J. BURRY, DEC'D.

M. BURRY, EXECUTRIX.

PRINTING TELEGRAPH RECEIVER.

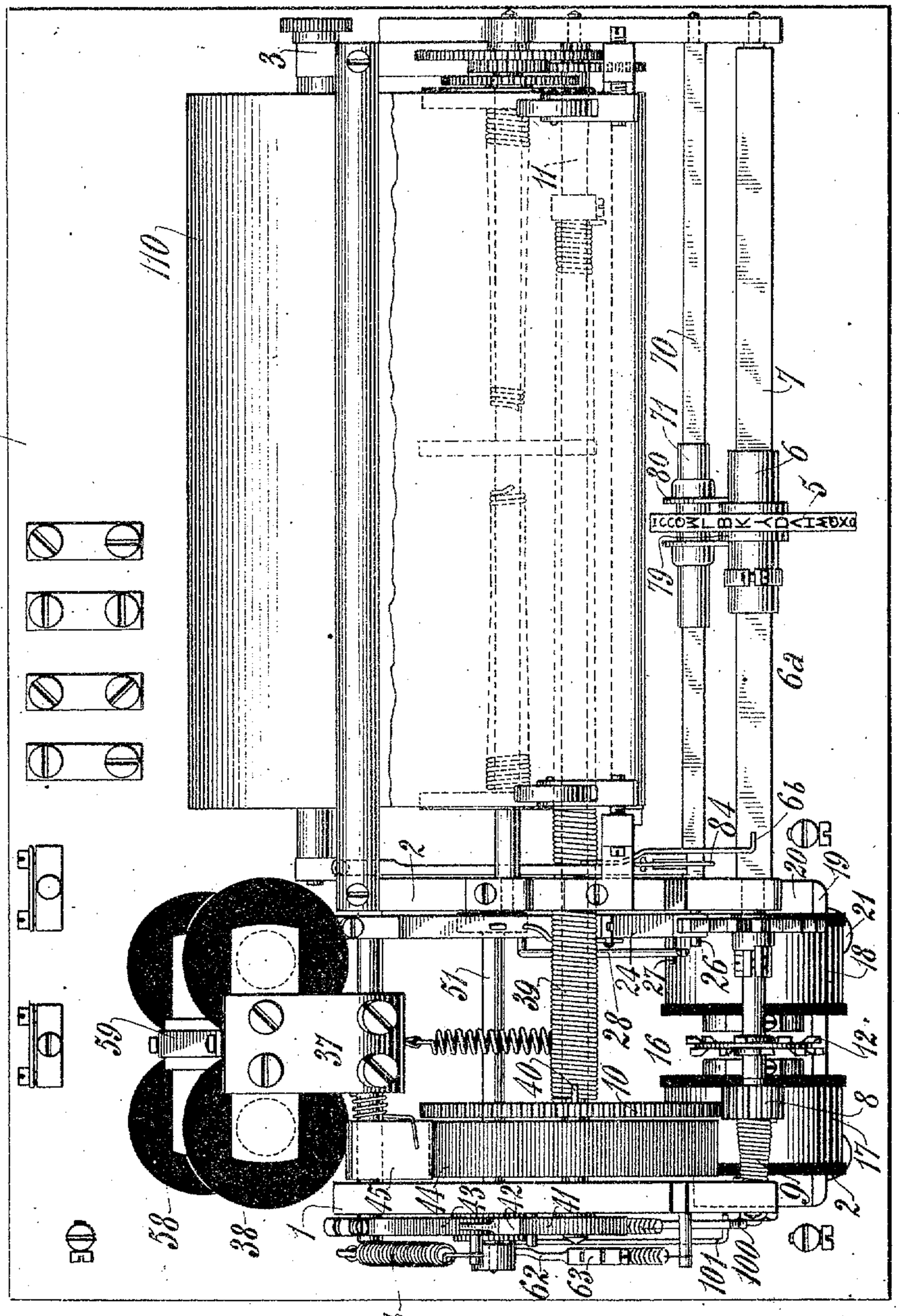
APPLICATION FILED AUG. 27, 1908.

962,694.

Patented June 28, 1910.

7 SHEETS—SHEET 1.

Fig. 1.



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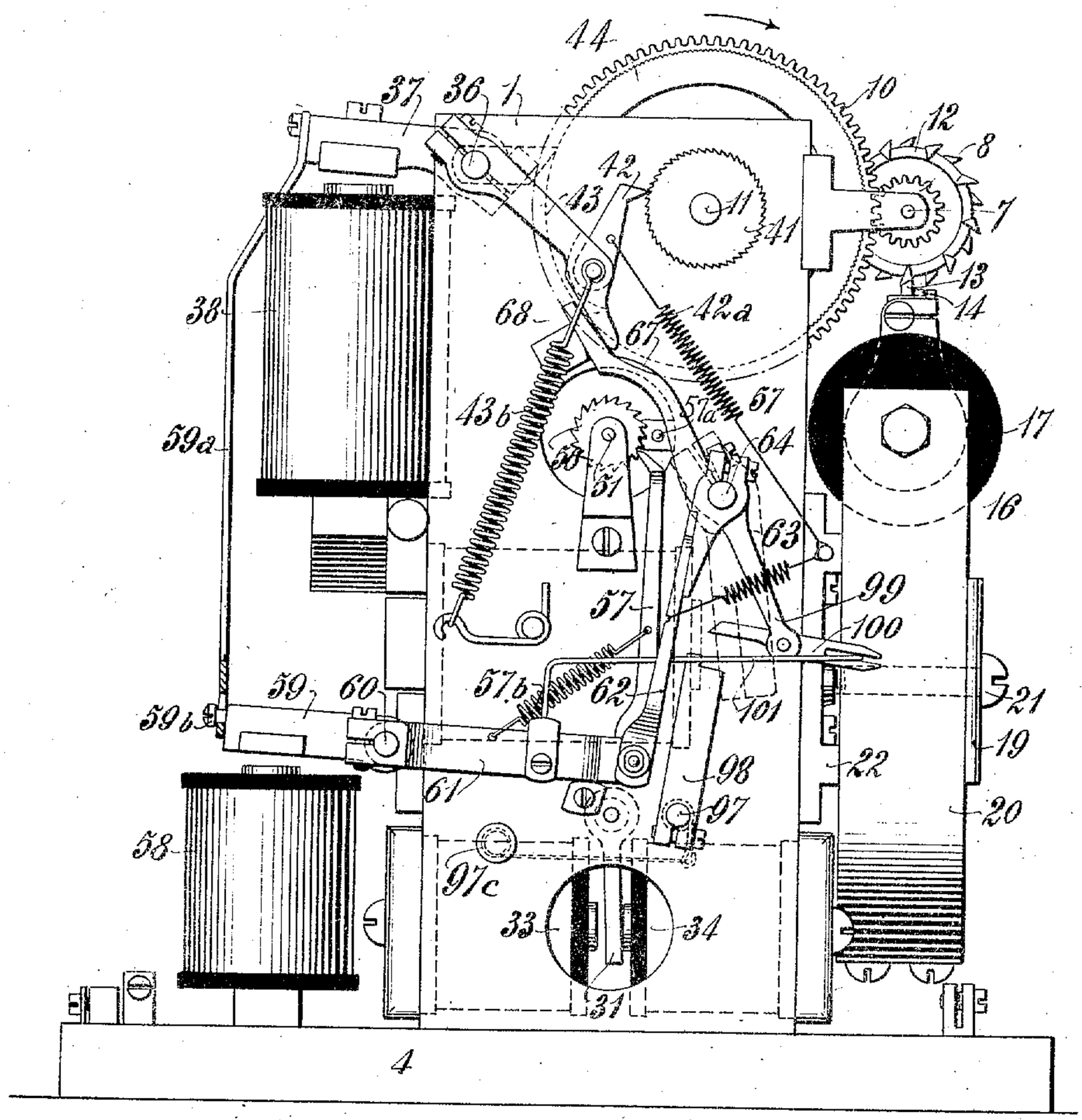
7 SHEETS—SHEET 2.

Fig. 2.



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7 SHEETS—SHEET 3.

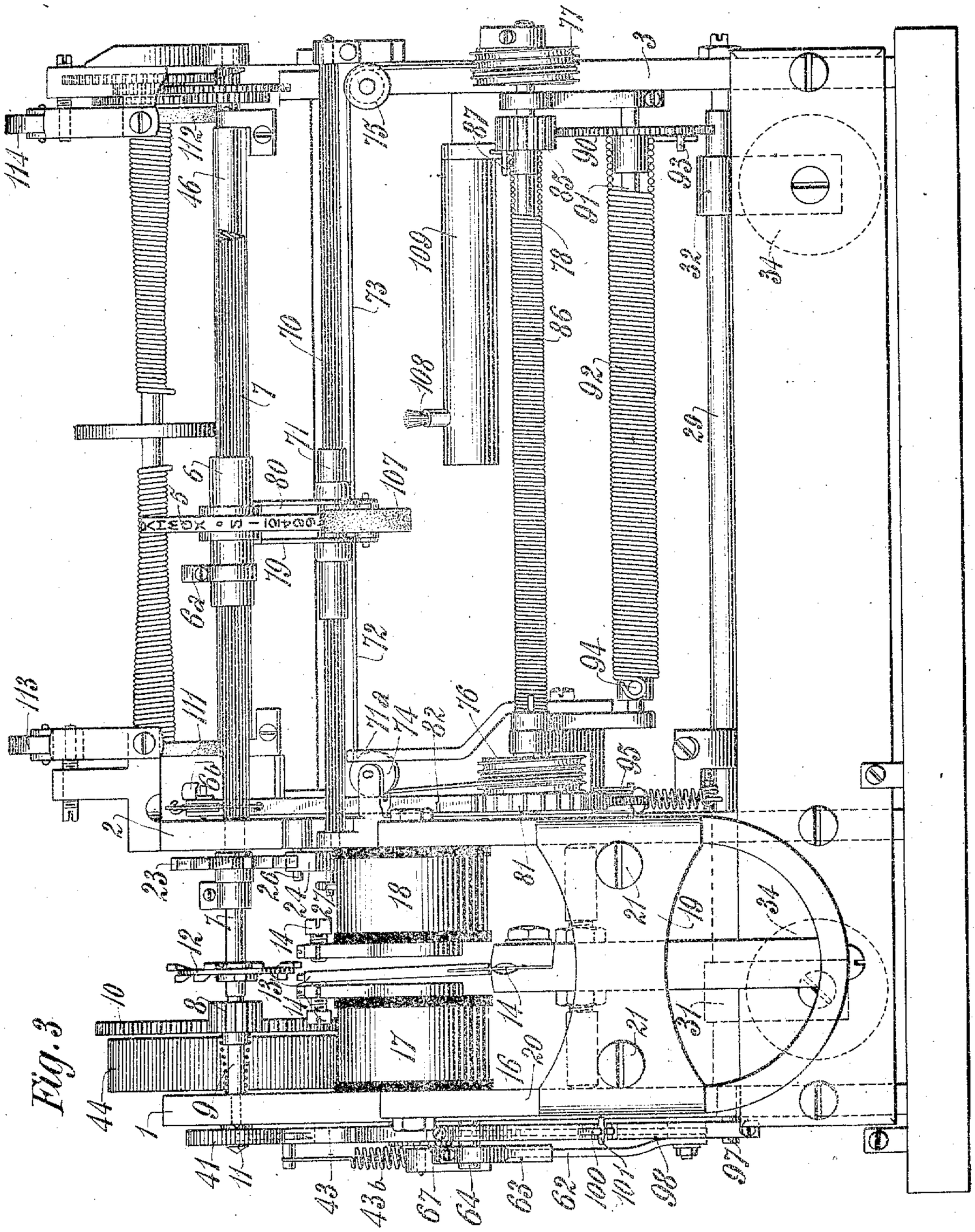

Fig. 3

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7 SHEETS—SHEET 4.

Fig. 4.

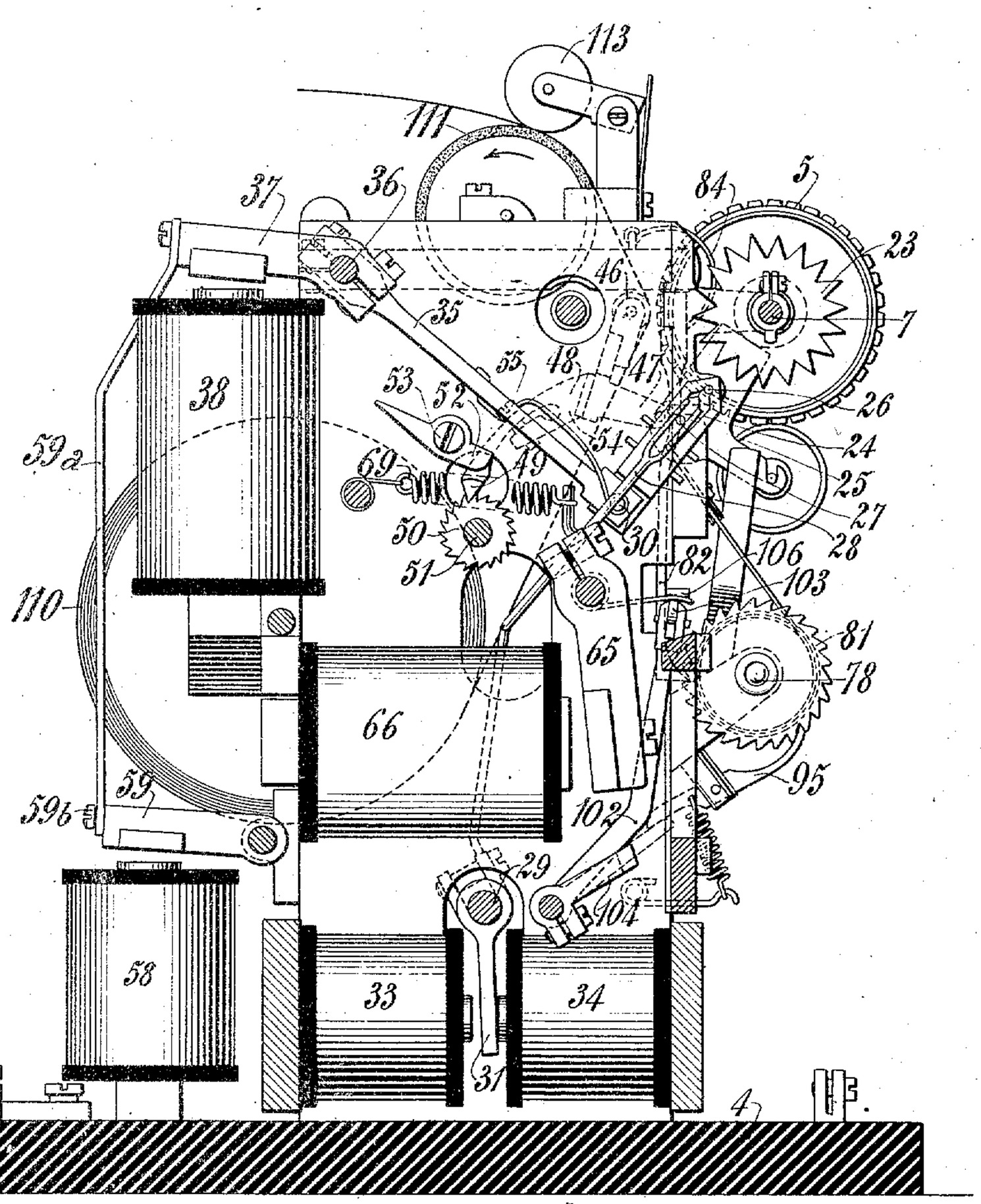

Fig. 10

Fig. 12

Fig. 11

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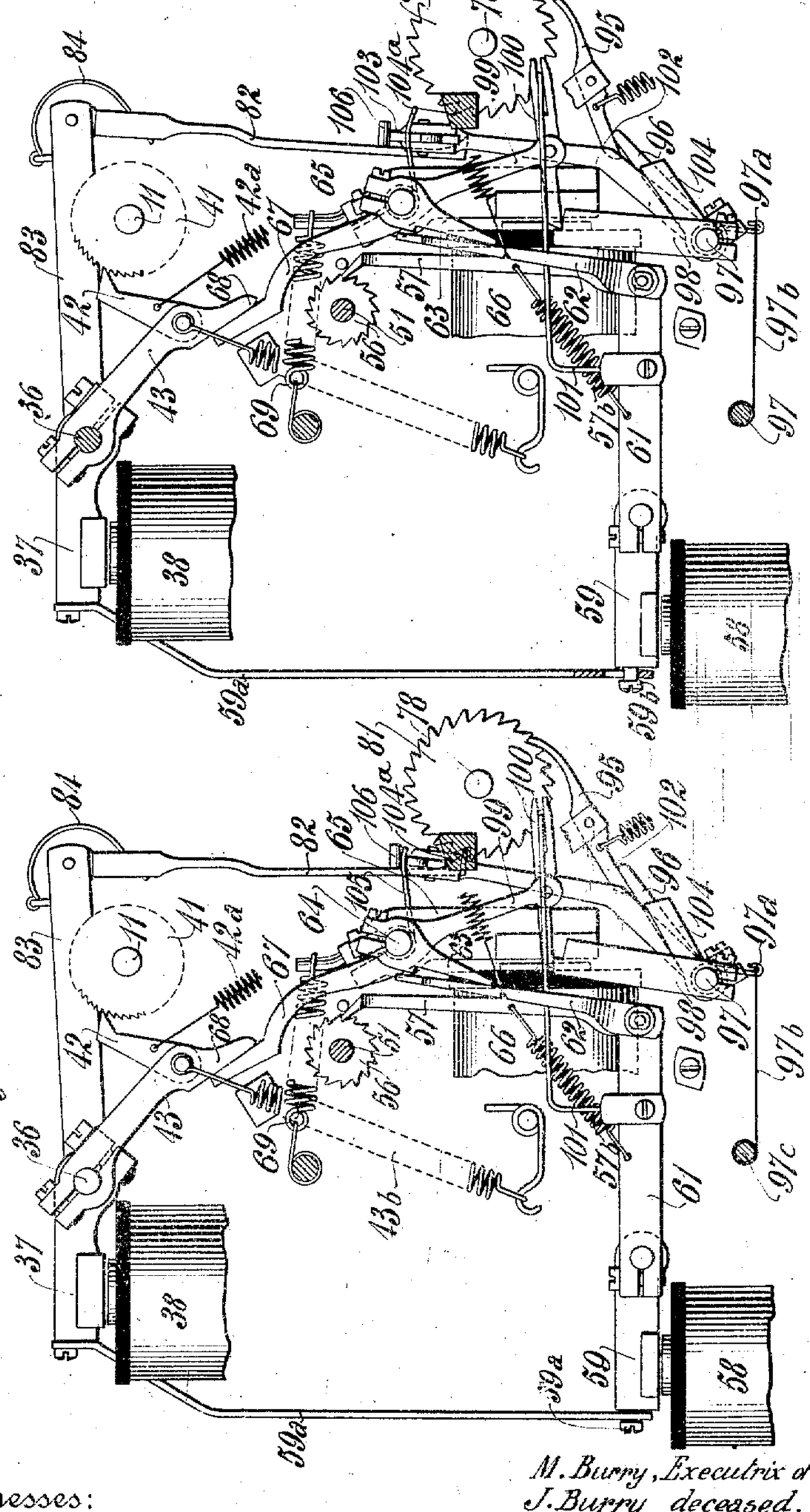
7 SHEETS—SHEET 5.

Fig. 5.



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7 SHEETS--SHEET 6.

Fig. 8.

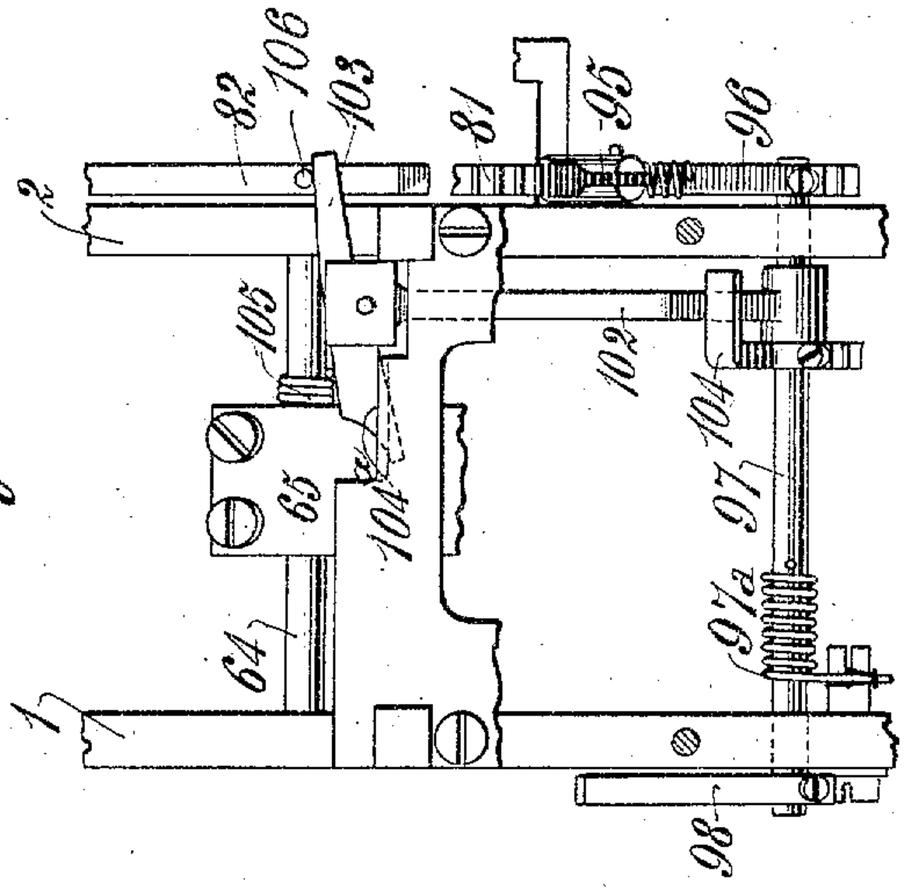

Fig. 7

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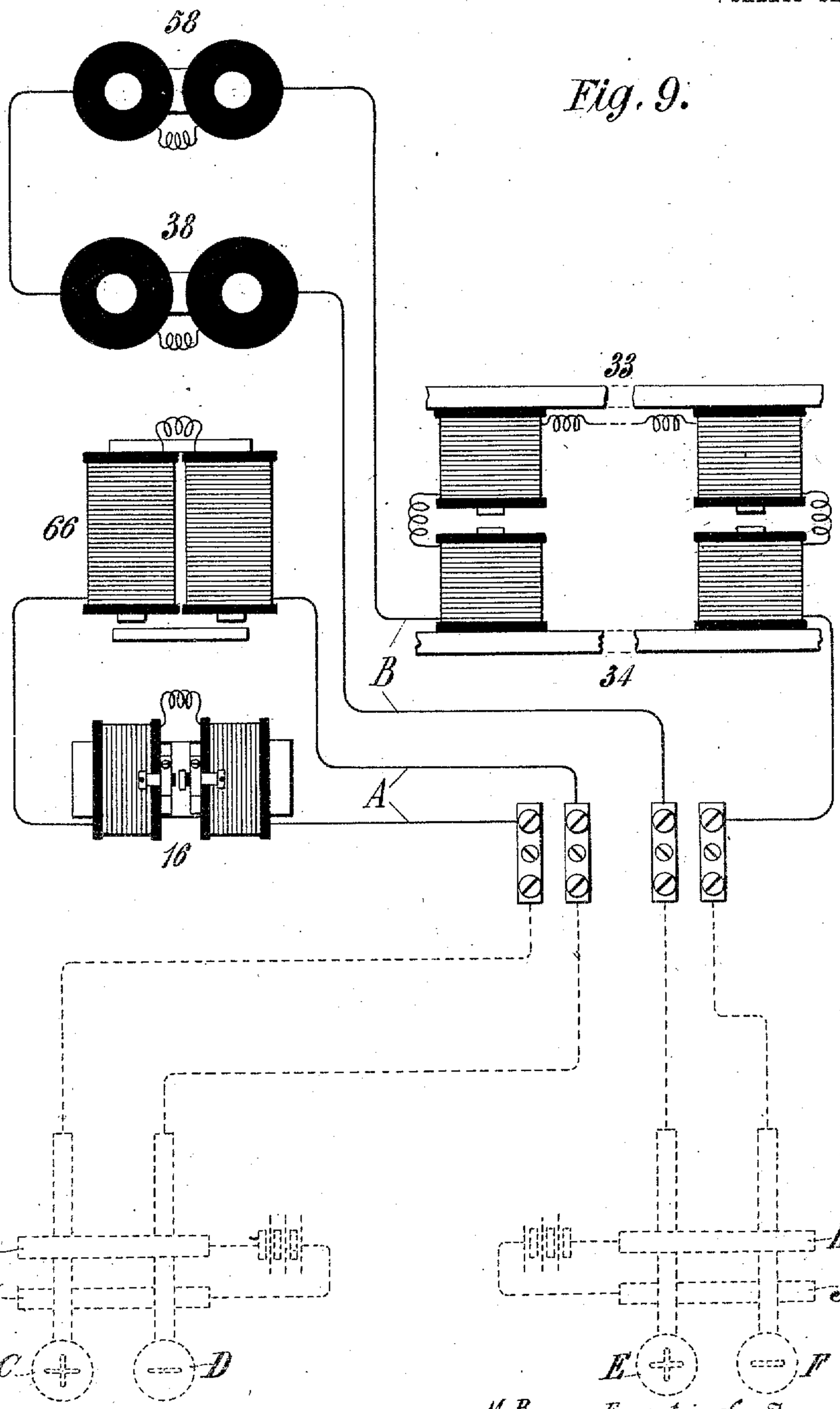
Patented June 28, 1910.

7 SHEETS—SHEET 7.

Fig. 9.



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UNITED STATES PATENT OFFICE.

MARIE BURRY, OF NEW YORK, N. Y., EXECUTRIX OF JOHN BURRY, DECEASED, ASSIGNOR TO THE STOCK QUOTATION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PRINTING-TELEGRAPH RECEIVER.

962,694. Specification of Letters Patent. Patented June 28, 1910.

Application filed August 27, 1908. Serial No. 450,579.

To all whom it may concern:

Be it known that JOHN BURRY, deceased, late a citizen of the United States, and a resident of New York, in the county of Richmond and State of New York, did invent certain new and useful Improvements in Printing-Telegraph Receivers, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

This invention relates to receiving apparatus for printing telegraph systems, more particularly apparatus of the general type described in the prior patent of the said John Burry No. 680,693, dated August 20, 1901, and its chief object is to simplify and improve the construction and operation of receivers of the type referred to.

To this and other ends the invention consists in the novel features of construction, arrangements of parts, and combinations of elements, hereinafter described and more particularly set forth in the claims.

The preferred embodiment of the invention is illustrated in the annexed drawings, in which:

Figure 1 is a plan view of the machine. Fig. 2 is an end elevation, at the left as viewed in Fig. 1. Fig. 3 is a front elevation. Fig. 4 is a cross section, looking in the direction of the arrow, substantially on the planes indicated by the line IV—IV in Fig. 7. Fig. 5 is a diagrammatic end view similar to Fig. 2 but showing certain parts in different operative position. Fig. 6 is a view similar to Fig. 5 but showing the parts in another operative position. Fig. 7 is a fragmentary front elevation, partly in section, with the polarized typewheel magnet, the typewheel, and parts of the typewheel returning mechanism, removed. Fig. 8 is a detail view showing certain parts of the typewheel returning in different operative position from that shown in Fig. 7. Fig. 9 is a diagram of the wiring of the machine, showing also, for the purposes of explanation, a simple type of transmitting apparatus. Figs. 10, 11 and 12 are detail views of a portion of the typewheel shaft.

The various operative parts of the machine are conveniently mounted in three vertical plates or frames designated by 1, 2, 3, which are in turn mounted on a base-plate 4, preferably of insulating material.

The type which produce the impression are arranged on the periphery of a type-carrier or wheel 5, on a hub or carriage 6, mounted to slide freely on a shaft 7 journaled in the frames 1, 2, 3, at the front of the machine near the top. Between the frames 2, 3, the shaft is triangular in cross-section or otherwise formed to permit the hub to slide thereon, but to rotate therewith, as will be readily understood. The type-wheel can therefore be revolved by rotating its shaft, to bring any character to the printing position, and may be shifted laterally to effect the letter spacing.

The triangular typewheel shaft 7 has a pinion 8 loosely mounted on it near the frame 1, and wrapped tightly around the shaft is a coil spring 9 which is also in frictional engagement with the pinion, so that rotating the pinion will rotate the shaft but permit an independent movement of rotation of the shaft (and with it the typewheel) in either direction independently of said pinion. The pinion is itself rotated by a gear wheel 10, loosely mounted on a shaft 11 and actuated by means hereinafter described so as to turn in the direction of the arrow in Fig. 2 under the influence of a force constantly exerted. Near the pinion 8 the typewheel shaft 7 carries an escapement wheel 12 having staggered teeth on its opposite sides, as clearly shown in Fig. 2. This scape wheel is controlled by a vertical armature tongue 13, supported at its lower end by a flat spring 14, and vibrating laterally between screw stops 15, by which the extent of the swing of said tongue is regulated. The tongue is vibrated by a polarized magnet 16 having magnet coils 17, 18, the whole being secured in position by a tie-plate 19 which bears against the permanent magnet 20 and which is fastened by screws 21 to a plate 22 on the frames 1, 2. By loosening the screws 21 the magnet may be adjusted vertically and laterally to bring the tongue 13 into proper relation to the scape-wheel. The tongue stands normally in engagement with a tooth on the scape wheel, but for the sake of clearness the two are shown disengaged in Fig. 3. From the foregoing it will be seen that as the tongue swings to right or left, as the case may be, under the influence of the polarized magnet the tooth with which the tongue is in en-

gagement will be released, thus permitting the scape wheel (and shaft 7) to turn until the next tooth, on the opposite face of the wheel, strikes the tongue.

The teeth on the scape wheel are so arranged that when a tooth rests against the tongue (as is normally the case) a space between two letters on the typewheel will stand at the printing point. Thus by repeated vibrations of the tongue the space in advance or to the rear of the type which it is desired to print may be brought to the impression point. The typewheel is then given a slight rotary movement, backward or forward as may be necessary, to bring the desired type into position for printing, and for this purpose the following instrumentalities are provided. On the typewheel shaft 7 is a star wheel 23, having teeth sufficient in number and so arranged that the spaces or notches between the teeth are in register with the characters on the printing wheel 5; in other words, the notches are in register with the type. Adjacent to the star wheel is a pointed finger 24 (see Fig. 4) so arranged that when the star wheel is in normal position, that is, when a space on the typewheel stands opposite the printing point, the apex of the finger will be opposite a tooth on the star wheel. If now the finger be raised or lowered and shifted toward the star wheel it is clear that the apex of the finger, entering a notch on the wheel, will cause the wheel (and shaft 7) to turn slightly in one direction or the other according as the finger were first moved above or below the tooth,—such slight movement of the star wheel and shaft being permitted by the yielding connection between shaft 7 and pinion 8 before described. Thus when a selected pair of characters has been brought to the printing point either character of the pair may be brought to the printing point by proper adjustment and movement of the shifting finger. This finger also serves to center or justify the typewheel as will be readily understood. For the purpose of shifting or adjusting the finger to bring it into position to engage one or the other notch as desired, it is provided with a longitudinal slot or opening in which is an elongated member 25, pivoted at its lower end to swing transversely in its slot and having its upper end pointed as shown. Extending through the slot in the finger 24, at the upper end thereof, is a pin 26, fixed to the plate 2, while extending from the adjusting member 25 is a pin 27 engaged by the forked end of an arm 28 which extends down to a shaft 29, at the bottom of the machine, on which shaft the said arm is rigidly mounted.

It will now be clear that by rocking the shaft 29 the shifting or adjusting member 25 will be swung by the forked arm 28 in one direction or the other; hence when the shifting finger 24 is carried toward the star wheel the pointed end of the shifting member 25 will strike on one side or the other against the pin 26 and thus cause the shifting finger 24 to swing on its pivot 30 and so engage the upper or lower notch in the star wheel according as the member 25 was moved up or down. For the purpose of rocking the shaft 29 it is provided at its ends with armatures 31, 32, (Figs. 3 and 4) lying between polarized magnets 33, 34, so that by suitable energization of these magnets, as hereinafter described, the shaft will be rocked in one direction or the other as desired. The shifting and justifying finger 24 is pivoted at 30, as before stated, on the lower end of an arm 35, the other end of which is rigidly mounted on a short shaft 36 journaled in the plates 1, 2, at the top of the machine. Fast to the same shaft is a rearwardly extending arm 37 constituting the armature of a magnet 38, which, as will be explained hereafter, also furnishes the power for effecting the letter-spacing. Energization of this magnet will therefore advance the shifting finger and throw the type wheel forward or back, as before described.

The mechanism for rotating the gear 10, which, it will be remembered, engages the pinion 8 to revolve the type wheel shaft 7, is shown in Figs. 1 and 2. On the shaft 11 is a coil spring 39 at one end engaging a pin 40 on the gear and at the other end engaging the shaft frictionally so as to prevent overwinding. Adjacent to the gear but fast on the shaft outside of the plate 1 is a ratchet wheel 41 engaged by a pawl 42 pivoted on the lower end of an arm 43 extending downwardly and forwardly from the shaft 36. Said pawl is yieldingly held in engagement with its ratchet by a coil spring 42^a, and the arm 43 is depressed (and the armature 37 raised) by a coil spring 43^b. It will now be seen that at each downward movement of the armature arm 37 the pawl will partially rotate the shaft 11, winding the spring 39 and urging the gear 10 in the direction of the arrow in Fig. 2. During the return of the pawl to its initial position the shaft is held against backward rotation by a fine-toothed ratchet 44 engaged by a pawl 45 loosely mounted on the shaft 36. This fine-toothed ratchet is made heavy enough to serve as a fly-wheel or momentum device, so that the impulse given to it by the vigorous upward stroke of the pawl 42 will cause it to turn farther than would otherwise be the case and so have a greater winding effect on the spring 39.

The printing is effected by a platen or printing bar 46 round or flattened slightly on the printing side, as desired, mounted on angular supports, one of which is shown at 47 in Fig. 4, pivoted at their forward ends to the frames 2, 3. On the support adjacent

to the frame 2 is a rearwardly and downwardly extending arm 48, having at its lower end a V shaped finger 49 projecting laterally through an aperture in the frame 2, into engagement with a ratchet 50 fast to a short shaft 51. The quick rotation of the ratchet will therefore lift the finger 49 suddenly and so throw the platen 46 forward against the type wheel. To regulate the throw of the platen a stop 52 is secured to the plate or frame 2 above the finger 49 by a screw 53. By loosening the screw the stop may be adjusted as desired. Passing through the arm 48 into an underlying stud 54 is a screw 55, by which the said arm, being of spring metal, can be shifted toward or from the ratchet 50. In this way the arm and the finger 49 can be adjusted whenever necessary, to allow for wear on the finger. The shaft 51 at its other end carries a ratchet wheel 56, engaged by a vertically extending pawl 57, so that reciprocation of the latter will rotate the ratchet and with it the shaft 51 and ratchet 50. A stop 57ª prevents the pawl being thrown too far by the vigorous upward movement of the arm 61.

The pawl 57 is held in engagement with the ratchet by a spring 57ᵇ, and is actuated by the printing magnet 58 on the base of the machine, through the instrumentality of the armature 59, fast to a short shaft 60 journaled in frames 1, 2. On the shaft outside of frame 1 is a forwardly extending arm 61, on the forward end of which the pawl 57 is pivoted, as shown in Fig. 2, so that depression of the armature by the printing magnet will raise the pawl and so rotate the ratchet 56, as will be readily understood. For the purpose of raising the armature 59 to its initial position after deënergization of the printing magnet it is connected to armature 37 by a rod 59ª. This rod is rigidly fixed to the upper armature but at its lower end has a slot engaged by a screw pin 59ᵇ on the armature 59. The slot being so arranged that when the two armatures are raised the pin will be in contact with the bottom of the slot, it is clear that when both magnets are deënergized the upward movement of the rod will raise armature 59 to its initial position, as shown in Fig. 2. It is also evident that magnet 38 can draw down its armature without affecting armature 59.

As hereinafter explained, and for the purpose of making the machine as rapid as possible in operation, the magnets 33, 34, 38 and 58 are intended to be energized simultaneously; but it is clear that their armatures should not be actuated at the same instant. That is, armatures 31, 32, which set the shifting member 25 (Fig. 4), should precede armature 37, which actuates the shifting and justifying finger 24; while the last-mentioned armature should precede armature 59 which effects the printing. The precedence of magnets 33, 34 is secured by making them quicker in action, and the proper order is given to the others by the means now to be described.

Pivoted on the arm 61 adjacent to the pawl 57 is an upstanding finger 62 (Figs. 2 and 5) normally engaging a rearward shoulder on a downwardly extending stop 63. This stop is on a shaft 64, which also has fast to it the armature 65 of a horizontally arranged magnet 66. It will therefore be clear that so long as the finger 62 is in engagement with the stop the arm 61 and pawl 57 cannot be raised. If now magnet 66 be energized the shaft 64 will be rocked and thus cause the lower portion of the stop to throw the finger off of the shoulder, as illustrated in Fig. 5, in which the armature 65 is shown drawn back to its rearward position by the magnet 66. The magnet 58 can now depress its armature and effect the printing. It is also intended that magnet 66 be energized at the same time as magnets 38 and 58, but evidently the first named should not actuate its armature until magnet 38 has acted, as otherwise the printing might be effected before the type wheel was set. Provision is therefore made as follows for insuring the operation of magnet 66 after magnet 38. On the shaft 64, adjacent to the stop 63, is an arm 67 extending into rearward engagement with an extension 68 of the arm 43, which, it will be remembered, is fast to the shaft 36 which carries the armature 37. Hence if the magnet 66 were to act before magnet 38 it would have to raise the arm 43; but the spring 43ᵇ, added to the tension of the spring 69 which retracts the armature 65, puts too great a load on the arm 67, for the magnet 66 to move unaided, and the result is that although current is flowing through both magnets simultaneously, magnet 66 cannot act to release the printing mechanism until magnet 38 has acted and caused the typewheel to be set.

For shifting the typewheel along the shaft 7 to effect the letter spacing the following devices are provided. On a bar or rail 70, below the shaft 7 (Fig. 3) and fixed in frames 2, 3, is a hub 71, said bar being triangular in cross section or otherwise formed to permit the hub to slide, but not to rotate. Extending in opposite directions from the hub, parallel with the rail, are two flexible cords 72, 73 passing over pulleys 74, 75 and winding in opposite directions on two winding drums 76, 77, fixed on a shaft 78. It will therefore be seen that as the shaft is rotated to wind the cord 73 on its drum the hub is drawn to the right (as viewed in Fig. 3), while rotation of the shaft in the opposite direction winds up

cord 72 and draws the hub to the left. Extending upwardly from the hub are two arms 79, 80, embracing an enlargement on the typewheel hub 6, so as to permit rotation of the latter but cause the same, with the typewheel, to move along the shaft 7 in company with the hub 71. Since the movement of the typewheel to effect the letter spacing must be step by step, such movement is produced by a ratchet wheel 81 (Figs. 3 and 5) on the shaft 78 adjacent to the drum 76, and a pawl 82, extending upwardly and pivotally connected with an arm 83 fast to the shaft 36. Hence at each actuation of armature 37 by its magnet the pawl will be raised and caused to ride over a tooth on the ratchet. When the magnet 38 is deënergized the armature 37, returning to its initial position, depresses the pawl 82 and so rotates the shaft 78, by a space corresponding to one tooth on the ratchet, in the direction necessary to wind cord 73 on its drum. The ratchet teeth being properly proportioned, this movement of the shaft will carry the typewheel one letter space to the right, and since the actuation of the ratchet occurs at each return of the armature 37 to its initial position it will be seen that after each printing operation, which of course includes the energization of magnet 38, the typewheel will be shifted to the right for the next letter. The pawl 82 is held in yielding engagement with its ratchet by a spring 84 fixed to the arm 83, as shown in Fig. 5.

The return of the typewheel to its initial position at the left is effected by the following mechanism. Loosely mounted on the shaft 78 (Fig. 3) is a pinion 85; and around the shaft is a coil spring 86, at one end engaging a pin 87 on the pinion and at the other end engaging a pin 88 on a collar 89 rigidly mounted on the shaft. In mesh with the pinion 85 is a gear wheel 90, loose on a fixed shaft 91, which latter is surrounded by a coil spring 92 engaging a pin 93 on the gear and fast to a stud 94 on the shaft. The springs 86 and 92 are arranged so as to be wound up by the rotation of the ratchet 81 and shaft 78; the reverse movement or unwinding of the springs, during the retraction of pawl 82, being prevented by a holding pawl 95 engaging the ratchet. It will therefore be clear that if both pawls 82 and 95 are disengaged from the ratchet the springs, previously wound up as described, will rotate shaft 78 in the opposite direction, thereby winding cord 72 on the drum 76 and bringing the typewheel back to its initial position with the hub 71 resting against the vertical stop 71ª. This release of the ratchet 81 is effected by the mechanism now to be described.

Below the rear end of the pawl 95 is a finger 96 (Figs. 2, 5 and 6) fast to a shaft 97 journaled in the plates or frames 1, 2, and carrying on the outside of plate 1 an upwardly extending arm 98 having a shoulder on its upper end as shown. Hence if shaft 97 be rocked by throwing arm 98 to the left the finger 96 will disengage the pawl 95 from the ratchet. To thus actuate the arm 98, the arm 67, (which, it will be remembered, is oscillated by magnet 66), is extended downwardly, as at 99, and is provided with a small lever 100 arranged to engage the shoulder or stop on arm 98. Normally the lever is held out of engagement with said arm by a light spring rod 101 mounted on the arm 61 and having its forward end turned laterally to engage the bifurcated forward end of the said lever. When, however, the arm 61 is raised by magnet 58, as shown in Fig. 5, the rear end of the lever is depressed against the top of the arm 98. If now the magnet 66 (which it will be remembered must actuate its armature 65 before magnet 58 can work) be deenergized it will permit the spring 69 to throw the arm 99 forward and with it the lever 100, thus permitting the rear end of the latter to be depressed by the spring rod 101 into engagement with the shoulder or stop on arm 98. On energizing the magnet 66 again, the arm 99 retracts the lever 100 and arm 98 to the positions shown in Fig. 6, thus disengaging pawl 95 from the ratchet 81 as previously described. On the end of the shaft 97 adjacent to plate 2 is an upwardly extending arm 102, carrying at its top a lever 103 the right end of which (see Figs. 7 and 8) lies in front of the pawl 82. The arm 102 is loose on its shaft, and is held yieldingly against a stop 104, fixed on the shaft, by the pressure of the pawl on the lever 103. It will now be seen that when the shaft 97 is rocked to withdraw pawl 95 from the ratchet 81 it will also throw the arm 102 backward and, through the instrumentality of the small lever 103, disengage the pawl 82 also. Thus both pawls are disengaged; and the shaft 78 being free, it is instantly rotated by the springs 86 and 92, winding up the cord 72 and drawing the typewheel back to its initial position. On deënergizing magnet 66 after the operation just described, the parts associated with shaft 97 are restored to normal position by a coil spring 97ª, urging said shaft in the clockwise direction. One end of this spring is fast to the shaft, while its other end, depending below the shaft, is held rearwardly under tension by a cord 97ᵇ, wrapped around a winding stud 97ᶜ by which the tension of the spring can be regulated.

As previously explained, magnet 66 cannot operate its associated mechanism unless magnet 38 be also energized, and hence the latter magnet must be energized during the operation of retracting the typewheel. But

at each deënergization of magnet 38 the pawl 82 is depressed and so by turning the ratchet 81 advances the typewheel one step to the right. It will therefore be seen that the deënergization of the magnets preparatory to a printing operation after return of the typewheel to its initial position would cause the typewheel to be advanced a step from such position, thus making it impossible to print in the first space. This result is prevented, however, through the instrumentality of the small lever 103 in the following manner. When this lever is in its normal position its left end (see Figs. 4, 5, and 7) rests on a rearwardly and downwardly inclined surface 104 formed on top of the plate 22. When the lever is moved to the rear to disengage the pawl 82 from the ratchet 81 (which operation, it will be remembered, cannot take place unless the magnet 38 is energized and the pawl therefore raised) the lever clears the surface 104ª and its left end is instantly depressed as shown in Fig. 8, by a spring 105 fast on the shaft 64 and having its free end pressing downwardly on the lever. Hence on breaking the circuit of magnet 66 the lever 103, stopped by the plate 22, cannot move forward and therefore holds the pawl 82 out of engagement with the ratchet 81. On breaking the circuit of magnet 38 the pawl just mentioned is depressed, and a pin 106 thereon swings the lever clear of the stop, permitting the lever and the pawl to move forward to their initial positions. But before the lever has cleared the stop and moved forward a space sufficient to allow the pawl to engage the ratchet the pawl has been depressed far enough to clear the tooth which it was approaching and hence no actuation of the ratchet will occur. The printing wheel is thus left in its initial position and can print in the first space of the line. In practice no effort is made to deënergize magnet 66 in advance of magnet 38, for the reason that by the time the lever has cleared the stop the pawl has already passed beyond the tooth which it must engage to actuate the ratchet. Hence all the magnets may be deënergized at the same time without causing the typewheel to advance. When the typewheel is restored to its first position the operator brings it to unison, as hereinafter described, by causing it to rotate until the unison finger 6ª, rotatively and axially adjustable on the hub 6, strikes the unison stop 6ᵇ on the arm 83.

Rotatably mounted on arms extending from the hub 71 is a roller 107 of felt, soft rubber or other suitable material, arranged to bear on the typewheel so as to be rotated thereby in contact with the type. In the path of the roller is a brush 108 carried by and extending into an ink-reservoir 109 and serving to draw ink from the reservoir in the manner of a wick. In its travel across the machine the inking roller strikes the brush and receives ink therefrom. As the brush seldom engages the roller in the same spot twice in succession the peripheral surface of the roller is effectively supplied with ink, which it transfers to the typewheel as the latter rotates.

The paper on which the impressions are made is drawn from a roll 110, suitably mounted at the back of the machine, and passes between the platen and the typewheel. From the platen the paper passes over friction disks 111, 112, (Figs. 3 and 4) in contact with cramp disks 113, 114. The friction disks are mounted loosely on a shaft 111ª, on which are two oppositely wound coil springs 111ᵇ and 111ᶜ, each in frictional engagement at one end with the adjacent disk and at the other end with the shaft, as shown in Fig. 7, the springs being arranged so that in unwinding they will rotate the disks in the direction of the arrow, Fig. 4, and hence tend to draw the paper off the roll. The springs are wound up by a system of multiplying gears now to be described. The end of shaft 11 is provided with gear teeth, as shown in Fig. 7 at 11ª, which mesh with a large gear 11ᵇ rotatable on shaft 111ª, and rigidly connected to or integral with the large gear is a smaller gear 11ᶜ, in mesh with another large gear, 11ᵈ, rotatably mounted on shaft 11. The last-mentioned gear also has a small gear 11ᵉ rigidly connected to or integral with it, and this small gear 11ᵉ is in mesh with a larger gear 11ᶠ fast to the shaft 111ª. It will therefore be seen that the rotation of shaft 11 (by the ratchet 41 and pawl 42, as previously described) will rotate the gears 11ᵇ, 11ᶜ, 11ᵈ, 11ᵉ, 11ᶠ and so rotate the shaft 111ª, winding up the springs. It will also be clear that since the driving gears 11ª, 11ᶜ, 11ᵉ, are smaller than the respective driven gears 11ᵇ, 11ᵈ, 11ᶠ, the power will be multiplied in transmission from shaft 11 to shaft 111ª. The speed of the last-mentioned shaft will of course be correspondingly reduced; but this is no drawback, since the unwinding of the springs, necessary to rotate the friction disks through an angle sufficient for the line-spacing, is very slight. Moreover, the springs are rewound at each travel of the typewheel to the end of a line, so that they are rewound after each movement of the paper. The springs are prevented from unwinding by the friction of the paper, held against the friction disks by the cramp disks, the paper itself being prevented from unwinding off the roll by suitable mechanism not shown. The preferred mechanism for the purpose is described and claimed in prior patents of the said John Burry, deceased, (Nos. 734297 and 754420, dated July 21, 1903, and March 15, 1904, respectively),

and hence need not be described herein. Suffice it to say that at each return of the typewheel to its initial position the paper roll is released and allowed to rotate (by the friction disks acting on the paper) to an extent sufficient for a line-space.

The wiring of the machine is illustrated diagrammatically in Fig. 9, in which it will be seen that two circuits are employed, designated by A and B. In one of the circuits, as A, magnets 16 and 66 are included, and in the other the magnets 33, 34, 38 and 58. Any suitable transmitter may be employed which is capable of sending current impulses of either polarity at will and a simple apparatus for the purpose is illustrated in Fig. 9 in dotted lines. The two circuits A and B are connected through the batteries to keys C, D, E, F, playing between conducting bars G, H, placed above the keys, and bars I, J, placed below. The keys being normally in electrical contact with the upper bars it will be clear that on depression of key C or E an impulse of one polarity, say positive, will be sent over the respective circuit, and, similarly, depression of key D or F will give an impulse of the opposite sign. Thus current impulses in either direction can be sent over the circuits simultaneously or in any desired order of succession according to the order in which the keys are depressed.

The operation of the machine will now be readily understood. The first function to be performed is the rotating of the typewheel to bring to the printing point the pair of characters containing the character which it is desired to print. For this purpose alternate positive and negative impulses are sent over circuit A, as by alternate depression of keys C and D, until the rotation of the typewheel, in the manner described, brings the selected pair of type to the printing position. While the key (C or D) last employed is kept depressed (thereby energizing magnet 66 but not actuating its armature, since, as previously explained, this magnet cannot operate until its armature load is partially relieved by the action of magnet 38) one or the other of keys E, F, is depressed thereby causing an impulse of corresponding polarity to be sent over circuit B. Which of these keys is depressed depends upon whether the letter to be selected from the pair at the impression point is above or below the platen. Thus, if a positive impulse will energize the polarized magnet 33, and hence cause the shifting member 25 to be lowered, depression of key E will result in the character below the platen being brought to the printing position. Similarly, depression of key F will, by sending a negative impulse and energizing polarized magnet 34, cause the shifting member 25 to be lifted and the character above the platen to be brought to position. These magnets being quick-acting the shifting member is set before magnets 38 and 58 can be fully energized. Current is now flowing in both circuits, and the magnet 38, instantly after the setting of the shifting member 25 by magnet 33 or 34, as the case may be, draws down its armature 37, thereby throwing the shifting finger 24 into engagement with the shifting wheel 23 and raising the arm 43—68 off of arm 67. Magnet 66 is thus relieved of part of its load, and, being already fully energized, at once actuates its armature 65, which releases the printing mechanism by throwing arm 57 out of engagement with its stop 63. Thereupon magnet 58, fully energized like the rest, draws down its armature 59, which raises the pawl 57 and so actuates the platen. The parts are now in the positions shown in Fig. 5. On breaking the circuits no effect is produced on the tongue 13, since the magnet 16 is polarized and hence the tongue remains against whichever pole it came to rest on. The deënergization of magnet 66, however, permits the spring 69 to restore the armature 65 to its initial position, as shown in Fig. 2, while the deenergization of magnet 38 retracts the shifting finger 24, thus freeing the typewheel, and depresses the pawl 82, thereby rotating the shaft 78 and advancing the typewheel one letter-space. The upward movement of the armature 37, under the influence of spring 43^b, raises armature 59, whereupon the arm 62 is reëngaged with the stop 63. The parts are thus restored to their initial positions, as shown in Figs. 2 and 4.

The printing wheel may be returned to its initial position from any point in its line of travel, after any printing operation, the parts then being, as previously stated, in the positions shown in Fig. 5. The circuit of magnet 66 is now broken, allowing the armature 65 to be retracted and therefore causing the lever 100 to engage the shoulder on arm 98. The circuit is now closed again, whereupon the armature is actuated and through the instrumentality of the lever named throws the arm 98 rearward, thus disengaging pawls 82 and 95. The shaft 78 being freed the springs 86 and 92 revolve the shaft and wind up cord 72 on its drum. The typewheel is thus returned to its leftward position; and the operator, having broken the circuit of magnets 16 and 66, sends impulses of alternating polarity over this circuit until the unison finger 6^a on the typewheel is brought against the unison stop 6^b. The machine is now in condition for beginning a new line, with the typewheel at unison.

It is found in practice that there should be a little play or lost motion between the star wheel 23 and the scape wheel 12, so that

the setting of the star wheel by the shifting finger 24 cannot by any possibility turn the scapewheel backward far enough to bring the tooth which has just passed the tongue 13 back in engagement with or close to the latter. For such purpose the shaft 7 is divided at the star wheel, and the hub of the latter is provided with a transverse shoulder cut slightly off center, as shown at 23^a, Figs. 10 and 12. On the adjacent end of the other section of shaft 7 is a collar 7^a, having a similar shoulder 7^b, off center on the opposite side. Hence when the two sections are brought together in alinement, either section can turn slightly in either direction independently of the other section, as clearly indicated in Fig. 10. To afford a bearing for the scapewheel section of the shaft it is provided with an axially extending pin 7^c, which projects into a central bore 23^b in the star-wheel section of the shaft when the parts are assembled, as shown in Fig. 11.

What is claimed as the invention of the said JOHN BURRY, deceased, is:

1. In a printing telegraph receiver having a type-carrier, the combination with type-carrier setting mechanism including an electromagnet for actuating the same, and printing mechanism including an actuating electromagnet, in circuit with the first so as to be energized simultaneously therewith; of mechanism, including an electromagnet in another circuit, for causing the first two electromagnets to actuate the respective mechanisms in the order named; as set forth.

2. In a printing telegraph receiver having a type-carrier, the combination with type-carrier setting mechanism including an electromagnet for actuating the same, and printing mechanism including an actuating electromagnet in circuit with the first so as to be energized simultaneously therewith; of locking mechanism releasably restraining the printing mechanism from operation, an electromagnet in another circuit for actuating said locking mechanism to release the printing mechanism, and means under the control of the setting electromagnet for releasably holding the said locking mechanism against release; whereby when the three electromagnets are simultaneously energized the printing mechanism will follow the type-carrier setting mechanism in operation; as set forth.

3. In a printing telegraph receiver having a type-carrier, the combination with a type-carrier setting electromagnet, and a printing electromagnet in circuit with the first so as to be energized simultaneously therewith, of an independently energizable electromagnet in another circuit, means releasable by the last named electromagnet normally restraining the printing magnet from operation, and means under the control of the type-carrier setting magnet for releasably restraining the third-named electromagnet from operation to release the printing magnet; whereby when the three magnets are simultaneously energized the setting magnet and the printing magnet will operate in the order named; as set forth.

4. In a printing telegraph receiver having a type-carrier, the combination of electromagnetic means for setting the type-carrier, locking mechanism, electromagnetic printing means normally locked by the locking mechanism, electro-magnetic means for releasing the locking mechanism, and means wholly mechanical for causing the three electromagnetic means to operate in the order named when simultaneously energized, as set forth.

5. In a printing telegraph receiver having a type-carrier, the combination of electromagnetic escapement mechanism for preliminarily adjusting the type-carrier; electromagnetic means for shifting the type-carrier to its final adjustment; electromagnetic means in circuit with and mechanically connected with the said type-carrier shifting means to predetermine the operation of the latter; electromagnetic printing mechanism in circuit with the electromagnetic means for shifting the type-carrier; electromagnetically releasable means for locking the printing mechanism, in circuit with the electromagnetic type-carrier shifting means; and mechanism actuated by the said type-carrier shifting means for normally preventing the locking means from releasing the printing mechanism; as set forth.

6. In a printing telegraph receiver having a type-carrier, the combination of a printing magnet, a releasing magnet in an independent circuit, a stop actuated by the locking magnet, a locking arm associated with the printing magnet armature and normally engaged by said stop to lock the said armature, a type-carrier setting magnet in circuit with the printing magnet whereby the two may be simultaneously energized, and means under the control of the setting magnet serving to normally restrain the releasing magnet from operation; whereby the setting magnet, the releasing magnet, and the printing magnet, will operate in the order named when simultaneously energized; as set forth.

7. In a printing telegraph receiver having a type-carrier, the combination of mechanism for setting the type-carrier; a rock-shaft for actuating said mechanism; an electromagnet for rocking said shaft; printing mechanism for taking impressions from the type-carrier; an electromagnet in circuit with the first for actuating the printing mechanism; means for releasably locking the printing mechanism; an electromagnet in another circuit for actuating said locking means to release the printing mechanism; and an arm on the said rock-shaft arranged to normally restrain the locking means from releasing the printing mechanism, whereby

when the said electromagnets are energized simultaneously the type-carrier setting mechanism will operate in advance of the release of the printing mechanism by the locking means; as set forth.

8. In a printing telegraph receiver having a type-carrier, the combination of mechanism for setting the type-carrier, an electromagnet, an armature associated therewith and connected with the said mechanism to actuate the same, a second electromagnet, an armature therefor, an arm connected with the last-mentioned armature, an arm connected with first-mentioned armature and engaging the first-named arm to prevent actuation thereof while the first-named electromagnet is unenergized, mechanism for taking impressions from the type-carrier, an electromagnet for actuating the impression mechanism, an arm connected with the impression mechanism, and a stop associated with the armature of the second electromagnet and engaging the last-mentioned arm to normally lock the impression mechanism, as set forth.

9. In a printing telegraph receiver having a type-carrier, the combination of mechanism for setting the type-carrier to bring a desired character to the printing position, an electromagnet having an armature connected with said mechanism to actuate the same when the magnet is energized, printing mechanism for taking impressions from the type-carrier, an electromagnet constantly in circuit with the first for actuating the printing mechanism, and means controlled by the first electromagnet for causing the operation of the second magnet to follow the first, as set forth.

10. In a printing telegraph receiver having a type-carrier, the combination of mechanism for setting the type-carrier to bring a desired character to the printing position, mechanism for shifting the type-carrier to effect the letter spacing, an electromagnet having an armature connected with both said mechanisms to actuate the first when the magnet is energized and the second when the magnet is deënergized, mechanism for taking impressions from the type-carrier, an electromagnet in circuit with the first and having an armature connected with the impression-taking mechanism to actuate the same, and means under the control of the first-mentioned electromagnet for causing the type-carrier setting mechanism and the impression-taking mechanism to be operated in the order named when their electromagnets are simultaneously energized, as set forth.

11. In a printing telegraph receiver having a type-carrier, the combination with mechanism for setting the type-carrier to bring a desired character to the printing position, of mechanism for shifting the type-carrier to effect the letter spacing, an electromagnet common to said mechanisms to actuate the first-named before the second, a printing magnet in circuit with the first for taking impressions from the type-carrier, and means under the control of the first-mentioned magnet for causing the printing operation to follow the operation of the type-carrier setting mechanism, as set forth.

12. In a printing telegraph receiver having a type-carrier, the combination with mechanism for setting the type-carrier to bring a desired character to the printing position, and mechanism for shifting the type-carrier to effect the letter spacing; of an electromagnet; an armature therefor, operatively connected with both said mechanisms to actuate the first when the magnet is energized and the second when the magnet is deënergized; mechanism for taking impressions from the type-carrier; an electromagnet in circuit with the first; an armature for the second magnet, operatively connected with the impression mechanism to actuate the same when said second magnet is energized; a stop arranged to normally lock the impression mechanism against operation; an arm associated with said stop to control the actuation thereof; an electromagnet in another circuit for actuating the stop to release the impression mechanism; and an arm connected with the first-mentioned armature and engaging the first-mentioned arm; as set forth.

13. In a printing telegraph receiver having a type-carrier, the combination with a rotatable ratchet connected with the type-carrier to advance and retract the same; of a spring tensioned by the rotation of the ratchet when effecting the letter spacing; a pawl for rotating the ratchet against the tension of the spring; an electromagnet having an armature connected with the pawl to retract the same when the magnet is energized and to advance the pawl to rotate the ratchet when the magnet is deënergized; means operable only when the said electromagnet is energized, for withdrawing the pawl from engagement with the ratchet; a holding pawl normally engaging the ratchet to prevent reverse rotation thereof while the other pawl is being retracted; means connected with the first-mentioned means, for disengaging said holding pawl from the ratchet when the other pawl is withdrawn from the ratchet; and a stop arranged to hold said first mentioned means with both pawls disengaged from the ratchet during retraction of the ratchet-rotating pawl; as set forth.

14. In a printing telegraph receiver having a type-carrier, the combination with the ratchet 81 for shifting the type-carrier from an initial position to effect the letter spacing; of a spring tensioned by the rotation of the ratchet in effecting the letter spacing; a

pawl 82 engaging said ratchet to rotate the same; a lever 104 having one end engaging the pawl; a stop adjacent to the other end of the lever; a pin 106 on the pawl, arranged to depress the contiguous end of said lever to disengage its opposite end from said stop; an arm 102 carrying said lever; and means for retracting the arm to carry the lever rearwardly into position to be engaged by the said stop; as set forth.

15. In a printing telegraph receiver having a rotatable type-carrier, the combination of mechanism for setting the type-carrier to bring a desired character to the printing position, mechanism for shifting the type-carrier axially from an initial position to effect the letter spacing, an electromagnet having an armature connected with said setting mechanism to actuate the same, an arm connecting the armature with the letter spacing mechanism and extending to a point adjacent to the initial position of the type-carrier, a stop on the rotatable type-carrier, and a unison stop on said arm, arranged to be engaged by the first named stop when the type-carrier is at unison in its initial position, as set forth.

In testimony whereof MARIE BURRY, executrix of the estate of the said JOHN BURRY, deceased, has signed this specification, in the presence of two subscribing witnesses.

MARIE BURRY,
Executrix of the estate of John Burry, deceased.

Witnesses:
S. S. DUNHAM,
BERT SANDMAN.