No. 862,402. PATENTED AUG. 6, 1907.

C. L. KRUM.

PRINTING TELEGRAPH.

APPLICATION FILED OCT. 6, 1904.

8 SHEETS—SHEET 1.

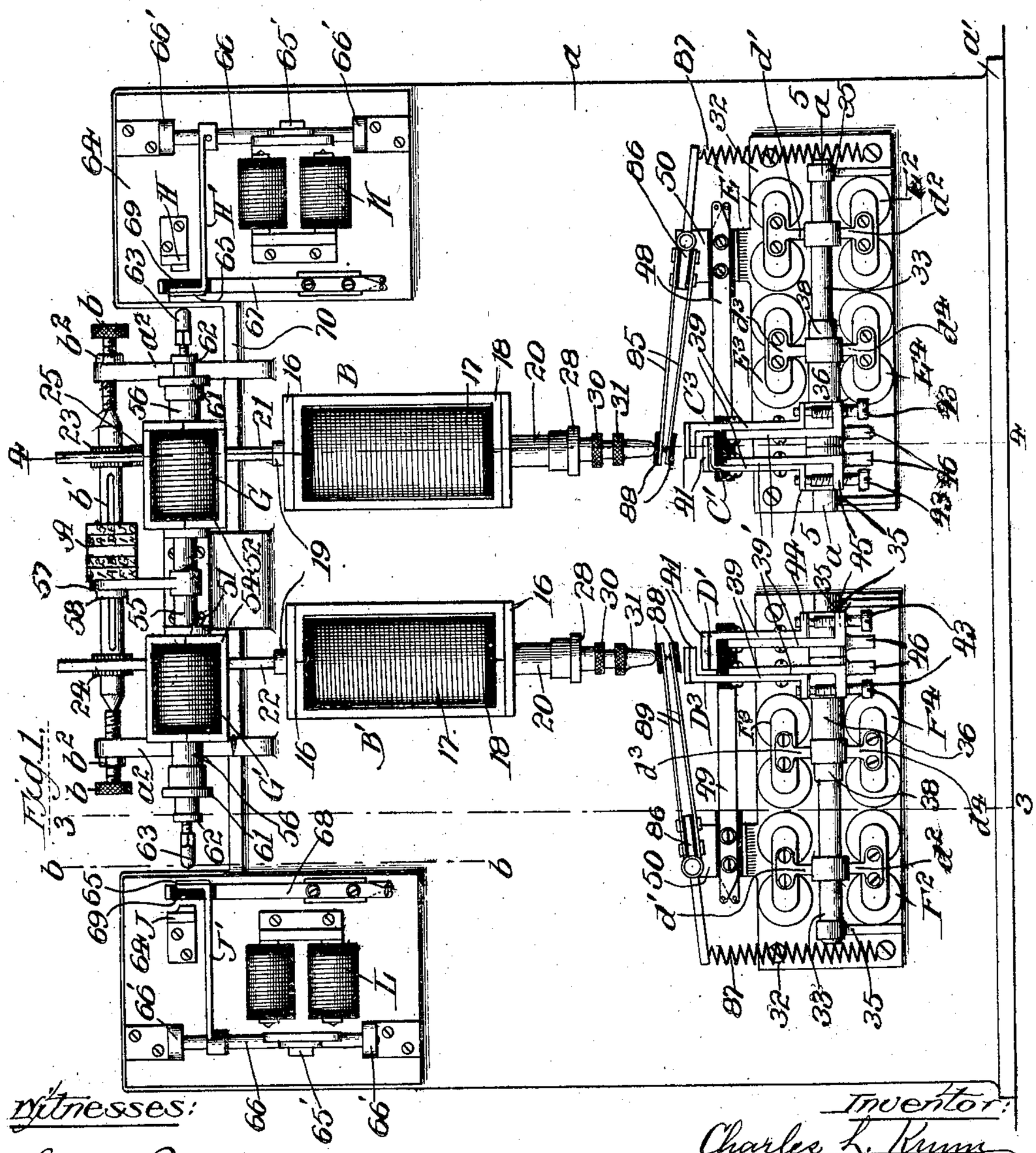

Fig. 1.

Witnesses:

Lillian Prentice

Lulu L. Ritter

Inventor:

Charles L. Krum

By Pierce & Fisher

Attys.

No. 862,402. PATENTED AUG. 6, 1907.

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8 SHEETS—SHEET 2.

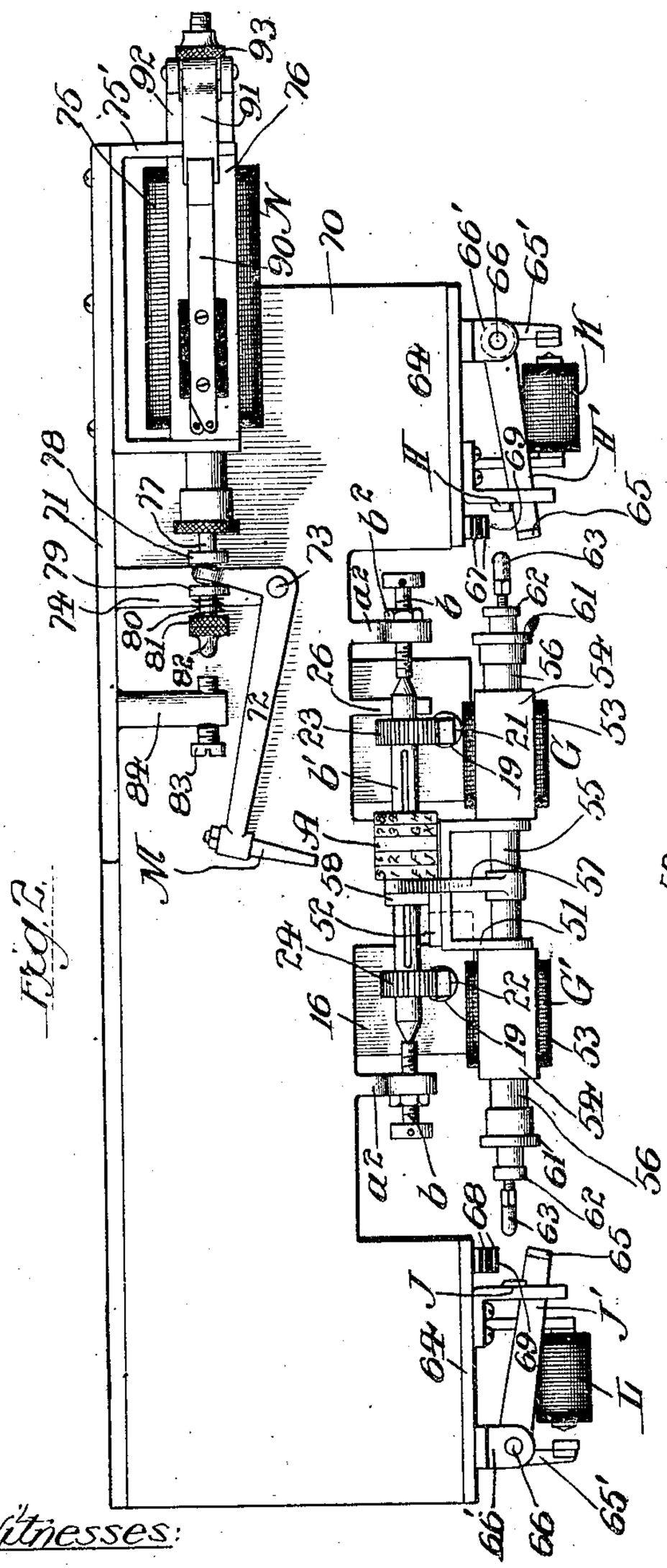

Fig. 2.

Fig. 2a.

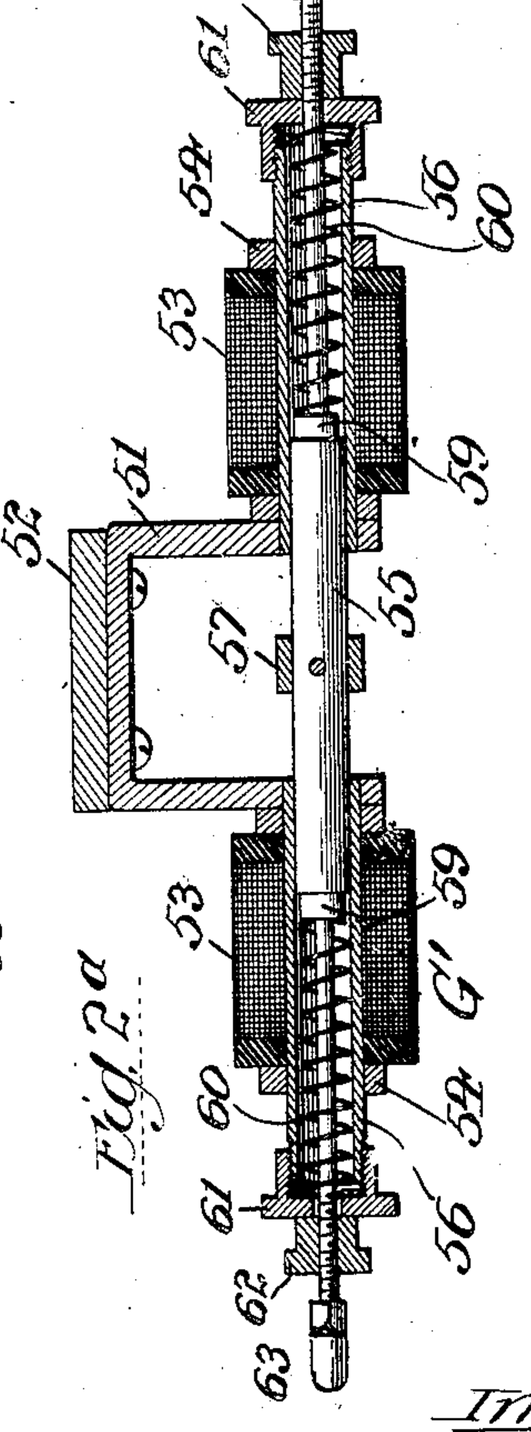

Fig. 2b.

Witnesses:

Lillian Prentice

Luke S. Alter

Inventor:

Charles L. Krum

By Pierce & Fischer

Attys.

No. 862,402. PATENTED AUG. 6, 1907.

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8 SHEETS—SHEET 3.

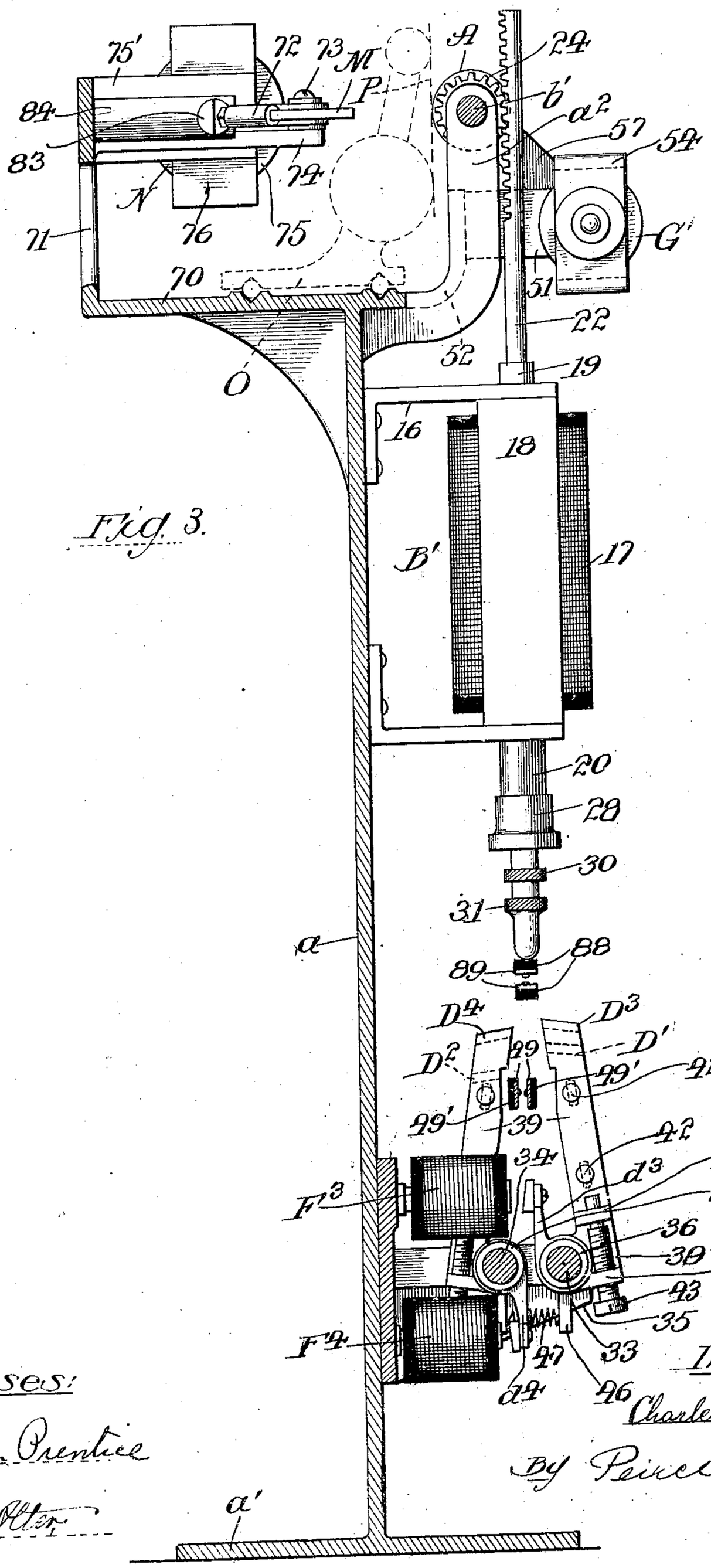

Fig. 3.

Witnesses:

Lillian Prentice

Lulu L. Ritter

Inventor:

Charles L. Krum

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8 SHEETS—SHEET 4.

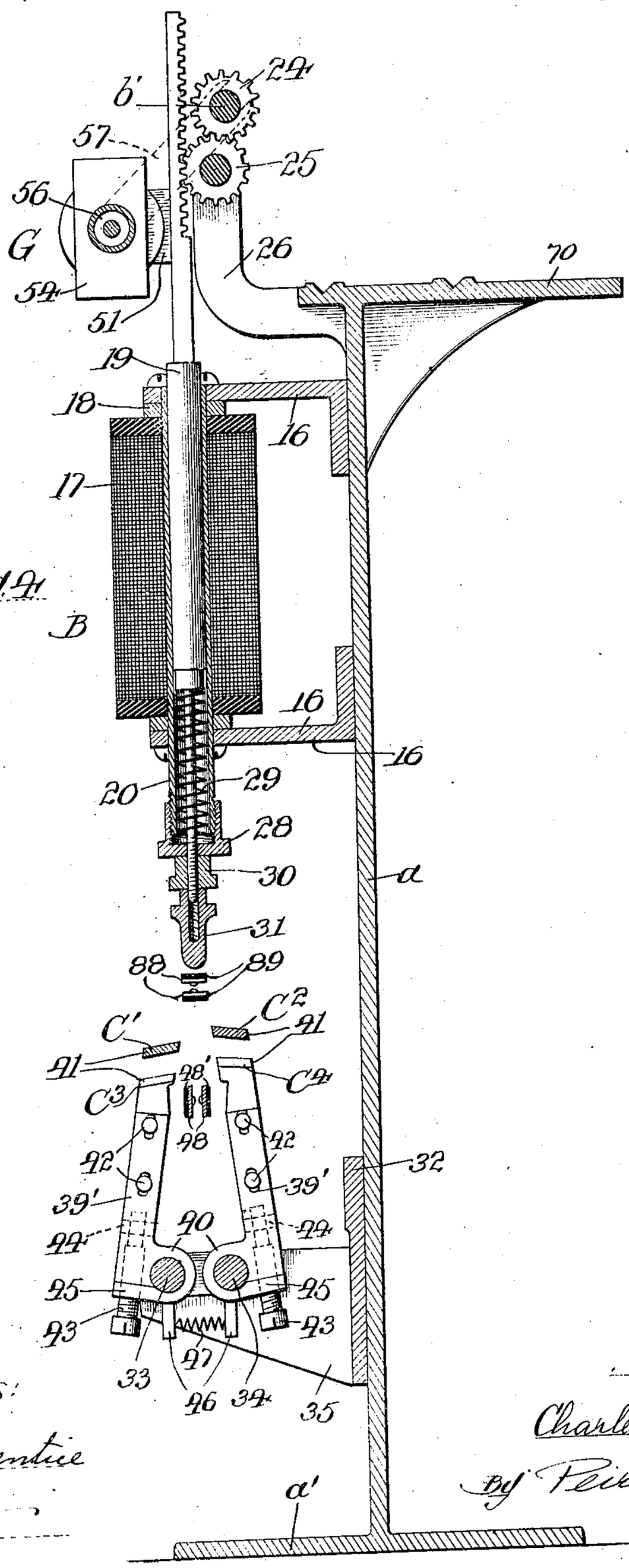

FIG. 4.

Witnesses:

Lillian Prentice

Leto L. Fisher.

Inventor.

Charles L. Krum

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PRINTING TELEGRAPH.

APPLICATION FILED OCT. 6, 1904.

8 SHEETS—SHEET 5

Fig. 5.

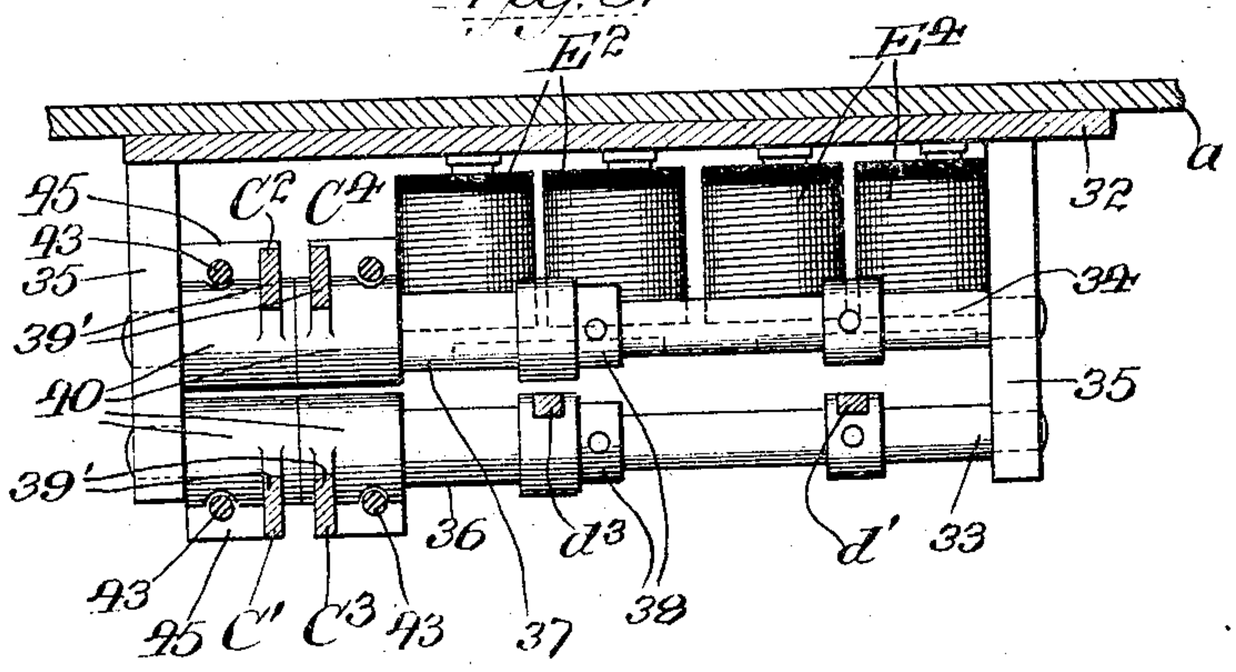


Fig. 5a

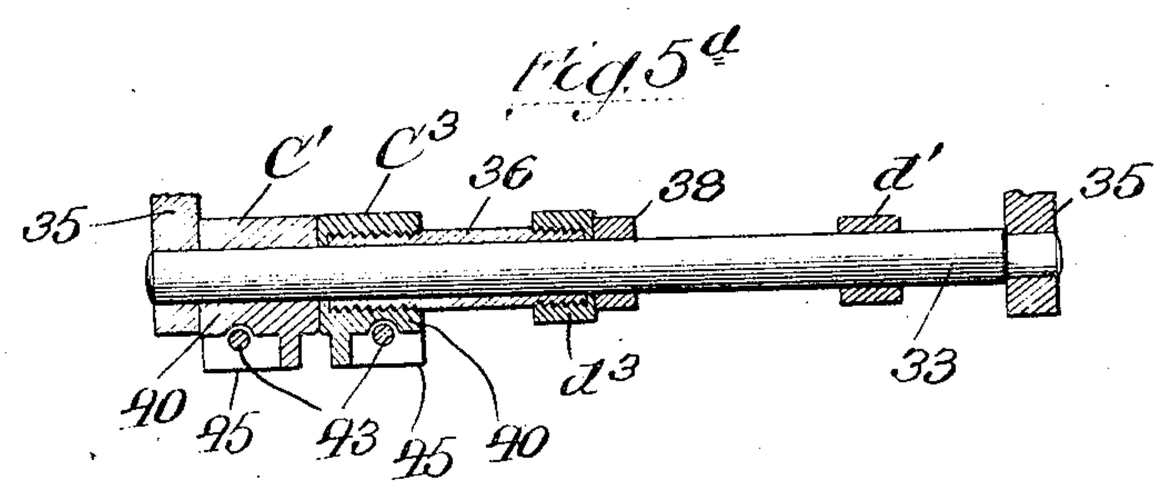
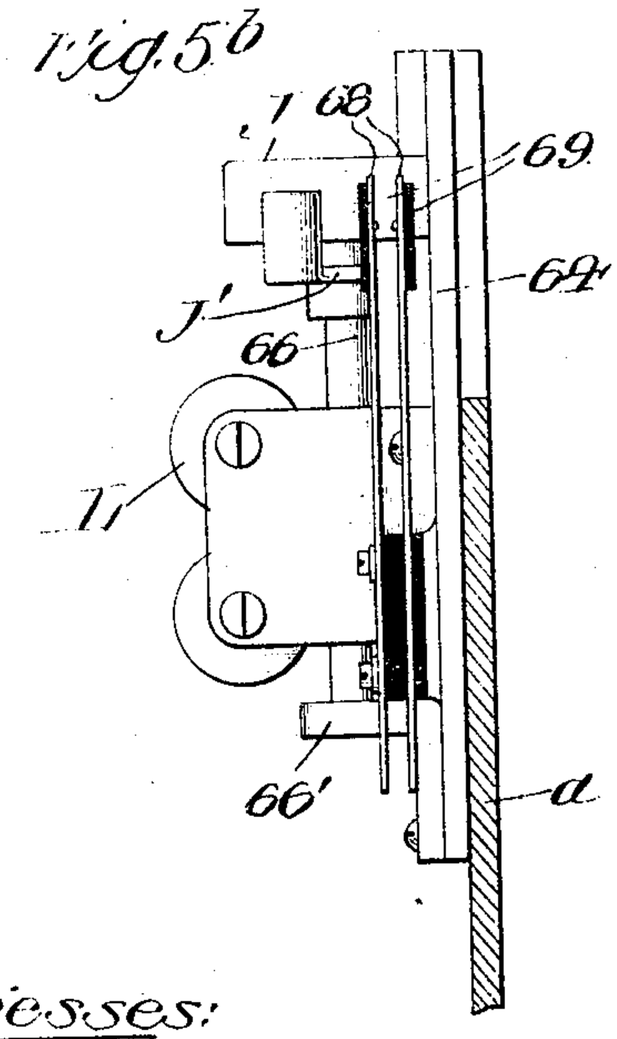


Fig. 5b



Witnesses:

Lillian Prentice

Luis S. Alter.

Inventor:

Charles L. Krum

By Peirce & Fisher

Attys.

No. 862,402. PATENTED AUG. 6, 1907.

C. L. KRUM.

PRINTING TELEGRAPH.

APPLICATION FILED OCT. 6, 1904.

8 SHEETS—SHEET 6

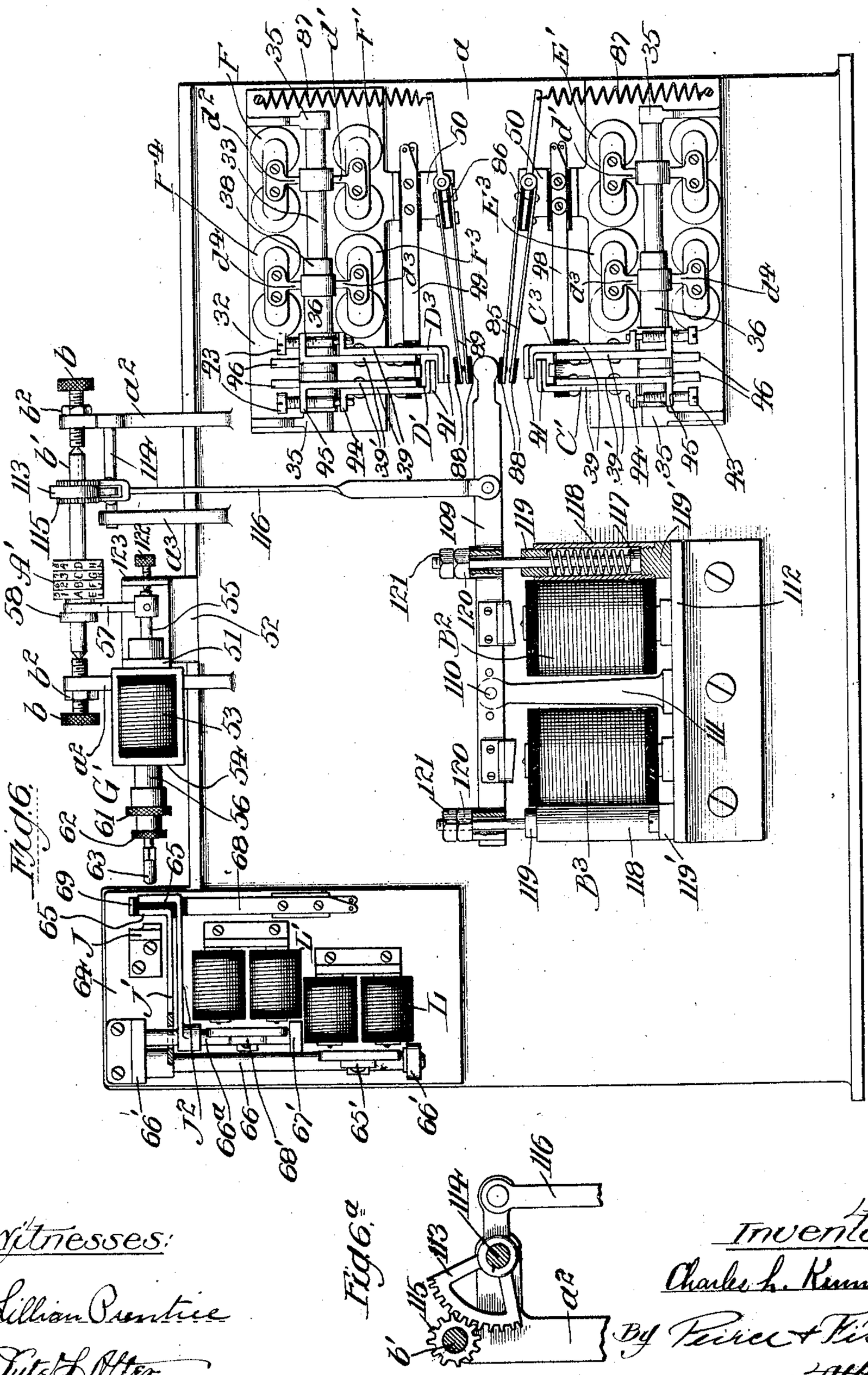


Fig. 6.

Fig. 6a.

Witnesses:

Lillian Prentice

Lulu L. Otter

Inventor:

Charles L. Krum

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Attys.

No. 862,402. PATENTED AUG. 6, 1907.

C. L. KRUM.

PRINTING TELEGRAPH.

APPLICATION FILED OCT. 6, 1904.

8 SHEETS—SHEET 7.

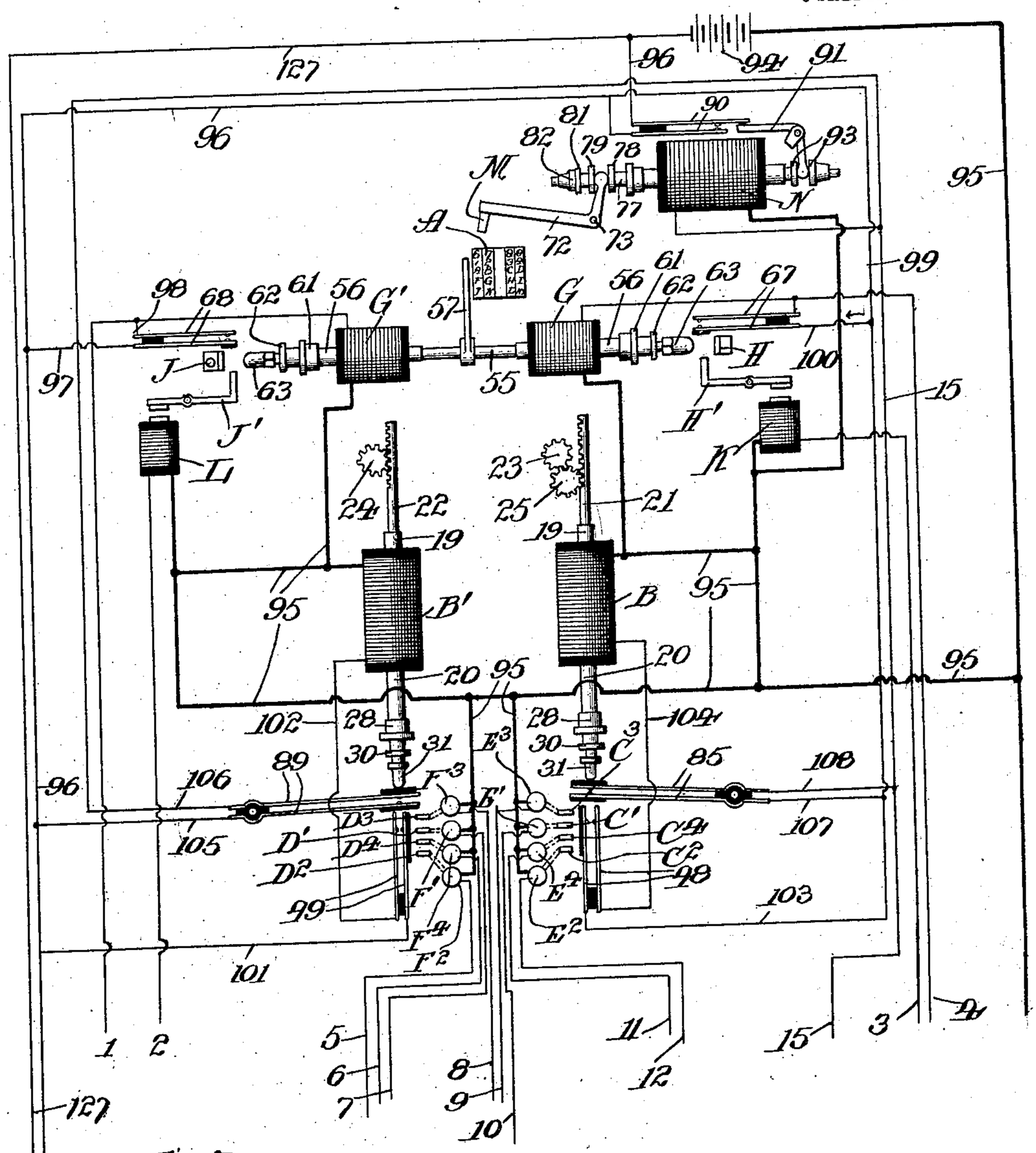

Fig. 7.

Witnesses:

Lillian Prentice

Luther S. Otter

Inventor:

Charles L. Krum

By Peirce & Fischer

Att'ys.

No. 862,402. PATENTED AUG. 6, 1907.

C. L. KRUM.

PRINTING TELEGRAPH.

APPLICATION FILED OCT. 6, 1904.

8 SHEETS—SHEET 8.

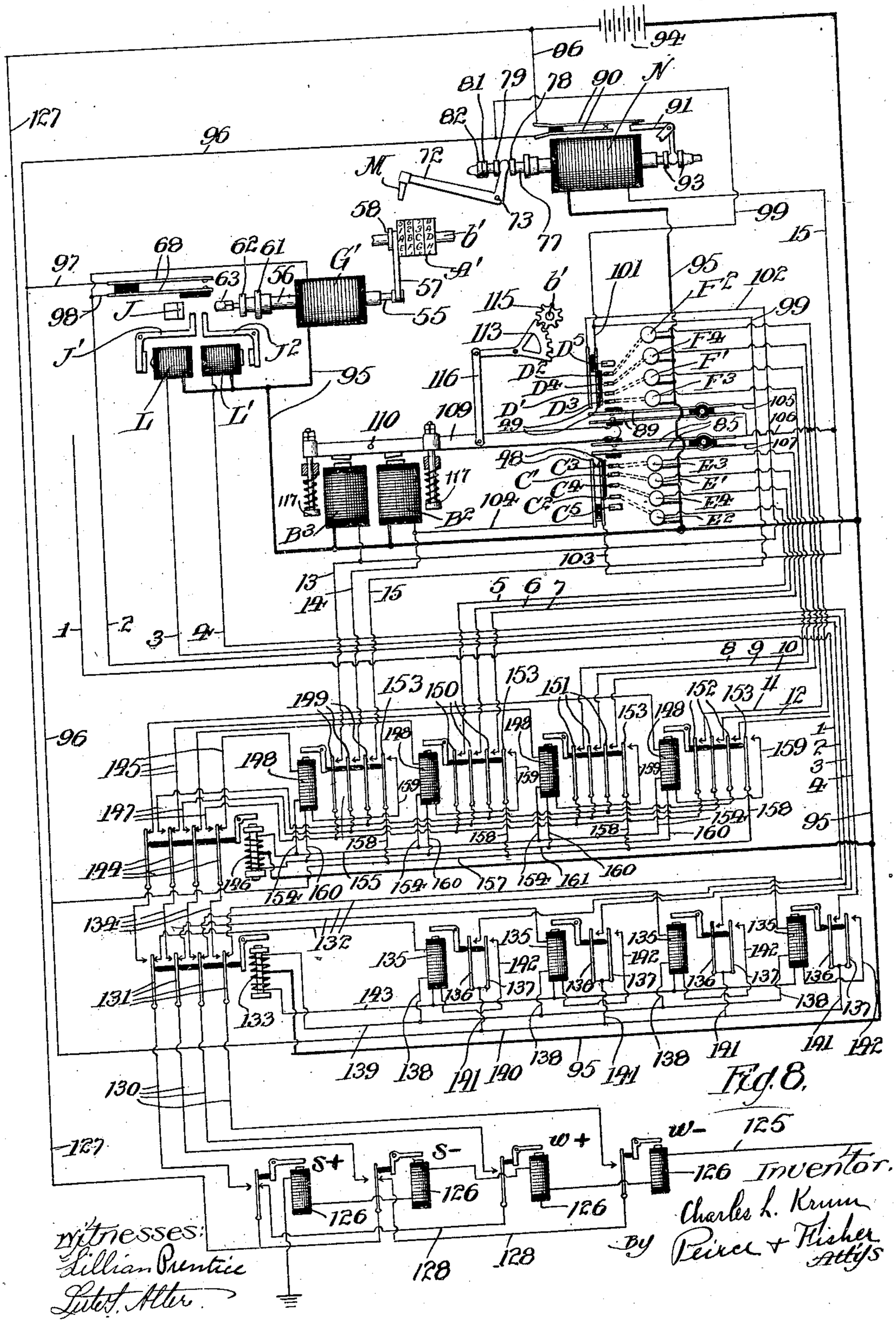

Fig. 8.

Witnesses:
Lillian Prentice
Luteo. Alter.

Inventor.
Charles L. Krum
By Peirce & Fisher
Attys

UNITED STATES PATENT OFFICE.

CHARLES L. KRUM, OF CHICAGO, ILLINOIS.

PRINTING-TELEGRAPH.

No. 862,402. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed October 6, 1904. Serial No. 227,467.

To all whom it may concern:

Be it known that I, CHARLES L. KRUM, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is declared to be a full, clear, and exact description.

The improvement relates to printing apparatus and controlling electric devices for automatically recording telegraphic messages and seeks to provide a simple and effective arrangement which will operate with rapidity and certainty.

The invention consists in the features of construction, combinations and arrangements of parts hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings: Figure 1 is a front elevation of the improved telegraphic printing apparatus. Fig. 2 is a plan view thereof. Fig. 2^a is a horizontal section of the side shifting devices for the type wheel or carrier. Fig. 2^b is a view in elevation of the printing hammer magnet. Figs. 3 and 4 are detail sections on lines 3—3 and 4—4 respectively of Fig. 1 illustrating the shifter mechanism for rotating the type wheel. Figs. 5, 5^a and 5^b are detail sections of parts taken on lines 5—5, *a*—*a* and *b*—*b* respectively of Fig. 1. Fig. 6 is a front elevation of a modified form of the invention. Fig. 6^a is a detail view of parts shown in Fig. 6. Fig. 7 is a diagram of the operating circuits for the form shown in Fig. 1. Fig. 8 is a diagram of the operating circuits for the form shown in Fig. 6, and of the controlling electric selecting means.

The apparatus may be mounted upon any suitable frame. In the form shown, the frame comprises an upright plate *a*, having a suitable base section or foot *a'*. At the upper part of the frame are arranged a pair of uprights a^2 offset in front of the frame plate, as shown in Figs. 3 and 4. Pivot screws *b* adjustably threaded through the uprights a^2 engage the cone-shaped ends of a horizontal shaft *b'* which carries the type-carrier or wheel A. Lock-nuts b^2 hold the pivot screws *b* in adjusted position.

Type-wheel A is preferably provided with a plurality of rows of type and is keyed to rotate with shaft *b'*, but is free to shift laterally thereon. Suitable shifter mechanism is provided for rotating and laterally shifting the type wheel to bring any of the type thereon to the printing point. In the form shown in Fig. 1, the shifters for rotating the type-wheel are actuated by a pair of electro magnets preferably in the form of solenoids B, B'. These solenoids are alike in construction and each is supported upon the front of frame plate *a* between a pair of brackets 16. Each solenoid comprises a vertically disposed spool 17 surrounded by a rectangular piece 18 of soft iron and having a shiftable core-piece 19 of soft metal. Each core 19 is arranged to slide within a tube 20 of brass or other suitable non-magnetic material which extends through the spools of the solenoids and projects below the same to a considerable extent.

The solenoid cores 19 are provided with toothed racks 21 and 22 at their upper ends which coöperate with pinions 23 and 24 on opposite ends of shaft *b'* to rotate the type-wheel in opposite directions. In the form shown, an intermediate or idle pinion 25 is journaled upon an offset upright or lug 26, which projects from the upper end of the frame plate *a* (see Fig. 4) and this idler is interposed between the rack 21 and the pinion 23. The spools 17 of the solenoids B, B' are so wound that when energized the cores 19 and the racks 21 and 22 are drawn downwardly, and by properly energizing one or the other of said solenoids, the type-wheel may be rotated in one or the other direction. Each solenoid core 19 (see Fig. 4) rests upon the head of stop-plunger 27, arranged within the tube or cylinder 20. The stem of the stop-plunger 27 extends through a cap 28 upon the end of the tube 20, and a spring 29 coiled about the stem extends between cap 28 and the head of the stop-plunger to yieldingly hold the latter in position. The position of the stop-plunger 27 and the tension of the spring 29 may be properly adjusted by means of the cap 28 and a thumb-nut 30, which are adjustably threaded upon the ends respectively of the tube 20 and the stem of the plunger. Thumb-nut 30 is of course held into engagement with the cap-piece 28 by the spring 29. A lock-nut or stop-member 31, having a rounded lower end is threaded upon the extreme lower end of the stop-plunger stem, as shown. By this arrangement of yielding stop-plungers, which are held against movement in one direction, but yield in opposite directions, the type wheel and rotating shifters therefor, may be held in central position, but are free to be actuated to rotate the type wheel in opposite directions from normal against the resistance of one or the other of said stop-plungers. Moreover, the stop-plungers may be adjusted to securely, yet yieldingly hold the type wheel in central position so that all "back lash" or lost play between the connected parts is taken up.

The rotating of the type wheel in each direction is variably arrested in one direction by a set of stop-arms C', C^2, C^3 and C^4, and in the other direction by a set of stop-arms D', D^2, D^3 and D^4, which, in the form shown, are arranged respectively beneath the solenoids B, B' and shiftable into the path of movement of the stop-members 31 upon the ends of the stop-plungers 27, to variably limit the movement of the corresponding shifters operated by the solenoids.

The separate sets of stop-arms and the operating devices therefor, are alike except that they are oppositely arranged beneath the separate solenoids as shown.

Each set is arranged upon a suitable support 32, secured to the front face of the frame plate 10. A pair of rock-shafts 33 and 34 (see Figs. 3, 4 and 5) are journaled between forwardly extending lugs or brackets 35 upon the supports 32, and the stop-arms C', C^2 are secured to the inner ends of the shafts, while the stop-arms C^3, C^4 are secured to the inner ends of sleeves 36, 37 loosely mounted on the shafts but held against longitudinal movement thereon by collars 38.

The stop-arms are oppositely arranged, that is to say, stop-arms C' and C^3 on shaft 33 and sleeve 36, respectively, are normally held in front of the path of movement of the abutment 31, with which they coöperate to arrest the movement of the corresponding shifter, while the stop-arms C^2 and C^4 on shaft 34 and sleeve 37 lie inside of the path of abutment 20. Operating electro magnets E' and E^3 are arranged upon the support 32 above the shafts 33 and 34 and their armatures are carried upon arms d' and d^3 secured respectively to and extending upwardly from the outer ends of the shaft 33 and the sleeve 36. Electro magnets E^2 and E^4 are arranged below the shafts and their corresponding armatures are mounted upon downwardly projecting arms d^2 and d^4 secured respectively to the outer ends of the shaft 34 and sleeve 37.

The stop-arms are similarly constructed and each corresponds to upper and lower sections 39 and 39′. The lower sections 39′ have hub portions 40 secured to the corresponding operating shaft or sleeve, while the upper sections 39 of each arm has a laterally projecting stop-lug 41 at its upper end. The upper and lower sections are adjustably connected together by pin-and-slot connection 42, and screws 43 connected to ears 44 upon the upper section and threaded through ears 45 upon the lower section, serve to properly position the stop-lug 41 at the outer end of the stop-arm. The hubs of the several stop-arms are provided with downwardly extending lugs 46, between which extend tension springs 47.

By selectively controlling the energizing circuits of the electro magnets E', E^2, E^3 and E^4, the outer stop-arms C' and C^3 may be shifted inwardly and the stop-arms C^2 and C^4 shifted outwardly against the tension of springs 47, to bring the corresponding stop-lugs 41 at their upper ends into the path of movement of the shifter operated by the solenoid B. The stop-lugs 41 are located at different distances below the ends of the shifter so as to variably arrest the rotation of the type wheel.

The stops D', D^2, D^3 and D^4 and their operating magnets F', F^2, F^3 and F^4 are similar in construction and arrangement and coöperate with the shifter operated by the solenoid B′ to variably limit the rotation of the type wheel in the opposite direction. By the arrangement of the solenoids B and B′, the corresponding shifters and sets of stops, the type wheel may be rotated in opposite directions from normal to select any one of the longitudinal row of type thereon.

The energizing circuits of the solenoids B and B′ are preferably controlled, each by the corresponding sets of stops or the operating circuits therefor For this purpose, pairs of normally open spring-contacts 48 and 49, mounted upon but insulated from lugs 50 on the supports 32 are interposed respectively in the energizing circuits of the solenoids B and B′. Each pair of spring-contacts extends between the corresponding set of stop-arms so that when any one of them is shifted, the circuit through the corresponding solenoid is also closed. The contacts 48 and 49 are provided with insulating strips 48′ and 49′ against which the stop-arms strike. It is therefore only necessary to selectively control the energizing circuits of the stop-actuating magnets to rotate the type wheel to desired position.

The lateral shift of the type carrier or wheel is effected in the form shown in Fig. 1 by a pair of electro magnets or solenoids G, G′, arranged horizontally and in line as shown, and secured at their inner ends to a U-shaped piece 51 which, in turn is mounted upon an upright projection or lug 52 at the upper edge of the frame plate *a*. Lug 52 is offset toward the front and solenoids G, G′ are as shown, arranged in front of the racks and pinions by which the type wheel is rotated.

The solenoids G, G′ are alike and each comprises a spool 53, surrounded by a rectangle 54 of soft iron. A core-piece 55 common to both solenoids, is arranged to slide within the inner ends of a pair of cylinders or tubes 56 of brass or other suitable non-magnetic material arranged within the solenoid spools, as shown and projecting beyond the outer ends thereof. A shifter-arm 57 fixed to the central portion of the core 55 and projecting rearwardly and upwardly therefrom, has a slotted or forked end engaging a grooved collar 58 on the type wheel. By energizing one or the other of the solenoids G or G′, the type wheel may be shifted laterally in opposite directions from normal.

The type wheel and the lateral shifter therefor, are yieldingly held in central position between a pair of spring-held stops 59 (see Fig. 2^a), similar in all respects to the stop-plungers 27. These stops or stop-plungers 59, are arranged within the tubes 56, engage the opposite ends of the shifting core 55, and are yieldingly held in position to center the type wheel in lateral direction by springs 60, coiled about the stems of the stop-plungers and extending between the heads thereof and the cap-pieces 61 threaded over the ends of the tubes 56. Thumb-nuts 62 adjustably threaded upon the stems of the stop-plungers, engage the cap-pieces 61, limit the inward movement of the plungers and hold them in normal position. By adjusting the cap-pieces 61 and nuts 62, the positions of the stop-plungers 59 are properly adjusted to securely hold the type wheel in central position and take up all lost play or "back lash" between the parts.

The extent of lateral shift of the type wheel is limited in one direction by the set of stops H, H′ and in the opposite direction by the set of stops J, J′, the stops being arranged to engage abutments 63 adjustably threaded upon the projecting ends of the stem of the stop-plungers 59. Both sets of stops and the controlling devices therefor, are similar in construction and mounted upon supporting plates 64, which are fixed to the upper, front portion of the frame plate *a*. Stop H is fixed to the support 64, but stop H′ is in the form of a shiftable arm. The latter is provided with a laterally projecting stop-lug 65 on its end normally out of the path of the adjacent abutment 63, but arranged to shift into position between the abutment and the stop H. Stop-arm H′ is mounted upon a rock-shaft 66, journaled between a pair of brackets or lugs 66′ on the support 64, and provided with a laterally projecting arm 65′ to

which the armature of the operating magnet K is secured. Magnet K is mounted as shown upon the support 64.

A pair of normally open spring contacts 67 are mounted upon but insulated from the supporting plate 64 in the path of movement of the stop-arm H′, so as to be shifted to closed position when the electro magnet K is energized. These contacts are interposed in the energizing circuit of the adjacent solenoid G, which serves to shift the type laterally.

The stops J, J′ and the operating magnet L for the stop-arm J′, are similarly constructed but are oppositely arranged to variably arrest the lateral shift of the type wheel in the other direction. Stop-arm J′ is arranged to engage and close a pair of normally open spring-contacts 68 interposed in the energizing circuit of the solenoid G′. The contacts 67 and 68 are provided with insulating pieces 69 against which the stop-arms H′ and J′ strike.

By closing the energizing circuit of one or the other of the solenoids G or G′, the type wheel may be shifted laterally in one or the other direction until arrested by the stop H or J. If either of the magnets K or L is energized, either the stop H′ or J′ is operated, the circuit through the adjacent solenoid G or G′ is closed and the type wheel is shifted laterally as before in one or the other direction, but is arrested by the engagement of one of the abutments 63 with the stop-lug 65 upon either one of the stop-arms H′ or J′. By this means, the type wheel may be quickly shifted endwise in opposite directions from normal and its shift is variably arrested by the stops to bring any one of the lateral rows of type upon the wheel to printing position.

At the top of the frame plate *a* is arranged a horizontal platform or top plate 70, which extends rearwards, as shown in Fig. 3. An upright portion 71, at the extreme rear of the platform 70, carries the printing hammer M and the operating magnet N therefor. The printing hammer M is upon the arm of a bell crank 72, arranged to swing in a horizontal plane upon a pivot 73, which is carried upon a horizontal support 74, projecting forwardly from the upright 71.

The actuating magnet N is preferably in the form of a solenoid and is carried by horizontally arranged U-shaped support 75′ fixed to the outer end of the upright 71 and forwardly projecting therefrom. This solenoid comprises a spool 75 surrounded by a rectangular piece 76 of soft iron and provided with a shifting core-piece 77. The inner end of the core-piece or shifter 77 is provided with a fixed collar 78 and a loose collar 79, between which extends the forked end of the short arm of the bell crank 72. Collar 79 is yieldingly held in position by a coiled spring 80 which extends between the collar and a nut 81 adjustably threaded upon the end of the shifter 77. A lock nut or stop-member 82, having a rounded outer end is threaded upon the extreme end of the shifter 77 and holds nut 81 in adjusted position. A stop screw 83 is adjustably threaded through a stud 84, projecting forwardly from the upright 71 and is arranged in the path of the stop-member 82.

When the solenoid N is energized, the core-piece or shifter 77 is actuated to move the hammer M toward the type wheel A. The stop-member 82 upon the shifter is arranged to engage the stop-screw 83, before the hammer strikes the wheel. The hammer is however, not arrested but the spring-held collar 79 permits it to continue its movement under the influence of the momentum acquired until the blow upon the type at the printing point is struck to effect the impression thereof upon the paper. The blow is thereby rendered sharp and quick.

Each of the shifters of the solenoids B, B′, which rotate the type wheel, is also arranged to close the energizing circuit of the solenoid N which operates the printing hammer. For this purpose, a pair of normally open spring-contacts 85 (see Fig. 1) are mounted upon an arm 86, but are insulated therefrom as shown. Arm 86 is pivoted to the lug 50 on the supporting plate 32. A spring 87 extending between the end of the arm 86 and the plate 32 holds the free ends of the contacts into engagement with the stop-member 31 on the lower end of the shifter of the solenoid B and above the set of stops C′, C², C³ and C⁴. Whenever any one of the latter and the shifter of solenoid B are operated, the contacts 85 and arm 86 are swung about the pivot of the arm until arrested by the engagement of the free ends of the contacts with the selected stop. The contacts are then brought into engagement to close the energizing circuit of the solenoid N and to operate the printing hammer M. The free ends of the contacts 85 are provided with insulating strips 88 with which the stop-members 31 on the shifter of solenoid B and the stop-lugs 41 of the arms C′, C², etc. engage.

A pair of contacts 89 similar in construction and arrangement are interposed in the circuit of solenoid N and coöperate in a similar manner with the shifter of solenoid B′ and the set of stops D′, D², D³ and D⁴. A pair of normally closed spring-contacts 90 (see Figs. 2 and 2ᵇ) are mounted upon but insulated from the rectangular piece 76 of the solenoid N. A bell crank 91 is pivotally connected to a bracket 92 upon the outer end of rectangular piece 76. One end of the bell crank is forked and extends between a pair of collars 93, adjustably threaded upon the outer end of the shifting core-piece 77, and its opposite end is arranged to engage one of the spring-contacts 90, and break the engagement thereof, whenever the printing hammer actuating solenoid is energized.

Contact-springs 90 are interposed in the energizing circuit leading to the operating magnets and solenoids, so that as soon as the impression of the selected type is made, the circuit is broken and the several magnets and solenoids are deënergized to permit the return of the shifted parts to normal position. The type wheel is quickly returned to normal by the spring-actuated stop-plungers 27 and 59.

The paper upon which the messages are recorded is carried in the rear of the type wheel A, and intermediate the same and the printing hammer M, upon a carriage O (indicated in dotted lines in Fig. 3) arranged to slide transversely upon the platform 70. The paper carriage may be of any suitable construction, and any suitable means may be employed for shifting the same laterally or in letter-space direction step-by-step at each operation of the printing mechanism. So too, the paper carriage may be provided with any suitable form of paper feed mechanism to properly form the spaces between the lines of printed matter.

It will be observed that the mechanism for rotating

and laterally shifting the type wheel, is entirely in front of the wheel and in front of the supporting platform 70, and that the printing hammer is mounted above the path of movement of the carriage upon the upright 71 at the rear of the platform. Ample space is thus provided for the laterally shiftable paper carriage. Moreover, the paper P (see Fig. 3) is held in vertical position at the rear of the type wheel and in front of the horizontally arranged printing hammer, so that the message may be conveniently read as soon as it is recorded by any one in front of the machine.

A diagram of the operating circuits is illustrated in Fig. 7. The several operating magnets and solenoids derive current from a local battery 94 and are connected on one side thereto by a series of branches and a common return conductor 95, indicated by heavy lines in the diagram. The operating magnets and solenoids are connected to a number of branch conductors numbered 1 to 12 inclusive and 15. Any suitable arrangement of electric selecting means may be arranged to close the circuit from the local battery 94 through the several branch conductors, the electric selecting means being in turn controlled by the line circuit. One form of such selecting means is illustrated diagrammatically in Fig. 8 and will be hereinafter described.

A power wire or conductor 96 leads from the local battery 94 to the electric selector means and back through one of the branches and one of the magnets or solenoids in accordance with the operation of the selector means. The normally closed spring-contacts 90 are interposed in the conductor 96 as shown. The circuit is first closed through one of branches 1, 2, 3 or 4, leading respectively to the solenoids G′, magnet L, magnet K and solenoid G. If the circuit is closed directly by branch 1 into the solenoid G′, the type-wheel is shifted to the left until arrested by the engagement of the stop-member 63, with the stop J. By closing the circuit through branch 2, and magnet L, stop J′ is shifted into the path of the stop-member 63, and moves contacts 68 into engagement. A circuit is then closed from battery by power wire 96, conductor 97, contacts 68, conductor 98 and branch 2 through the solenoid G′, and back to battery through the return conductor 95. The type-wheel is then shifted to the left but is arrested by the engagement of the stop-member with the stop J′, which is then in front of the stop J. The circuit through conductor 2, thus not only controls the operation of stop-magnet L, but also controls the operation of the shifter magnet or solenoid G′. In a similar manner, the type-wheel may be shifted to different extents to the right, or until the stop-member 63 engages either the stop H or the stop H′, by closing the circuit through the branch 3 or branch 4 to engage the magnet K or the solenoid G. When magnet K is operated to shift stop H′ into the path of the stop-member 63, contacts 67 are brought into engagement and a circuit may be traced from battery by conductors 96, 99, and 100 to contacts 67, thence by conductor 101 to solenoid G and back to battery by return wire 95. In this way, the type-wheel may be shifted one or two steps to the right or left, to bring any one of the four rows of type thereon in line with the printing point, and to bring any one of four letters in the longitudinal row of type beneath the printing hammer to the printing point. If one of the four type in this row is desired, the hammer M is operated directly after the side shift of the wheel, by closing the circuit through the branch 15 and solenoid N, to effect the impression of the selected type upon paper. If one of the type to be brought to the printing point is in one of the other longitudinal rows, the type wheel must be rotated after the side shift, by closing the energizing circuit through one of the branches 5, 6, 7, 8, 9, 10, 11, 12 and through one of the stop-actuating magnets E′, E², E³, E⁴, F′, F², F³ or F⁴, which are respectively connected to the several branches on one side and to the return conductor 95 upon the other. Branches 5, 6, 7, and 8 also control solenoid B′, since whenever one of the set of magnets F′, F², F³ and F⁴ is energized, one of the stops D′, D², D³ or D⁴ is shifted into the path of the stop-member 31 to arrest the movement of the shifter actuated by solenoid B′, the shifted stop also moves contact 49 into engagement and closes the energizing circuit of solenoid B′ as follows, from battery by power wire 96, conductor 101, contacts 49, conductor 102, through the coil of solenoid B′ and back to battery by return conductor 95. So that the type wheel is rotated in one direction and variably arrested to bring the selected type to the printing point. In a similar manner magnets E′, E², E³ and E⁴ operate to shift any one of the set of stops C′, C², C³ or C⁴ into the path of the corresponding stop-member 31 to limit the movement of the shifter of solenoid B and shift contacts 48 into engagement to close the circuit through solenoid B, as follows;—from power wire 96, conductors 99 and 103, contacts 48, conductor 104 to the coil of solenoid B and back to the battery by return conductor 95. By this means, the type wheels may be variably rotated in the opposite direction.

By combining the lateral and rotary movement of the type wheel, any character thereon may be brought to the printing point. When solenoid B′ is energized contacts 89 are brought into engagement and a current may be traced from power wire 96, by conductors 105, contacts 89, conductor 106 and branch conductor 15 to the coil of solenoid N and back to battery by return conductor 95, so that the printing hammer M is shifted to effect the impression of the selected type. Similarly, the shifter of solenoid B moves contacts 85 into engagement to close the printing hammer circuit as follows:—from power wire 96, by conductors 99 and 107 to contacts 85, conductor 108 and branch conductor 13 through the coil of solenoid N as before. In this form, the type wheel may be shifted laterally to the right or left one or two steps, to bring any one of four transverse rows of type in line with the printing hammer, and rotated in one or the other direction, one, two, three or four steps to bring any one of eight longitudinal rows of type to the printing point. The longitudinal row of type in line with the hammer may also be utilized, so that the type wheel may be provided with thirty-six characters in all. The number of stops for variably arresting the rotation and lateral shift of the type wheel, may of course be varied as desired, so that more or less characters may be employed. Whenever the printing hammer solenoid N is energized, contacts 90 are disengaged by the shift of bell crank 72 and the power circuit is broken at this point so that all parts may quickly return to normal position and are ready to record the succeeding character.

In the form shown in Fig. 6, the type wheel A′ is

similarly mounted upon a shaft b' at the upper portion of the frame plate a, and is arranged to rotate with the shaft and shift laterally thereon. The rotation of the type wheel in opposite directions is effected by a horizontal shifter arm 109, carried upon a pivot 110 at the upper end of a standard 111. Standard 111 is mounted as shown, upon a horizontal supporting plate 112 fixed to the upright frame plate A. A toothed segment 113 is mounted upon a short rock shaft 114 carried between the upright a^2 and a second upright a^3 upon the frame. Segment 113 meshes with the teeth of a pinion 115 upon the type wheel shaft b' and is connected by a link 116 with the shifter 109. A pair of magnets B^2, B^3 are mounted upon the support 112 on opposite sides of the standard 111 and the armatures of these magnets are fixed to the shifter 109 on opposite sides of its pivot. By energizing one or the other of said magnets, the type wheel may be rotated in one or the other direction. The type wheel A is held in normal central position by a pair of stop-plungers 117, arranged within vertical guide cylinders or tubes 118 mounted upon the support 112. The stems of the stop-plungers extend through plugs 119 adjustably threaded into the upper ends of the tubes 118, and also extend loosely through slots in the shifter-arm 109. Stop nuts 120 are adjustably threaded upon the upper ends of the stems of the stop-plungers and engage the upper edge of the shifter-arm. Lock-nuts 121 hold the stop-nuts 120 in place. The stop-plungers, shifter-arm and type-wheel are yieldingly held in place against bottom plugs 119′ in cylinders 118 by springs 122, coiled about the stems of the stop-plungers 117 and extending between the heads thereof and the plugs 119. By adjusting the latter, springs 122 may be placed under proper tension. By properly adjusting the stop-nuts 120, all loose play or "back lash" between the parts may be taken up and the shifter-arm 109 and type-wheel A accurately held in central position. The sets of stops C′, C^2, C^3 and C^4 and the stops D′, D^2, D^3 and D^4 for variably limiting the extent of rotation of the type wheel in either direction, are entirely similar in construction and mode of operation to those employed upon the form shown in Fig. 1, and are arranged on opposite sides of the projecting end of the shifter arm 109 to limit its movement in either direction. The contacts 48, arranged to be closed by any one of the stops C′, C^2, C^3 or C^4 are interposed in the circuit of magnet B^2 and contacts 49 controlled by the stops D′, D^2, D^3 and D^4 are interposed in the circuit of magnet B^3. In this form however, additional stationary stops C^5 and D^5 are fixed to the supports 32, respectively, below and above the sets of movable stops and by closing the energizing circuits by either magnet B^2 or magnet B^3, independently of the shiftable stops, the arm 109 may be moved in one or the other direction into engagement with one or the other of the stationary stops C^5 or D^5. The pairs of contacts 85 and 89, for closing the printing hammer circuit, are held by the springs 87, into engagement with the end of the shifter-arm 109, so that this circuit is closed whenever the arm is moved in either direction.

The printing hammer, operating means therefor and paper-carrying means in rear of the type wheel (not shown in Fig. 6) is entirely similar in construction and arrangement to that already described. In this form, the type wheel may be rotated in one or the other direction, one, two, three, four or five steps, and, since the row of type in line with the printing hammer may be utilized, the type wheel may be provided with eleven longitudinal rows of type. The type wheel in this form, is shifted laterally in one direction only. Shifter 55 and solenoid G′ for moving the type wheel laterally toward the left, are entirely similar in construction and arrangement to that previously described, except that the type wheel and shifter are held against movement toward the right from normal position by a stop-screw 122 adjustably threaded through a lug 123 on the bracket 51.

Stops J, J′ for limiting the shift of the type wheel to the left are similar to those previously described. An additional movable stop-arm J^2 is provided, having its stop lug 65 in advance of that on the stop-arm J′. This stop-arm is secured to a shaft 66^a journaled in lugs 66′ and 67′ and extending through a slot in the stop-arm J′. The armature of a magnet L′ is fixed to an arm 68′ on the shaft 66^a so that the stop J^2 is shifted into the path of the stop-member 63 when magnet L′ is energized. Stop-arms J′ and J^2 are arranged to close the energizing circuit of the solenoid G′ by shifting the contacts 68 into engagement in the manner previously described. By this means, the type wheel may be shifted to the left, one, two or three steps, and as the transverse row of type in line with the printing hammer may be utilized, the type wheel may have four transverse rows of type as shown. As there are eleven longitudinal rows, forty-four characters may be employed, any one of which may be brought to the printing point by properly combining the lateral and rotary movements of the type wheel.

A diagram of the operating circuits is illustrated in Fig. 8. As before, the current is derived from a local battery 94 to which the several operating solenoids and magnets are connected on one side by the branched return conductor 95 indicated by heavy lines. On the other side, the several solenoids and magnets are connected to a set of branches, (numbered 2 to 15 inclusive) which are controlled by suitable electric selective means. A power wire 96 leads from the battery to the electric selective means and back through any one of the set of branches in accordance with the operation of the selector controlling means. If the character to be selected, is not in the transverse row of type in line with the printing hammer M, the circuit is first closed through one of the branches 2, 3 or 4 which lead respectively through the solenoid G′ and magnets L and L′. If the circuit through branch 2 and directly through solenoid G′ is closed, the type wheel is shifted to the left until stop-member 63 engages the fixed stop J and the fourth transverse row of type is brought to the printing point. If the circuit is closed through branch 3 or 4 and magnet L or L′, either one of the stops J and J′ is shifted into the path of stop-member 63. At the same time contacts 68 are brought into engagement and the circuit through the solenoid G′ is closed, as previously described, from power wire 96, by conductor 97, contacts 68 conductor 98 and branch conductor 2, and the type wheel is shifted to the left to bring either the second or third transverse row of type in line with the printing hammer. After the side shift of the type wheel, it is rotated to bring the desired type to the printing point by closing the energizing circuit through one

of ten of the branches, number 5 to 14 inclusive. The branch circuits numbered 5 to 12 as before, are arranged to selectively operate the sets of stops D', D^2, D^3 and D^4 and the set of stops E', E^2, E^3 and E^4 which, when shifted, close the circuits respectively through the magnet B^2 and B^3 and coöperate with the shifter-arm 109 to variably arrest the movement of the type wheel as it is rotated in one or the other direction, one, two, three or four steps to bring the selected type to the printing point. Branches 13 and 14 are arranged to close the circuit directly through the type wheel rotating magnets B^2 and B^3 (without first actuating any of the movable stops) so that the wheel may be rotated in one or the other direction five steps until arrested by the engagement of the shifter-arm 109 with one or the other of the fixed stops C^5 or D^5. As before, the shifter mechanism for rotating the type wheel coöperates, when actuated, with the contacts 85 or 89 to close the hammer operating circuit through the solenoid N. One of the type on wheel A' lies at the printing point, and to effect the impression of the type, the circuit is closed through branch 15 and directly through the hammer-actuating solenoid N. If the type to be selected lies in the longitudinal row in line with the hammer, the wheel is first shifted laterally to bring the same to the printing point and the circuit is then closed directly through branch 15 and solenoid N to operate the printing hammer without rotating the type wheel. If the character is in the transverse row of type in line with the printing point, the wheel is rotated to the proper extent, without first shifting the same endwise and the hammer actuating circuit is automatically closed as before by the shifter 109. The other characters must be brought to the printing point by continuing the laterally and rotary movements. Thus one character may be printed without shifting the type wheel at all, thirteen by variably shifting the wheel with one movement only and the remainder of the forty-four characters by combining the two variable movements in different directions. The variable shifts moreover, are not step-by-step but the type wheel is quickly moved by a single throw in one and the other direction. Moreover, no time is lost in restoring the parts to normal position, since as soon as the printing hammer is actuated the contacts 90 are disengaged to open the circuit through the several operating magnets and all shifted parts are instantly returned to normal position by their restoring springs. The type wheel may thus be operated with great rapidity and certainty to record the succeeding characters of the message.

Various means may be employed to selectively control the flow of current through the several branch conductors 1 to 15 inclusive. The selective means in turn is controlled by the line circuit over which the messages are transmitted, the various characters being represented by variably modifying the circuit impulses over the line in keeping with a suitable code.

In Fig. 7 is illustrated one arrangement of electric selector means which may be employed. In this arrangement, the line circuit 125 extends from the transmitting station, through a set of relays 126, at the receiving station, and then to ground. These relays respond differently to the varied line impulses, for example, to strong positive and negative and weak positive and negative impulses respectively, as indicated. The armatures of the first and second relays which respond to the strong impulses are connected to battery 94 by a conductor 127, and the armatures of the third and fourth relays are connected to the back contacts of the first and second relays by conductors 128. A set of conductors 130 are connected to the front contacts of the several relays and are selectively connected to the battery or other source of power by the operation of the relays 126 in response to varied line impulses. The set of conductors 130 are connected to a set of transfer switches 131, to the back contacts of which a set of branch conductors 132 are connected, so that the conductors 130 are normally connected at this point at the branches 132. A relay 133 having oppositely wound coils or coil sections, is arranged to actuate the transfer switches 131, at the end of the first line impulse to shift the connection of the conductors 130 from the branch conductors 132 to a set of conductors 134, which are connected to the first contacts of the switches 131. In each of the branch conductors 132 is arranged a relay 135, and each relay is arranged to actuate a switch-arm 136 and a second locking switch-arm 137. In this arrangement of selecting means, each character is represented by three modified line impulses. At the first line impulse, the circuit may be traced from battery 94, by conductor 127 to the armature of one of the line relays 126 (operated in accordance with the character of the line impulse) to one of the conductors 130, and one of the branches 132 and the corresponding relay 135, thence by a conductor 138 and a conductor 139 (common to all of the relays 135) through one of the coils of transfer switch relay 133 and back to battery by return wire 95. One of the switches 137 then actuated, closes a circuit from battery wire 96, conductors 140, 141, switch 137, conductor 142, through the coil of the magnet 135, which has been energized and by a common conductor 143 through the opposite coil of transfer switch relay 133 and back by return wire 95. The shifted switches 136 and 137 are thus locked in shifted position after the first line impulse has ceased.

The circuit is closed through the oppositely wound coils of transfer switch relay 133 before it can operate, and as the coils balance each other, the switches 131 are not moved until the cessation of the first line impulse opens the circuit through the branch conductor 132 and one of the coils of the relay 133. Switches 131 are then shifted to change the connection of the conductors 130 from the branches 132 to the set of conductors 134, and the transfer switches, together with the selected switches 136 and 137 are locked in shifted position.

The set of switches 136, selectively control the branch circuits 1, 2, 3 and 4 leading to the operating path of the printing mechanism. The selected switch 136, closes a circuit from battery wire 96, conductors 140 and 141, selected switch 136 and one of the branches 1, 2, 3 or 4, to effect the side shift of the type wheel. The form of printing apparatus shown in Figs. 6 and 7 does not utilize branch 1, controlled by the first relay 135, so that if the wheel is not to be shifted laterally, the first line impulse selects this relay and merely serves to operate the transfer switches 131.

The set of conductors 134 lead to a second set of transfer switches 144 to the back contacts of which a set of branch conductors 145 are connected. A relay 146

having oppositely wound coils or coil sections, is arranged to shift the switches 144 at the cessation of the second line impulse to change the connections of the conductors 134 from branch conductors 145 to the branches 147 (three in number) which are connected to the front contacts of the transfer switches 143. In each of the branch conductors 145 is arranged a magnet 148, each controlling a set of switches. The first magnet 148 is arranged to operate the set of switches 149, and the second, third and fourth magnets respectively operate the sets of switches 150, 151, and 152. There are three switches as shown in each of these sets and they control the flow of current through the branch conductors 5 to 15 inclusive, which lead to the operating parts for effecting the rotation of the type wheel and the independent operation of the printing hammer. Each magnet is also arranged to operate a locking switch 153.

At the second line impulse, the local operating circuit is closed as follows:—from battery 94 by conductor 127, to the armature of one of the line relays 126, thence by one of the conductors 130, the corresponding switch 131, conductor 134 and switch 144, to one of the branch conductors 145, through the coil of the corresponding magnet 148, conductor 154 and common conductor 155 through one of the coils of transfer switch relay 146, and by return conductor 96 to battery. One of the sets of switches 149, 150, 151 or 152 corresponding to the selected magnet 148 is then shifted and locked in shifted position by the operation of the corresponding locking switch 153. The latter closes a circuit as follows: from battery wire 96 by common conductor 157, conductor 158, the selected locking switch 153, conductor 159 through the coil of the selected magnet 148, by conductor 160, and common conductor 161 through the opposite coil of transfer switch relay and back to battery as before by conductor 95. The opposite coils of transfer switch relay 146 are thus both energized, and, as they balance each other, the relay is not actuated until the cessation of the second line impulse. At this time, the circuit through one of the coils of relay 146 is opened and transfer switches 144 are actuated to shift the connection of the conductors 134, from the set of branches 145 to the set of branches 147. The locking circuit controlled by the shifted locking switch 153 is held however, in closed condition through the selected magnet 148 and through one of the coils of relay 146, so that one of the sets of switches 149, 150, 151 and 152, and the set of transfer switches 144 are shifted and locked in shifted position by the second line impulse of the signal.

Each one of the three branch conductors 147 is connected as shown to one of the three switches in each of the sets 149, 150, 151 and 152. As stated, each character is represented by three line impulses. At the third line impulse, the local circuit is closed as follows: from battery 94 by conductor 127, the armature of one of the line relays 126, one of the conductors 130, through the corresponding switch 131, conductor 134 and switch 144 to one of the branch conductors 147, thence to one of the switches in that set 149, 150, 151 or 152, which have been previously selected and shifted by the second line impulse, and thence to one of the branches 5 to 15 inclusive, and through the operating parts of the machine, as previously described.

As above stated, branches 5 to 12 inclusive, control the stop-actuating magnets which effect the variable rotation of the type wheel. Branches 13 and 14 directly control the type wheel rotating magnets B^2 and B^2 without first operating the one of the stop magnets. If it is not necessary to rotate the wheel to bring the desired type to the printing point, the circuit is directly closed through branch 15 and hammer actuating magnet N.

The controlling circuit through the selecting means as well as through the printing apparatus, is broken as soon as the printing hammer is actuated to disengage the contacts 90 in battery wire 96, and all parts are immediately returned to normal position, and are ready to receive the succeeding signal and record the character corresponding thereto. This same selector means could be employed to control the operation through the set of branches which govern the operation of the printing mechanism diagrammatically illustrated in Fig. 7. The controlling branch conductors are correspondingly numbered in Figs. 7 and 8.

The particular electric selector means set forth forms no part of the present invention, and other arrangements may be employed for selectively controlling the flow of current through the set of conductors leading to the operating parts of the printing mechanism.

It is obvious that numerous changes may be made in the details of structure and arrangement of parts without departure from the essentials of the invention. For example, the type-wheel or carrier may be segmental in form, if desired.

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

1. In printing telegraphs, a type-carrier having a plurality of rows of type, operating shifters arranged to move said type carrier in different directions at an angle to each other, stop devices arranged to variably arrest the movement of said type-carrier in either direction, electric selective means controlling the operation of said stop devices, and means for operating said shifters controlled by said stop devices.

2. In printing telegraphs, a type-carrier, a shifter therefor, an electro magnet for operating said shifter, stop devices for variably arresting said type-carrier and shifter, an energizing circuit for said electro magnet controlled by said stop devices and electric selective means controlling the operation of said stops.

3. In printing telegraphs, a type-carrier having a plurality of rows of type movable in different directions at an angle to each other, operating shifters for said type-carrier, separate sets of movable stops for variably arresting the movements of said type-carrier in either direction, operating electro magnets for said shifters and for said stops, electrical means selectively controlling the energizing circuits of said stop actuating magnets, and means operated by said stops controlling the circuits of said shifter operating magnets.

4. In printing telegraphs, a type-wheel having a plurality of rows of type, separate shifters arranged to rotate and laterally shift said type-wheel, sets of stops for variably arresting the rotating and lateral shift of said type-wheel, operating electro magnets for said shifters and for said stops, electric means selectively controlling the operation of stop-actuating magnets and means controlled by said stop actuating magnets for energizing said shifter operating magnets.

5. In printing telegraphs, a type-carrier, a shifter there-

for, an operating electro magnet for said shift, a set of stops arranged to variably arrest the movement of said shifter, a normally open switch in the energizing circuit of said electro magnet arranged to be shifted to closed position by each of said stops, operating electro magnets for said stops and electrical means selectively controlling the energizing circuits of said stop actuating magnets.

6. In printing telegraphs, a type-wheel having a plurality of rows of type, shifters for rotating and laterally shifting said type wheel, operating electro magnets for said shifters, normally open spring-contacts in the energizing circuits of said electro magnets, sets of stops arranged to variably arrest the rotation and lateral shift of said type-wheel, and to shift said contacts to closed position, and electric selective means controlling the operation of said stops.

7. In printing telegraphs, a type-carrier, a shifter therefor, stop devices arranged to variably arrest the movement of said shifter, operating electro magnets for said shifter and said stop devices, a switch in the energizing circuit of said shifter magnet controlled by the operation of said stop devices, a printing hammer, an operating electro magnet therefor, a switch in the circuit of said hammer magnet controlled by the operation of said shifter, and electric means selectively controlling the energizing circuits of said stop-actuating magnets.

8. In printing telegraphs, a type-carrier, a shifter therefor, stop devices arranged to variably arrest the movement of said shifter, operating electro magnets for said shifter and said stop devices, a switch in the energizing circuit of said shifter magnet controlled by the operation of said stop devices, a printing hammer, an operating electro magnet therefor, a switch in the circuit of said hammer magnet controlled by the operation of said shifter, electric means selectively controlling the energizing circuits of said stop-actuating magnets, means for locking said circuits in closed condition and a normally closed unlocking switch arranged to open by the operation of said hammer-actuating magnet.

9. In printing telegraphs, a type-carrier, a shifter therefor, a fixed and a movable stop for variably arresting the movement of said shifter, operating electro magnets for said shifter and said movable stop, electrical selective means for closing the energizing circuit of either of said magnets and a switch in the circuit of said shifter magnet controlled by the operation of said movable stop.

10. In printing telegraphs, a type-carrier, a pair of spring-held stops yieldingly holding said type-carrier in central position, shifter mechanism for moving said type-carrier in opposite directions from normal against the resistance of one or the other of said yielding stops and selector mechanism controlling the movement of said shifter and type-carrier.

11. In printing telegraphs, a type-carrier, a pair of oppositely arranged stops by which said type-carrier is held in central position, springs yieldingly holding said stops in position, shifter mechanism for moving said type-carrier in opposite directions from normal against the resistance of one or the other of said yielding stops, stop devices for variably limiting the movement of said type-carrier and controlling electric selective means for said devices.

12. In printing telegraphs, a type-carrier, a pair of oppositely arranged stops by which said type-carrier is held in central position, springs yieldingly holding said stops in position, means for adjusting the normal position of said stops, shifter mechanism for moving said type-carrier in opposite directions from normal against the resistance of one or the other of said stops, stop devices for variably arresting the shaft of said type-carrier and controlling electric selector means for said stop devices.

13. In printing telegraphs, a type wheel yieldingly spring held in central position, shifter mechanism for rotating said wheel in opposite directions from normal, separate shifter mechanism for axially moving the type wheel in opposite directions, stop devices for variably arresting the rotary and axial shift of said type wheel and electro selective means controlling the operation of said stop devices and shifter mechanism.

14. In printing telegraphs, a type-wheel, shifter mechanism for rotating said type-wheel, a pair of oppositely arranged yieldingly spring-held stops holding said shifter mechanism and type-wheel in central position, a pair of electro magnets for actuating said shifter mechanism and type-wheel in opposite directions from normal, sets of stops for variably arresting the movement of said shifter mechanism and type-wheel, electro magnets for operating said stops and electrical means selectively controlling the energizing circuits of said shifter and stop magnets.

15. In printing telegraphs, a type-wheel having a plurality of rows of type, separate shifter mechanisms arranged to respectively laterally shift and rotate said type-wheel, operating magnets for said shifter mechanisms, separate sets of stops for variably arresting the lateral shift and rotation of the type-wheel, magnets controlling the operation of said stops and electric selective means controlling the energizing circuits of said shifter and stop-actuating magnets.

16. In printing telegraphs, a type-wheel having a plurality of rows of type, separate shifter mechanism arranged to respectively laterally shift and rotate said type-wheel, operating magnets for said shifter mechanism, separate sets of stops for variably arresting the lateral shift and rotation of the type-wheel, magnets controlling the operation of said stops, means for closing the energizing circuits of said shifter magnets controlled by said stops and electric selective means controlling the energizing circuits of said stop actuating magnets.

17. In printing telegraphs, a type-wheel having a plurality of rows of type, separate shifter mechanism arranged to respectively laterally shift and rotate said type-wheel, operating magnets for said shifter mechanism, separate sets of stops for variably arresting the lateral shift and rotation of the type-wheel, magnets controlling the operation of said stops, means for closing the energizing circuits of said shifter magnets controlled by said stops, a printing hammer, an actuating circuit therefor controlled by one of said shifter mechanisms and electric selective means controlling the energizing circuit of said stop-actuating magnets.

18. In printing telegraphs, a type-carrier, an operating solenoid, a shifter for said type-carrier forming the core of said solenoid and longitudinally shiftable therethrough, a set of stops for variably limiting the throw of said shifter and type-wheel and selector mechanism controlling the operation of said solenoid and arresting stops.

19. In printing telegraphs, a type-carrier, an operating solenoid, a shifter for said type-carrier forming the core of said solenoid and longitudinally shiftable therethrough, a spring-held yielding stop engaging said shifter against the resistance of which said shifter is moved and by which said shifter and type-wheel are held in normal position, means for variably limiting the throw of said shifter and type-carrier and controlling electric selective means therefor.

20. In printing telegraphs, a type-carrier, an operating solenoid, a shifter for said type-carrier forming the core of said solenoid and longitudinally shiftable therethrough, a tube extending through said solenoid within which said shifter is guided, a spring-held yielding stop-plunger within said tube and engaging the end of said shifter to hold the same and said type-wheel in normal position, means for adjusting the position of said stop-plunger within said guide tube, and selectively controlled stop mechanism for variably limiting the throw of said shifter and type-carrier.

21. In printing telegraphs, a type-wheel, shifter mechanism for rotating said type-wheel in opposite directions, a pair of stops engaging said shifter mechanism to hold said type-wheel in normal, central position, means for adjusting the normal positions of said stops, springs yieldingly holding said stops in normal position, a pair of magnets arranged to actuate said shifter mechanism respectively in opposite directions, and selectively controlled stop devices for variably limiting the movement of said shifter mechanism and type-wheel.

22. In printing telegraphs, a type-carrier, shifter mechanism for moving said type-carrier in opposite directions from normal position, a pair of spring-held stops arranged to hold said shifter mechanism and type-carrier in central position, each of said stops being held against movement in one direction but arranged to yield in opposite direc-

tions to permit the opposite shift of said type-wheel, means for actuating said shifter mechanism and electrically controlled selective stop devices for variably limiting the movement of said type-wheel.

23. In printing telegraphs, a type-wheel yieldingly held in central position, shifter mechanism arranged to rotate said type-wheel, a pair of operating magnets for respectively moving said shifter mechanism and type-wheel in opposite directions, separate sets of selectively controlled stops for variably limiting the movement of said type-wheel and shifter mechanism and a switch in the energizing circuit of each of said magnets and to be shifted by the operation of any one of the corresponding sets of stops.

24. In printing telegraphs, a type-wheel yieldingly held in central position, shifter mechanism arranged to rotate said type-wheel, a pair of operating magnets for respectively moving said shifter mechanism and type-wheel in opposite directions, separate sets of selectively controlled stops for variably limiting the movement of said type-wheel and shifter mechanism, a printing hammer, an energizing circuit therefor and separate switches in said circuit arranged to be respectively actuated by said shifter mechanism when moved in one or the other direction.

25. In printing telegraphs, a type-wheel yieldingly held in central position, shifter mechanism arranged to rotate said type-wheel, a pair of operating magnets for respectively moving said shifter mechanism and type-wheel in opposite directions, separate sets of selectively controlled stops for variably limiting the movement of said type-wheel and shifter mechanism, a pair of normally open spring contacts in the energizing circuit of each of said shifter-actuating magnets arranged to be brought into engagement by any one of the corresponding sets of stops, a printing hammer, an actuating circuit therefor and separate pairs of normally open spring contacts in said circuit, arranged to be respectively brought into engagement by said shifter mechanism when moved in one or the other direction.

26. In printing telegraphs, a type-carrier, a shifter for said type-carrier, an operating magnet for said shifter, stop devices for variably limiting the throw of said shifter and type carrier, a set of operating magnets for said stop devices, a series of conductors leading respectively to said shifter and stop-actuating magnet and electric means selectively controlling the flow of current through said conductors.

27. In printing telegraphs, a type-carrier, a shifter for said type-carrier, an operating magnet for said shifter, stop devices for variably limiting the throw of said shifter and type, a set of operating magnets for said stop devices, a series of conductors leading respectively to said shifter and stop-actuating magnet, electrical means selectively controlling the flow of current through said conductors, and means controlled by said stop-actuating magnets for closing the energizing circuit of said shifter magnet independently of said selecting means.

28. In printing telegraphs, a type-carrier, a shifter for said type-carrier, an operating magnet for said shifter, stop devices for variably limiting the throw of said shifter and type, a set of operating magnets for said stop devices, a printing hammer, an actuating magnet therefor, branch circuits extending respectively through said shifter magnet, stop-actuating magnets and hammer actuating magnet, electric means selectively controlling the flow of current through said separate circuits and means controlled by said shifter magnet for closing the circuit through said hammer actuating magnet independently of said electric selecting means.

29. In printing telegraphs, a type-carrier having a plurality of rows of type, separate shifters arranged respectively to laterally shift and rotate said type-wheel, separate operating magnets for said shifters, separate sets of stops for variably limiting the lateral and rotary movements of said type-wheel, separate sets of actuating magnets, a printing hammer and actuating magnet therefor, a series of branch circuits leading respectively to said shifter, stop-actuating and hammer magnets, electric selective means for closing any one of said circuits, means controlled by each set of stop-magnets for independently closing the energizing circuit of the corresponding shifter magnet and means controlled by one of said shifter magnets for independently closing the energizing circuit of said hammer-actuating magnet.

30. In printing telegraphs, a type-carrier, a pair of spring-held stops arranged to yieldingly hold said type-carrier in central position, shifter mechanism for moving said type-carrier in opposite direction against the resistance of one or the other of said yielding stops, selector mechanism controlling the movement of said shifter and type-carrier, a printing hammer for effecting the impression of the selected type, operating electro magnets for said shifter mechanism, said selector mechanism and said printing hammer and a normally closed switch in the energizing circuit of all of said magnets arranged to be opened by the operation of said hammer-actuating magnet whereby said type-wheel and shifter mechanism are restored to normal, central position by said spring-held stops.

31. In printing telegraphs, a type-carrier, a shifter therefor, stop devices arranged to variably arrest the shift of said type-carrier, a set of circuits arranged to control the operation of said stop devices and also each arranged to effect the operation of said shifter, and electrical means arranged to selectively energize said set of circuits and to effect the independent operation of said shifter.

32. In printing telegraphs, a type-carrier, a shifter therefor, an operating magnet for said shifter, a set of stops for variably arresting the shift of said type-carrier, a set of operating magnets therefor, a series of controlling circuits and stop-actuating magnets, each arranged to effect the operation of said shifter magnet, a separate controlling circuit for said shifter magnet and electrical means selectively controlling the circuits of said shifter and stop-actuating magnets.

CHARLES L. KRUM.

Witnesses:
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HARRY L. CLAPP.