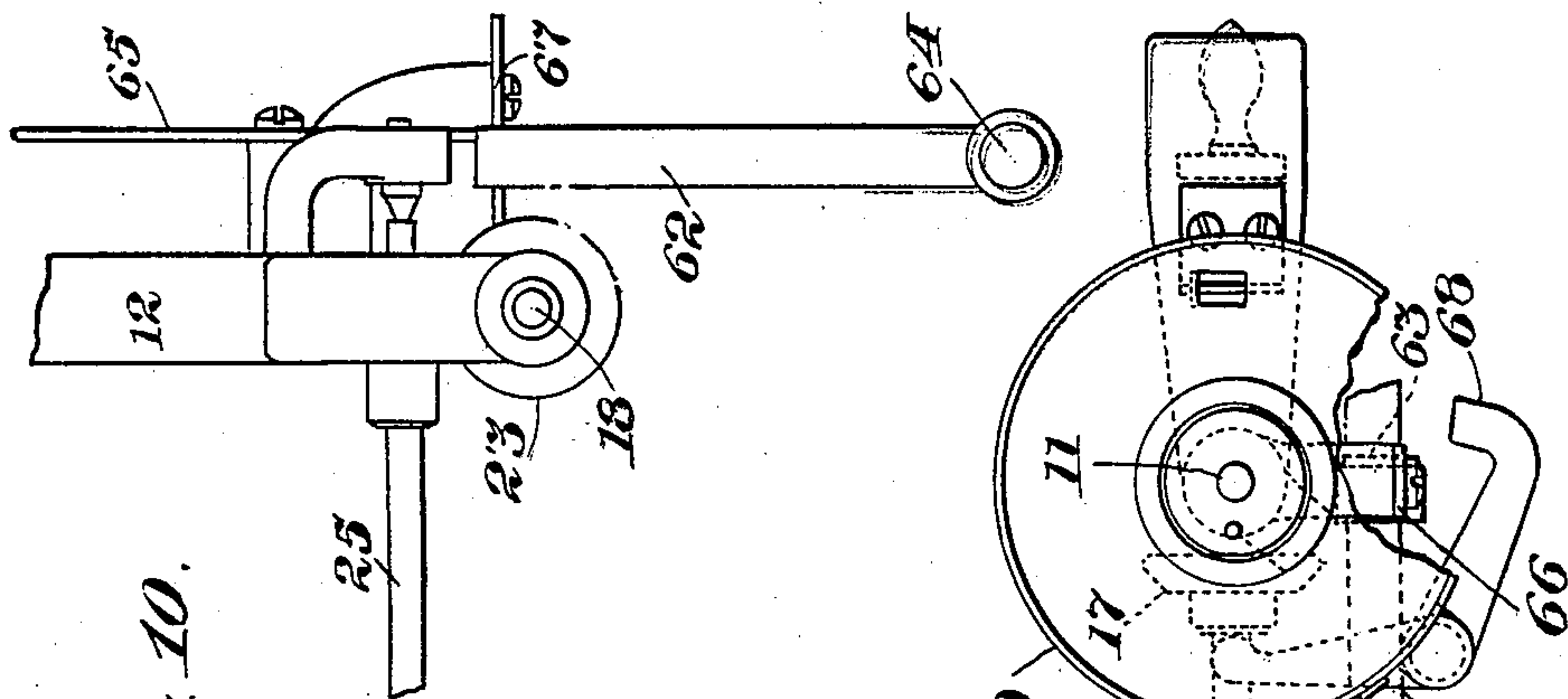


Fig. 10.

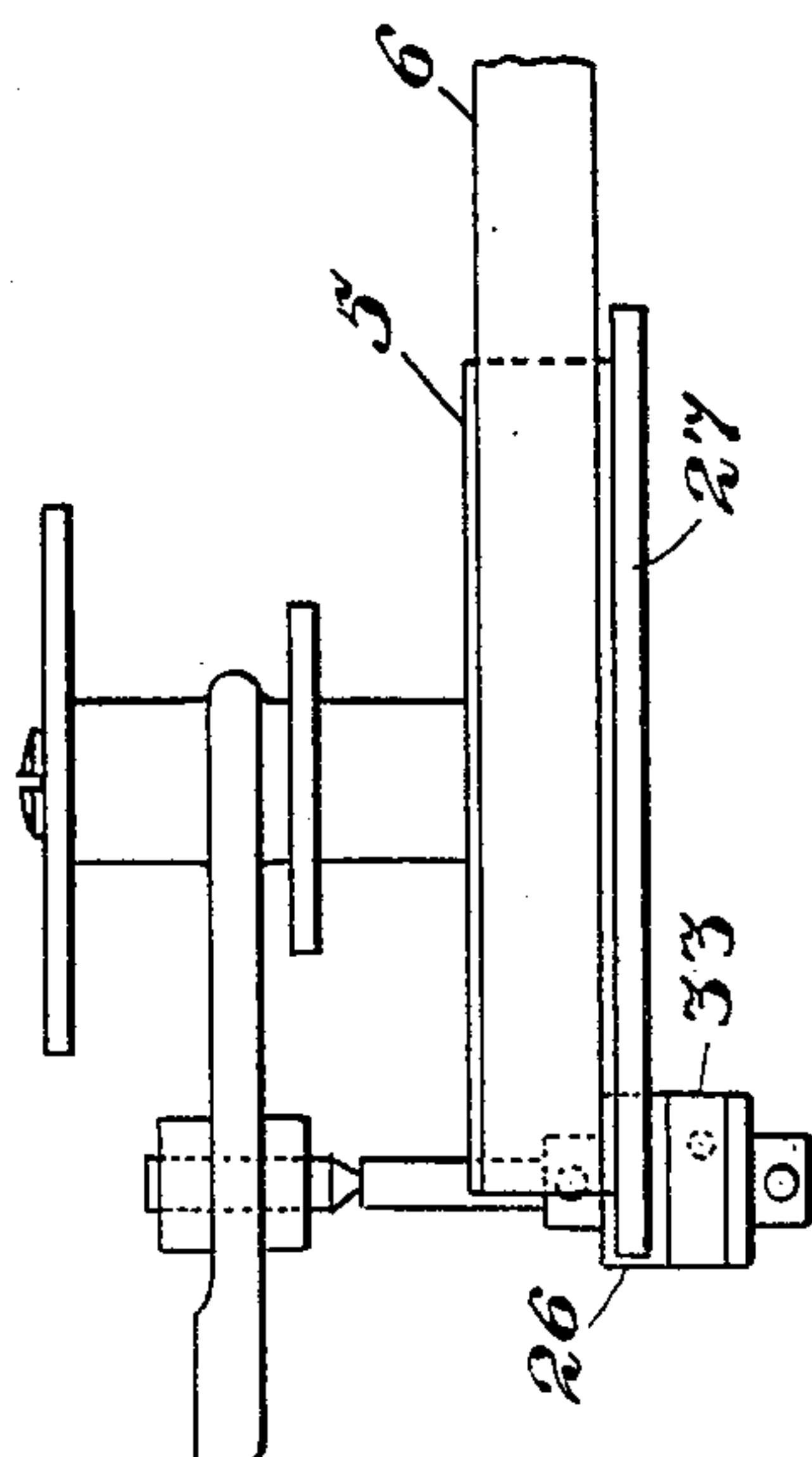
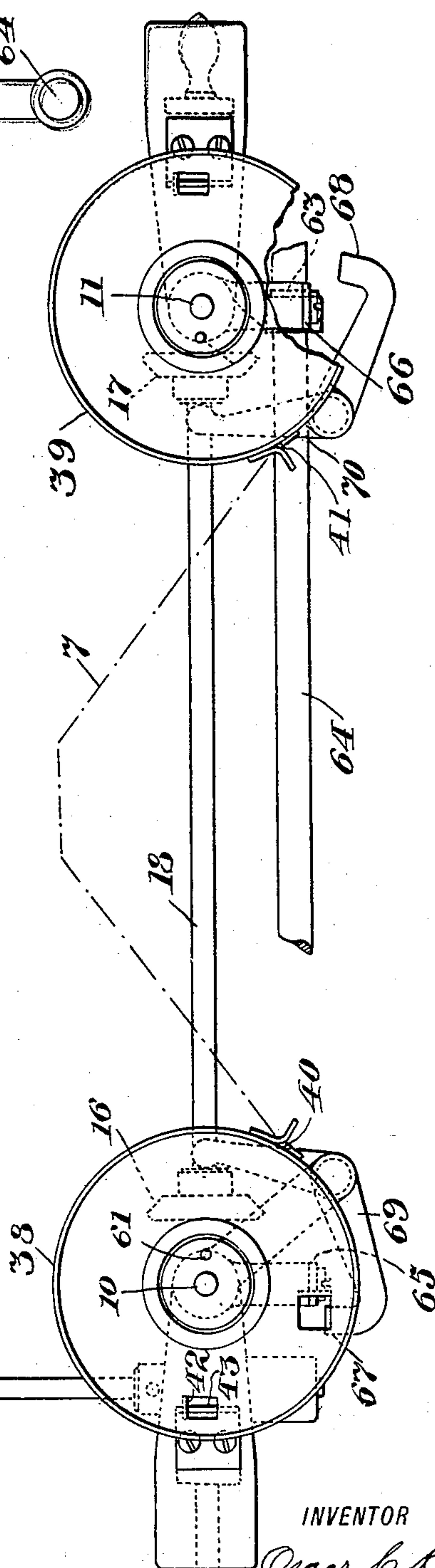


Fig. 9.



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UNITED STATES PATENT OFFICE.

OSCAR C. KAVLE, OF HARTFORD, CONNECTICUT, ASSIGNOR TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 763,906, dated June 28, 1904.

Application filed April 9, 1904. Serial No. 202,305. (No model.)

To all whom it may concern:

Be it known that I, OSCAR C. KAVLE, a citizen of the United States, residing in Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Type-Writing Machines, of which the following is a specification.

This invention relates generally to the ribbon mechanisms of type-writing machines, particularly those of the "front-strike" class; and its principal objects are to provide improved means for winding the ribbon and reversing automatically the direction of its winding when either spool becomes filled.

The machine to which I have applied my invention is of the well-known "Underwood" type, in which the spools are forward of the platen and lie horizontally edgewise to the platen, one at each side of the printing-point. The spools are contained in receptacles or cups, which are loosely mounted; and according to my invention the pull of the ribbon when either spool is empty causes a slight rotation of its receptacle, and this in turn effects coöperation between a switching-lever and a prime mover which is connected to some active part of the type-writing machine—as, for instance, the carriage—so that the prime mover actuates the switching-lever, which causes the direction of the ribbon-feeding movement to be reversed. The construction and operation are such that only a very light tension of the ribbon is sufficient to cause the switch to be actuated, which is an advantage, particularly in machines of this type in which a narrow ribbon is employed which it is undesirable to subject to great tension. The greater part of the work of switching the ribbon-feeding mechanism is performed by the prime mover, and the ribbon has only to effect coöperation between the prime mover and the switching-lever. I further provide for the almost instantaneous actuation of the switching-lever upon the ribbon becoming taut, thus avoiding the liability of a hole being worn in the ribbon by the types before the ribbon begins to feed back.

The ribbon mechanism has the additional

characteristic that the spools may be readily detached and attached without interference with the ribbon-reversing mechanism, it being only necessary to thread the ribbon through the guides that are usually employed in this type of writing-machine. Thus the spools may be manipulated with celerity either to transpose them or to take off either spool and replace it with a spool containing a fresh ribbon, and when desired both spools may be removed and replaced by a pair containing a differently-colored ribbon.

My invention further embodies simplified and improved means for operating the ribbon-spools of a front-strike machine from the carriage-driving spring-barrel, including a transverse shaft for operating the upright ribbon-spool shafts and inexpensive devices for enabling the spring-barrel to operate said transverse shaft. The latter is provided with a crank whereby the ribbon may be wound manually upon either spool when desired. A valuable feature of the improvements consists in the provision of roller-clutches, whereby the usual racket of the ribbon-winding mechanism, which is highly objectionable, is wholly avoided, the cost of the ribbon mechanism is reduced, and prompt feeding of the ribbon at the beginning of a new line of writing is secured.

My invention further consists in certain combinations of devices, features of construction, and arrangements of parts, all as will be hereinafter described, and pointed out in the concluding claims.

In the accompanying drawings, Figure 1 is a front elevation, Fig. 2 a plan, and Fig. 3 a side elevation, of a ribbon mechanism adapted to an Underwood writing-machine and embodying my improvements. Fig. 4 is a side elevation showing in edge view a ribbon-feed shifting-lever, a shaft shifted by said lever, means for operating the lever to shift the shaft, and a ribbon-controlled lever for controlling the shifting-lever. Fig. 5 is a front elevation of the shifting-lever and associated parts. Fig. 6 shows a ribbon-winding roller-clutch in transverse section, taken on the line

xx of Fig. 3. Fig. 7 is a section of another roller-clutch, taken on line *yy* of Fig. 1. Figs. 8, 9, and 10 show a modified mechanism for reversing the ribbon-feed, Fig. 8 being a front elevation, Fig. 9 a plan, and Fig. 10 a partial side elevation.

In the several views like signs identify like parts.

Referring to Figs. 1 to 7, inclusive, type-bars 1 strike rearwardly against a platen 2, the latter being mounted upon a carriage 3, having a letter-spacing rack 4, and propelled by a spring-drum 5, to which it is connected by a strap 6.

A ribbon 7 extends across the machine in front of the platen and is wound upon a pair of spools 8 and 9, which are mounted in front of the platen and lie horizontally and edge-wise thereto, one at each side of the printing center or point. The spools are mounted upon a pair of vertical shafts 10 11, journaled in brackets 12 13 and carrying at their lower ends miter-pinions 14 15, engageable, respectively, by miter-pinions 16 17, fixed upon a transverse shaft 18, whereby either vertical shaft may be rotated, the transverse shaft being shiftable endwise to bring either pair of pinions into mesh and being detained in either position by a spring 19, having a detent portion 20 to engage either of two adjacent grooves 21 22 formed upon the shaft.

Near its left-hand end the transverse shaft 18 carries a worm-wheel 23, in mesh with which is a worm 24, the latter being fixed upon the forward portion of a horizontal rearwardly-extending shaft 25, carrying at its rear end a small pinion 26, that meshes with a large gear 27, fixed upon the spring-drum 5. During the rotation of the spring-drum to drive the paper-carriage the gear 27 drives the pinion 26, and through the worm 24 and worm-wheel 23 the shaft 18 is rotated to wind the ribbon upon one or other of the spools.

In order that the ribbon may not be affected by the movement of the spring-drum during the return of the carriage to begin a new line of writing, a clutch is provided between said drum and the transverse shaft 18, being preferably located between the pinion 26 and its shaft 25 and consisting, preferably, of a roller-clutch, the details of which are seen at Fig. 6. Upon the shaft 25 is loosely mounted a collar 28, which is formed upon or fixed to the pinion 26 and is provided with a series of three bores 29 30 31, which are substantially tangential to the shaft 25, the latter protruding slightly into each bore. The bores form races for balls 32 and are closed by a snap collar or hoop 33. Preferably the balls operate solely by gravity and run to the inner ends of the bores as the latter ascend, where they engage directly with the shaft, and owing to the tangential direction of the bores the balls bind against the shaft by a sort of wedging action, whereby

the shaft is forced to turn with the collar 28. When, however, the collar turns in the opposite direction during the return movements of the paper-carriage, the balls release the shaft and the latter lies motionless. By having the series of balls at least one is always sure to be in position to grip the shaft, the bores being equidistant and it being impossible for all of them to incline downwardly from the shaft at the same time.

The transverse shaft 18 is preferably provided with a crank 34, operable manually to wind the ribbon on either spool, and in order to enable said shaft to turn independently of the worm-wheel 23 (which of course is locked by the worm 24) a second roller-clutch is provided between said worm-wheel and said shaft 18, the details of this clutch being seen at Fig. 7. The shaft 18 is formed with a flattened portion 35 to fit within a correspondingly-shaped bore in a headed sleeve 36, upon which loosely fits a collar 37, fixed to worm-wheel 23, said collar being similar to the collar 28 and carrying a similar series of balls, which engage and clutch the sleeve 36, the latter being fixed upon the shaft 18. These balls enable the worm-wheel to rotate the shaft, while permitting the latter to be rotated by the crank 34 independently of the worm-wheel.

It will be seen that by the use of roller-clutches the ribbon mechanism is rendered simple, inexpensive, and not liable to injury or derangement, while owing to the absolutely noiseless action of the balls or rollers the clatter usually noticed during the return movements of the paper-carriage, due to the clicking of the usual ribbon-feeding pawls over the ratchet-wheels, is wholly avoided, thus making the machine more desirable for use in offices and elsewhere where noise is an objection.

A further and very important improvement effected in the ribbon mechanism by the use of the roller-clutches arises from the prompt action of the balls, the clutches acting at once upon the return of the carriage to begin a new line, so that the ribbon is fed forward promptly instead of standing still during the writing of the first five or ten letters on the line, as is the case in some well-known types of writing-machines. Owing to this inactivity of the ribbon under such circumstances, the labor of writing a narrow column down the page—say of two or three letters or figures upon each line—is greatly increased, since the ribbon must be constantly wound by hand, while according to the present invention the feeding of the ribbon is assured, even if only a single letter or figure is written upon each line, so long as the carriage moves at each impression.

The ribbon-spools 8 and 9 lie within cups or receptacles 38 39, which may be of the ordinary type, and provided, as usual, with guides or slits 40 41, through which the rib-

bon is threaded and by which it is guided. Each receptacle is pivoted concentrically with its spool, its vibration being limited by a depending tongue 42, playing between a pair of stops 43. The movements of the receptacles are effected by the opposite pulls of the ribbon when the spools become empty, and the purpose of moving the receptacles is to effect reversals of the ribbon-feeding movements. The pull of the ribbon is exerted only upon the receptacle that contains the empty spool, as it will be observed at Fig. 2 that the ribbon 7 extends from the coil on the full spool 9 substantially in a tangential line through the guide-slit 41 to the usual vertically-acting vibrator 44 at the printing-point, so that the ribbon exerts no appreciable pressure upon the edge of said guide-slit 41, and hence the receptacle 39 remains inert. Upon the empty spool, however, the ribbon that stretches from the spool-core to the guide-slit 40 lies at a relatively sharp angle to the portion of the ribbon that extends from said slit 40 to the vibrator 44, so that the pull of the ribbon caused by the continued winding movement of the full spool 9 is transmitted to the receptacle itself, which is caused to move, the effect upon the receptacle or guide being substantially the same as if the ribbon were attached directly thereto instead of to the spool-core. This turning movement of the receptacle, whereby the reverse of the ribbon-feeding movement is effected, occurs only when the ribbon is all paid off from the spool. While unwinding, the spool turns easily, and the slight tension upon the ribbon necessary for turning the spool is insufficient to turn the receptacle to the extent required for reversing the feed of the ribbon. While the receptacle is capable of some idle movement, still it resists being turned to an extent to operate the ribbon-reversing devices, and this resistance is not overcome until the pull on the ribbon caused by the continued winding of the full spool after the other becomes empty and ceases to unwind is sufficient for that purpose. Said resistance arises because the receptacle must actuate certain parts in order to effect the reversal of the ribbon, as will now be explained.

By means of a tongue 45 depending from the receptacle the movement thereof is transmitted to an upstanding lever 46 below the receptacle, pivoted at 47 to the front of the bracket 12, said lever being connected by a link 48 to a similar lever 49 below the receptacle 39 and operable by a tongue 50 on the latter. When either of the levers is vibrated by the turning of its associated receptacle, a cone-shaped cam 51, fixed upon the lever 46, is moved in either one direction or the other to engage with the side edge of an indentation or hole 52, Fig. 5, formed in an arm 53 of a switching-lever, pivoted at 54 upon the front of the bracket 12, and said arm being

thin and flexible is cammed rearwardly by said cam 51, so that a fork 55 56, formed upon the end thereof, is forced into the path of a tappet 57, fixed upon the front face of the worm 24, that winds the ribbon. The tappet engages the edge of either one fork or the other and reverses the position of the shifting-lever, the latter having an arm 58, that shifts the transverse ribbon-winding shaft 18 in endwise direction, said arm 58 working between two collars 59 and 60, fixed on said shaft. At Fig. 5 it will be seen that the shaft 18 is in its left-hand position and that the tappet 57 will engage the lower arm 56 of the fork, forcing down the lever-arm 53 and throwing the arm 58 and the shaft 18 to the right, thereby disengaging the shaft 18 from the left-hand spool and connecting it to the right-hand spool to wind the ribbon thereon. By this movement of the shaft 18 the full left-hand spool becomes of course disconnected from the driving mechanism, and hence the longitudinal tension upon the ribbon is wholly relieved, and the resilient arm 53 springs forwardly to normal position out of the range of the tappet 57. It is only the tension on the ribbon that arises by the continued winding of the full spool after the ribbon is all paid off from the empty spool that moves said arm 53 within range of tappet 57 and holds it there. Consequently when the ribbon tension is relieved said arm resumes its normal condition. When the ribbon subsequently becomes all wound upon the right-hand spool, as at Fig. 2, the pull of the ribbon, acting through receptacle 38 and lever 46, effects a camming back of the flexible arm 53, whereupon the tappet 57 engages the under edge of the upper fork 55, lifting the arm 53 and throwing the shaft 18 to the left, as at Fig. 5, whereupon the ribbon begins to wind upon the left-hand spool 8. The tappet 57, which constitutes the prime mover of the feed-shifting mechanism—*i. e.*, the part that forcibly disengages the winding devices from one spool and engages them with the other—rotates very rapidly during the letter-feeding movements of the paper-carriage, so that the reversing of the ribbon-feed takes place almost instantaneously when the ribbon is all paid off from either spool, and hence danger of the types wearing a hole in the ribbon by striking repeated blows in one spot thereon before the rewinding begins is avoided.

Each of the ribbon-spools is provided with the usual perforations to fit upon the top of its shaft, and the carrying-pin 61, that rotates with the shaft, and the spools may be detached and attached independently of the feed-shifting mechanism. When they are in place, the ribbon is fed from spool to spool during the letter-feeding movements of the carriage by means of the train of gearing 27 26 24 23 17 15. During the return movements of the carriage the clutch associated with the pin-

ion 26 permits said pinion and the gear 27 to revolve idly, the remainder of the ribbon mechanism being inert. When either spool is empty, the continued winding of the other 5 spool effects a slight rotation of the receptacle of the empty spool, thereby vibrating one or other of the levers 46 49 and throwing the shifting-lever into coöperation with the rotating prime mover 57, which releases the 10 winding mechanism from the full spool and connects it to the empty spool. The yielding arm 53 of the switching-lever is sufficiently resilient to return the levers 46 and 49 to normal position, as at Fig. 1, and the receptacles 15 are capable of considerable play without affecting either lever, or, in other words, the movement of the levers can be effected by either receptacle without being obstructed by engagement of the other receptacle with its 20 lever. The levers stand normally in midway position, whence they may be moved in either direction by one or other of the receptacles. The latter have considerable play, and it is immaterial how they stand during the ordinary 25 winding movements of the ribbon. When the ribbon becomes taut at the cessation of the winding movement of an empty spool, it first rotates the receptacle sufficiently to take up such play and then by a slight further rotation thereof throws the reversing devices into 30 action. The drag of the ribbon during ordinary winding may be sufficient to turn the receptacles idly in either direction, since they may move freely; but such drag is of course 35 insufficient to cause the spring-arm 53 to be flexed into the path of the tappet 57. When the ribbon is worn, the spools may, if desired, be lifted out and reversed or transposed, thereby permitting the ribbon to be used a lit- 40 tle longer before renewal.

From the foregoing it will be seen that the switching mechanism is normally ineffective, owing to the disengagement of the switching-lever 53 and the prime mover 57; that the lat- 45 ter is connected to a frequently-operated part of the machine—viz., the worm 24; that the switching mechanism is rendered effective by the movement of either guide 40 or 41; that at the cessation of the delivery movement of 50 either spool the pull of the ribbon is transmitted to the receptacle of the empty spool without being transmitted to the receptacle of the full spool, so that liability of faulty action of the reversing mechanism is avoided; 55 that the guides 40 41 are movable in alternation by successive opposite pulls of the ribbon; that the switching-lever is movable in alternate directions by successive operations of the prime mover 57, said lever, how- 60 ever, springing away from the path of said prime mover whenever shifted by the latter, owing to the relief of the lever from the camming pressure due to the disconnection of the full spool from the main winding-shaft 18; 65 that the employment of a single switching-le-

ver, as 53, with mechanism ramifying therefrom, as 46 48 49, to the two spool-receptacles conduces to simplicity of construction and operation, and that the power-rotated member comprising the worm 24 and the tap- 70 pet 57 thereon winds the ribbon forward and backward from spool to spool without interruption, the worm being connected to impart winding movements to both spools in alter- 75 nation, thus conducing to simplicity and certainty of operation.

In Figs. 8, 9, and 10 the prime mover 57 is omitted and a different form of prime mover substituted, consisting of a pair of arms 62 63, 80 fixed upon the usual space-key rock-shaft 64 and extending upwardly therefrom. The receptacle-controlled levers (indicated at 65 66) are not necessarily connected, but extend to said arms 62 63 and are capable of flexing the 85 latter, as indicated in dotted lines at the left of Fig. 8, the arms being sufficiently flexible for this purpose. When either of the arms 62 63 is flexed by its lever, it assumes a position opposite to one of a pair of fingers 67 68, Fig. 9, formed upon a pair of horizontal 90 shifting-levers 69 70, having arms to engage the hubs of the bevel-pinions 16 17 upon the endwise-shiftable winding-shaft 18. Upon the next operation of the space-key, which of course is operated very frequently, the flexed 95 arm strikes the finger on the associated shifting lever and vibrates said lever, thereby throwing the shaft 18 endwise to the opposite position, said shaft being always held by the spring 19 in the position to which it is shifted. 100 At Fig. 9 the right-hand shifting-lever is shown as having been operated by its associated space-key arm 63, while the left-hand lever is in position to be operated by its associated space-key arm 62 as soon as the ribbon 105 pays off from the left-hand spool.

Still other variations may be resorted to within the scope of the invention, and portions of the improvements may be used without 110 others.

Having thus described my invention, I claim—

1. In a type-writing machine, the combination of a ribbon-spool, a ribbon-spool receptacle movable by the pull of the ribbon, a lever movable by said receptacle, spool-winding means, a switch, and a prime mover connected to a frequently-operated part of the type-writing machine; one of said switch and prime-mover elements having a yielding construction and being sprung by said lever into position to coöperate with the other of said elements. 115 120

2. In a front-strike writing-machine, the combination with spool-winding means and a pair of ribbon-spools connected thereto, of receptacles for said spools movable by the pull of the ribbon, a prime mover connected to a frequently-operated part of the machine, a switch movable in opposite directions to ef- 125 130

fect reversals of the ribbon-feeding movements, said switch having a single member capable of engaging with said prime mover, and means ramifying from said single engaging member to said receptacles, for enabling either of the latter to move said switch into position to be actuated by said prime mover; said switch being movable in alternate directions by successive operations of said prime mover thereon.

3. In a type-writing machine, the combination with a pair of spools and spool-winding means, of a pair of spool-receptacles movable by the pull of the ribbon, a pair of levers connected together and operable in opposite directions by said receptacles, a prime mover connected to a frequently-operated part of the machine, and a switch having a yielding construction and movable by either lever into the path of said prime mover.

4. In a type-writing machine, the combination of a pair of ribbon-spools, winding means, a pair of spool-receptacles movable by the pull of the ribbon, a pair of levers movable by the receptacles, a single switch, and a prime mover connected to a frequently-operated part of the machine, said switch having a single member capable of engaging with said prime mover, and said engaging member being movable by either of said levers into engagement with said prime mover.

5. In a type-writing machine, the combination of a pair of ribbon-spools, winding means, a pair of ribbon-guides movable in alternation by successive pulls of the ribbon, a pair of levers movable by the ribbon-guides, a prime mover, and a shift-lever having a yielding arm movable by said levers into the path of said prime mover.

6. In a front-strike writing-machine, the combination with types and a platen, of a pair of ribbon-spools forward of the platen and lying edgewise thereto, spool-winding means, ribbon-guides movable in alternation by successive pulls of the ribbon in opposite directions, a pair of upright levers below the spools and operable by said ribbon-guides, means operatively connecting said levers, a prime mover, and a switch-lever having a single member for engaging said prime mover; said engaging member being directly controlled by said levers, and said switch-lever being also movable in alternate directions by successive operations of said prime mover.

7. In a front-strike writing-machine, the combination with types and a platen, of a pair of spools forward of the platen, a pair of upright spool-shafts, a transverse shaft shiftable endwise for driving either of said spool-shafts, a prime mover, and means called into action by the pull of the ribbon for causing said prime mover to shift said transverse shaft; said prime mover being operated by a frequently-operated part of the machine.

8. In a front-strike writing-machine, the combination with types and a platen, of a pair of spools forward of the platen, a pair of upright spool-shafts, a transverse shaft shiftable for driving either of said spool-shafts, a lever for shifting said shaft, a prime mover connected to a frequently-operated part of the machine, and means for enabling the ribbon to effect coöperation between said prime mover and said lever.

9. In a front-strike writing-machine, the combination with types and a platen, of a pair of spools forward of the platen, a pair of upright spool-shafts, a transverse shaft shiftable for driving either of said spool-shafts, a lever for shifting said transverse shaft, a prime mover connected to a frequently-operated part of the machine and capable at successive operations of moving said shifting-lever in opposite directions, a pair of ribbon-guides movable alternately by successive opposite pulls of the ribbon, and means for enabling either guide to effect coöperation between said shifting-lever and said prime mover.

10. In a front-strike writing-machine, the combination with types and a platen, of a pair of ribbon-spools forward of the platen and lying edgewise thereto, a pair of spool-receptacles movable by the pull of the ribbon, a pair of upright shafts for said spools, a transverse shaft shiftable endwise for driving either of said upright shafts, a shift-lever connected to said transverse shaft, and having a yielding arm, a prime mover adjacent to said yielding arm and connected to a frequently-operated part of the machine, a pair of levers connected together and movable by either of said receptacles, and means operable by said levers for moving said yielding arm into the path of said prime mover; the latter being capable at successive operations of moving said shift-lever in alternate directions.

11. In a type-writing machine, the combination with spools, winding means, and a prime mover connected to a frequently-operated part of the machine, of a shift-lever having a yielding arm and movable in alternate directions by successive operations of said prime mover, and a ribbon-controlled cam for moving said yielding arm into the path of said prime mover.

12. In a type-writing machine, the combination with spools, winding means, and a prime mover connected to a frequently-operated part of the machine, of a shift-lever having a yielding arm and movable in alternate directions by successive operations of said prime mover, a pair of ribbon-guides, and a cam operable by either guide for moving said yielding arm into the path of said prime mover.

13. In a type-writing machine, the combination with spools and winding means, of a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation

of the machine, a ribbon-feed switch movable in alternate directions by successive operations thereon of said tappet, and ribbon-controlled means for effecting coöperation between said tappet and said shifter.

14. In a type-writing machine, the combination with spools and winding means, of a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation of the machine, a switch-lever engageable by said tappet and movable in alternate directions thereby, and means for enabling pulls of the ribbon in alternate directions to effect engagements between said switch-lever and said tappet.

15. In a type-writing machine, the combination with spools, winding means, and a pair of ribbon-guides movable in alternation by opposite pulls of the ribbon, of a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation of the machine, a switch-lever having a yielding arm in position to be actuable by said tappet, and means for enabling either guide to move said arm into the path of said tappet.

16. In a type-writing machine, the combination with a pair of spools and a pair of spool-shafts, of a transverse shaft shiftable to drive either spool-shaft, a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation of the machine, a lever having a portion to engage said transverse shaft and a portion to engage said tappet, the latter being capable of moving the lever to shift the shaft in alternate directions, and ribbon-controlled means for effecting engagement between said tappet and said lever.

17. In a type-writing machine, the combination with a pair of spools and a pair of spool-shafts, of a pair of guides movable alternately by opposite pulls of the ribbon, a transverse shaft shiftable endwise to drive either spool-shaft, a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation of the machine, a lever having a part to engage said transverse shaft and also having a yielding arm provided with a fork to engage said tappet, and means for enabling either of said guides to move said fork into engagement with said tappet.

18. In a type-writing machine, the combination with a pair of spools and a pair of spool-shafts, of a transverse shaft shiftable endwise to drive either spool-shaft, a tappet, a rotatable member whereon said tappet is mounted, means for causing said tappet to rotate frequently during the operation of the machine, a lever having a part to shift said transverse shaft and also having a yielding arm provided with a fork, a pair of ribbon-guides movable

alternately by opposite pulls of the ribbon, a pair of levers movable by the guides and connected together, and a cam upon one of said levers to engage said yielding arm to move said fork into the path of said tappet.

19. In a type-writing machine, the combination with a pair of ribbon-spools and a pair of ribbon-spool shafts, of a transverse shaft common to said spool-shafts for driving the same, a worm-wheel upon said transverse shaft, a power-driven worm meshing with said worm-wheel, and means for rotating said transverse shaft manually independently of said worm-wheel.

20. In a type-writing machine, the combination with a pair of ribbon-spools and a pair of ribbon-spool shafts, of a transverse driving-shaft common to said spool-shafts and movable endwise to drive either shaft, a worm-wheel clutched to said transverse shaft, a power-driven worm meshing with said worm-wheel, and a crank for turning said transverse shaft.

21. In a type-writing machine, the combination of a carriage, a carriage-driving spring, a gear driven by said spring, a pinion meshing with said gear, a worm operated by said pinion, a clutch between said worm and said spring, a worm-wheel meshing with said worm, an endwise-shiftable transverse shaft to which said worm is clutched, a crank for said transverse shaft, and a pair of ribbon-spool shafts operable by said transverse shaft.

22. In a front-strike writing-machine, the combination with types, a platen, and a platen-carriage, of a carriage-driving spring-drum, a gear on said drum, a pinion meshing with said gear, a forwardly-extending pinion-shaft, a worm upon the forward portion of said shaft, a clutch between said drum and said worm, a worm-wheel meshing with said worm, an endwise-shiftable transverse shaft upon which the worm-wheel is mounted, a pair of upright shafts rotatable by said transverse shaft, and spools upon said upright shafts forward of the platen.

23. In a front-strike writing-machine, the combination with a carriage and a carriage-driving spring-drum, of a gear on said drum, a pinion meshing with said gear, a worm clutched to said pinion, a worm-wheel meshing with said worm, a transverse shaft to which said worm-wheel is clutched, a crank upon said transverse shaft, and a pair of ribbon-spools either of which may be driven by said transverse shaft.

24. In a type-writing machine, the combination with a carriage, a carriage-driving spring, a pair of spools, and a pair of spool-shafts, of a transverse shaft shiftable endwise to drive either spool-shaft, a worm-wheel upon said transverse shaft, a worm meshing with said worm-wheel, a pinion connected to said worm, a gear meshing with said pinion and

operated by said spring, a tappet rotating with said worm, and a ribbon-controlled switch having a portion to engage said tappet and a portion to shift said transverse shaft.

5 25. In a type-writing machine, the combination with a carriage, a carriage-driving spring, a pair of spools, and a pair of spool-shafts, of a transverse shaft shiftable to drive either spool-shaft, a worm-wheel upon said transverse shaft, a worm meshing with said worm-wheel and operated by said spring, a tappet rotating with said worm, a lever operable by said tappet in alternate directions and connected to said transverse shaft, a pair of ribbon-guides movable in alternation by opposite pulls upon the ribbon, and means for enabling either guide to effect coöperation between said lever and said tappet.

20 26. In a front-strike writing-machine, the combination with a platen and a platen-carriage, of a carriage-driving spring-drum, a gear thereon, a pinion meshing with said gear, a forwardly-extending pinion-shaft, a worm upon the forward portion of said shaft, a transverse endwise-shiftable shaft having a worm-wheel in mesh with said worm, a pair of upright shafts rotatable by said transverse shaft, ribbon-spools upon said upright shafts forward of the platen, a shifting-lever connected to said shiftable shaft and having a yielding arm, a pair of ribbon-guides movable by the ribbon, means for enabling either guide to move said yielding arm, and a tappet rotating with said worm and engageable by said yielding arm.

27. In a front-strike writing-machine, the combination with types, a platen, and a platen-carriage, of a carriage-driving spring-drum, a gear on said drum, a pinion meshing with said gear, a forwardly-extending pinion-shaft, a worm upon the forward portion of said shaft, a tappet carried by said shaft, a clutch between said drum and said worm, a worm-wheel meshing with said worm, an endwise-shiftable transverse shaft upon which the worm-wheel is mounted, a pair of upright shafts rotatable by said transverse shaft, spools upon said upright shafts forward of the platen, spool-receptacles movable in alternation by the opposite pulls of the ribbon, levers movable by said receptacles, a switch-lever having a yielding arm provided with a fork, a cam for enabling either of said receptacles through its lever to move said yielding arm into the path of said tappet, and a connection between said switch-lever and said transverse shaft.

28. In a type-writing machine, the combination with a carriage and a carriage-driving drum, of a gear driven by said drum, a pinion meshing with said gear, ribbon-spools, and a roller-clutch mechanism between said pinion and said spools and comprising a shaft, a col-

lar loose thereon and provided with a ball-race substantially tangential to said shaft, and a ball in said race engageable with said shaft.

29. In a type-writing machine, the combination with a carriage and a carriage-driving drum, of a pair of ribbon-spools, and means, including a clutch mechanism, for enabling said drum to wind said spools; said clutch mechanism being inclusive of a central shaft or cylinder, a collar thereon, said collar being provided with a series of ball-races substantially tangential to said shaft, and balls in said races engageable with said shaft.

30. In a type-writing machine, the combination with a carriage and a carriage-driving drum, of a pair of ribbon-spools, and means, including a clutch mechanism, for enabling said drum to wind said spools; said clutch mechanism being inclusive of a central shaft or cylinder, a collar loose thereon, said collar being bored in a direction substantially tangential to said shaft, a ball in the bore engageable with said shaft, and means closing the bore.

31. In a type-writing machine, the combination with a carriage and a carriage-driving drum, of a pair of ribbon-spools, and means, including a clutch mechanism, for enabling said drum to wind said spools; said clutch mechanism being inclusive of a central shaft or cylinder, a collar loose thereon, said collar being provided with a series of bores each substantially tangential to said shaft, a ball in each bore engageable with said shaft, and a hoop upon the collar closing said bores.

32. In a type-writing machine, the combination with a carriage and a carriage-driving drum, of a pair of ribbon-spools, and means, including a clutch mechanism, for enabling said drum to wind said spools; said clutch mechanism being inclusive of a central shaft or cylinder, a collar loose thereon, said collar being provided with at least three bores forming a series and each substantially tangential to said shaft, a ball in each bore engageable with said shaft solely by the action of gravity, and means closing the bores.

33. In a front-strike writing-machine, the combination with a platen, platen-carriage, and carriage-driving drum, of a gear upon said drum, a pinion in mesh with said gear, a forwardly-extending shaft for said pinion, a roller-clutch between said pinion and said shaft, a worm upon said shaft, a transverse shaft having a worm-wheel in mesh with said worm, and upright spool-shafts forward of the platen and rotatable by said transverse shaft.

34. In a front-strike writing-machine, the combination with a platen, platen-carriage, and carriage-driving drum, of a gear upon said drum, a pinion in mesh with said gear, a forwardly-extending shaft for said pinion, a

roller-clutch between said pinion and said shaft, a worm upon said shaft, a transverse shaft having pinions and a crank, a worm-wheel meshing with said worm, a roller-clutch
5 connecting said worm-wheel to said transverse shaft, a pair of upright spool-shafts forward of the platen and having pinions engage-

able by the pinions upon said transverse shaft, and means for detaining the transverse shaft in position to drive either upright shaft.

OSCAR C. KAVLE. [L. s.]

Witnesses:

EDWARD J. MANNING,
EDWIN C. SMITH.