No. 849,484. PATENTED APR. 9, 1907.

C. J. MENASCO.

PRINTING TELEGRAPH.

APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 1.

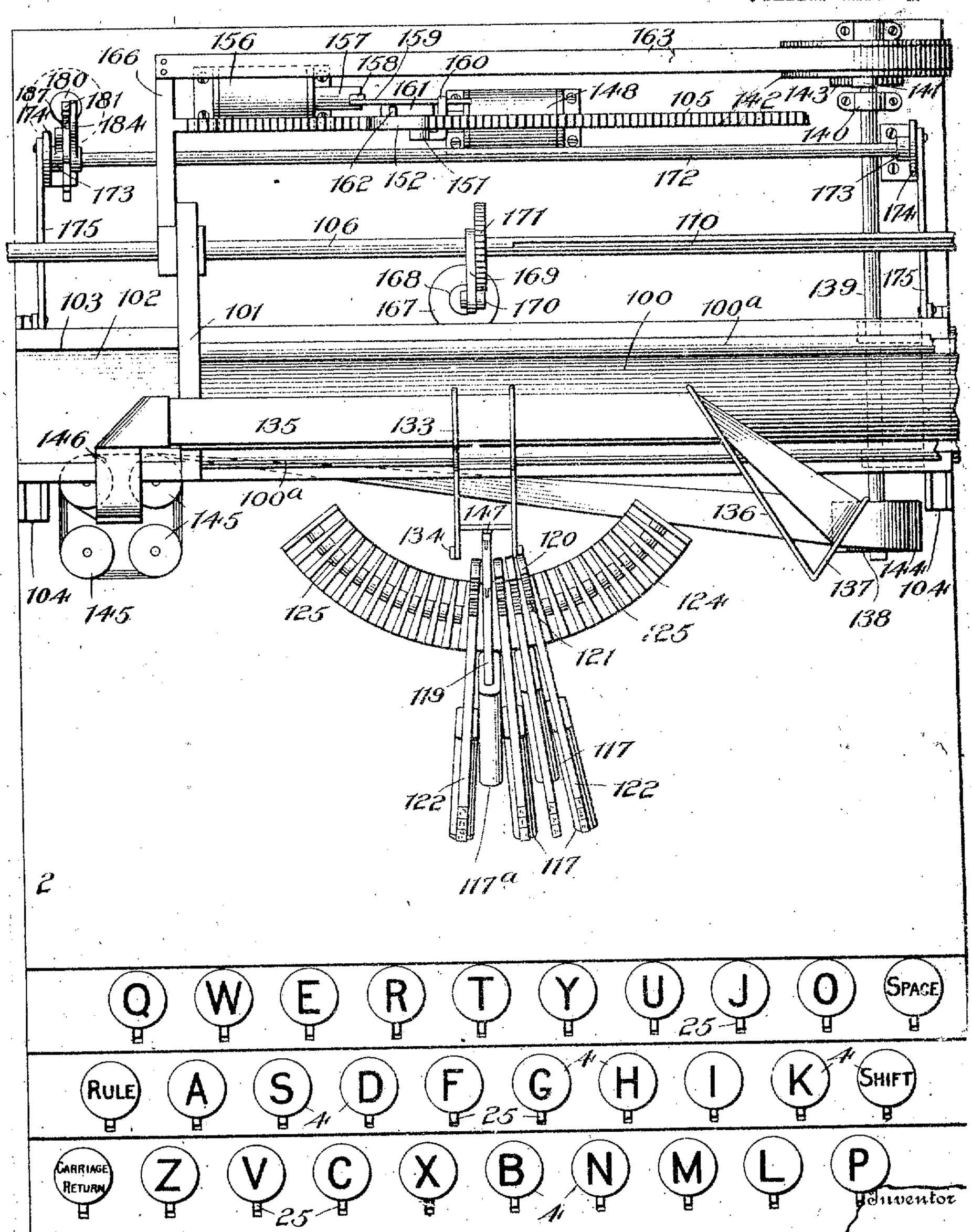

Fig. 1.

Witnesses

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Charles J. Menasco

By

Paul D. Johnston Jr.

Attorney

No. 849,484. PATENTED APR. 9, 1907.

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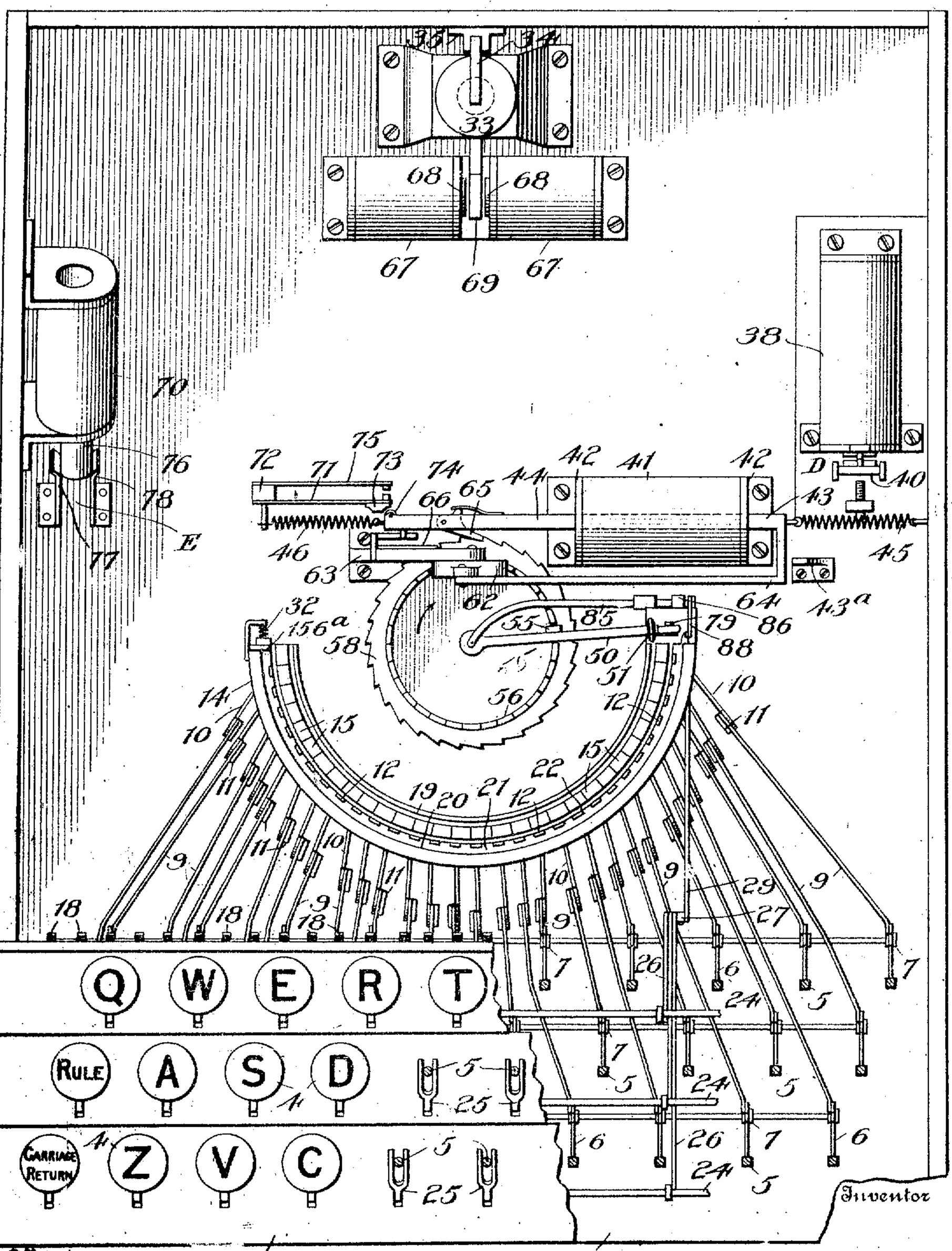
9 SHEETS—SHEET 2.



Witnesses

Edward L. Bradford

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Fig. 2.

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No. 849,484. PATENTED APR. 9, 1907.

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9 SHEETS—SHEET 3.

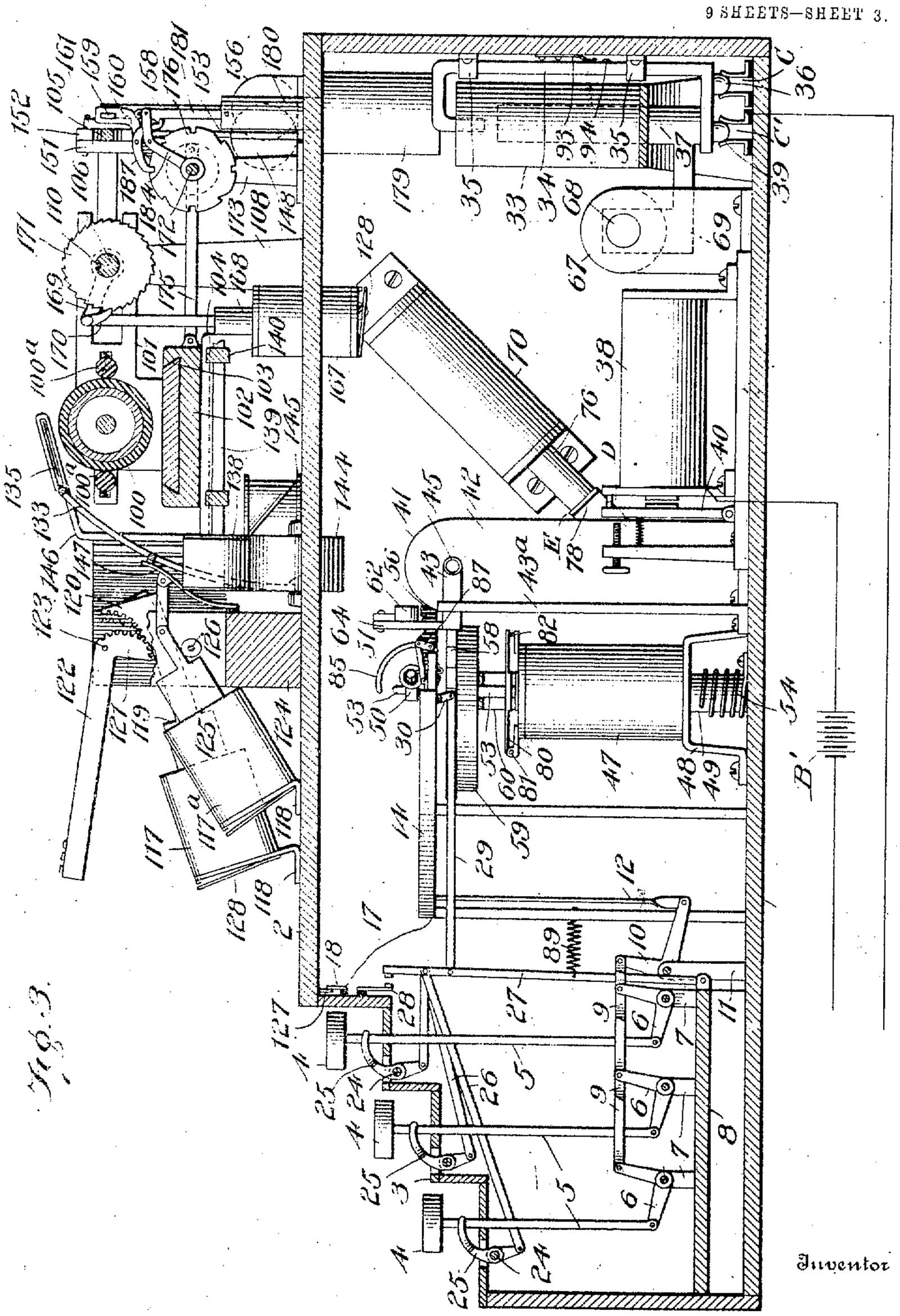

Fig. 3.

Witnesses

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Attorney

No. 849,484. PATENTED APR. 9. 1907.

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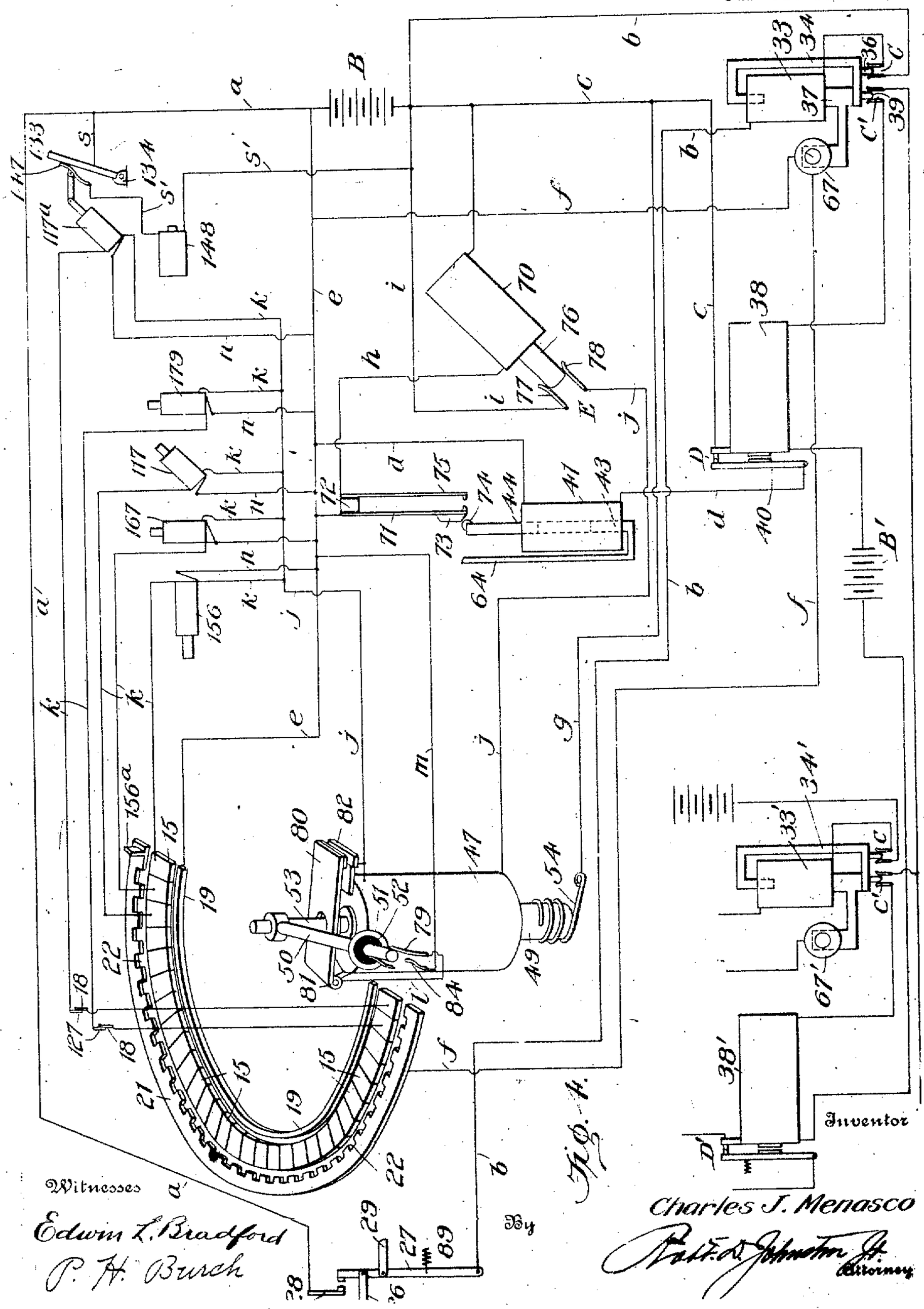
APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 4.



Witnesses
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Fig. 4.

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Attorney

No. 849,484. PATENTED APR. 9, 1907

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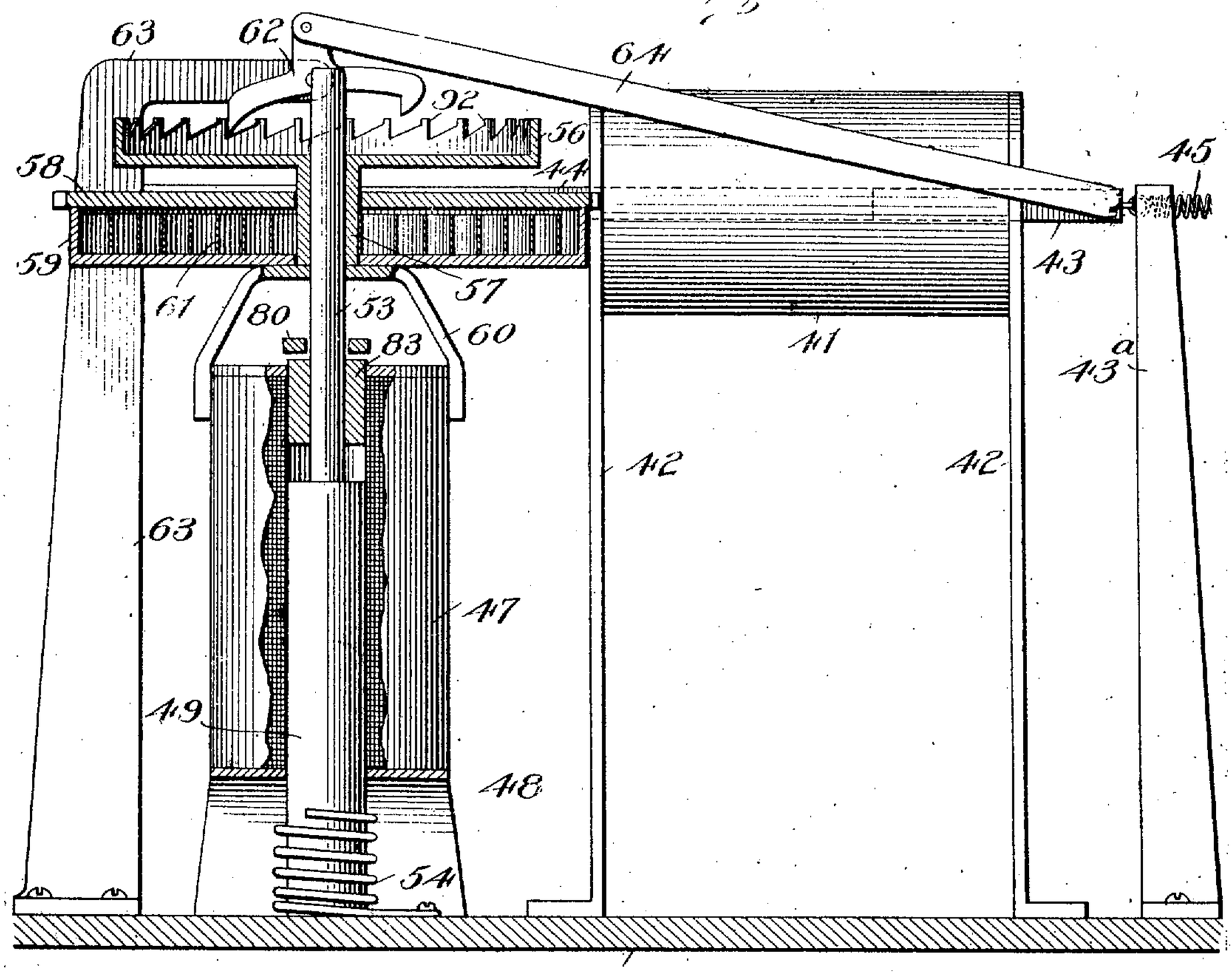
9 SHEETS—SHEET 5.

Fig. 5.



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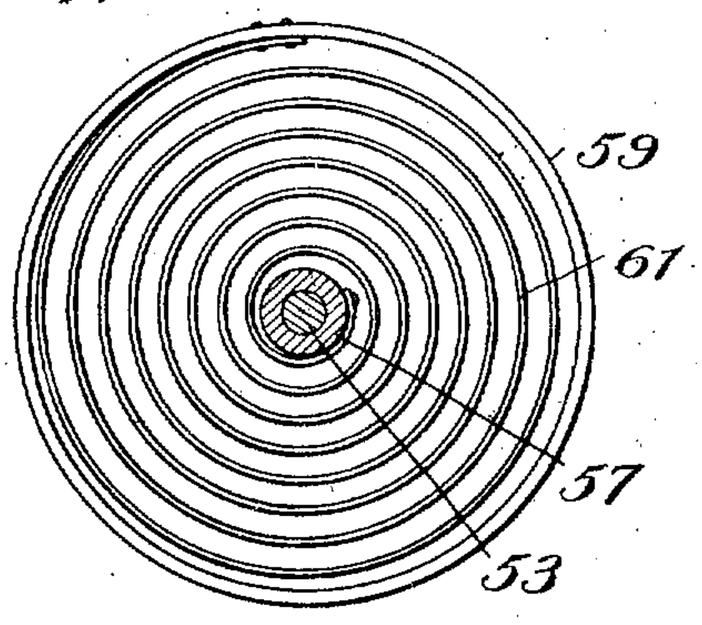


Fig. 6.

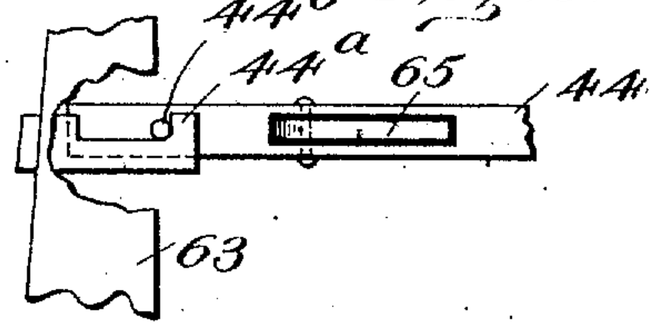
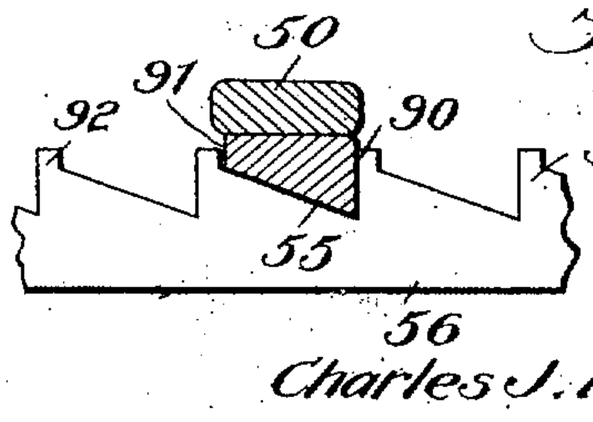


Fig. 8.



Witnesses

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PRINTING TELEGRAPH.

APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 6.

Fig. 14.

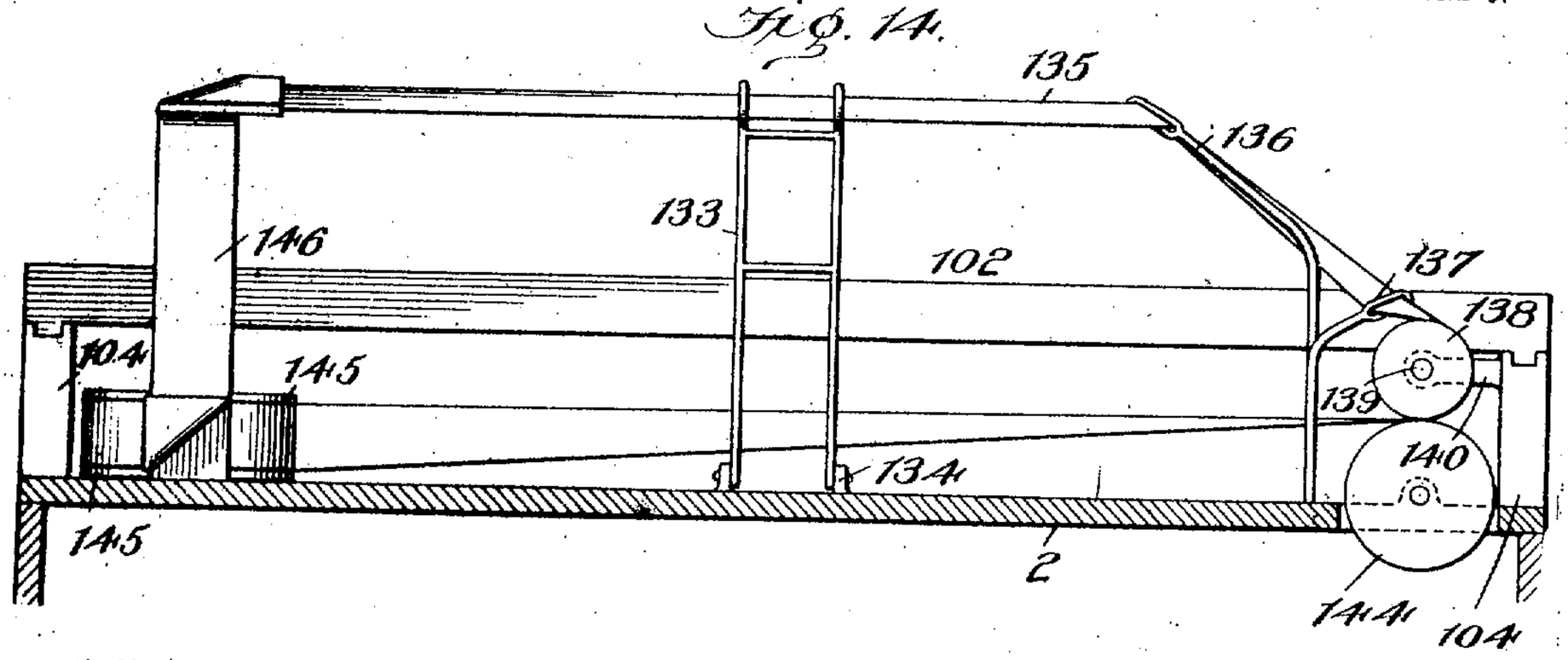


Fig. 15.

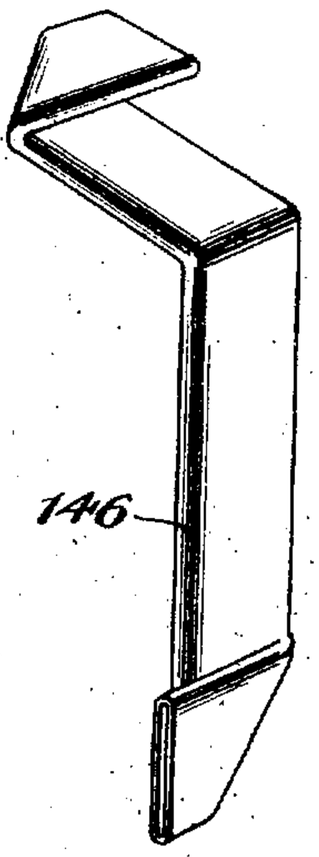


Fig. 9.

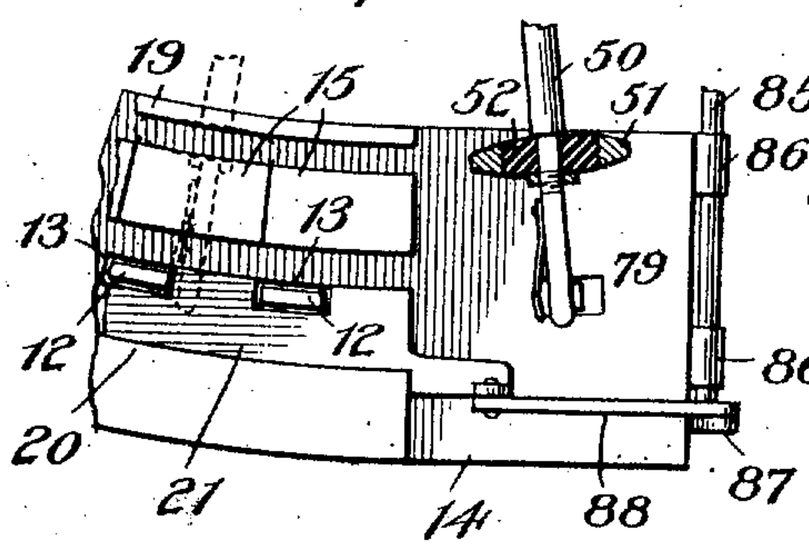
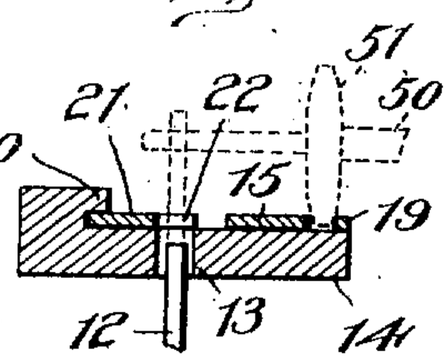


Fig. 12.



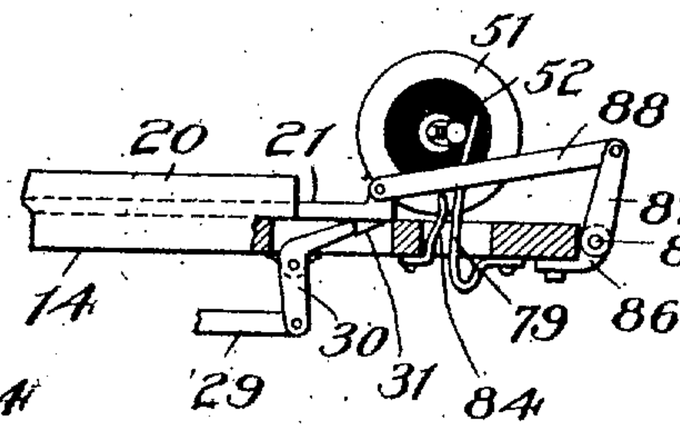
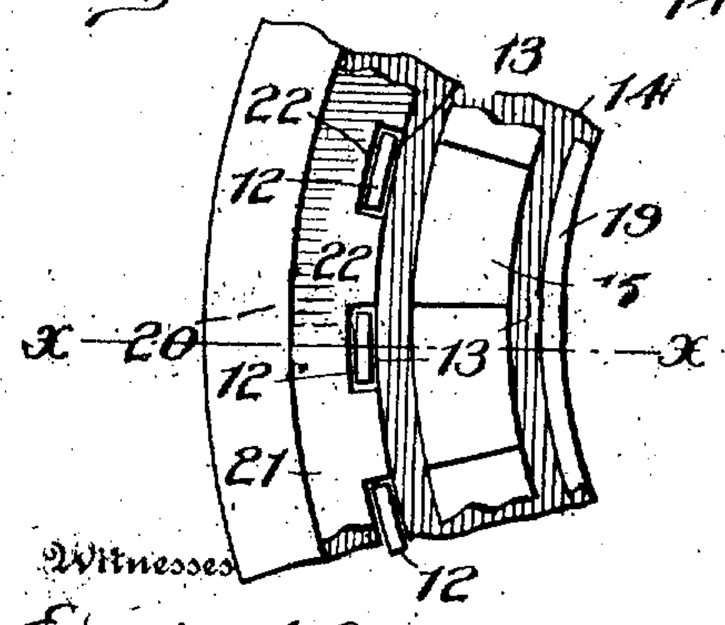


Fig. 10.

Fig. 11.

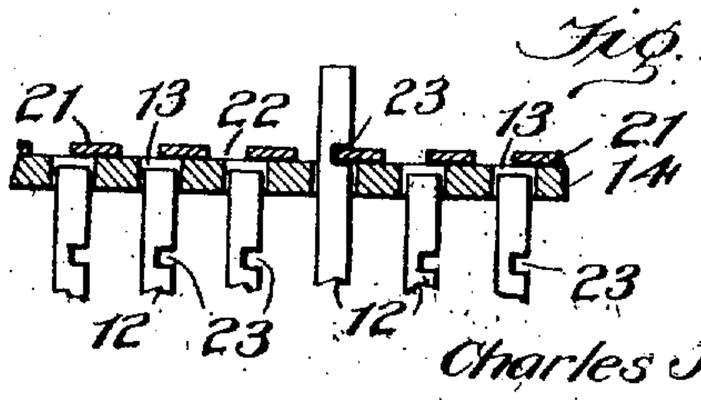


Witnesses

Edwin L. Bradford

P. H. Brush.

Fig. 13.



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No. 849,484. PATENTED APR. 9, 1907.

C. J. MENASCO.

PRINTING TELEGRAPH.

APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 7.

Fig. 16.

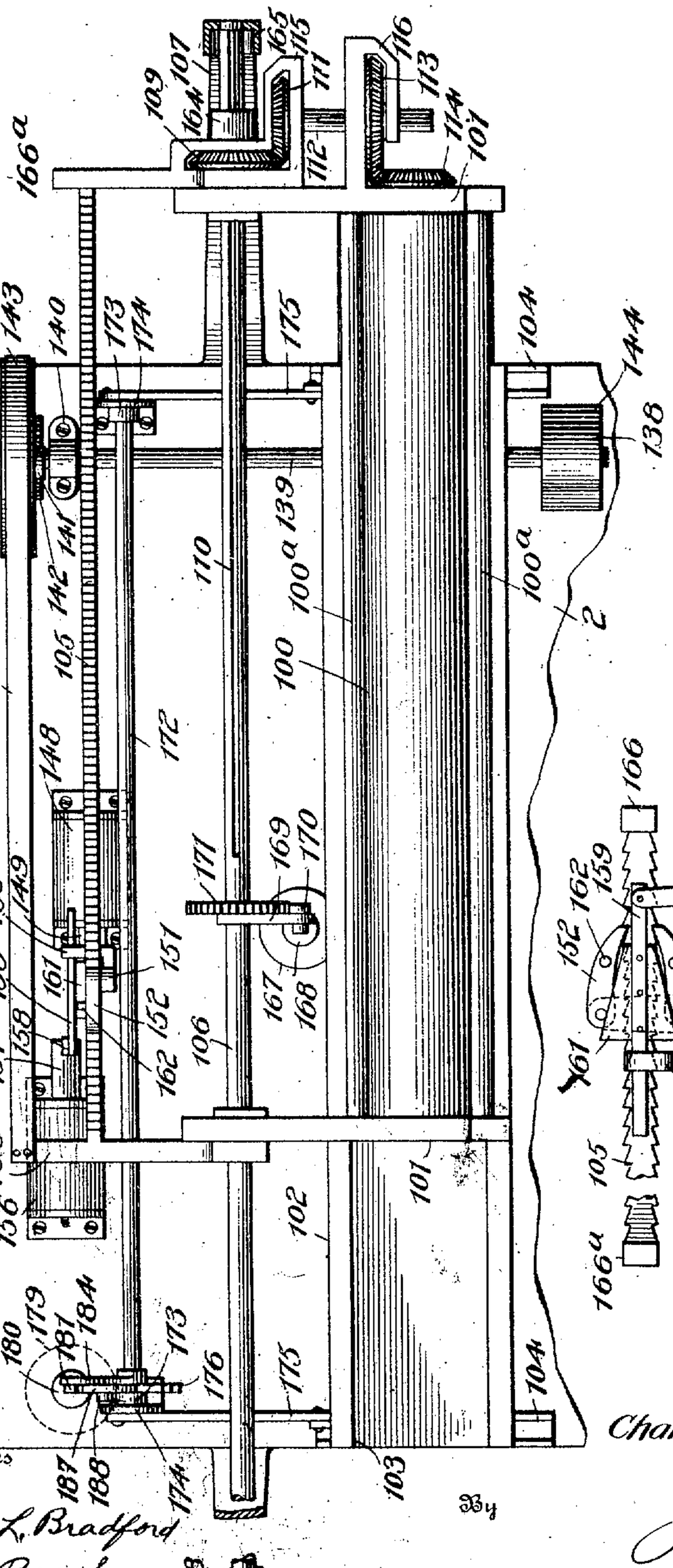
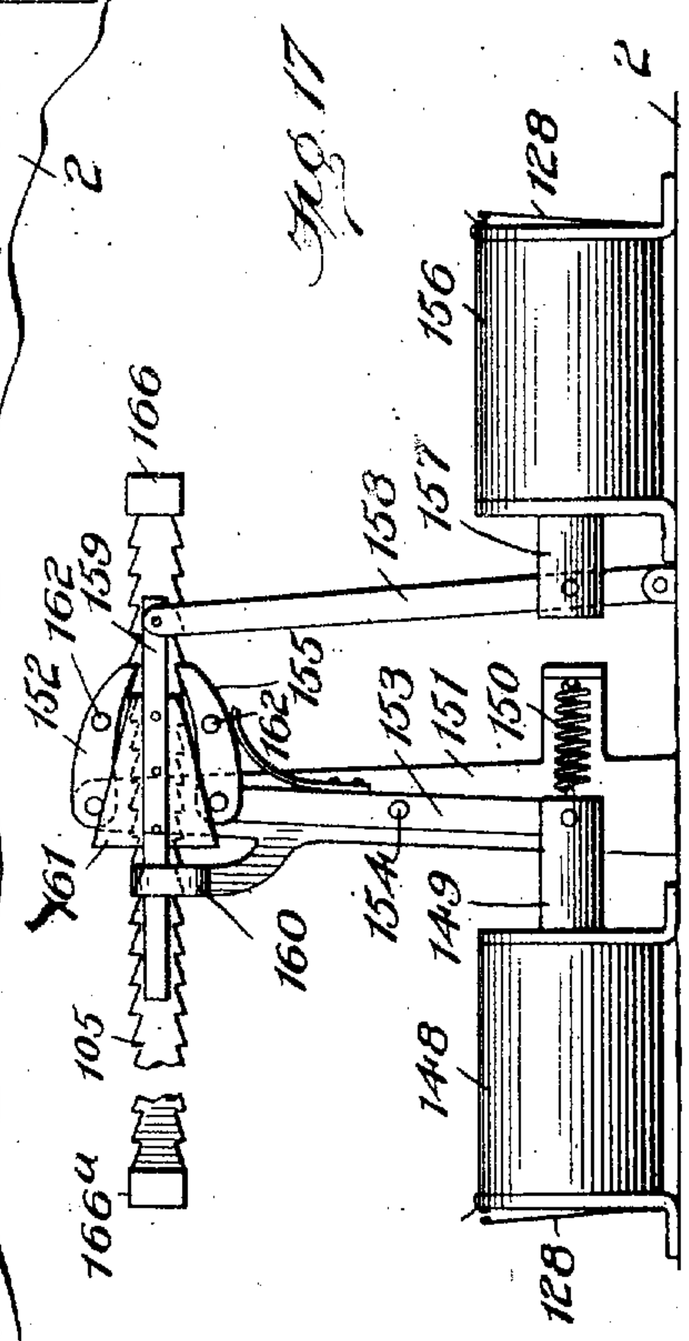


Fig. 17.



Witnesses

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No. 849,484. PATENTED APR. 9, 1907.

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PRINTING TELEGRAPH.

APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 8.

Fig. 18.

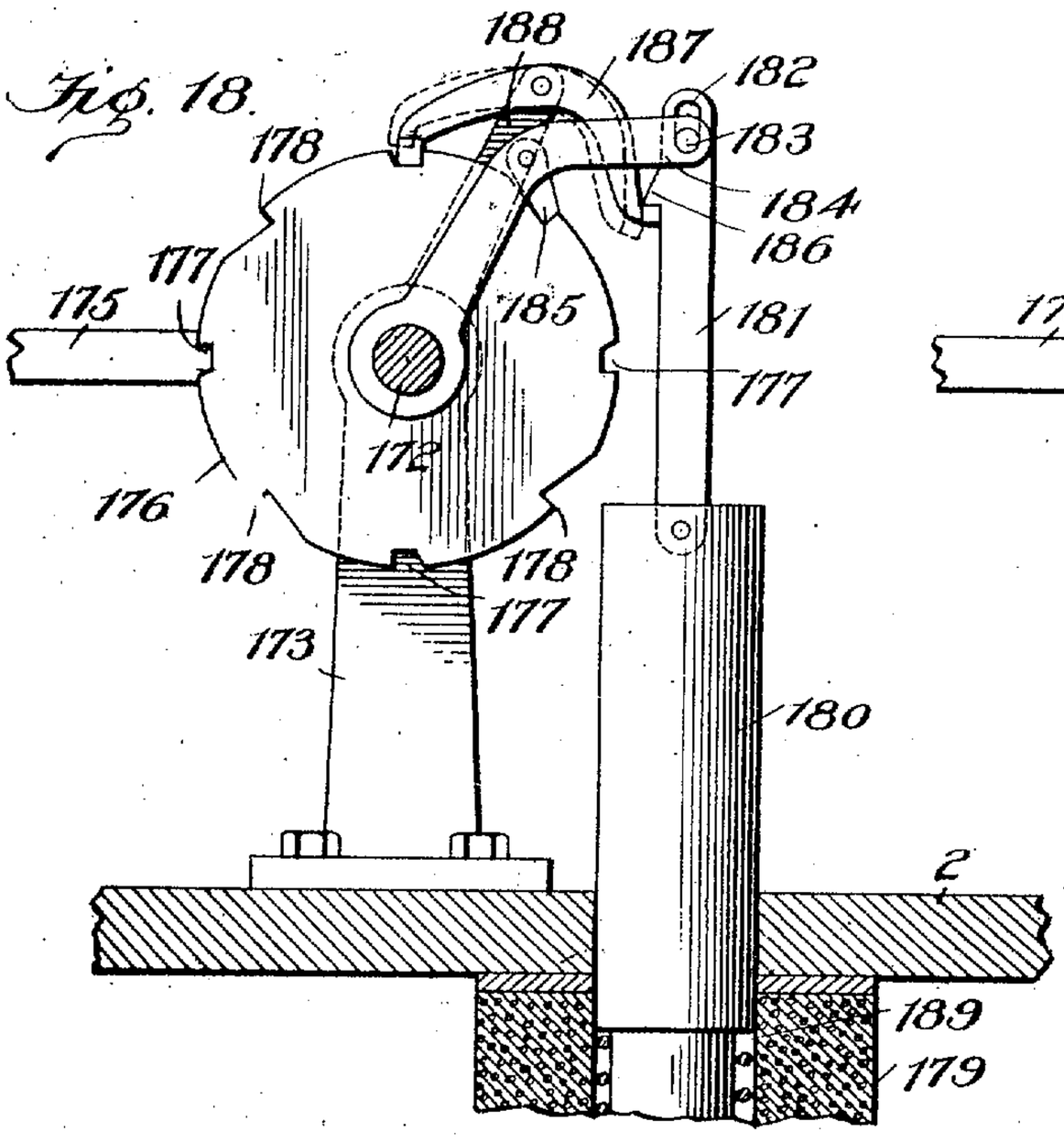


Fig. 20.

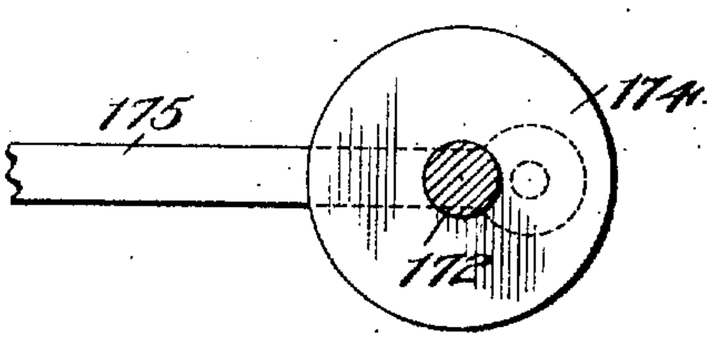


Fig. 21.

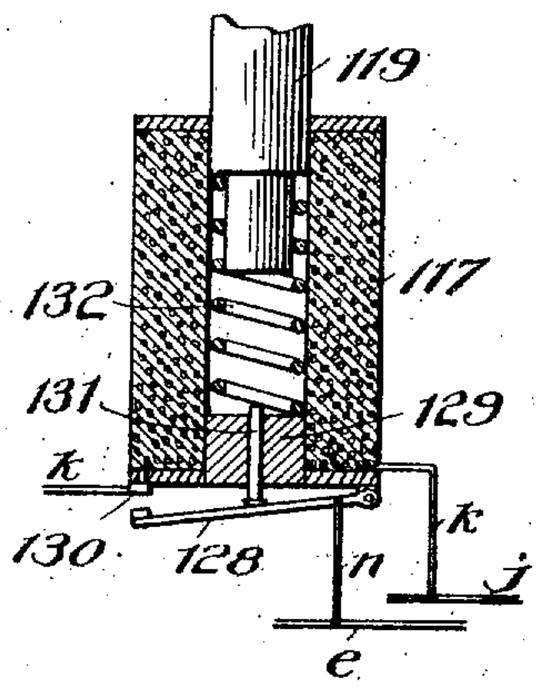
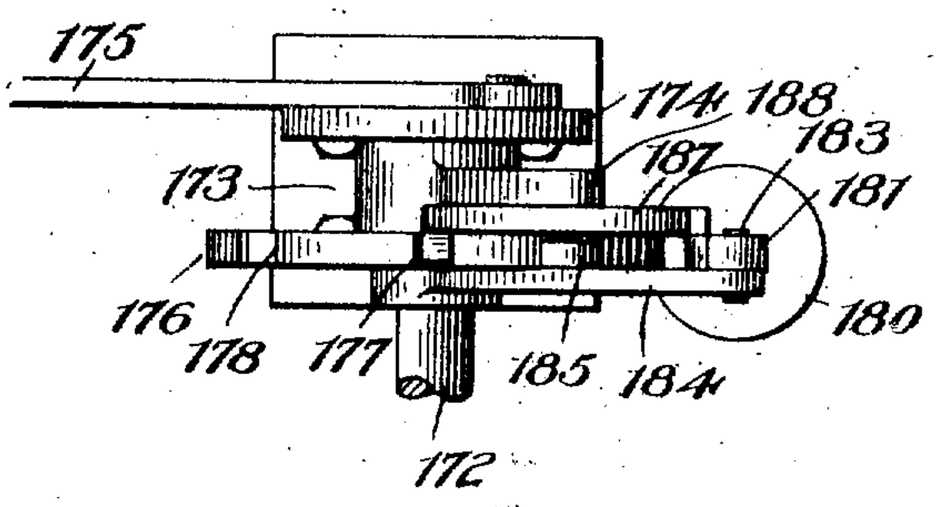


Fig. 19.



Witnesses
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Attorney

No. 849,484. PATENTED APR. 9, 1907.

C. J. MENASCO.

PRINTING TELEGRAPH.

APPLICATION FILED MAR. 5, 1906.

9 SHEETS—SHEET 9.

Fig. 22.

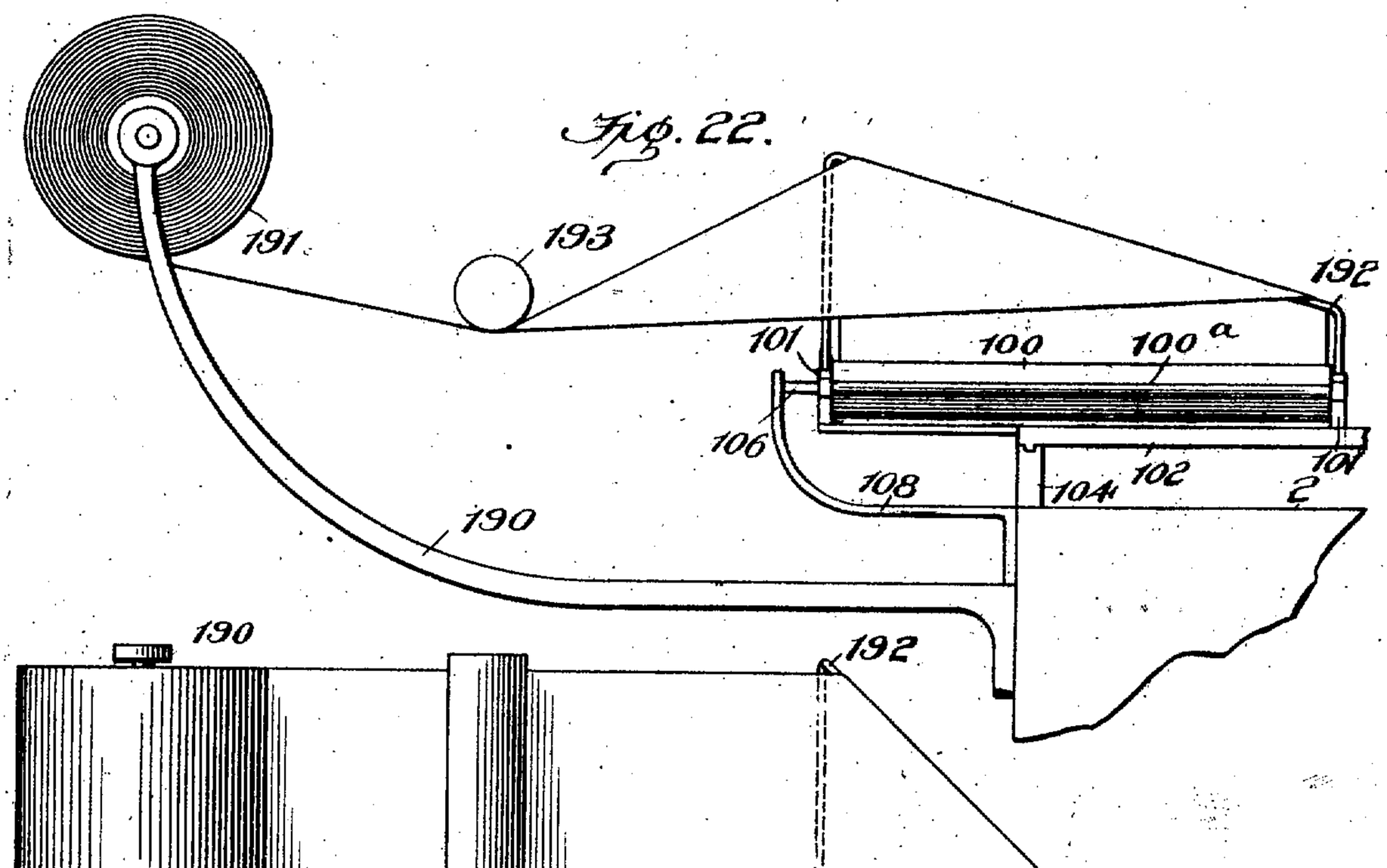


Fig. 23.

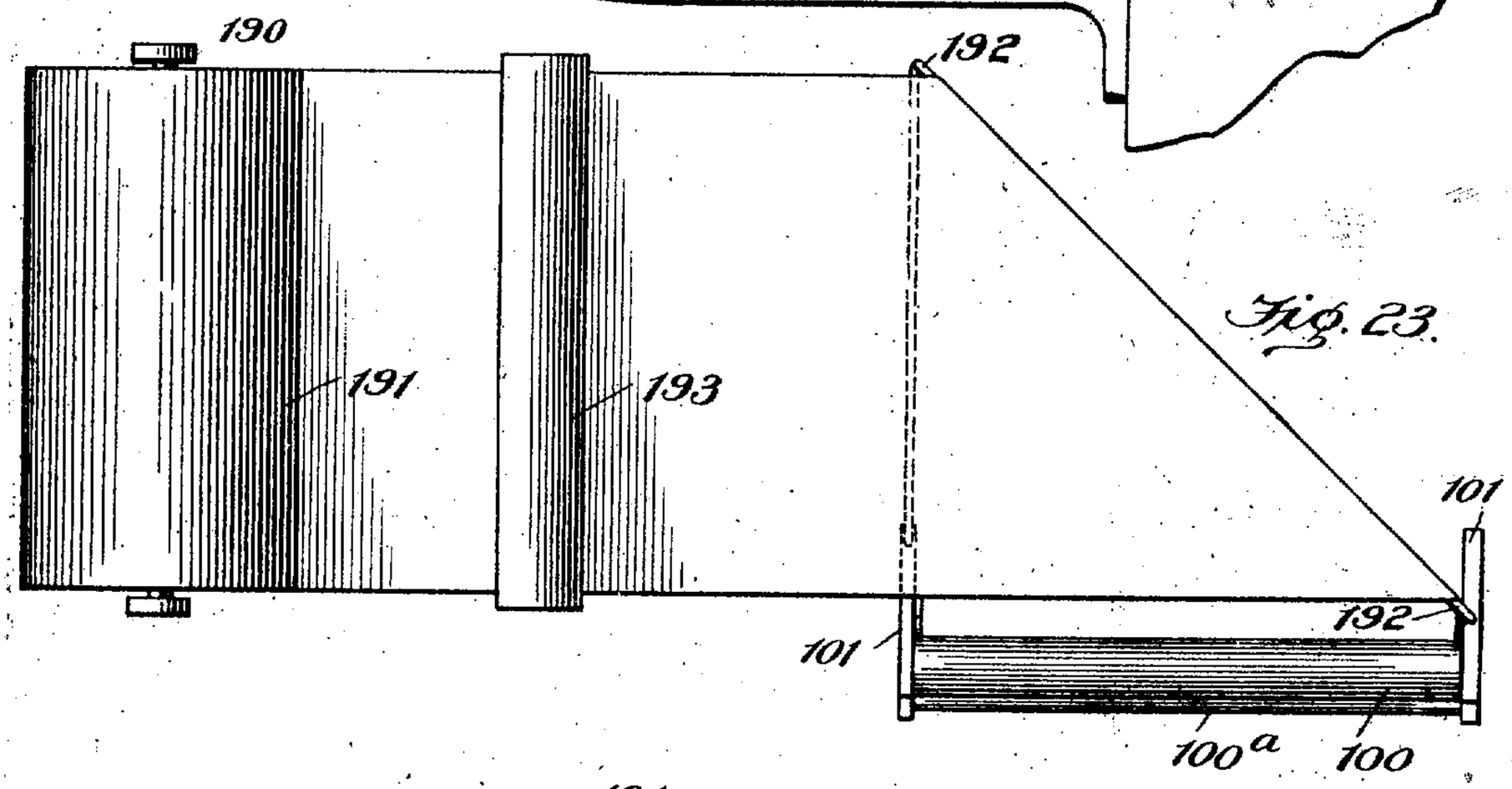
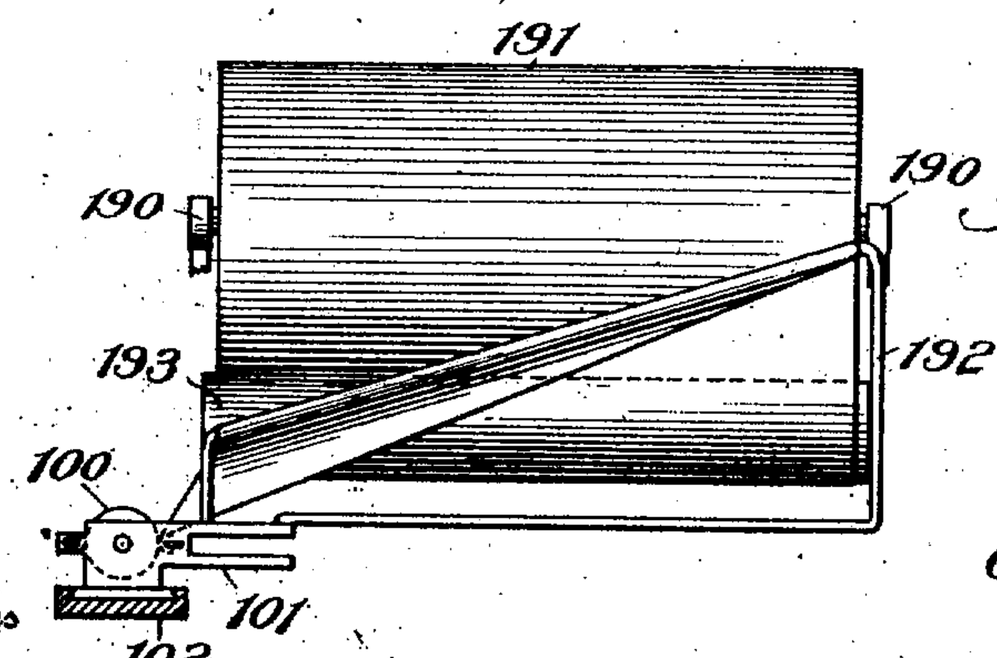


Fig. 24.



Witnesses
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P. H. Burch

Inventor
Charles J. Menasco

By Robt. D. Johnston Jr.
Attorney.

UNITED STATES PATENT OFFICE.

CHARLES J. MENASCO, OF BIRMINGHAM, ALABAMA, ASSIGNOR OF TWENTY-FIVE ONE-HUNDREDTHS TO RUFUS N. RHODES AND THIRTY ONE-HUNDREDTHS TO RICHARD C. BANKSTON, BOTH OF BIRMINGHAM, ALABAMA.

PRINTING-TELEGRAPH.

No. 849,484. Specification of Letters Patent. Patented April 9, 1907.

Application filed March 5, 1906. Serial No. 304,332.

To all whom it may concern:

Be it known that I, CHARLES J. MENASCO, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

My invention relates to improvements in electrically-controlled type-writers which are particularly designed for use as telegraph type-writers, any desired number being connected in series by a single wire and adapted to copy in exact duplicate messages written on the type-writer which for the time being serves as a transmitting-machine.

I propose to utilize an electrical "make-and-break" device for the main-line circuit which is electrically controlled by the operation of the keys of the transmitting-machine and interrupts said circuit a predetermined number of times for each key, the makes and breaks of the main line causing local-circuit selecting mechanisms to move in unison in the several machines in circuit. These mechanisms comprise selector-arms which are advanced over local-circuit contact-plates with a step-by-step movement from their initial positions, the synchronous movement of the selector-arms being simultaneously arrested upon the completion of the number of impulses designated by the transmitting-key operated at the sending-machine. These arms now stand the same number of spaces distant from their initial positions and close local circuits on corresponding operating-solenoids in the several machines, which simultaneously print the same letters or similarly rule, space, shift, or return the platen-carriages. Any machine may be used for the purpose of sending or receiving messages or independently as an electrical type-writer.

It is one object of my invention to increase the speed of the machines by using each make or break of the main-line circuit to advance their selector-arms a step. Hence where sets of thirty contact-plates for the local circuits coact with the selector-arms only fifteen electrical impulses or makes of the main-line circuit are required to move the selector-arms into engagement with the thirtieth contact-plate, which is thirty steps distant from the arms' zero position. To further increase the speed of the mechanism, I adapt the local-circuit selecting mechanisms to effect only an instantaneous closing of the desired local circuits, after which the selector-arms are rapidly and automatically returned to their initial position while the printing or carriage-shifting functions of the solenoids in the local circuits last closed are being performed.

My invention contemplates the provision of automatic means to hold the solenoid or electromagnet in a local circuit energized for a sufficient time to enable it to properly function after its circuit has been made and instantly broken at the selecting mechanism.

My invention further contemplates the use of automatic mechanism to open all the local circuits during the travel of a selector-arm over their respective contacts and to close the circuit connected to the contact-plate with which said arm is in engagement when its advance is arrested.

My invention further comprises improvements in the operating mechanism for each selector-arm, an electromechanically-controlled actuator being adapted to engage and move the arm with a step-by-step movement over the contact-plates until its travel is arrested by a key-actuated stop, whereupon the arm is automatically disengaged from said actuator and returned with great rapidity by a spring or other similar means to its initial position. I thus give the arms a controlled step-by-step advance in synchronism from a unison-point until they close a local circuit, after which they are freed and swung rapidly to their initial position or unison-point, the time required for this being hardly greater than that necessary for the operating of a key or the adjustment of the carriage.

My invention further comprises a novel mechanism for locking the key-operated stops for the selector-arm one at a time in the path of said arm, said mechanism preventing a stop being raised until the stop last raised and the selector-arm have both resumed their initial positions.

My invention further comprises various other improvements in the mechanism for operating the carriage, for feeding a continuous strip of paper to the machine and for controlling an endless ribbon, and also in the construction and arrangement of parts, which in

their preferred embodiment are illustrated in the accompanying drawings, wherein—

Figure 1 is a top plan view of an electro-mechanical type-writer provided with improvements constituting my present invention, the endless-paper feed being removed. Fig. 2 is a similar view with the top of the casing removed and with the keyboard broken away. Fig. 3 is a longitudinal vertical sectional view showing the internal mechanism in side elevation. Fig. 4 is a diagrammatic view of the circuit connections in a transmitting-machine and illustrates the manner in which the receiving-machines are connected with and controlled by the transmitting-machine. Fig. 5 is an enlarged detail view, in side elevation, of the mechanism controlling the movements of the selector-arm. Fig. 6 is a detail view, in side elevation, of the core carrying the dog for winding the coil-spring which advances the selector-arm. Fig. 7 is a plan view of said spring. Fig. 8 is an enlarged view, broken away, of a segment of the crown gear-wheel which moves the selector-arm. Figs. 9 and 10 represent, respectively, top plan and end views of the selector-arm in its initial or unison position and illustrates the mechanism for controlling the stop-lock. Fig. 11 is an enlarged plan view, broken away, of a portion of the circularly-disposed contact-plates which the selector-arm engages. Fig. 12 is a cross-sectional view along the lines $x\,x$, Fig. 11, the selector-arm being shown in dotted lines. Fig. 13 shows a plurality of the stops and illustrates the manner in which they are adapted to pass through the stop-lock plate and be held thereby. Fig. 14 is a detail view of the endless-ribbon-feed mechanism. Fig. 15 is a detail view of a guide for the ribbon. Fig. 16 is an enlarged plan view of the printing-carriage, showing the mechanism for spacing, ruling, and moving the platen. Fig. 17 is a rear view of the mechanism for spacing the printing-carriage. Fig. 18 is an enlarged view, in side elevation, of the carriage-shifting mechanism. Fig. 19 is a top plan view of Fig. 18. Fig. 20 is a detail view of the platen-shifting rod and eccentric operated by the shift mechanism. Fig. 21 is an enlarged sectional view of one of the printing and carriage-operating solenoids, illustrating the secondary or shunt circuit connections. Fig. 22 is a front view of the continuous-paper feed devices. Fig. 23 is a top plan view of the paper-feed devices shown in Fig. 22. Fig. 24 is a side elevation of said paper-feed devices.

Similar reference-numerals refer to similar parts throughout the drawings.

In the embodiment of my invention illustrated in the drawings I provide a type-writer machine having a base 1, a detachable top 2, and a keyboard 3, above which the keys 4 are arranged in three banks, there being preferably thirty keys in all, twenty-six for printing and one each to shift, space, rule, and return the carriage, which is electrically-controlled in its movements. The keyboard is provided with slots through which the key-shanks 5 pass and connect at their lower ends to bell-crank levers 6, pivotally mounted in studs 7, carried by a stationary plate 8, rigidly mounted below the keyboard. Each of these levers 6 is adapted to operate an arm 9, which through a second bell-crank lever 10, mounted on a standard 11, acts to lift a stop 12. As seen in Fig. 2, the arms 9 and 10 are so disposed that the stops 12 may be arranged in a semicircle, their upper ends entering guide-openings 13 in a curved plate 14, through which the stops are adapted to project when lifted by depressing their corresponding keys for the purposes of arresting the selector-arm and making the desired local-circuit connections to the printing or other operating devices for the type-writing machine which are electrically controlled.

I shall first describe my invention as applied to a single type-writing machine and shall later show how other machines may be connected up in series therewith and synchronized, so that all will print duplicate matter.

The plate 14, which is of any suitable insulating material, carries a series of thirty contact-plates 15, one for each key, suitably insulated from each other and connected by separate wires 17 to a series of thirty contact-plates 18, mounted near the top of the keyboard and adapted to engage other contacts 127, carried by the removable top 2. The plate 14 has at its inner edge a curved contact-strip 19, spaced equidistant from the inner edge of the row of plates 15. Movable in a suitable guide formed by an overhanging portion 20 near the outer edge of the plate 14 is a curved plate 21, which I term the "lock-plate" for stops 12. This plate 21 is provided with a plurality of slots 22 in its concave edge, one for each of the stops 12, which are adapted to project therethrough when lifted. The slots 22 are but little wider than the stops, each of which is provided with a notch 23 in its right-hand edge, which when the stop is raised comes into position to receive the plate 21 when shifted to the left, as seen in Fig. 13. The purpose of this is to enable the lock-plate to engage in the notch 23 of the elevated stop and lock it in its raised position, while the movement of the plate to effect this brings the other slots 22 in the plate out of register with the other stops, so that the plate prevents more than one at a time being raised.

Mounted in journal-bearings depending from the top of the keyboard are three rock-shafts 24, each provided with a row of ten rocker-arms 25, which have bifurcated ends that project above the keyboard and straddle the shanks 5 of the several keys in the

bank adjacent to the shaft. Upon the depression of any key its finger-piece strikes an arm 25 and rocks a shaft 24. The shafts 24 are each connected by a lever 26 to the switch-arm 27 and when rocked bring this arm into engagement with a contact-plate 28 to close the local controller-circuit. An arm 29 leads from the arm 27 to a dog 30, Fig. 10, pivotally connected to the right-hand end of plate 14 and adapted to engage a tooth 31 on the lock-plate 21. A spring 32 at the left-hand end of plate 21 tends to draw it to the left when the dog 30 is tripped and moves the tooth 31 to a position over the dog, which is held depressed thereby, so that through the arm 29 the local controller-circuit is held closed until the plate 21 is shifted to the right in the manner hereinafter described. Upon the depression of a key its corresponding stop 12 is raised, the local controller-circuit is closed by switch-arm 27, and the dog 30 releases the plate 21, which shifts and locks the raised stop 12 in position above it and holds the controller-circuit closed.

The local controller-circuit closed by the operation of a key comprises the wires *a* and *b*, which connect with the positive and negative terminals of the local battery B. Wire *b* leads to a switch C and through the solenoid 33. An anvil 34, vertically movable in guides 35, secured to the frame, carries at its lower end a contact-piece 36 to close switch C and at its upper end is bent over the top of solenoid 33 and projects downwardly to a point where it will be struck by the core 37 as it is drawn upwardly by the attractive power of the solenoid when its circuit is closed. The blow of the core serves to lift the anvil and break the circuit to the solenoid, which therefore permits the core and anvil 34 to drop and again close the circuit. In other words, this mechanism acts to completely make and break the local controller-circuit at the switch C very rapidly. I propose to cause it when used as a telegraph typewriter to similarly make and break the circuit to a relay-magnet 38 at the switch C′, the main-line batteries B′ being in the latter circuit. To this end I provide the anvil with a second contact-piece 39, which opens and closes the switch C′ with the switch C. The magnet 38 acts to attract a switch-arm 40 against the action of a spring and close the switch D, so that current flows from battery B through wires *c*, *d*, and *e*. Included in this circuit is a solenoid 41, which controls the operation of the selector-arm in the manner which will now be described.

It has already been seen that immediately upon the depression of a key a circuit is closed through the solenoid 33, which in the manner described acts to rapidly make and break the circuit to the relay-magnet 38 and solenoid 41. This latter solenoid is mounted on supports 42 in horizontal position and provided with two cores 43 and 44, one at each end, which are normally drawn outwardly by coil-springs 45 and 46, respectively. Adjacent to the solenoid 41 is a second solenoid 47, supported in a vertical position by angle-irons 48, connected to the base 1. The core 49 of this solenoid carries at its upper end the selector-arm 50, which is horizontally disposed and provided with a contact-wheel 51, rotatably mounted thereon, but insulated therefrom by the provision of a non-conducting web 52. The arm 50 is shown mounted on a stem 53, connected to the core 49, which latter at its lower end is connected to the base 1 by a coiled spring 54, which opposes movements of the core to lift the selector-arm or move it to the left, Fig. 2. The selector-arm is so disposed that its wheel 51 will run between the contact-strip 19 and the inner edges of the contact-plates 15, so as to close the circuit between said strip and any desired one of the contact-plates, which are cut out of circuit during the travel of the arm, as will be later described. The arm 50 carries a depending tooth 55, which engages a crown gear-wheel 56, having connected thereto a sleeve 57, through which the stem 53 passes freely. The sleeve 57 passes freely through a central opening in a gear-wheel 58 and through a spring-barrel 59, movable with said gear 58, being supported at its lower end on the guide-iron 60 for the stem 53. A coiled spring 61 is connected at its inner end to the sleeve 57 and at its outer end to the barrel 59, its tendency being to rotate the crown-wheel in the direction of the arrow in Fig. 2.

A double anchor escapement 62, supported by a standard 63, engages the teeth of the crown-wheel 56, permitting it to be moved by the spring 61 the distance of one tooth upon two movements of the escapement, one in each direction. Each movement of the escapement, which permits the wheel to be advanced half the distance of a tooth and advances the selector-arm one full step, is independently controlled by the make or the break of the local controller-circuit, which includes the solenoid 41, as the core 43 of the latter is connected by an arm 64 to the escapement and rocks it to the position shown in Fig. 5 when the solenoid is energized upon the make of the controller-circuit, the spring 45 acting, when the solenoid is deënergized upon the break of said circuit; to move the arm 64 against stop 43ª and rock the escapement to its other position, which permits the crown-wheel to advance the distance of half a tooth—*i. e.*, a full step—thereby bringing the selector-arm into engagement with another circuit contact-plate 15. The selector-arm will, through the engagement of its tooth 55 with the crown-wheel, be moved step by step over the contacts 15 under the control of the escapement, each step-by-step movement

bringing it into engagement with a different contact-plate.

Since I propose to utilize the spring 61 to move the arm always in the same direction, I make provision to keep it wound at substantially the same tension by providing the outer end of the core 44 with a laterally-projecting spring-pressed pawl 65, adapted as it is drawn inwardly by the solenoid 41 to engage the gear-wheel 58 and advance it one tooth, a spring-pawl 66 acting to prevent return movement. A lug on the core engages a stop-plate 44ª, which limits its travel. This movement of the gear 58 is imparted to the spring-barrel 59 and serves to wind the spring. The number of teeth on the gears 56 and 58 being the same, it will be seen that upon a make and break of the controller-circuit the escapement in making two movements will release the crown-wheel one tooth and the pawl 65 will turn the gear 58 one tooth, so that the tension of the spring remains practically unchanged.

Assuming that the selector-arm is in its initial position, Fig. 2, upon the depression of a key its respective stop 12 is locked in position in the path of the arm's travel and the local controller-circuit closed, whereupon the circuit of the solenoid 41 is rapidly made and broken, and for each make or break the selector-arm is advanced by spring 61 one step, or the distance of half a tooth on the crown-wheel 56. As the arm moves the distance of a half tooth its contact-wheel 51 passes from engagement with one contact-plate 15 to the next in the line of its travel until the arm strikes the lifted stop and comes to rest opposite the contact-plate corresponding to the stop. Immediately upon the engagement of the arm and stop a circuit is closed through the wire *f*, plate 21, the stop, arm 50, core 51, spring 54, and wires *g* and *c* to battery B. Included in this circuit are two solenoids 67, connected in series, which when energized move their cores 68 to clutch an arm 69, rigidly connected to the core 37 of the make-and-break switch C, thereby instantly stopping the solenoid 33 from further making or breaking the controller-circuit. As soon as the controller-circuit is thus held open or closed the solenoid 70 effects the closing of the printing-circuit, as follows:

The solenoid 70 is included in a circuit taken from wire *e* to a spring switch-arm 71, mounted upon a stud 72 and provided at its outer end with a shoulder 73, adapted to be engaged by a roller 74, carried by the core 44, and to be moved thereby to bring the arm 71 into contact with a similar switch-arm 75, also mounted on stud 72, thereby closing the circuit through wire *h* and solenoid 70 to the battery. The shoulder 73 is so formed that when the roller 74 comes to rest at either end of its travel it will permit the spring-arm 71 to move away from arm 75 and break the circuit to solenoid 70; but when core 44 is rapidly oscillated, as is the case when the selector-arm begins to move, it will hold that circuit closed, the roller moving so fast that the shoulder prevents arm 71 moving to break its contact with arm 75, or if the contact is broken it is for so short a period that it will not take effect in the core 76 of the solenoid 70, which is disposed at such an angle that it will drop by gravity when the solenoid is deënergized and close the switch E. This switch E comprises a terminal 77, connected by wire *i* to battery B, and a terminal 78, from which a wire *j* leads to the solenoid 47. The local operating-circuits comprise wires *k*, which lead from the contact-plates 15 to the several operating-solenoids for printing or moving the platen and connect to this wire *j* beyond the solenoid 47. It is evident that as the wheel 51 engages each contact-plate 15 it would close a local circuit from strip 19 through its respective wire *k* and operating-solenoid and solenoid 47 but for the fact that switch E is opened by the energization of solenoid 70 as soon as the arm 50 begins to move responsive to the making and breaking of the controller-circuit. All the local operating-circuits including the wires *k* are broken until the arm 50 comes to rest, when the action of solenoids 67 hold the controller-circuit open or closed, and core 44 comes to rest, permitting the circuit of solenoid 70 to be broken and core 76 to drop and close switch E and the circuit across the wheel 51 to the plate 15 opposite which the selector-arm has stopped, thereby energizing the operating-solenoid corresponding to the key depressed.

Having thus described the manner in which any desired operating-solenoid is energized by the operation of its respective key and the movement of the selector-arm, it becomes necessary to return the selector-arm rapidly and accurately to initial position. According to my invention this is effected in the following manner: The solenoid 47, which controls the vertical movement of the selector-arm and its engagement with the crown-wheel 56, is included in the local circuits from the contact-plates 15 through the wires *k* and *j*. Therefore when the selector-arm is in its initial position this solenoid is cut out of circuit even though switch E is closed, since the contact-wheel 51 is out of engagement with the contact-strip 19, thereby breaking all the operating-circuits at this point. As soon as the selector-arm begins to move and the wheel 51 engages the strip 19 and the several plates 15 successively the controller-circuit, which would otherwise be closed thereby, is held broken by the action of solenoid 70 at switch E. Therefore the solenoid 47 does not become energized until the arm is arrested by one of the stops and the solenoid 70 permits the

switch E to close a local operating-circuit. As soon as this occurs the solenoid 47 becomes energized and acts to draw its core 49 upwardly, moving it and the selector-arm a sufficient distance to disengage the tooth 55 thereon from the crown-wheel 56, whereupon the coil-spring 54 acts to swing the arm rapidly back to its initial position. The lifting of the arm acts to break the local controller-circuit last closed by lifting wheel 51 out of engagement with its contact-strip 19. This occurs almost instantaneously after the arm strikes the stop and breaks the circuit to solenoid 47 at the same time. I provide the following means to hold the solenoid 47 energized until the arm has completed its return movement: A stop 79, which arrests the return travel of the arm at its initial position, consists of a spring-arm attached to the plate 14 near its right-hand end and connected by wire *l* with a flat armature 80, pivotally connected at 81 to a part carried by the solenoid 47, and adapted at its outer end to coöperate with a contact 82, also suitably supported from the solenoid or otherwise and connected with wire *j* where it enters the upper end of the solenoid. This armature has an enlarged circular opening, through which the stem 53 passes freely and without contact. This stem 53 also passes through a cylindrical body 83, of iron or other magnetic metal, fixed in the upper end of the solenoid 47 and adapted to be magnetized under the influence of the induction of the solenoid and attract the armature 80, so as to move it into contact with 82. A contact-plate 84, connected by wires *m* and *e* to the battery, is also mounted on the plate 14 and so disposed that the stop 79 will engage it as soon as the selector-arm leaves its initial position. The action of the spring 54 against the selector-arm holds the stop 79 bent out of engagement with the contact-plate 84 as long as the selector-arm is in its initial position. As soon, however, as it moves the circuit is closed to the armature 80, and upon the energization of the solenoid 47 the magnet 83 draws the armature 80 downwardly into engagement with the contact 82 and closes the circuit through the wires *e m l*, solenoid 47, and wire *j* to the battery, the switch E being closed and remaining closed during the return movement of the selector-arm. This secondary or shunt circuit through the solenoid holds its core and the selector-arm in their raised position until the latter strikes the stop 74 and breaks the secondary circuit, whereupon the spring 54 draws the selector-arm downwardly and brings its tooth 55 again into engagement with the crown-wheel.

It will be recalled that upon the depression of a key the dog 30 was tripped and the plate 21, carrying the tooth 30, was shifted by the spring 32 to lock the stop lifted by the key in the path of the selector-arm and to hold the dog in a position where the controller-circuit was closed by the switch-arm 27. To shift the plate 21 back to its initial position and release the stop which has last arrested the movement of the selector-arm, I provide a rocking arm 85, Fig. 2, journaled in bearings 86, connected to the right-hand end of plate 14. This rocking arm is bent upwardly and to the front of the machine in such a manner that its inner end projects above the top of stem 53. Upon the elevation of this stem by solenoid 47 the arm 85 is engaged and rocked. As seen in Fig. 10, this rocking arm carries at its other end a crank-arm 87, which is connected by a link 88 to the right-hand end of the plate 21. It follows that when the selector-arm is lifted for its return movement the arm 85 will be rocked so that through the link 88 the plate 21 is drawn to the right sufficiently to enable the dog 30 to again catch behind the tooth 31 and permit the lifted stop to drop by gravity back to its initial position. A spring 89 may be used to engage the contact-arm 27, so as to insure the breaking of the contact and the forcing of the dog 30 into position behind the tooth 31 upon the return of the plate 21 to initial position. To prevent the selector-arm jumping out of engagement with the crown-gear 56, its tooth 55 is provided with parallel faces 90 and 91, which positively engage the shouldered sides of the teeth 92 of the crown-gear, so that the tooth 55 is in positive engagement with the crown-gear so far as movements in a horizontal plane in either direction are concerned. The tooth will, however, readily disengage itself from the crown-wheel when moved vertically. This arrangement prevents the selector-arm jumping from the crown-wheel under rapid operation. To prevent the anvil 34 jumping under the hammering-strokes of the core 37 and give the full time for the make and break allowed by the lost motion between core and anvil, I may provide a flat spring 93, connected to the rear wall of the casing and adapted to ride over a curved lug 94, carried by the anvil. This prevents the anvil rebounding.

Having thus described the local-circuit-selecting mechanism inclosed within the body of the casing, attention will now be directed to the devices which move under the control of said mechanism for the purpose of operating the type-writer.

Referring to Fig. 3, it will be seen that all parts of the type-writer proper are mounted upon the detachable top 2 to the casing. They are adapted for visible type-writers, although any other desired form may be substituted within the contemplation of my invention and comprise, preferably, a platen 100, journaled in a laterally-shifting carriage 101. This carriage is supported at its front side by a slide 102, having its side

edges beveled so as to make a dovetail joint with an undercut guide 103, mounted on the top 2 by supports 104 and adjustable thereon from front to rear. At its rear side the carriage 101 is connected to a rack-bar 105, provided with similarly-disposed teeth on its top and bottom edges. The end bars of the carriage are slotted and pass on either side of a rod 106, which is suitably journaled in arms 107 and 108, which project from the opposite sides of the top 2 and are bent upwardly. The carriage 101 at its right-hand end carries a gear-wheel 109, which has a tongue that enters a longitudinal groove 110 in the rod 106. The gear 109 meshes with a second beveled gear 111, mounted on a short shaft 112, which also carries a larger beveled gear 113, adapted to mesh with a gear 114 on the axle of the platen 100. The shaft 112 is journaled in the frames 115 and 116, rigidly connected to the end of the carriage and bent over and around the gears, so that they furnish bearing-points for the shaft 112 on both sides of the gears 111 and 113. The frame 115 is continued at right angles in front of the gear 111 and serves as an outer stop to hold the gear 109 against lateral movement with the rod 106.

In front of the platen I provide a set of twenty-six printing-solenoids 117, disposed at an angle to the top 2 and connected to angle-irons 118, which in turn are connected to the top. These several solenoids, as seen in Fig. 1, are oblong in cross-section and disposed on edge and in staggered relation, so that they may be closely positioned at the front of the machine. Each solenoid has a wide flat core 119, connected to a curved rack 120. The racks are so disposed that they will severally engage the toothed ends 121 of a curved row of type-bars 122, mounted upon a common curved rod 123, supported in standards 124. These several type-bars are provided with three separate type—one for small letters, one for capitals, and one for numerals or punctuations. The toothed ends 121 of the type-bars are so disposed that the racks 120 act with diminishing leverage and increasing speed as the bar is thrown to its printing position. Antifriction-rollers 125, mounted upon a common curved shaft 126, supporting the standards 124, severally engage the under faces of the several racks 120 and hold them in mesh with the toothed ends in the type-bars. The several solenoids 117 are each connected by a wire *k* to a contact-point 127, of which there are thirty, which depend from the front edge of the top 2, so that when the latter is in position they engage the several spring-contacts 18, mounted in the casing and connected by wires 17 to the contact-plates 15. When the top is in position, each of the plates 15 is connected by these means with its respective solenoid 117, which is thereby included in a local operating-circuit normally broken at the selector mechanism.

Since rapidity of operation is of vital importance to a machine of this character, it will be seen that the controlling mechanism will act slowly if called upon to more than instantaneously energize the printing and carriage-operating solenoids. This cannot be depended upon to fully complete the desired movement of the cores with which I provide these solenoids, so I use an automatic switch, which is attracted to the solenoid as an armature the moment the former is energized and shunts a current through the solenoid until its core has completed its travel, when the switch is automatically opened, the secondary circuit broken, and the core free to be returned to its initial position by a coiled spring. This shunt mechanism, which is similar for the several printing-solenoids, is best seen in Fig. 21 and comprises a spring switch-arm 128, suitably mounted at the lower end of the solenoid and connected by branch wire *n* with the wire *e*. A metallic block 129 is fixed in the lower end of the solenoid and is magnetized by the instantaneous flow of the current therethrough and acts to attract the arm 128 as an armature until its outer end engages a contact-point 130 in circuit with the wire *k* entering the solenoid. The instantaneous closure by the selecting mechanism of a local operating-circuit will cause the switch 128 to close a secondary or shunt circuit through the solenoid, in which the current will flow from the wires *e*, along wires *n*, switch-arm 128, contact 130, along wires *k*, through the solenoid to the wires *j*, and thence to the battery. This maintains the flow of the current through the solenoid until the inner end of its core 119 strikes a pin 131, which passes through the block 129 and rests on the arm 128. By this means the solenoid continues to act upon its core 119 until the latter has completed its travel, when it automatically breaks the shunt-circuit by means of pin 131 and is free to be returned to initial position by the coiled spring 132, which is disposed between the inner end of the core and the block 129. The magnetization of block 129 causes it to attract the core as it approaches, thereby insuring to the latter a full and rapid stroke.

As each type-bar is swung on its pivot to print it is adapted to engage the ribbon-guide frame 133, journaled at its lower end in studs 134, mounted on the top 2 and insulated therefrom, this slight movement of the guide-frame acting, through the mechanism hereinafter described, to automatically space the platen-carriage after each letter is printed. The ribbon 135, as seen in Fig. 14, is in the form of an endless band which moves in the direction of the arrow, being twisted from the horizontal position in which it passes

through loops in the free end of the guide-frame 133 by means of two other guides 136 and 137, mounted on a common standard and adapted each to give the ribbon a quarter-turn, so that it will pass over a feed-roll 138, driven by a shaft 139, supported in standards 140 and driven by a dog 141, connected to the spring-barrel 142 and meshing with a ratchet-wheel 143, rigid on the stem 139. A friction-roll 144, which is journaled so that a portion of it is disposed below the top 2 of the casing, serves as a friction-roll to coöperate with roll 138 in drawing the ribbon and passing it with the half-twist to be wound around four vertical flanged guide-rollers 145, Fig. 1, disposed at the opposite side of the top 2. The ribbon is wound around these four guide-rollers and is taken off from one of them toward the center and twisted by a guide-tube 146, which takes the ribbon on edge, turns it, and delivers it in line with the guide-loops of the frame 133 and in a horizontal position. This mechanism provides for a continuous endless feed, the spring-barrel 142 and shaft 139 acting in the usual manner to feed the ribbon as the printing-carriage is advanced during the operation of the machine.

A space-key controls, preferably, the first stop 12 and when depressed closes a local operating-circuit to the solenoid 117ª, having a plain core which is direct connected to a contact-spring 147, normally in engagement with the ribbon-frame 133. The core is preferably not acted upon by a spring 132, the spring 147 being sufficient to move it outwardly after its short instroke. The spring 147 will not follow the frame 133 when moved by a key-bar. The studs 134 prevent the frame swinging upwardly beyond the position shown in Fig. 3 and following the spring 147. A wire *s* connects the frame with wire *a* and battery B, and a wire *s'* leads from the contact-spring 147 to a spacing-solenoid 148 and thence back to the battery. This solenoid is normally energized, its circuit being closed by spring 147 engaging frame 133 and acts to draw its core 149 inwardly against the action of spring 150, connected to the standard 151, as best seen in Fig. 17. This standard is disposed at the rear of the casing and extends above the rack 105, being provided at its upper end with a dog 152, which engages the upper set of ratchet-teeth. At its outer end the core 148 is connected to an arm 153, pivotally mounted on a stud 154 in the standard 151 and provided at its upper end with a spring-pressed pawl 155, which engages the lower ratchet-teeth, being disposed in the same direction as the pawl 153. These two pawls normally engage the rack-bar, so that when the spacing-solenoid is deënergized the spring 150 shifts pawl 155 to position where the solenoid when next energized will advance the printing-carriage the space of one letter against the action of the return-spring, the carriage being held against return movement by the pawl 152. The spacing-solenoid circuit is broken when the solenoid 117ª, connected to spring 147, is energized and draws the spring out of engagement with frame 133. It is also broken by the slight forward movement given the frame 133 by the engagement of a type-bar therewith just before it strikes the platen in the act of printing. This provides the automatic spacing between letters, and it will be noted that the breaking of the spacing-circuit just as the type-bar prints will permit the spring 150 to come promptly into action, but will prevent any danger of the spacing action taking place during the printing of a letter.

I provide a carriage-return key which does not operate a stop 12, but which closes the circuit on the solenoid 33 and permits the selector-arm to travel to the last contact-plate, where it is stopped by the lug 156ª, Fig. 2, and closes local circuits to the clutch-solenoids 67 and to the carriage-return solenoid 156. This latter solenoid is provided with a shunt-switch and connections as in the case of solenoids 117 and a free core 157, connected at its outer end to an arm 158, pivotally connected to the base 1 and to a bar 159, supported in a guide 160 on the standard 151 and disposed on the opposite side of the rack 105 from said standard. This bar carries a wedge-plate 161 adjacent to the bottom edges which are adapted to engage pins 162, carried by the pawls 152 and 155. When the solenoid 156 is energized, its core being free will move inwardly and remain there, the wedge-plate being moved thereby against the pins 162 and acting to hold them out of engagement with the rack, thereby leaving the carriage free to be returned by the spring 163. To stop the carriage without too great a jar, I provide it with a plunger 164, rigidly connected to its right-hand end and adapted to enter a dash-pot 165, supported by the arm 107. Any other form of cushion or stop may be provided. The spring 163 is connected to an arm 166, projecting rearwardly from the carriage and in a position when the carriage has completed its return to engage the end of the bar 159, so as to throw the wedge-plate out of engagement with the pins 162, thereby permitting the pawls to again engage the rack and moving the core 157 to its outer position. This provides a key-controlled return for the carriage from any intermediate point in its travel and an automatic return at the end of lines when arm 166ª moves bar 159 to trip the pawls.

I provide a special ruling-key which preferably controls the stop 12 opposite next to the last contact-plate 15 and closes the circuit to a vertically-disposed solenoid 167, connected to the top 2 and provided with a core

168, which is swivelly connected at its upper end to an arm 169, loosely journaled on the rod 106 and carrying at its outer end a depending spring-pressed pawl 170, which engages a ratchet-wheel 171, keyed to the rod 106. The solenoid 167 being provided with the usual shunt-switch and connections and a compression-spring, all as described in connection with solenoids 117, acts upon the depression of the ruling-key to draw its core downwardly sufficiently to rotate the rod 106 the distance of one tooth. This movement of the rod through the several beveled gears already described in connection with Fig. 16 turns the platen the distance of one line.

The type-bars 122 are preferably provided with three type so arranged that each of the printing-keys will upon the proper shifting of the platen print small letters, capitals or numerals, and punctuation-marks. To shift the platen, a shaft 172 is journaled in standards 173 at the rear of the top and is provided with a plate 174 at each end beyond the standards. Rods 175 are eccentrically connected to these plates and pivotally connected to each end of the guide 103 for the carriage-supporting slide 102, carrying the platen. Keyed to the shaft 172 is a circular disk 176, (seen in detail in Fig. 18,) in the periphery of which is provided four rectangular notches 177 and four ratchet-teeth 178, spaced equidistantly. The shift-key controls the stop opposite the second contact-plate 15 and controls the circuit connections to a solenoid 179, connected to the under side of the top and provided with a shunt-switch and connections and compression-spring like solenoids 117. This solenoid has a core 180, pivotally connected to a bar 181, provided at its upper end with an elongated slot 182, into which projects a pin 183, carried by an arm 184, loosely journaled on the shaft 172. This arm carries a depending pawl 185, adapted to engage the teeth 178. The bar 181 carries a shoulder 186, having a slanting upper edge and a squared under face which is adapted to engage one end of a locking-lever 187, pivotally mounted in an extension 188 of one of the standards 173 and provided at its other end with a bent portion adapted to engage in one of the notches 177.

In operation the compression-spring 189 normally holds the parts in the position shown in Fig. 18. When the shift-key is operated, the solenoid 179 draws the bar 181 downwardly. For the first part of its stroke, before the upper end of slot 182 engages the pin 183, the bar acts through the shoulder 186 to strike the locking-lever 187 and move it out of engagement with the notch 177 to the position shown in dotted lines, after which the arm 184 and its dog 185 are moved downwardly and by engagement with a tooth 178 move the shaft and the eccentric plates 174 a quarter-revolution. The shoulder 186 will pass by the locking-lever on its downstroke, and its slanting upper face will permit it to ride by the lever on its upstroke.

It will be seen that by reference to Fig. 20 that the plates 174, by means of eccentric bars 175, are capable of shifting the guide 103 to three positions. When the plate swings the bar farthest to the rear, the platen will be in position to print small letters, when the plate swings upwardly one-quarter revolution the platen will be in its intermediate position to print capitals, and when the plate is shifted another quarter-revolution the eccentric bars will move the platen and its eccentric to its extreme forward position to print numerals or punctuation-marks. If the plates be advanced another quarter-revolution, the platen is moved back to its intermediate position for printing capitals. If the platen is set to print small letters, one depression of a key will move it to print capitals and two depressions for numerals. A small indicator may be provided, which is moved by one of the eccentric bars to indicate the position of the platen and to show the operator how many depressions of the shift-key are necessary to move the platen to the desired position.

Having thus described the manner of operation of an electrically-controlled type-writer constructed in accordance with my invention, I will now show how it is perfectly adapted for use where a number of machines are disposed at distant points and are connected up in circuit so that they may be controlled by the operation of the machine serving as the transmitting type-writer and all print the same matter. This arrangement is indicated in Fig. 4, where it will be seen that the main-line circuit, including the battery B' and the relay-magnet 38 in the transmitting-machine, also includes the relay-magnet 38' of a receiving-machine. This main-line circuit may include as many receiving-machines as desired, each being provided with a magnet 38', included in that circuit. The controller-circuits *a b* of the secondary machines, which include the solenoids 33', are broken, since the switch-arm 27 will not be closed, and the anvils 34' will all drop to close the switches C' and cut the relay-magnets 38' into the main-line circuit. This main-line circuit is made and broken at the switch C' of the transmitting-machine, with the result that all of the magnets 38 38' are synchronously energized and deënergized. These several magnets in the manner already described will through the switches D and D' control the make and break of several local circuits to the solenoids 41. As these several solenoids reciprocate their cores the several selector-arms in all of the machines are simultaneously and synchronously advanced

over the contact-plates, and when the clutch-solenoids 67 of the transmitting-machines are energized by the contact of its selector-arm with the raised stop the main-line circuit is simultaneously locked in its make or break position, whereupon the solenoids 70 of all of the machines are simultaneously cut out of circuit and the several local printing or operating circuits closed through the corresponding contact-plate in each machine. The several selector-arms can advance only the distance of one plate with each make or break of the main-line circuit, and therefore they will all be brought to rest by the same make or break, so that perfect synchronism is obtained. The several machines will then automatically and synchronously return their respective selector-arms to their initial position immediately after the closing of the desired operating-circuit and while the printing or carriage-shifting operation is going on. By permitting the selecting mechanisms to resume their initial or unison position during these operations a decided advantage is gained in the matter of synchronizing the mechanism and preventing the possibility of starting the selecting mechanism from other than their unison position. In fact, it is impossible to do this according to my invention, for neither the transmitting nor receiving mechanisms permit their selector-arms to engage the actuating-wheels 56 until they have resumed their unison position.

It is desirable to provide the printing-machines with a continuous paper-feed. To this end I provide supports 190, connected to one side of the top 2 and adapted to receive a roll of paper 191. The paper from this roll passes transversely of the machine to an angularly-disposed guide 192, connected to the carriage-frame. Paper leaves this guide in position to pass under the platen 100. To prevent the paper being jerked off the roll by the movements of the carriage, I provide a free roller 193, which rests on top of the paper midway between the roll 191 and the guide, its weight being sufficient to keep the paper pulled off the roll and to maintain sufficient slack between the roll and the carriage to prevent the latter jerking or tearing the paper.

Throughout the specification I have referred to the use of solenoids, but it will be understood that other electromagnet devices may be substituted.

As required by the patent statutes, I have described one operative mechanism which illustrates the principles of construction and operation which constitute my invention, but it will be understood that equivalent mechanisms may be substituted and the details of construction modified within the scope of my invention.

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

1. In electrically-connected printing-machines, a local-circuit-selecting mechanism for each machine comprising a sunflower and a movable switch coöperating therewith, a local controller-circuit for each selecting mechanism, electrically-controlled means included in each controller-circuit and adapted to operate said selecting mechanisms with synchronous step-by-step movements, electromagnetic devices to make and break said controller-circuits and which are connected together, and a key-controlled circuit in the transmitting-machine which includes devices to energize and deënergize the make-and-break devices for the local controller-circuits of both transmitting and receiving machines in unison.

2. In electrically-connected printing-machines, a relay-magnet for each machine included in a main-line circuit, a local controller-circuit for each machine which includes a local battery and a make-and-break switch adapted to be operated by one of said relay-magnets, local-circuit-selecting mechanisms comprising a sunflower and a movable switch-arm coöperating therewith electrically controlled by the action of said relay-magnets on the local controller-circuits and adapted to close corresponding local operating-circuits in the several machines, in combination with a make-and-break device which is cut into the main-line circuit to make and break it at the transmitting-machine only, and key-controlled mechanism which cuts said device into and out of service, its periods of operation varying for each key.

3. In a system of communication by electrically-connected printing-machines, the combination of a plurality of type-machines having printing mechanism controlled by local circuits, contact-plates for the local operating-circuits of each machine, a contact member which engages said plates, electrically-controlled means for moving the contact members of the transmitting and receiving machines in absolute synchronism, which means, responding to main-line current impulses of constant polarity, advance said arms to a different controlling position with each make and each break of said main-line circuit, keys at the transmitting-machine, and key-controlled means to make and break the main-line circuit a different number of times for each key.

4. The combination in a system of electrically-connected printing-machines, of a set of contact-plates for each machine, local operating-circuits connected to said plates, a contact-arm movable over said plates, electromechanical mechanisms included in local controller-circuits for controlling the forward travel of said arms of both transmitting and receiving machines in unison with a step-by-

step movement over said contact-plates, said mechanisms being in turn controlled by relay-magnets in a main-line circuit, a make-and-break device operating on the main-line circuit and key-controlled means at the transmitting-machine to start said make-and-break device from a unison-point and stop it after a determined number of makes and breaks, said electromechanical mechanisms being adapted to advance said arms into engagement with a different plate with each make or break of the main-line circuit, and means which act automatically when the contact-arms are stopped, to swing them freely back to unison position.

5. In a printing-telegraph, a circuit-selecting mechanism comprising contacts connected to local operating-circuits and a movable contact-arm, a local controller-circuit and mechanism controlled thereby to move said arm into engagement with said contacts, mechanism brought into operation by the depression of a key which rapidly makes and breaks said controller-circuit, causing said arm to advance step by step over said contacts, key-operated mechanism to arrest the travel of said contact-arm to close a local operating-circuit, means to hold said local operating-circuit open during the travel of said arm, and means included in each of said operating-circuits to effect the return of said arm to initial position.

6. In a printing-telegraph system, a machine comprising in combination a series of contacts, operating-circuits connected to said contacts, a contact-arm coöperating therewith, key-controlled means to stop said arm opposite each contact to close a local operating-circuit, means brought into action by the depression of a key which automatically breaks the circuit to said contacts and effects a step-by-step advance of said arm until it engages a stop, means to return said arm to its initial position, and an electromagnetic device, in a circuit closed upon the engagement of said arm with a stop, which closes the circuit to said contacts and brings said arm under the control of said returning means to restore it to initial position.

7. In a printing-telegraph system, a typewriter comprising keys, a set of contacts, a contact-arm coöperating therewith, stops controlled by said keys and adapted to arrest the travel of said arm in engagement with one of said contacts, electromagnetically-controlled means to advance said arm from its initial position, a spring to return said arm to initial position, and a circuit which is closed when the travel of said arm is arrested by one of said stops and which includes electromagnetic means to free said arm and permit said spring to return it to initial position.

8. A system of communication by means of electrically-connected printing-machines, said machines comprising in combination, a set of local-circuit contacts, a contact-arm for each set of contacts, a source of electricity, electromagnetically-controlled means to advance said arms step by step and in unison over said contacts, local operating-circuits leading from said contacts, means to simultaneously arrest the advance of all said arms by stopping the arm of the transmitting-machine, means to break the local operating-circuits during the arms' travel over the contacts and to automatically close corresponding operating-circuits through the arms when they come to a stop, and means to restore said arms to initial position immediately after closing an operating-circuit.

9. In a system of communication by electrically-connected type-writers, type-writers each comprising type-bars, a carriage, electromagnets for operating said parts, contacts, local operating-circuits connecting said electromagnets with said contacts, a contact-arm and a source of electricity, in combination with electrically-controlled mechanism to move the contact-arms of said machines with a synchronous step-by-step movement over said contacts, means to break the local operating-circuits to said contacts during the travel of said arms and close corresponding operating-circuits only when the arms stop, means to return the arms to initial position instantly after closing an operating-circuit, and means under the control of the electromagnet included in the operating-circuit last closed, which holds it energized, until it has completed its function.

10. In a system of communication by means of electrically-connected printing-machines, a machine comprising in combination, a local-circuit-controlling contact-arm, a toothed wheel to move said arm, electromagnetic means to control the travel of said toothed wheel, a mechanism to automatically disengage said arm from said wheel and restore it to initial position immediately after closing a local operating-circuit, an electromagnet for operating a printing device included in said local circuit, and auxiliary means to energize said magnet after said arm has broken the local circuit, substantially as described.

11. In a system of communication by electrically-connected type-writers, the combination of a set of contacts for said type-writers, a local operating-circuit connected to each contact, contact-arms which engage said sets of contacts and are moved in unison to temporarily close corresponding local operating-circuits in the several machines, means to hold the local circuits normally open, means to restore said arms to initial position immediately after closing a local operating-circuit, electromagnetic devices included in said local circuits, secondary circuits and means controlled by said magnetic devices to shunt the secondary-circuit cur-

rent through them and to break said circuit when the devices have completely functioned.

12. In a printing-telegraph system, electrically-connected printing-machines each comprising a local-operating-circuit-selecting mechanism which includes contacts and a movable contact-arm adapted to engage said contacts, operating mechanism for said arm which moves it out of engagement with a contact immediately after closing its respective local operating-circuit, an electromagnet for operating printing devices included in said local operating-circuits, and a switch closed by the instantaneous energization of each magnet and automatically opened when said magnet has completed its printing function. and secondary circuits including a local battery which are shunted through said magnets by the closing of said switches, as and for the purposes described.

13. In a system of communication by electrically-connected type-writers, the combination of a plurality of sets of contacts, a plurality of local circuits connected to each set of contacts, contact-arms which engage said contacts and are moved in unison to temporarily close corresponding local operating-circuits in the several machines, means to automatically break said local operating-circuits during the travel of said arms, means to close a local operating-circuit in each machine when the arm is stopped, a printing-magnet included in said local circuit, means to instantaneously break said local operating-circuit in each machine and restore the arms to initial position while said printing-magnets are performing their function, and means to shunt current through said magnets during the return travel of said arms.

14. In a printing-telegraph, a local-circuit-selecting mechanism comprising a shaft, a contact-arm carried by said shaft, a series of contact-plates with which said arm engages, a spring means to advance said arm with a step-by-step movement over said plates, means to disengage said arm from said spring means, and means to effect a free and instantaneous return of said arm to its initial position after disengagement from said spring means.

15. In a printing-telegraph, a local-circuit-selecting mechanism comprising a shaft, a contact-arm carried by said shaft, a series of contact-plates with which said arm engages, a toothed wheel normally in engagement with said arm, a spring which tends to move said wheel in one direction, an electromagnetic device in a circuit controlled by said arm which disengages said arm from said toothed wheel, a coiled spring, connected to said shaft and wound up by its movement with said wheel, which restores said arm to its initial position when it is disengaged from said wheel.

16. In a printing-telegraph, a local-circuit-selecting mechanism comprising a contact-arm, a series of contacts, a solenoid in a local circuit controlled by said arm, and a core for said solenoid with which said contact-arm is connected and by which it is moved out of engagement with said contacts, substantially as and for the purposes described.

17. In a printing-telegraph, a local-circuit-selecting mechanism comprising contact-plates, a contact-arm in engagement therewith, a solenoid having a core which supports said arm, a spring connected to said core and adapted to counteract movements thereof which tend to advance said arm over said contact-plates or disengage it therefrom, means to advance said arm over said plates, and means to arrest said arm and close a determined local circuit and a circuit including said solenoid, said core being moved by the solenoid when energized to free said arm and permit said spring to return it to initial position.

18. In a printing-telegraph, a local-circuit-selecting mechanism comprising contacts, a contact-arm, a toothed wheel with which said arm normally engages, a spring to turn said wheel and advance said arm over said contacts, means to wind said spring as the toothed wheel is advanced thereby, a solenoid included in a circuit controlled by said arm and adapted to disengage it from said wheel, and means to restore said arm to initial position before permitting it to again engage said wheel.

19. In a printing-telegraph, a local-circuit-selecting mechanism comprising contact-plates, a contact-arm adapted to engage said plates, a rotatable element with which said arm is normally in engagement and by means of which it is moved over said contact-plates, an electromagnetic device, in a circuit controlled by said arm, which disengages said arm from said element, means to return said arm to initial position before it reëngages said element, and local-circuit connections controlled by said device and arm and adapted to hold said arm free of said element until it has reached its initial position.

20. In an electromechanical type-writer, a set of keys, a local-circuit-selecting mechanism, a make-and-break device included in a controlling-circuit for said mechanism, electromagnetic means to start and stop said device, a circuit including said device, a source of electrical energy and a switch closed by the depression of each key, and mechanism to hold said switch closed after the release of said key and until said selecting mechanism resumes its initial position.

21. In a printing-telegraph system, an electromechanical type-writer comprising, in combination, manually-operated keys, a local controller-circuit closed by said keys, an automatic make-and-break device included in

said circuit, an electromagnetic device included in a circuit controlled by said make-and-break device, a plurality of contacts and local operating-circuits connected therewith, and a selector-arm which is advanced to position for closing any determined local operating-circuit by said electromagnetic device, said device advancing said arm from one to another circuit-controlling position with each make or break of the controller-circuit.

22. In an electromechanical type-writer, the combination of a type-writer base which carries the electromechanical controlling mechanism, a detachable top which carries the printing and operating mechanism, and a plurality of local-circuit connections between the controlling and operating mechanisms comprising contact members on said top and base which detachably engage and close said local circuits when said top is in place.

23. In an electromechanical type-writer, a circuit-selecting mechanism comprising a movable selector-arm, local-circuit contact-plates, a plurality of stops adapted to arrest said arm in its travel over said contact-plates, key-controlled means to operate said stops, a stop lock-plate adapted to engage a stop and hold it, when operated, in the path of said arm, while the other stops are locked against operation, and means which act upon the closing by said arm of a local circuit to free said stops from said lock-plate.

24. In an electromechanical type-writer, the combination with a plurality of key-operated stops, of a contact-arm which engages said stops, operating means for said arm, a spring-pressed lock-plate for said stops, a catch operated by a key, when depressed, which permits said lock-plate to move and lock the stop, operated by the key last depressed in position to engage said contact-arm and prevent other stops being operated until the operating means for said arm restores it to initial position.

25. In a telegraph type-writer, an electrical make-and-break device including a solenoid, a core therefor, and a contact-piece adapted to be oscillated by said core through a lost-motion connection, a circuit closed by the depression of a key and alternately made and broken by said device, and local-circuit-selecting mechanisms which operate responsive to the operation of said device, as and for the purpose described.

26. In a telegraph type-writer, type-bars, a platen-carriage, spacing mechanism therefor, an electromagnet for actuating said mechanism, a circuit for said magnet including a source of electrical energy and a switch, said switch comprising two contact members, one of which is engaged by said type-bars just before they strike said platen and is moved thereby to cause said spacing mechanism to advance the carriage a space, in combination with a key-controlled circuit including an electromagnet adapted to disengage said spacing mechanism from the carriage at any point in its travel, substantially as described.

27. In a telegraph type-writer, type-bars, a platen-carriage, spacing mechanism therefor, a solenoid having a spring-pressed core which operates said mechanism, a circuit for said solenoid including a source of electrical energy and a switch in said circuit comprising contact members, one of which is engaged and moved by said type-bars just before they strike the platen to cause said solenoid to automatically space the carriage, in combination with a spacing-key, and an electromagnet controlled thereby in a local operating-circuit and adapted to move one of said contact members to cause said spacing mechanism to advance the carriage a space, in combination with a key-controlled circuit including an electromagnet adapted to disengage said spacing mechanism from the carriage at any point in its travel, substantially as described.

28. In a system of electrically connecting printing-machines, a selecting mechanism comprising a contact-arm, a set of contacts, local operating-circuits leading from said contacts, a switch to break said circuits, a solenoid having a core adapted to normally close said switch, a switch in the circuit including said solenoid, and key-controlled mechanism to advance said arm over said contacts and act on said latter switch to hold said solenoid energized and open the switch controlled thereby during said advance of said arm, said switch in the solenoid-circuit automatically breaking the circuit to the solenoid when said arm's advance is stopped, to close a local operating-circuit.

29. In a printing-telegraph instrument, a local-circuit-selecting mechanism comprising a set of contacts, a contact-strip adjacent to said contacts, an arm carrying a contact-wheel adapted to engage said strip and contacts, electromagnets, for operating printing devices, connected to said contacts, and controller mechanism for moving said wheel into engagement with any desired contact and closing a circuit from a local battery through said strip and contact to a printing-electromagnet.

30. In a printing-telegraph instrument, a local-circuit-selecting mechanism comprising a contact-strip, separate contacts, a selector-arm carrying a contact member insulated therefrom and adapted to engage said strip and plates to close local operating-circuits, electrically-controlled mechanism for advancing said arm step by step over said contacts, stops to arrest the movement of said arm, and a local circuit, closed through said arm and stop, which includes electrical means to cut said arm-advancing mechanism out of service.

31. In a printing-telegraph instrument, a local-circuit-selecting mechanism comprising a set of contacts, a movable contact-arm, stops for said arm, a spring-pressed lock-plate for said stops, devices, engaged by a key when depressed, which raise a stop and release said lock-plate to spring into engagement with said stop, and means to automatically restore said lock-plate and arm to initial positions after a local operating-circuit has been closed.

32. In a printing-telegraph, local-circuit contacts, a selector-arm movable thereover, keys, stops for said arm which are operated by said keys, a spring-pressed lock-plate for said stops, a key-operated catch which releases said plate when a key is depressed, a step-by-step actuator for said selector-arm, means to disengage said arm from said actuator after engagement with a stop, and means operated by said disengaging movement of the arm to restore said plate to initial position where it is held by said catch.

33. In a printing-telegraph, a local-circuit-selecting mechanism comprising contacts and a movable selector-arm, an actuator to advance said arm with a step-by-step movement, key-controlled stops to arrest the travel of said arm, a local circuit closed by the engagement of said arm with a stop, and electromagnetic means in said circuit which arrests said actuator when said arm engages a stop.

34. In a circuit-selecting mechanism, an escapement, an escapement-wheel, a coiled spring connected thereto, a barrel for said spring, and a solenoid having two spring-retracted cores, one connected to said escapement and one to a device for winding said spring as the escapement-wheel unwinds it, a contact-arm movable with said escapement-wheel, and mechanism to control the circuits to said solenoid.

35. In a printing-telegraph instrument, a platen-carriage, mechanism to feed said carriage forward, a spring to return the carriage, an electromagnet in a key-controlled circuit, and a device moved by said magnet which disengages said carriage from said feed mechanism, said carriage engaging said device at the end of its return travel and moving it to permit said feed mechanism to again act on said carriage.

36. In a printing-telegraph instrument, a platen-carriage, a double rack-bar fixed thereto, feed mechanism comprising spring-pressed pawls engaging said bar and means to move one of said pawls and advance the carriage, a return-spring for the carriage, a cam-bar adapted to engage said pawls and move them out of engagement with said bar and permit said spring to return said carriage, said cam-bar being adapted to be engaged by said carriage at both ends of its travel for the purposes described, and a solenoid included in a local key-controlled circuit and provided with a free core connected to said cam-bar and adapted to disengage said pawls from said rack-bar at intermediate points in the travel of the carriage.

37. In a system of electrically-connected printing-machines, a printing-machine comprising, in combination, electrically-controlled printing mechanism, a platen-carriage, an endless ribbon, feed-rolls for said ribbon to move it during the forward movement of said carriage, guide devices for the ribbon comprising a set of guide-rollers around which the main portion of the ribbon is wound, means to receive the ribbon from said rollers and deliver it in position for printing on said platen, and stationary guide devices to twist the ribbon and deliver it to the feed-rolls from whence it continues back to the first-mentioned set of rollers.

38. In a system of electrically-connected printing-machines, a machine comprising electrically-controlled printing mechanism, a platen-carriage, mechanism for shifting said carriage to adapt said printing mechanism to print small letters or capitals, said carriage-shifting mechanism comprising an eccentric bar, connections therefrom to said carriage, an electromagnet in a key-controlled circuit, a core for said magnet, an element fixed on said eccentric bar and adapted to be engaged and rocked by said core as it moves in one direction, said rocking movement acting to shift said platen from one printing position to another printing position, and means to return said core to its position for engaging said element after each operation thereof.

39. In a printing-telegraph instrument, a platen-carriage, a rocker-shaft, arms eccentrically connected to said shaft and pivotally connected to said carriage, a toothed disk fixed on said rocker-shaft, a solenoid, a core therefor carrying a dog which engages a tooth on said disk as it moves in one direction and passes to the next tooth in its return movement, means to return said core, means to energize said solenoid comprising a local operating-circuit and key-controlled means to close said circuit, and printing devices which coöperate with said platen.

40. In a system of electrically-connected printing-machines, a platen, electrically-controlled means to rule said platen, supports at the side of the machine for a roll of paper, an angularly-disposed guide around which said paper is passed and which turns it in position to pass under said platen, and a weight on said paper between the roll and guide, substantially as described.

41. In a printing-telegraph instrument, a set of contacts, a movable contact-arm, local operating-circuits connected to said contacts, a device to break said circuits which is controlled by a circuit including a switch, said

switch comprising a contact and a spring-contact arm coöperating therewith and provided with a cam-shoulder, a solenoid which controls the movements of said contact-arm, a core for said solenoid adapted to engage said cam and hold said switch closed during its movements, and key-controlled means to cause said core to be rapidly reciprocated and hold said switch closed until its movements are arrested.

42. In a printing-telegraph, an electrically-controlled step-by-step actuator, a sunflower, a selector-arm coöperating with said sunflower and adapted to be advanced thereover by said actuator, electromagnetic means, in a circuit controlled by said arm, which automatically disengages it from said actuator to permit its restoration to initial position cotemporaneously with the closing by it of a local circuit.

43. In an electrical printing-machine, the combination with a local circuit-selecting mechanism, of a step-by-step actuator therefor, local circuits adapted to be closed by said mechanism, a magnetic device for disengaging said selecting mechanism and actuator to effect the restoration of said mechanism to initial position, a circuit which includes the selecting mechanism and said magnetic device, a circuit-breaker in said latter circuit which holds it open during the operation of said selecting mechanism and simultaneously energizes said magnetic device and closes a local circuit as the travel of said selecting mechanism is arrested.

44. In a printing-telegraph system, type-writing machines comprising each a local circuit-selecting mechanism which includes a sunflower and selector-arm, electrically-controlled devices to advance said arm, a coiled spring which acts both to hold said arm in engagement with said advancing means and to freely restore it to initial position when released from said latter means, and electrically-controlled means to release said arm from said advancing means after it has advanced a determined distance.

45. In a printing-telegraph, a local circuit-selecting mechanism comprising a row of contacts connected to local operating-circuits, a contact-strip adjacent to said contacts, a movable arm carrying an insulated contact-wheel adapted to close circuit between said strip and contacts, a plurality of stops, a stop-plate, a local circuit which includes said plate and arm and is closed when said parts both engage a stop, an electrically-controlled actuator to advance said arm, an interrupter in the circuit controlling said actuator, and electrically-operated means in the circuit closed through said arm and a stop which stops said interrupter substantially simultaneously with said arm.

46. In a type-writing machine, type devices adapted each to print two or more indicia, in combination with a platen, and electrically-controlled rotatable means for adjusting said platen and devices relatively to print from different indicia.

47. In a type-writing machine, type devices adapted each to print two or more indicia, in combination with a platen, eccentric means connected thereto and adapted to adjust said platen for printing from different indicia, electrically-controlled means to turn said eccentric means in one direction only, and means to arrest said eccentric in given positions to hold said platen in proper printing positions with relation to the several sets of printing indicia.

48. In a set of electrically-connected type-writers comprising printing devices provided with two or more separate sets of indicia, a platen adapted to print from one or the other of said sets of indicia in each machine, electrically-controlled mechanisms which adjust said platens and devices to different printing positions in rotation, and a shift-key at the transmitting-machine which controls, by the number of times it is depressed, the synchronous adjustment of said platens and devices to any desired printing position.

49. In a printing-telegraph, a printing-carriage, spring means to return it to initial position, electrically-controlled means to advance and release said carriage, a rod on which said carriage slides, a support for said rod which carries a cylinder concentric with said rod and opening inwardly, a piston on said carriage which enters said cylinder at the end of the carriage's spring-controlled return travel.

50. In a system of electrically-connected printing-machines, a type-writing machine comprising a laterally-movable paper-carriage, supports at one side of the machine, a paper-roll journaled in said supports and disposed so as to feed the paper in the direction of the travel of said carriage, a platen on said carriage, a guide, movable with said carriage, over which said paper passes and by which it is twisted to present it properly to said platen which is disposed transversely of the machine.

51. In a system of electrically-connected type-writers, a secondary machine comprising a transversely-movable platen, a paper-roll journally supported at the side of the machine and disposed so as to feed the paper transversely of the machine, and movable guide means to draw the paper off said roll, twist said paper, and feed it to said platen.

52. In an electrical type-writer, a movable paper-carriage carrying a rotatable platen, a ruling mechanism comprising a rotatable shaft, a gear loosely splined to said shaft, means to engage said gear and move it with said carriage along said shaft, means to ro-

tate said shaft, and means to transmit motion from said gear to said platen, for the purposes described.

53. In an electrical type-writer, a movable paper-carriage carrying a rotatable paper-roll, a shaft on which said carriage slides, a gear-wheel loosely splined to said shaft so as to be freely adjustable lengthwise thereof, a housing on said carriage which engages said gear and moves it along said shaft with the carriage, transmission means to impart rotary motion from said gear to said paper-roll, and electrically-controlled means to rotate said shaft.

54. In an electrical type-writer, a platen, a ribbon, a swinging guide for the ribbon, a flexible contact-piece normally in engagement with said guide, a spacing-circuit closed by the engagement of said contact-piece and guide, means included in said circuit which advance the platen when the circuit is broken, type-bars adapted to engage said guide as they move to print and break said circuit, and a spacing-magnet, in a key-controlled circuit, which is connected to one of said parts normally engaging and is adapted to separate them to break said spacing-circuit.

55. In a system of electrically-connected type-writers, machines each comprising a selecting mechanism which moves responsive to current impulses in a local controller-circuit, an interrupter for said circuit controlled by a circuit common to the several machines, an electromagnetic clutch for each interrupter which stops them synchronously under the control of said selecting mechanisms.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

CHARLES J. MENASCO.

Witnesses:
THOS. J. WINGFIELD,
NOMIE WELSH.