No. 680,693. Patented Aug. 20, 1901.

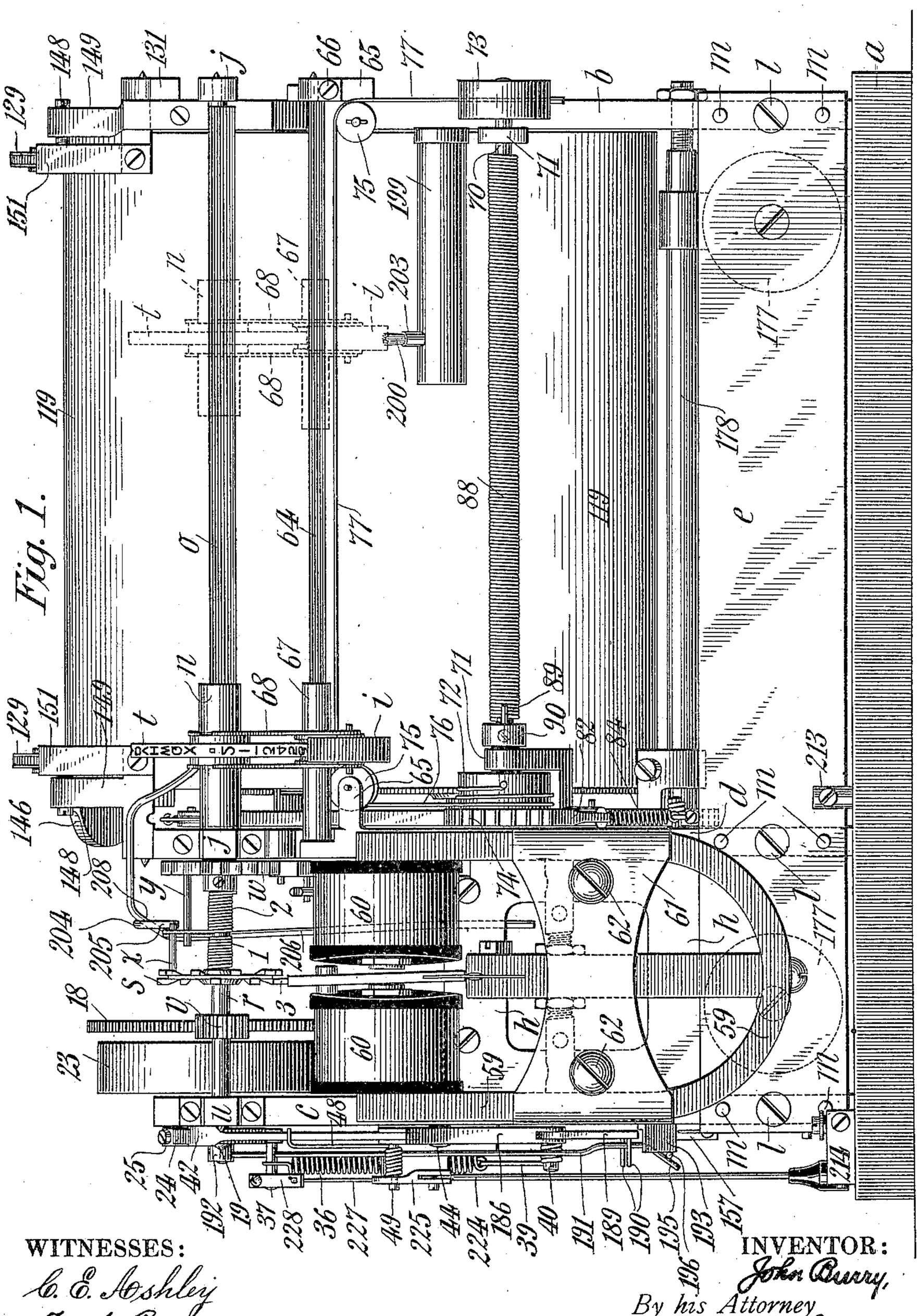
J. BURRY.

PRINTING TELEGRAPH.

(Application filed Apr. 13, 1900.)

(No Model.) 15 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

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Frank Ryalee.

INVENTOR:

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Richard W. Barkley.

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Fig. 2.

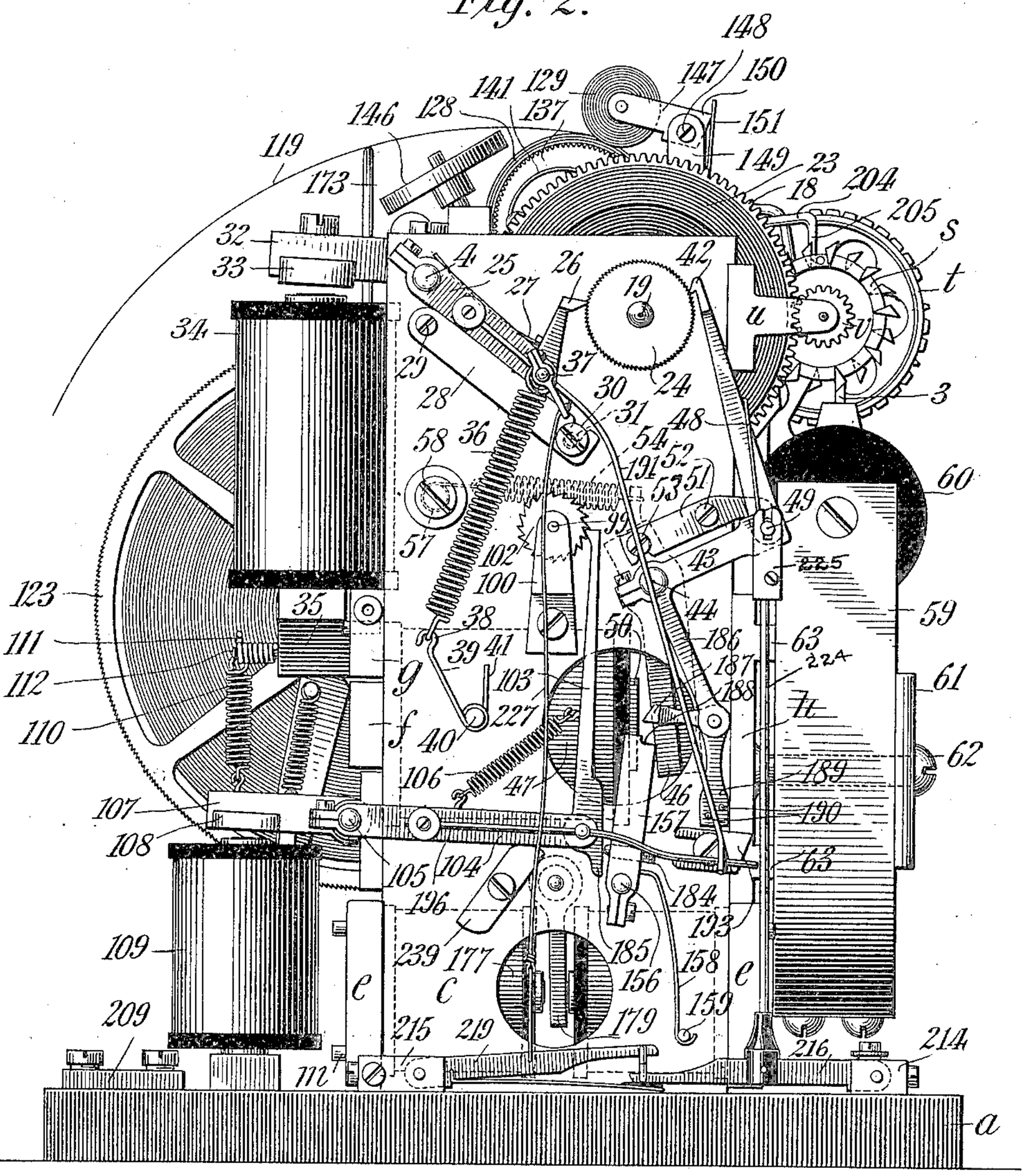

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Fig. 3.

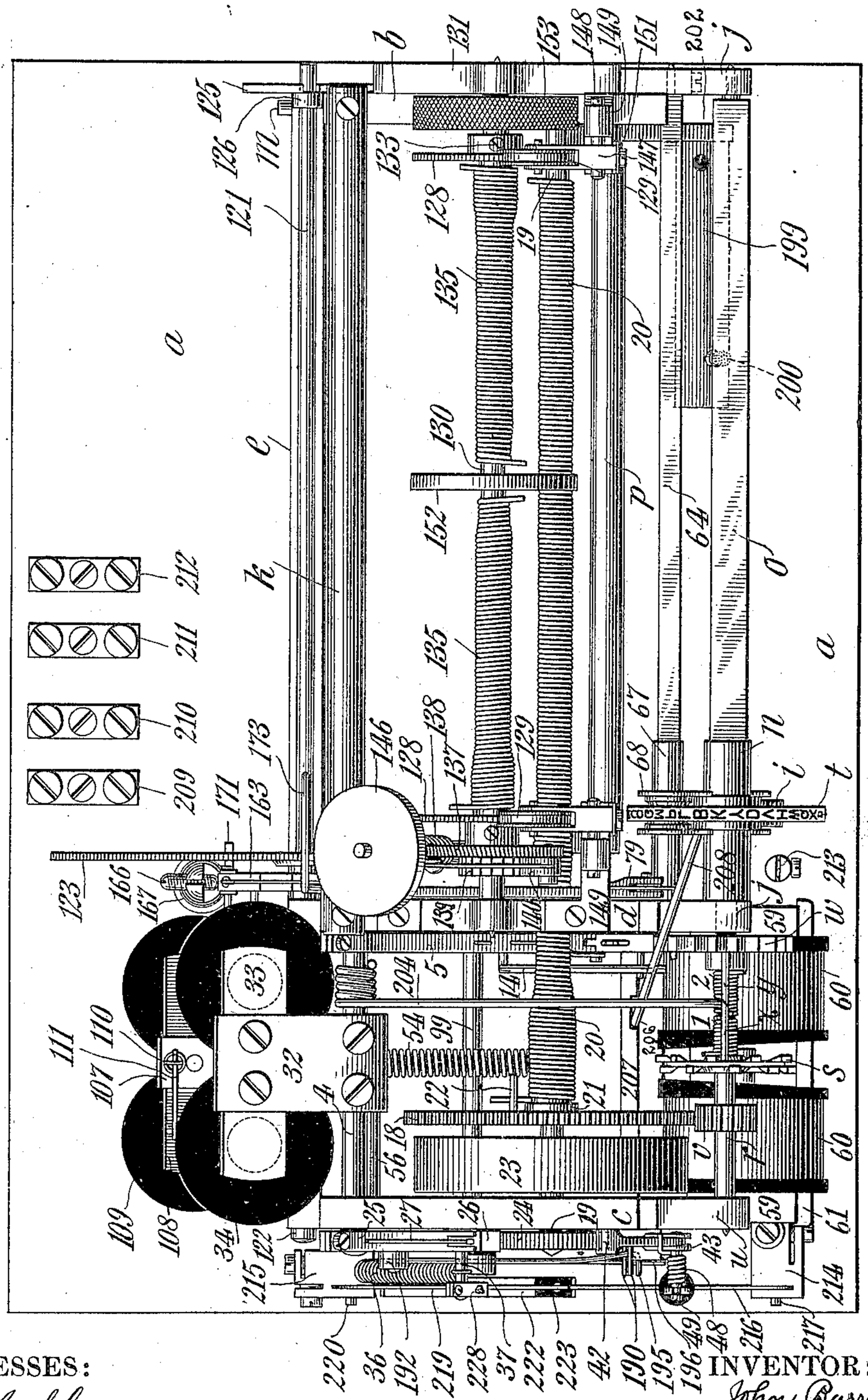

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Fig. 4.

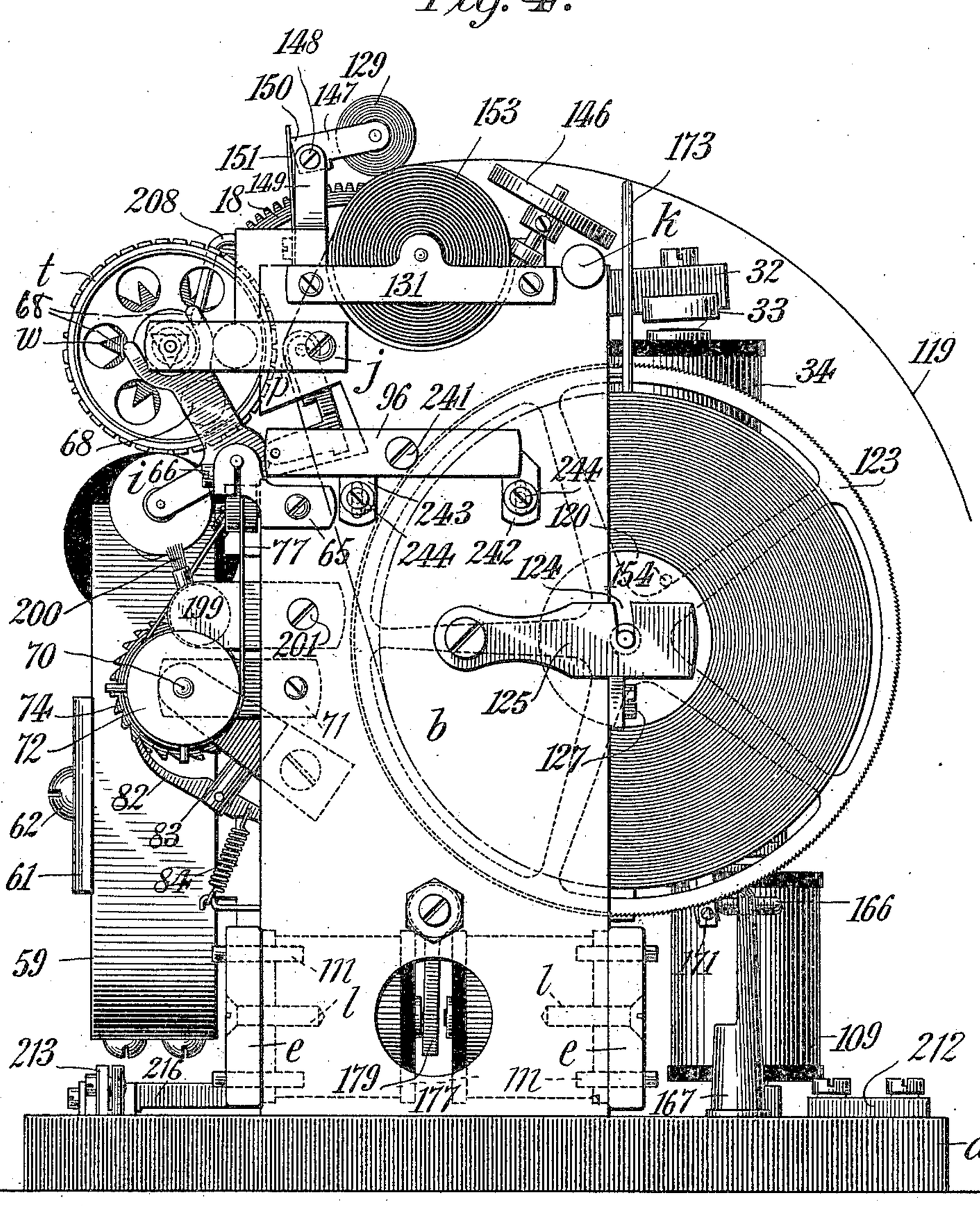

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Fig. 5.

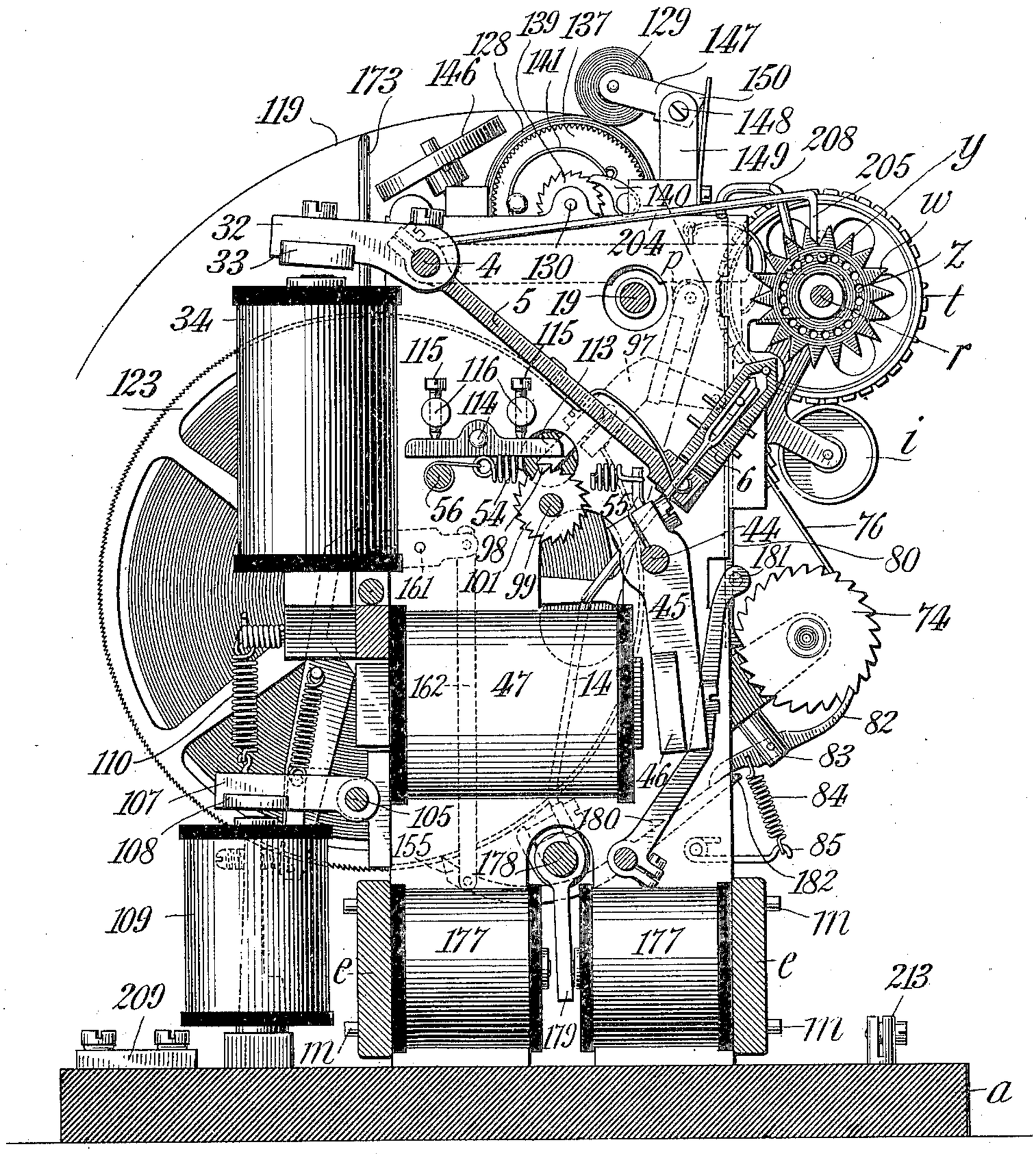

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Fig. 6.

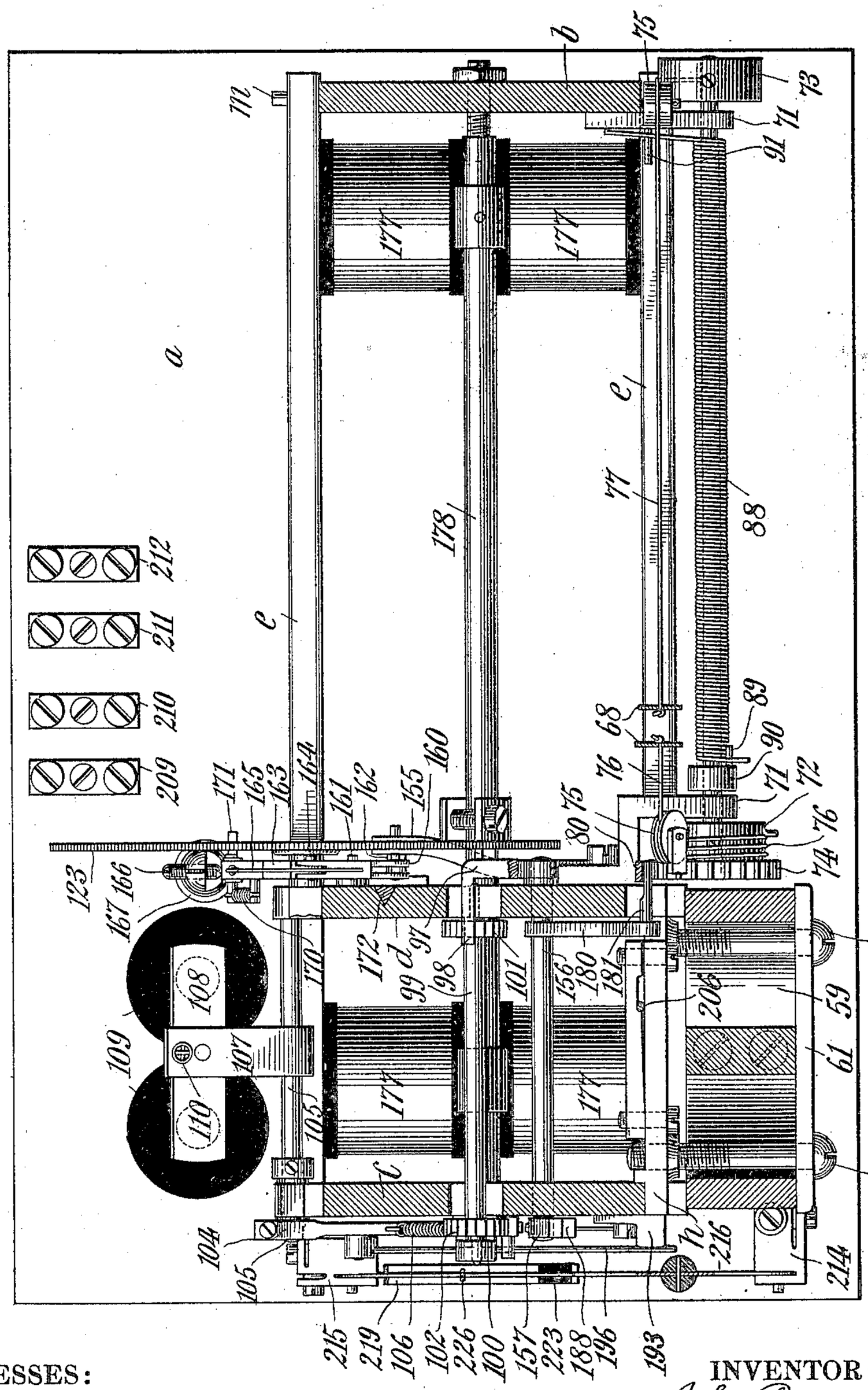

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Fig. 7.

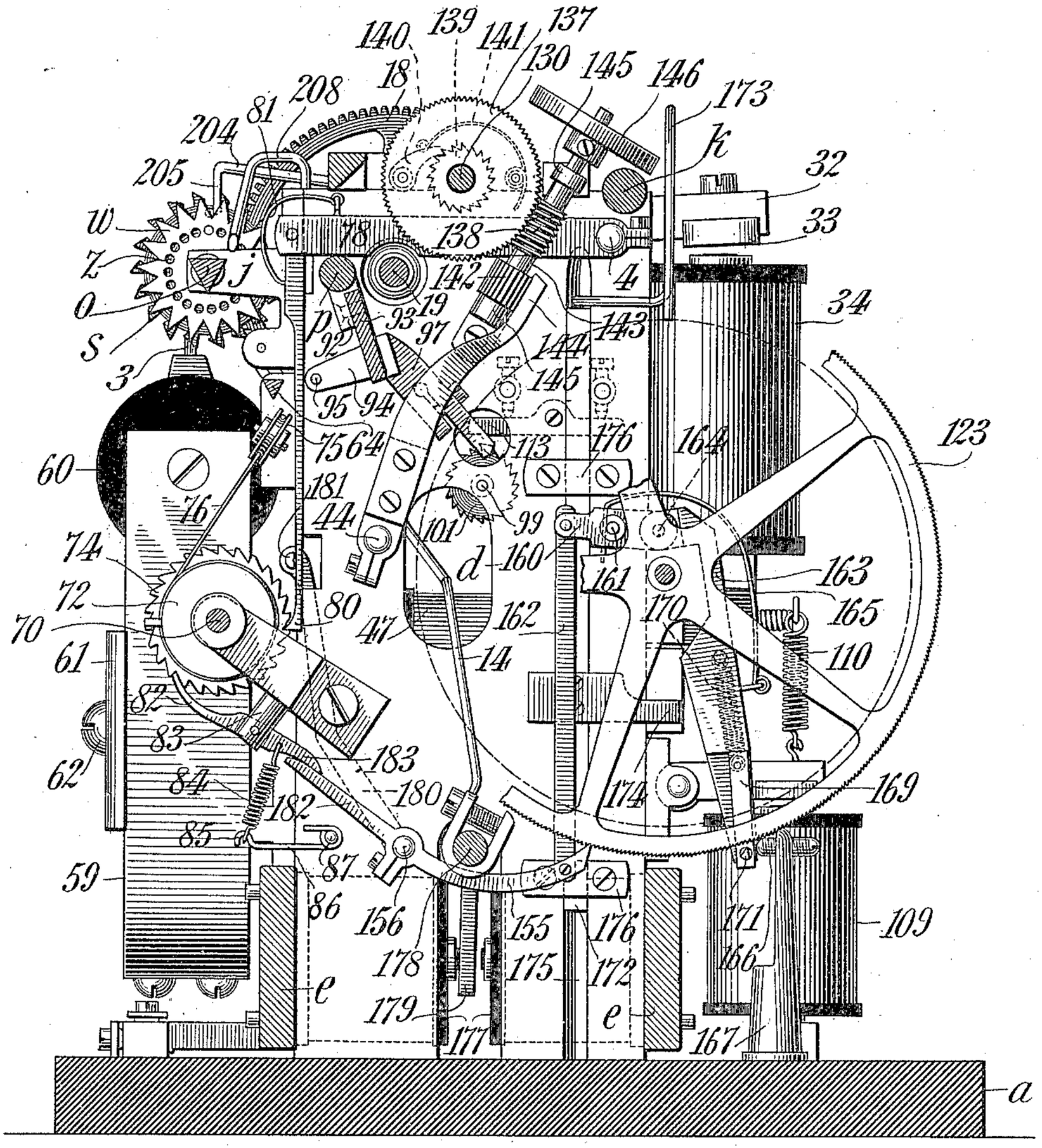
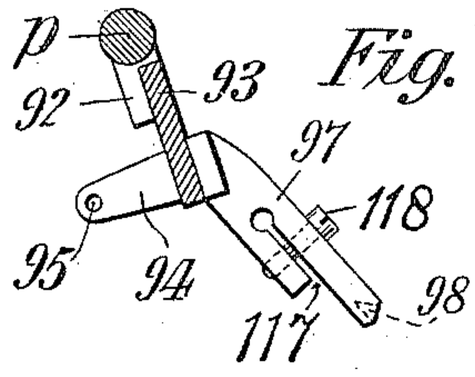


Fig. 8.



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(No Model.) 15 Sheets—Sheet 8.

Fig. 9.

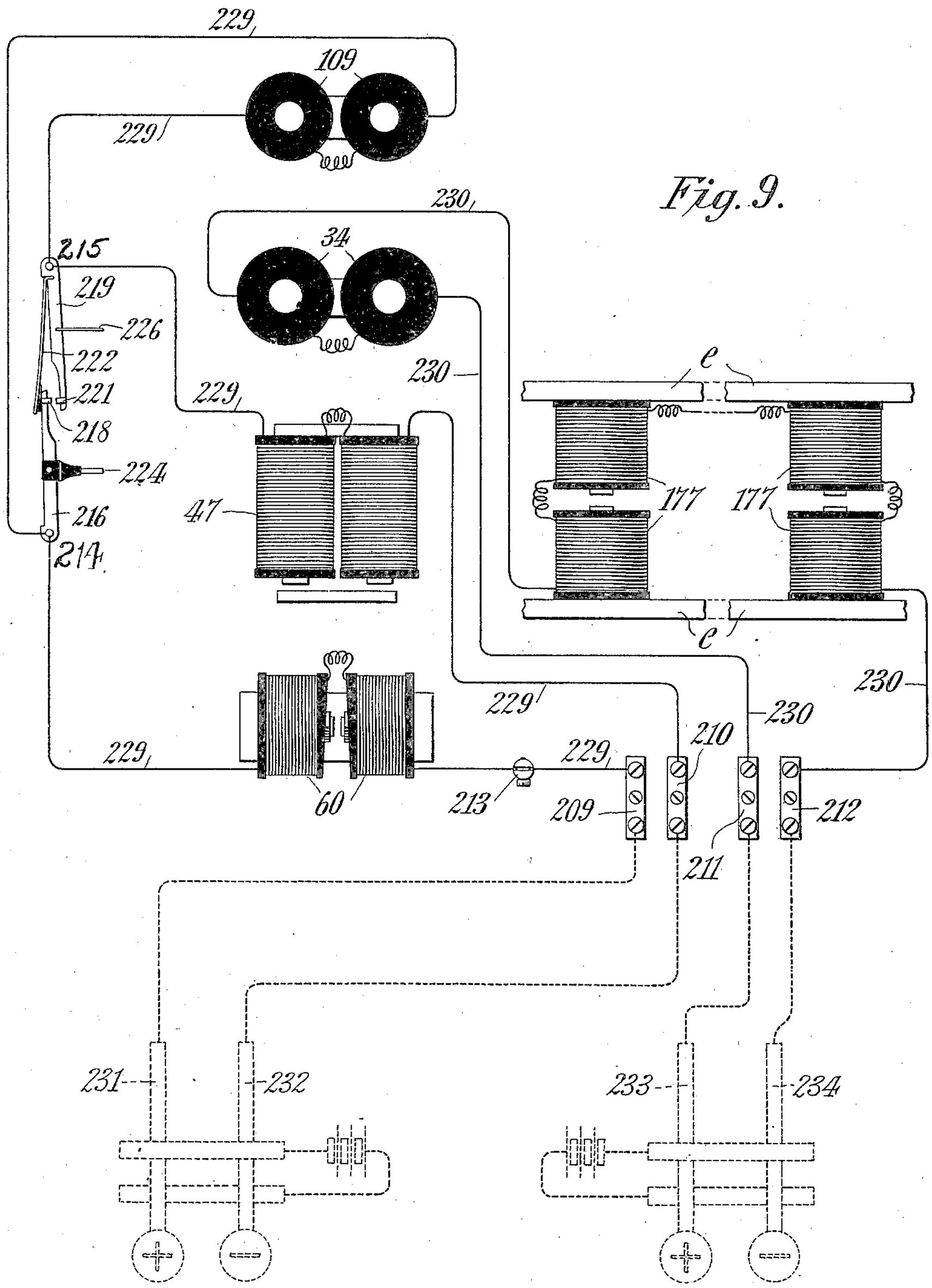

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Fig. 10.

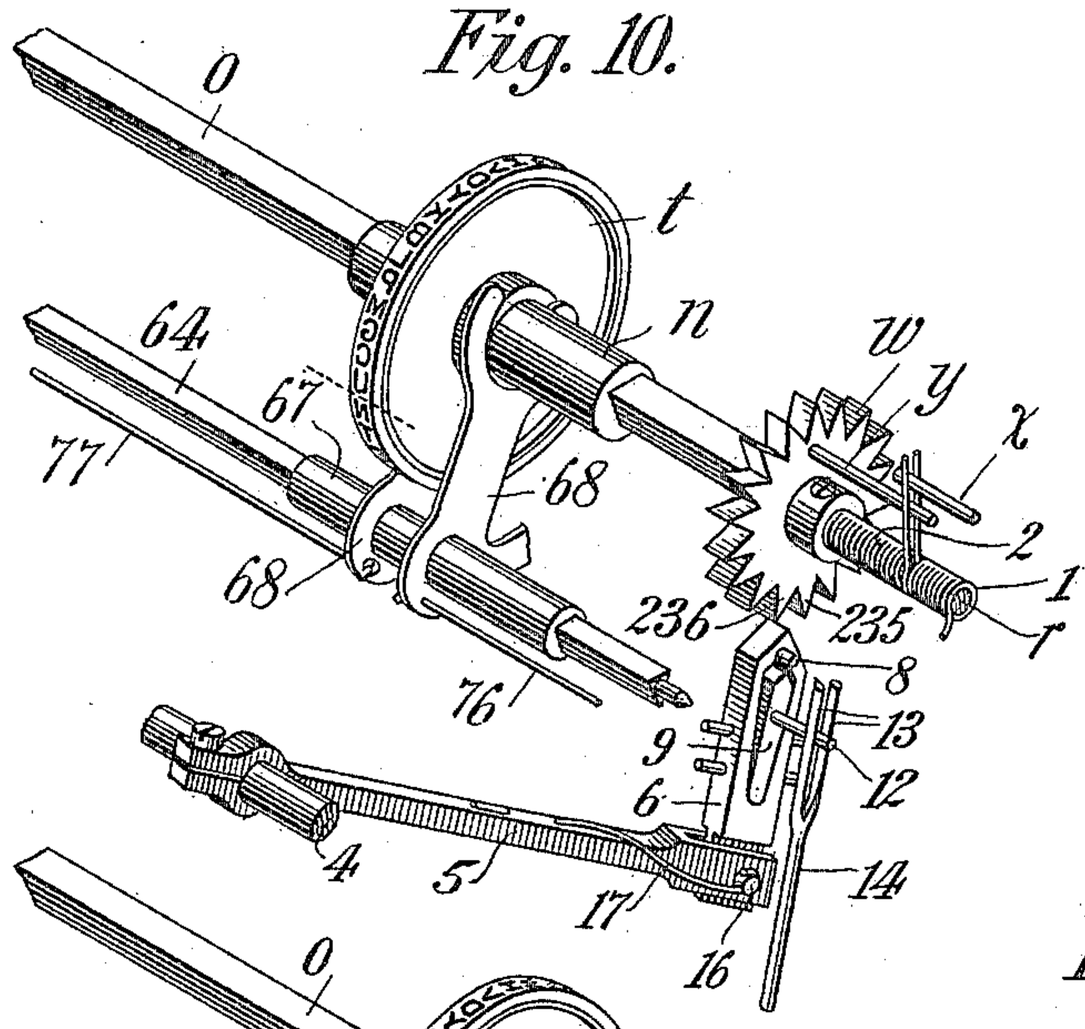

Fig. 11.

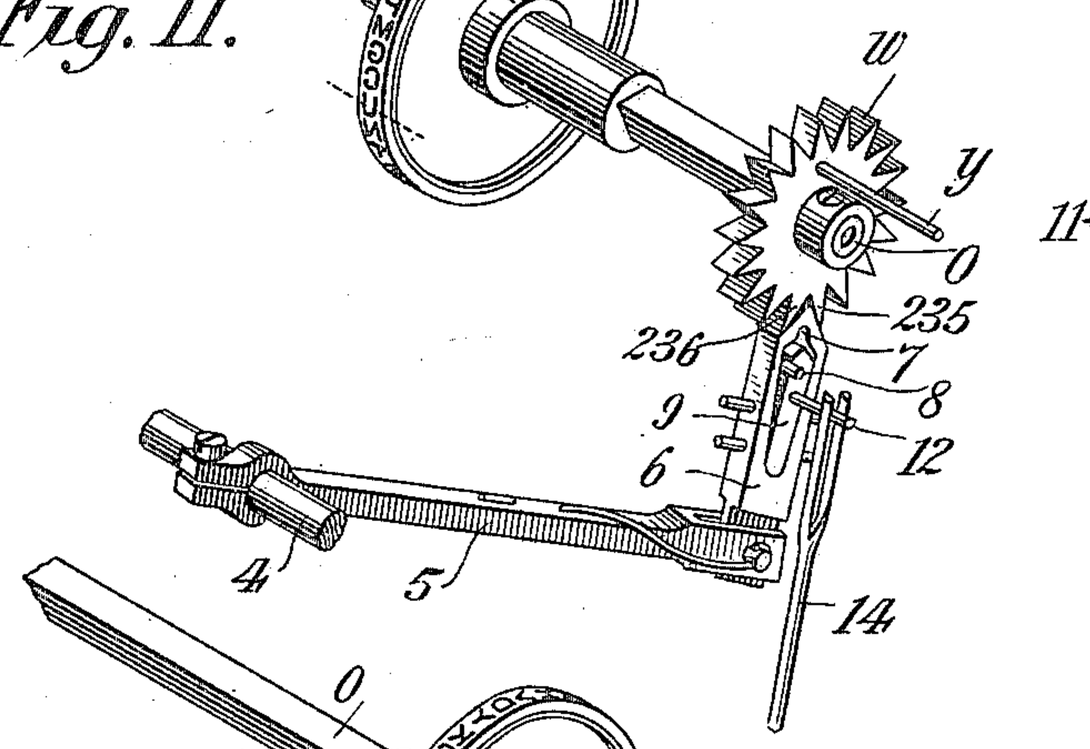

Fig. 12.

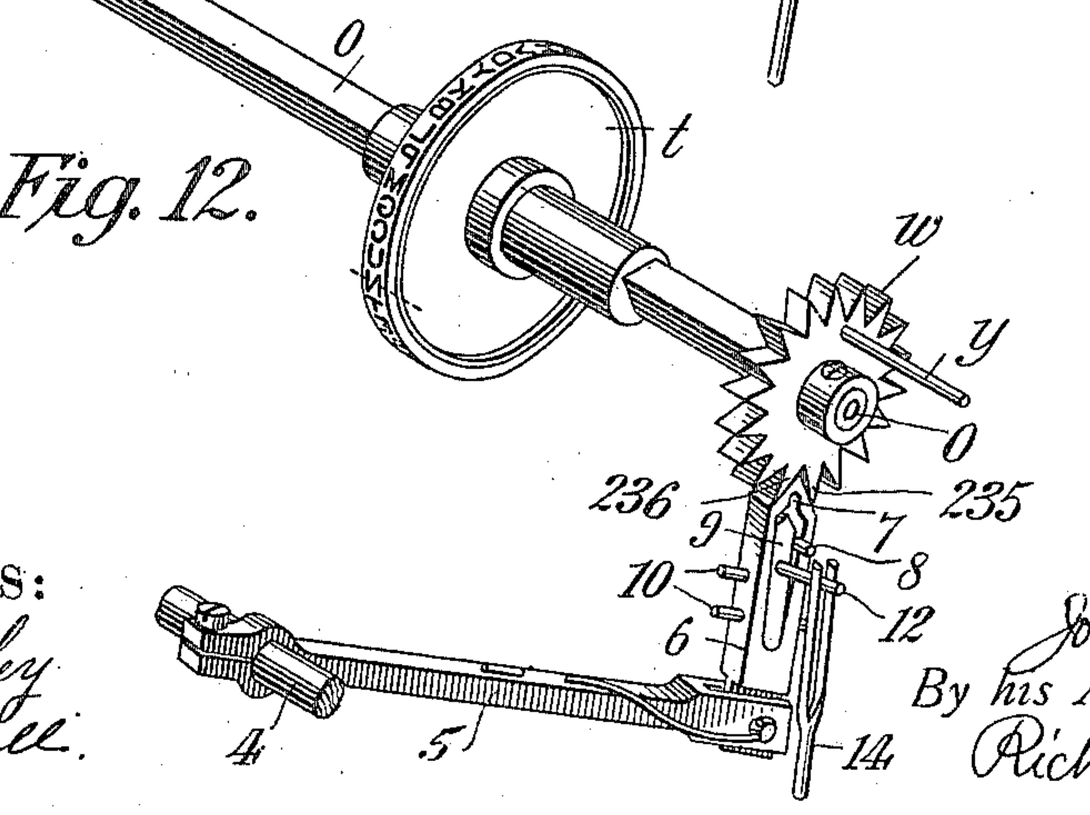

Fig. 13.

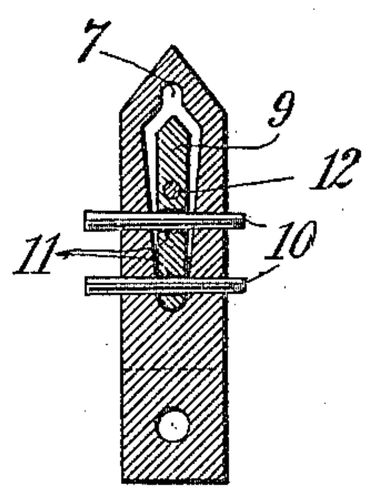

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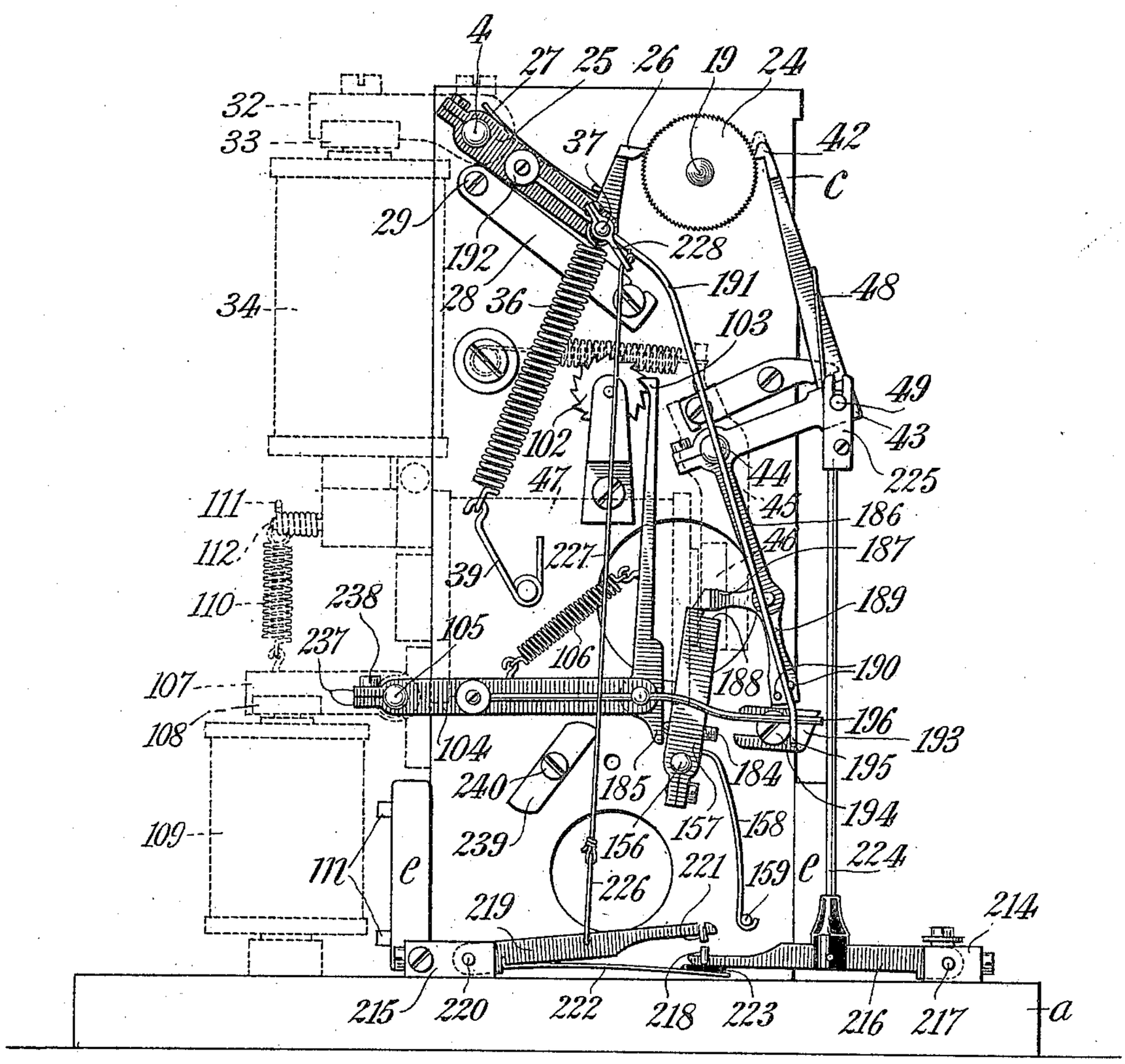
Fig. 14.



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(No Model.) 15 Sheets—Sheet 11.

Fig. 15.

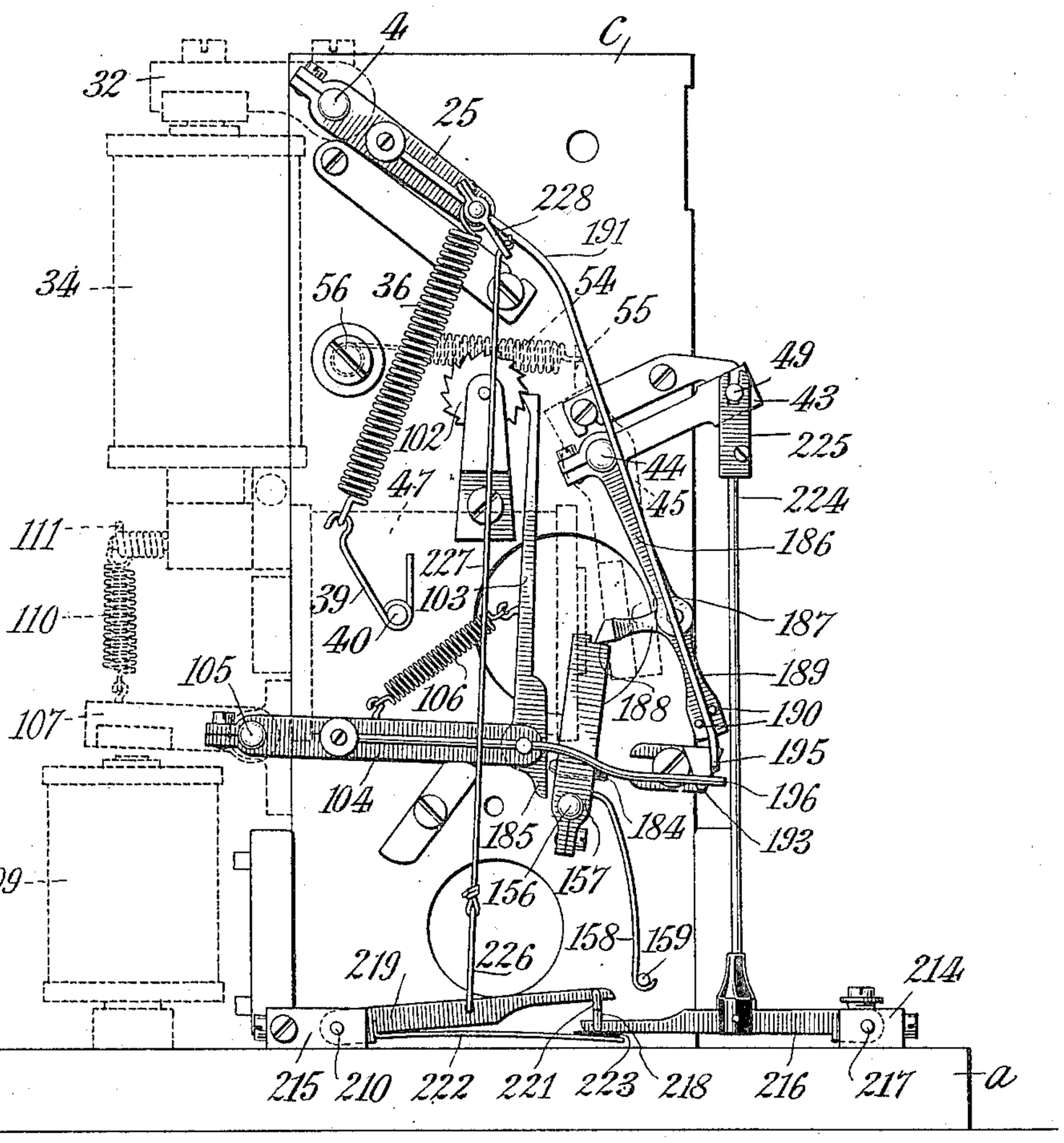

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Fig. 16.

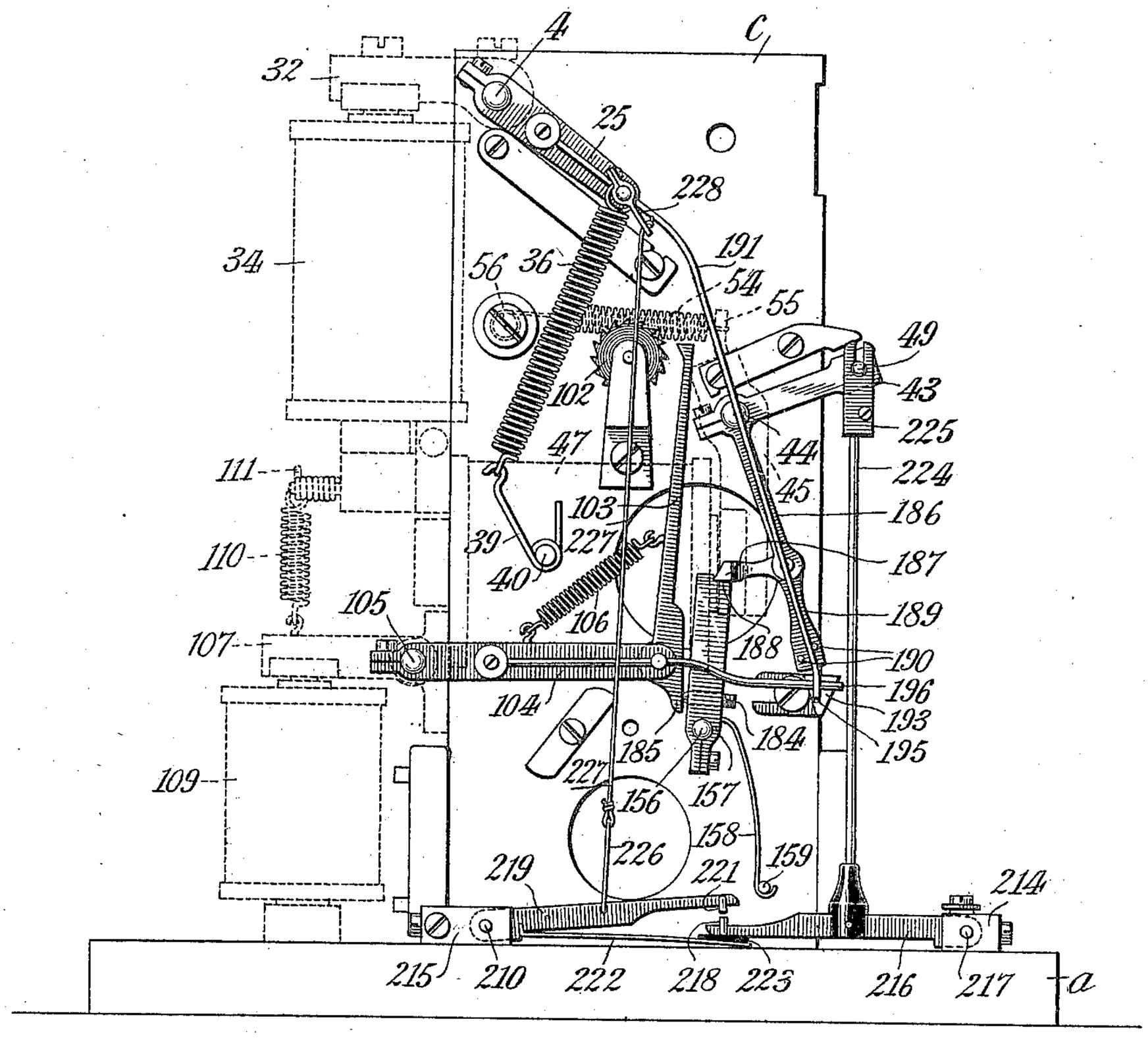

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Fig. 17.

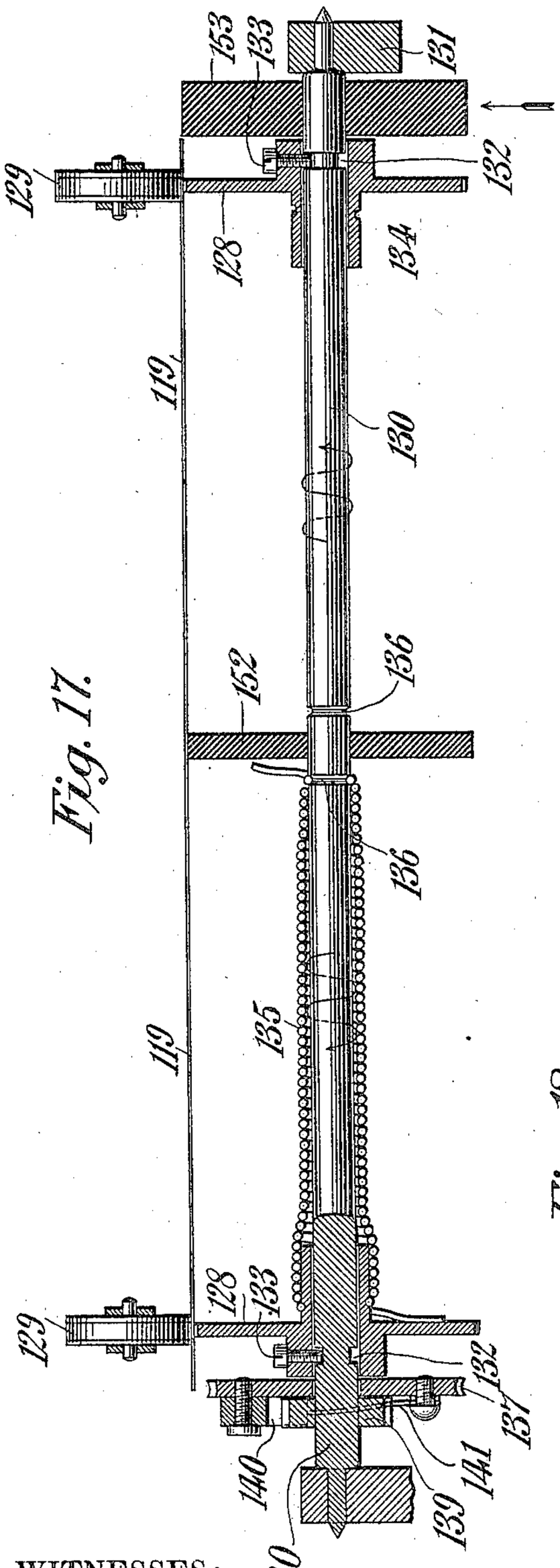

Fig. 20.

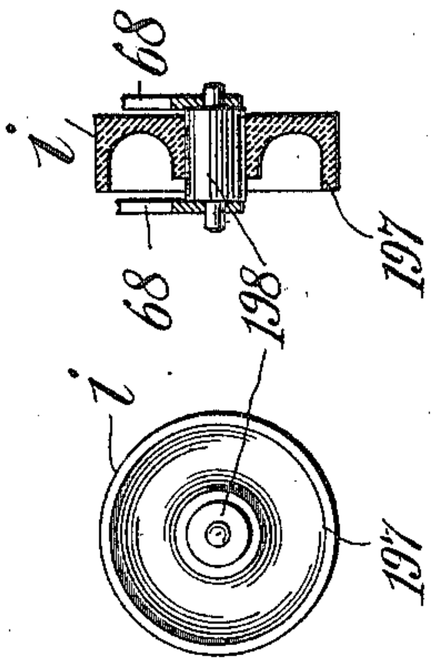

Fig. 19.

Fig. 18.

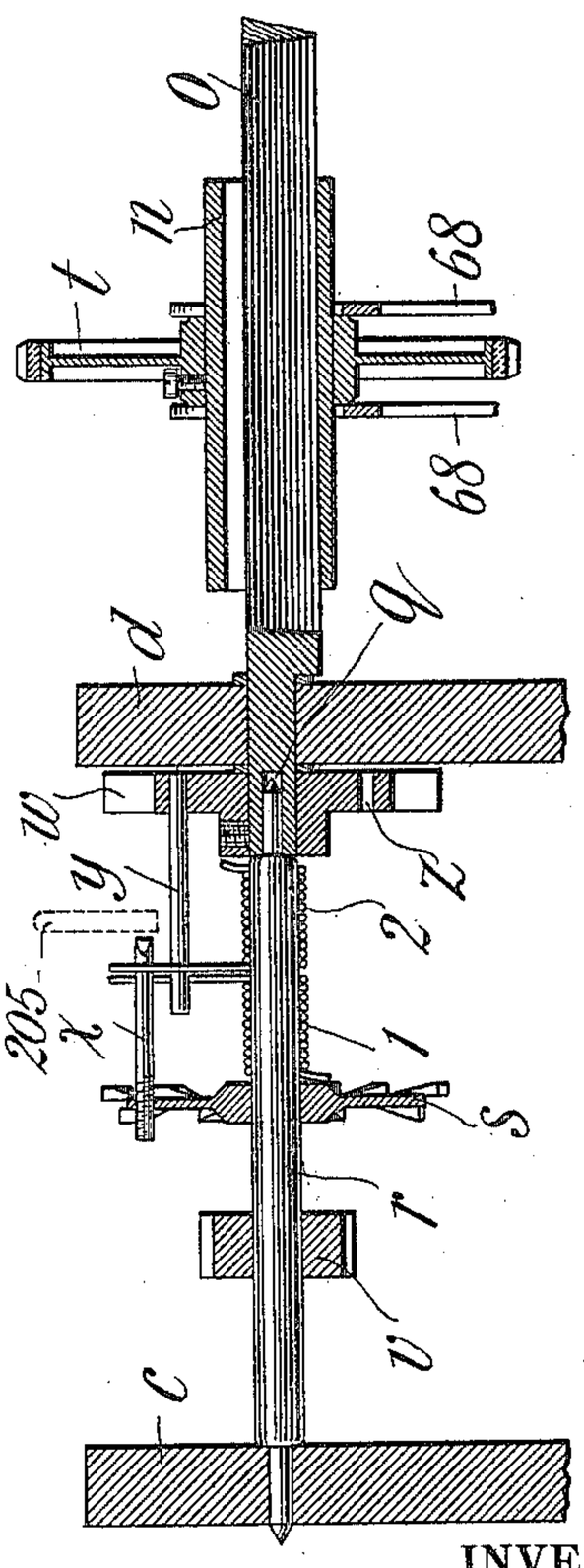

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Fig. 22.

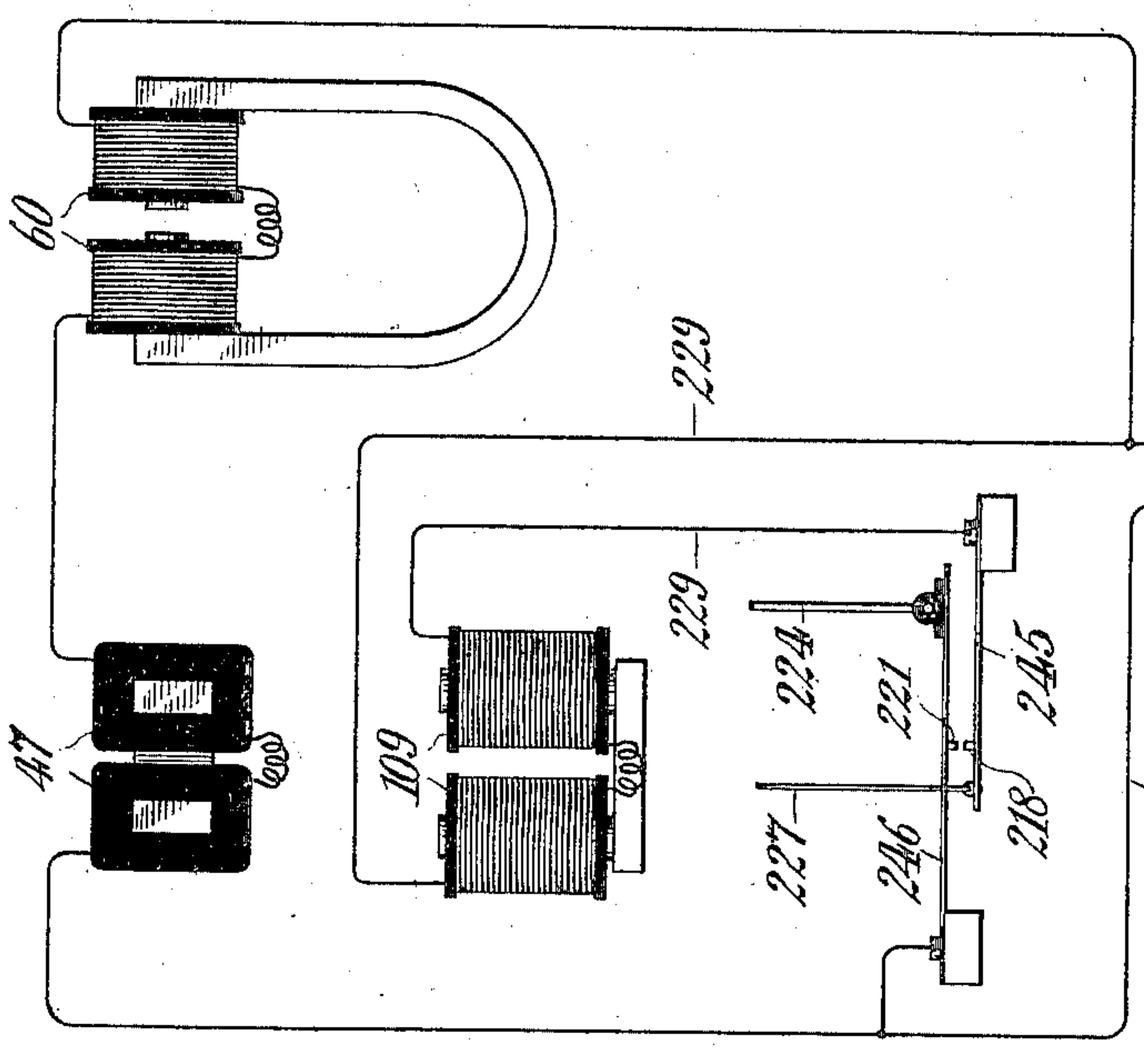
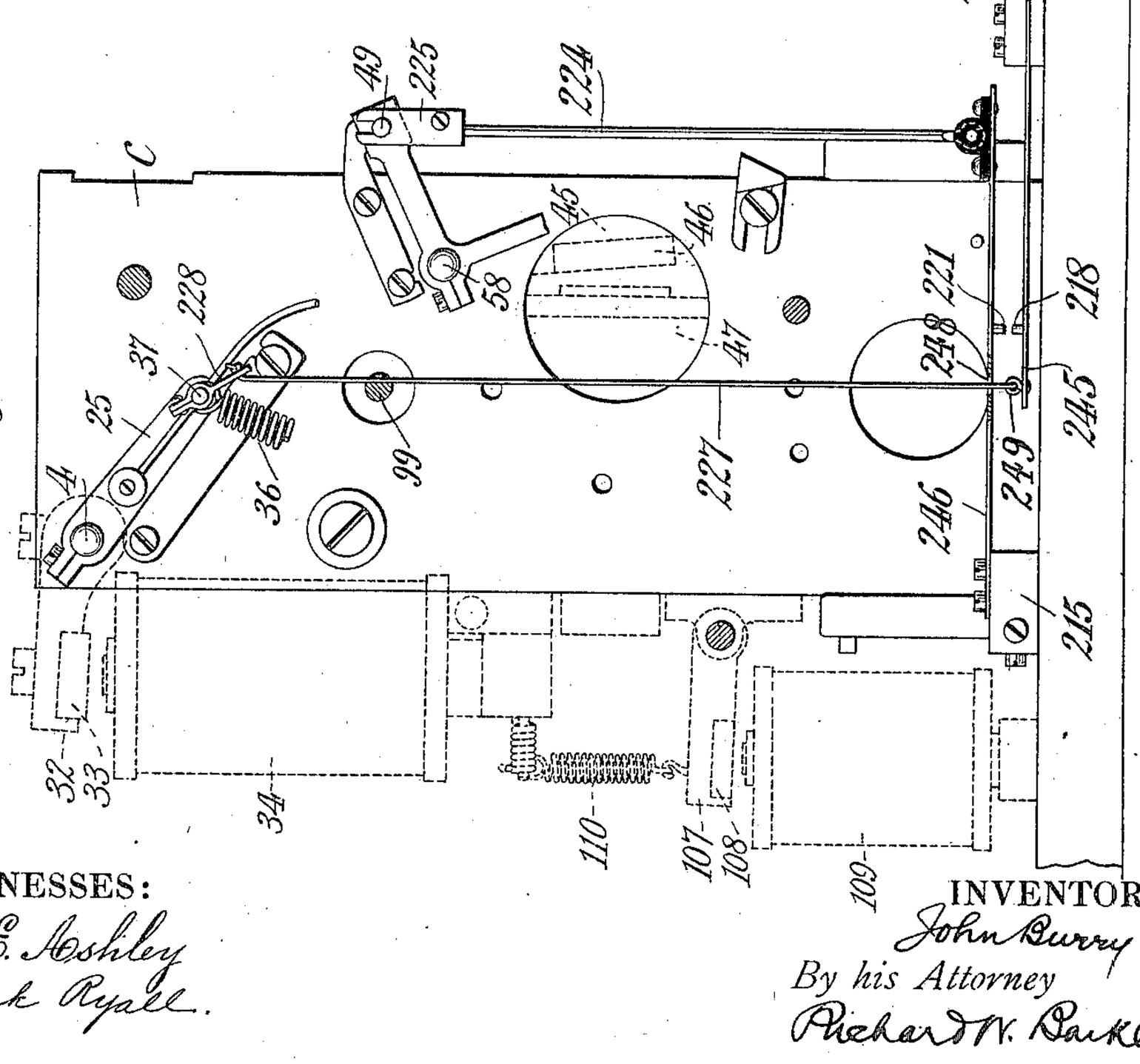


Fig. 21.



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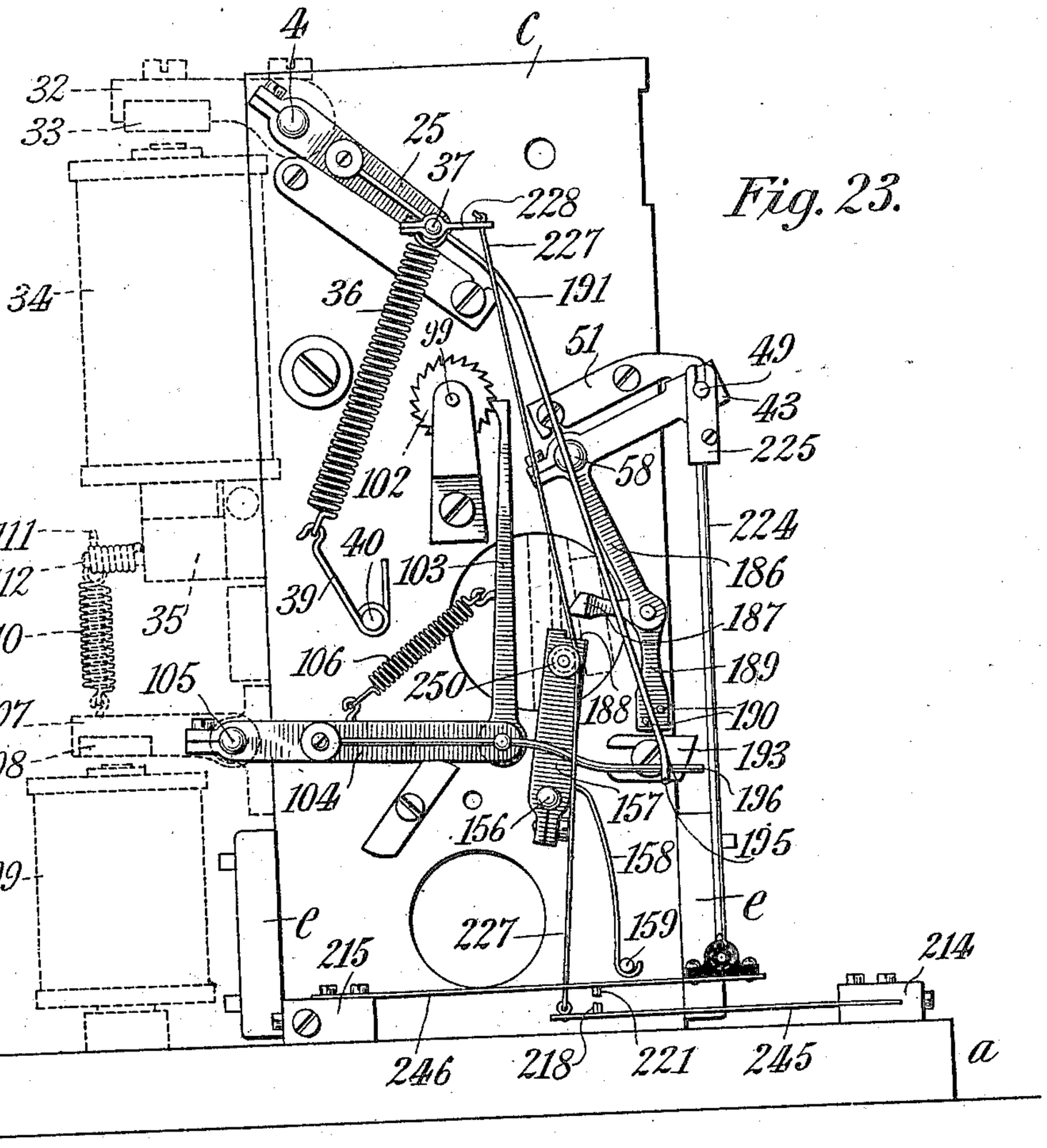

Fig. 23.

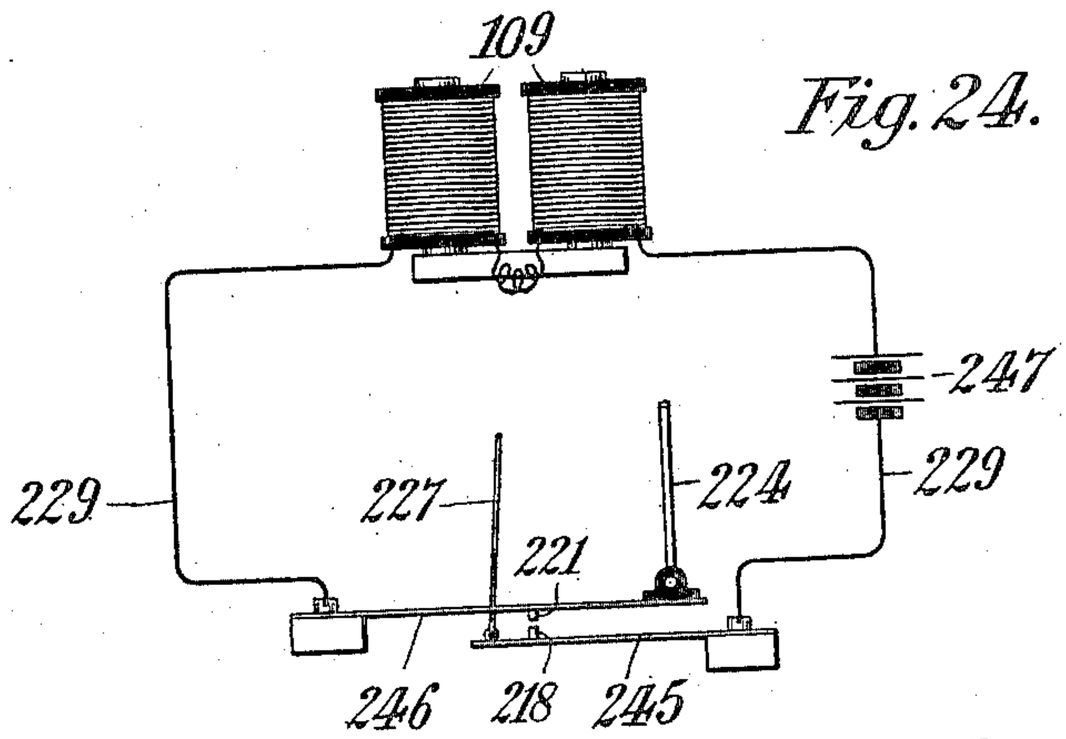

Fig. 24.

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UNITED STATES PATENT OFFICE.

JOHN BURRY, OF FORT LEE, NEW JERSEY.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 680,693, dated August 20, 1901.

Application filed April 13, 1900. Serial No. 12,660. (No model.)

To all whom it may concern:

Be it known that I, JOHN BURRY, a citizen of the United States, and a resident of Fort Lee, in the county of Bergen and State of New Jersey, have invented a certain new and useful Improvement in Printing-Telegraphs, of which the following is a specification.

The present invention relates more particularly to receivers for use in printing-telegraphs, though some of its combinations are capable of use elsewhere.

The general object of the invention is to increase the speed and efficiency of such apparatus.

Among the specific objects are, first, the increase of the speed of rotation of a power-driven escapement-controlled type-carrier as compared with similarly-operated type-carriers, the number of type-spaces in a circular row of type being equal in each case; second, the arrest of a power-driven rotatory type-carrier in given positions less in number than the type-spaces in a circular row of type on said carrier and the independent motion of rotation of said carrier to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested as stated; third, the printing of lines across a page or web; fourth, the release of a traversing type-carrier at any position in its letter-spacing movement to be automatically returned to an initial position for the beginning of a new line; fifth, the improvement of the inking of the type; sixth, the reduction of the resistance of the inker to the rotation of the type-carrier; seventh, the supply of ink from a stationary reservoir to a to-and-fro-moving inker; eighth, automatic line-spacing; ninth, to secure uniform distances between lines; tenth, to render the impression mechanism inactive during the return of the carrier to said initial position; eleventh, to bring a type-carrier which moves for letter-spacing to unison at one point in its traverse; twelfth, to control the action of the printing-magnet by the joint action of magnets in different circuits, said magnets acting simultaneously or dissimultaneously; thirteenth, to wind the spring for driving the type-carrier; fourteenth, to feed the paper by spring-power; fifteenth, to wind the paper-feeding spring automatically; sixteenth, to space between words without turning the type-carrier to any particular position—*i. e.*, in any position of the type-carrier—and other objects, as will hereinafter appear.

To these ends the invention consists in features of construction and combinations of devices hereinafter described, and more particularly set forth in the appended claims.

The preferred form of the invention is illustrated in the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front elevation, certain parts being omitted for the sake of clearness. Fig. 2 is an end elevation taken from the left in Fig. 1. Fig. 3 is a plan view, certain parts being omitted for the sake of clearness. Fig. 4 is an end elevation taken from the right in Fig. 1. Fig. 5 is a vertical sectional view from the left and just inside the left vertical end plate of the frame, certain parts being omitted for the sake of clearness. Fig. 6 is a sectional plan view, upon no particular plane, showing the general relation and operation of certain parts. Fig. 7 is a vertical sectional view from the right-hand end and taken just inside the right vertical end plate of the frame, certain parts being omitted for the sake of clearness. Fig. 8 is a detail view of an adjusting device. Fig. 9 is a diagrammatic view of the circuits of the apparatus and also showing (in dotted lines) an arrangement of circuits connecting with a central or transmitting office. Fig. 10 is a perspective view showing the type-wheel and certain connected parts and a centering device for the type-wheel in their positions at the instant of the arrest of the type-wheel and just before the centering device begins to act. Fig. 11 is a like view showing the action of the centering device for selecting one of two printing positions of the type-wheel. Fig. 12 is a like view showing the action of the centering device for selecting the other of the two printing positions of the type-wheel indicated in Figs. 9 and 10. Fig. 13 is a detail view. Fig. 14 is a view from the left showing the positions of certain parts at the moment an impression is made upon the paper by the type-wheel and platen. The normal positions of said parts is shown in Fig. 2. Fig. 15 is a similar view showing the positions of certain parts

just prior to the release of the type-wheel, the parts being partially positioned for that end. Fig. 16 is a similar view showing the positions of certain parts at the moment the type-wheel is released and during its return to the place for beginning a new line. Fig. 17 is a detail sectional view, with parts omitted, of the devices for keeping the paper under tension. Fig. 18 is a detail longitudinal sectional view of connections between the type-wheel and the escapement. Figs. 19 and 20 are detail views of an ink-roller. Fig. 21 is a view of a modified form of circuit-controlling means and operating devices therefor. Fig. 22 is a diagram showing an arrangement of the circuits corresponding to the modification shown in Fig. 21. Fig. 23 is a view of circuit-controller, operating devices therefor, and a modified form of means for preventing the operation of the platen when the type-carrier is being returned to an initial position. Fig. 24 is a diagram of a modified arrangement for energizing the printing-magnet.

The framework shown in the drawings comprises a base-plate *a*, preferably of insulating material, parallel vertical plates *b c d*, which are secured to plate *a*, two steel plates *e*, connecting plates *b c d*, tie plates or bars *f g h*, connecting plates *c d*, a tie-rod *k*, connecting the plates *b d*, and certain adjuncts hereinafter more fully described. The parts of the framework, except the base *a*, are of metal and are secured together firmly by screws *l* and by removable dowels *m* to form a rigid structure. Not all of the securing-screws and dowels are shown in the drawings.

Type-positioning mechanism.—According to the present invention the type are arranged on a rotatory carrier, which by preference is a wheel or disk having the type on the periphery thereof, and the carrier is moved about its axis and is arrested in given positions less in number than the type-spaces in a circular row of type thereon by a suitable driving and arresting means. The type in each circular row on said carrier are, so far as possible, arranged in groups of those letters which in any particular class of work, as stock-market and news reports, occur most frequently in combination with each other. In some cases the whole row of type may be in such groups, but in general there are type which cannot be so grouped except by duplicating particular type. In the first-named cases the number of said given positions is an exact divisor of the number of type-spaces in a circular row of type, or, stated differently, the number of said given positions is equal to the number of groups of type. As will be seen hereinafter, the members of each group of type may be printed in all possible orders without rotating the carrier beyond the limits of said group after it is once arrested for printing from a member of such groups—that is to say, the carrier is not moved from letter to letter, but from group to group, thus gaining speed, and the type of each group which are not arrested at the printing-point are brought thereto by means preferably separate from those by which the carrier is rotated and arrested in said given positions. It is more convenient, however, to treat all the type as being in groups and to arrest the carrier in given positions equal in number to said groups, as it involves a simpler construction and mode of operation to have uniformity of action in all cases than to have one mode of operation for one part (the groups of letters occurring in combination) and another for the remainder. In the latter case the given positions named might not be an exact divisor of the number of type-spaces in a row of type on the carrier, though they would still be less in number than said spaces. In order to bring to the printing-point type in said groups not brought thereto or stopped thereat by the driving and arresting mechanism, means are provided for giving a supplemental motion of rotation to the carrier within the limits of the group independent of the motion of rotation given by the driving mechanism aforesaid, said supplemental-motion means preferably acting as or after the carrier is arrested in any of said given positions. In some methods of driving and arresting the carrier the supplemental-motion means may coact with a part of or a part connected with the arresting means, though it is preferable, for reasons connected with simplicity of construction and operation, that the means for communicating the supplemental motion of rotation to the carrier be independent of the means for arresting the carrier in said given positions. In the first case there is a yielding connection between the driving and the arresting part of the means, while in the second case the yielding connection is preferably between the carrier and the arresting means. In both cases it is preferred that the yielding connection be also resilient or contain a spring or springs (spring member) in order that the carrier may be returned to a normal position with respect to some part of the driving or arresting means irrespective of any motion of the latter. In some forms of driving and arresting means for the type-carriers of printing-telegraph instruments the two functions are performed by one and the same apparatus. In using such a driving and arresting means in connection with the present invention the yielding connection is between such means and the type-carrier. The supplemental-motion means may be of various forms and modes of operation, each adapted more or less to secure the ends in view. In a simple and convenient form of said supplemental-motion means there is included a member connected to said carrier to rotate the same, said member being provided with a plurality of engaging or operating parts less in number than the type-spaces in a circular row of type on said carrier and a member movable into and

out of engagement with said parts to rotate the carrier independently of the driving means in order to bring to the printing-point type in said row that are not brought to or stopped at said point by the arresting means. Said multiple-part or first-named member may be in the form of a pinion or other toothed wheel, a star-wheel being used by preference, and the member movable into and out of engagement therewith may do so every time an impression is to be taken or only when the type-carrier is to be moved to bring to the printing-point type that are not brought to or stopped at said point by the arresting means and it is desired to print from such type not so arrested. In case the type-carrier is to be shifted both forward and backward in order to bring to the printing-point type which are not brought thereto by said driving and arresting mechanism, the said shifter-mechanism member, which is movable on the framework, is given a motion additional to that by which it is moved into and out of the path of the first-named member or that connected to the type-carrier, so as to determine which of the supplemental forward and backward motions of the carrier shall be had on any particular occasion. In order to simplify the construction and operation of the mechanism as much as possible, I prefer to arrange all the type in groups of two and to arrest the type-carrier in positions such that the printing-point shall always lie opposite the intervals between the members of successive pairs or groups of type on the carrier, the "unison" or blank space counting as a member of such a pair, and to give the type-carrier supplemental motions forward and back after it has been arrested by its driving and arresting mechanism in order to bring the type to the printing-point, whence it follows that in this instance the number of positions in which the carrier is arrested by its driving and arresting mechanism is one-half the number of type-spaces on the carrier or is equal to the numbers of pairs of type above referred to. The same statements as to numbers hold true also in the case where the type-carrier is stopped by its driving and arresting mechanism with type at the printing-point and the carrier is given a supplemental motion forward or backward to bring the remaining half of the type to the printing-point. When type are brought to the printing-point by said driving and arresting mechanism and other type forward and back or at each side of those so brought to said point brought thereto by supplemental motion of the type-carrier, the said given positions are one-third as numerous as the type-spaces in a row of type and equal the groups in number. In practice, however, it is more advantageous to arrest the carrier in the first instance at the intervals between the members of each of the successive pairs or groups of type and to move the carrier both forward and backward to bring the type to the printing-point.

In order to insure that the type shall be in proper position at the printing-point for the giving of impressions, any suitable centering means may be employed. I prefer to combine the functions of centering and of shifting the carrier in one and the same mechanism, as such combination involves a simpler and more effective construction and mode of operation than is possible when these functions are performed by separate or independent devices. The single apparatus can be worked faster than two apparatuses, since in the latter case one has to wait for the other to do its work before the first can act.

Referring now to the drawings, the type are on the periphery of a metal disk or wheel *t*, and, by preference, are of soft rubber. The wheel *t* is rigidly secured to and is carried by a sleeve *n*, which is adapted to slide along but which cannot turn independently of a triangular or other polygonal shaft *o*. The said shaft *o* is journaled at its ends in arms or brackets *j* in a manner such that it has no endwise motion. The brackets *j* are secured to the plates *b d* in such wise that they may be removed when desired. By preference the shaft *o* is triangular in section and the sleeve *n* is provided with internal longitudinal grooves for engagement with the corners of the shaft *o* and also with a very small part of each of the faces thereof. The shaft *o* extends beyond the bracket *j* at the plate *d* and is there bored out axially to form a seat or bearing *q* for the reduced end of a shaft *r* of driving and arresting mechanism. The other end of the shaft *r* is journaled in a bracket *u*, projecting from and removably secured to the plate *c*. The shaft *r* has no endwise motion. The shaft *r* has a scape-wheel *s* fast thereon, and also a pinion *v* fast thereto at a point between the wheel *s* and the arm *u*, while the shaft *o* has a star-wheel *w* fast thereto on that side of plate *d* which is next the scape-wheel *s*. Pins or arms *x y*, respectively, fast to the wheels *s* and *w*, project therefrom each toward the other of said wheels, said pins being at different distances radially, so as not to interfere with each other, but being long enough to overlap, as shown. The wheel *w* has a circular row of holes *z*, into any one of which holes the pin *y* may be inserted. The holes *z* exceed by one in number the number of teeth on the wheel *w*. Two springs 1 2 are coiled around the shaft *r* and have their ends projecting radially, as shown, the friction between the coils of the springs and the shaft being sufficient to retain them in any position. They may be adjusted about the shaft by pressing on their ends in such wise as to loosen the grip of their coils upon the shaft *r* and to move them in the required direction. The adjacent ends of the springs 1 2 bear against the pins *x y* at opposite sides at the said overlapping parts thereof and keep the pins in a relatively-fixed position, while permitting of motion of one relatively to the other. The number of teeth on the wheels *s*

and *w* is equal, and the number of type plus the unison space on the type-wheel *t* is double the number of teeth on each of said wheels *s* and *w*. The scape-wheel *s* is always arrested with one or another of its teeth in a given position, at which time the type-wheel *t* is so placed with respect to the printing-point as that no type thereon is opposite the printing-point, but said point is opposite the interval between some two type or type-spaces on the type-wheel. The described connection between the scape-wheel *s* and the star-wheel *w*, hereinafter referred to as a "centering shift-wheel," permits of a motion forward or back of the type-wheel to supplement the action of the driving and arresting mechanism and bring the selected type to the printing-point. This supplemental or shifting motion is communicated to the type-wheel by the centering shift-wheel, the shaft *o*, and sleeve *n* in the particular case illustrated in the drawings, but it may be otherwise communicated without departing from the scope of this invention.

The means for actuating the wheel *w* to cause the shift of the type-wheel includes a shaft 4, which is journaled in the plates *c d* near the upper rear corners thereof, an arm or lever 5 fast to said shaft 4 and extending forwardly and downwardly, and an arm 6, pivotally connected with the free end of the lever 5 and constructed to coact with the wheel *w* for the purposes of shifting the type-wheel and then centering it. The arm 6 may be swung about the pivotal point of connection with the arm 5 by means of any suitable switching device which will divert the working part of the arm 6 into one or another of the required paths. A convenient form of such a switching device comprises a slotted or recessed portion, a switching-tongue mounted and having a swinging motion in said slot, and a pin or stud projecting into the slot and going to one side or the other of said tongue when the two parts have relative motion. The slotted tongue-provided portion or element and the pin or stud are placed one on a fixed part of the framework and the other on the arm 6. In the instance shown in the drawings the arm 6 is slotted and has the tongue, while the pin is on the fixed framework; but this arrangement may be inverted. The centering shift-arm 6 is V-shaped at its free or working end and is provided with a longitudinally-extending through-slot 7, which is also V-shaped at that end next the centering shift-wheel, the said V of slot 7 terminating in a straight slot, into which a round pin 8 projects, said pin 8 being fast to plate *d* or a part connected therewith. Within the slot 7 is placed a movable tongue 9, the lower end of the tongue being rounded to have a bearing in the rounded lower end of the slot 7. The tongue 9 is held in position by two pins 10, which fit tightly in holes through the arm 6 and pass through slots 11 in the tongue without binding and which permit of a pivotal motion of the tongue about its rounded end. That end of tongue 9 which is adjacent the V-shaped end of slot 7 is itself V-shaped and is at a distance from the end walls of slot 7 such as will permit of the easy passage of pin 8 on either side of the tongue. The tongue 9 and the adjacent side wall of the slot 7 form a groove or slot of a size such that the pin 8, coacting therewith, guides the centering shift-arm 6 accurately to one side or the other of its central position, according to the position of the tongue 9 in the slot 7 aforesaid. The tongue 9 has a pin 12 fast thereto and projecting from its side, and a fork 13 at the end of an arm 14 coacts with said pin 12 to move the tongue to one side or the other of the slot 7, as indicated in Figs. 11 and 12. The V-shaped end of arm 6 is normally out of the path of the teeth of wheel *w* and when operated strikes one or the other of the two adjacent teeth of said wheel and turns the wheel *w*, shaft *o*, and type-wheel *t* forward or back until the other said adjacent tooth of the wheel *w* is arrested by the V-shaped end of the arm, and the type-wheel thus centered is brought to rest with one or the other of the said two type at the printing-point. The conjoint action of the arm 14, slotted arm 6, tongue 9, pin 8, and the lever 5, the arm 14 moving first, whereby the arm 6 is given a compound motion, is sufficient to determine which of any two type adjacent the said printing-point shall be brought thereto and in what order. The printing-point is indicated in Figs. 10, 11, and 12 by the dotted line. The row of holes *z* and the adjustable pin *y* provide means whereby the position of the kerfs of the wheel *w* may be adjusted with very great accuracy and ease with relation to the V-shaped end of the arm 6, which is not adjustable because the pin 8 is not easily adjusted. The type-wheel *t* is adjustable about the sleeve *n* by means of a set-screw. The arm 6 is shouldered at its pivoted end and is held in place between parallel bearing-arms of the lever 5 by a pin 16, which is provided with a circumferential groove. The pin or axis 16 is parallel with the shaft or axis 4, or substantially so. The free end of a wire spring 17 rests in said groove and retains the pin in place. The spring 17 is made fast in any suitable way to the lever 5.

Means whereby the lever 5 and the arm 14 are operated will be described hereinafter.

Driving and arresting mechanism.—In the machine illustrated in the drawings the power for rotating or driving the type-wheel *t* is derived from an automatically-wound mainspring and is transmitted to the scape-wheel *s* through the pinion *v* and a gear 18, which meshes with the pinion. The gear 18 is loose upon a shaft 19, which is journaled in the end plates *b c* and passes freely through a large opening in the plate *d*. A drive-spring 20 is coiled about the shaft 19 and a sleeve 21, to which the gear 18 is fast, and has its

ends free, except that the end adjacent the gear 18 bears against a pin 22, projecting from the side of the gear, and that its other end is held frictionally by a round part on the shaft 19. By preference the spring 20 is so placed or wound that it is untwisted or unwound as it is put under tension and that it is closed up or its coils decrease in diameter as it expends its force in driving the gear 18, as by this arrangement there can be no overwinding of the spring, for its opening-coils will slip on the round on the shaft 19 whenever the spring has been put under a given tension by the spring-winding apparatus. By preference there is, relatively speaking, considerable clearance between the coils of the spring 20 and the shaft 19, except at the ends of the spring, one end being caused to grip the shaft with considerable force in order to provide for slipping effect at the right-hand end of the spring.

The shaft 19 has a fly-wheel or momentum device 23, fast thereto, and also a ratchet-wheel 24, the latter being outside the plate *c*. The shaft 4 above named is provided with a lever or arm 25, fast thereto, which arm extends forwardly and downwardly of the apparatus and has a pawl 26 pivoted thereto at its free end. A spring 27, secured at one end to the pawl 26, bears against the top of the lever 25 and is tensioned to keep the pawl in engagement with the ratchet-wheel 24. The motion of the arm 25 away from the wheel 24 is limited in any suitable way, as by a bar 28, which is pivoted at one end at 29 to the plate *c* and is provided near its free end with a transversely-extending notch 30, through which the body of a screw 31 passes and engages with a threaded hole in the plate *c*. The head of the screw coacts with the side of the bar 28 to bind the bar 28 against the side of the plate *c* and so lock it against motion in any position to which it may be adjusted within the limits provided. The flat top of the bar 28 coacts with the flat under side of the arm 25 to limit its downward motion.

The shaft 4, between the plates *c d*, is provided with an arm 32, fast thereto, and the armature 33 of an electromagnet 34 is fast to the arm 32. The yoke of the magnet 34 is mounted on a bracket 35, which is fast to or integral with the tie-bar *g* of the fixed framework of the apparatus. The shaft 4 is operated to move the arms or levers 5 and 25 downwardly and the arm 32 upwardly by a spring 36, which engages at one end with the extended pin 37, by which pawl 26 is fastened to arm 25, and at its other end with a hook 38 at the end of a wire spring 39. The spring 39 is wound about a round pin 40, projecting from the plate *c*, and has its other end 41 extending away from said pin. The spring 39 is held in place on the pin 40 by the friction between its coils and said pin, and it may be adjusted circumferentially of the pin in either direction by pressing upon that end of the spring which will both loosen the coils of and move the spring in the required direction. In this way the position of the hook 38 relatively to the pin 37 may be varied, and thus the tension of the spring 36 may also be varied. Every time the magnet 34 attracts its armature 33 to itself the pawl 26 gives an impulse to the ratchet-wheel 24, the fly-wheel 23, and the shaft 19, thus causing the spring 20 to be wound or put under greater tension. The momentum device 23 continues the winding action of the shaft 19 for an interval of time after the pawl 26 ceases to act upon the ratchet-wheel 24. Means whereby the magnet 34 is energized from time to time will be described hereinafter. The ratchet-wheel 24 is also rotated from time to time by a pawl 42, which is pivotally connected with a pivoted arm 43. The arm or lever 43 is fast upon a shaft 44, journaled in the plates *c d*. The shaft 44 has an arm 45 fast thereto, and the armature 46 of an electromagnet 47 is fast to said arm 45. The magnet 47 is supported by the soft-iron tie-bar and yoke *f*. A spring 48 is coiled about an extension of the pin 49, by which pawl 42 is connected with the arm 43 and is tensioned to keep the pawl 42 in engagement with the ratchet-wheel 24. The spring 48 may be adjusted about pin 49 in the same way as the spring 39 is adjusted, thus varying the tension thereof. The motion of the lever 43 in one direction is limited by the contact of the armature 46 with the core-stop 50 (of insulating material) of the magnet 47 and in the other direction by a stop 51 on the plate *c*. The stop 51 is pivoted to plate *c* at 52 and is held in place by a screw 53 in substantially the same manner that stop 28 is held in place by the screw 31. The armature 46 is drawn away from its magnet 47 by a spring 54, which has its ends fast to arm 55, which forms an extension of arm 45, and to a cord which is wound upon and is fast to a rotatable shaft 56. The shaft 56 is journaled in the plate *c* by a reduced end and is locked in any position by a screw 57 and a washer 58, said screw engaging with a threaded hole in the end of the shaft and jamming a shoulder or collar on the shaft against the inner side of the plate *c*. The shaft 56 provides a means whereby the tension of the spring 54 may be varied by turning the shaft by means of the screw. The magnet 47 is energized from time to time, as hereinafter set forth. At each stroke of the lever or arm 43 downward the pawl 42 rotates the ratchet-wheel 24 and the parts rigidly connected with it, thereby winding or increasing the tension of the spring 20 in the manner hereinbefore set forth.

The type-wheel *t* is arrested by the scape-wheel *s* and the pallet 3 and the described connections between the type-wheel and the scape-wheel. Any suitable escapement mechanism may be employed subject to the conditions hereinbefore mentioned as to the number of positions in which it arrests the type-wheel. The escapement herein shown is sub-

stantially the same as that shown and described in my Letters Patent of the United States, granted the 27th day of April, 1897, and bearing No. 581,411, to which reference is made for a detailed description thereof. The horseshoe-magnet 59 and the escapement-magnets 60 and other parts carried thereby are adjustably attached in the present instance to the tie-plate *h* to be adjusted in two planes at right angles to each other in order to secure the desired relation between the teeth of the scape-wheel *s* and the pallet 3. A convenient means to this end comprises a clamp-bar 61, which spans the magnet 59 and is held in place by screws 62, which pass freely through the clamp-bar and engage with threaded holes in the tie-bar *h*. The screw-threaded portions are at the ends of round bars, having heads at their other ends, the round portions fitting in round holes in the clamp-bar. The rear edges of the magnet 59 bear against spacing-lugs 63 at the front side of the bar *h*, and the clamp-bar 61 bears against the front edges of said magnet. By using suitable liners between the lugs 63 and the magnet the latter may be adjusted toward the front and rear of the machine or the pallet moved in the plane of the scape-wheel. By moving the magnet to the right and left and up and down under the (loosened) clamp-bar the pallet 3 may be adjusted in a plane at right angles to the plane of the scape-wheel *s*. In this way universal adjustment of the pallet may be had. The polarized electromagnets 60 are energized, as hereinafter set forth.

Letter-space feed mechanism.—Any suitable means for the letter space feed of the type-wheel *t* may be employed; but I prefer that shown in the drawings, which will now be described.

A polygonal rod 64 is fastened to the framework, as plates *b c*, so as to be adjustable about its own axis, as by lugs or arms 65, detachably connected to the plates. One of said arms 65 is split to form a clamp for preventing rotation of said rod. A screw 66 passes through one part of said clamp and engages with a threaded hole in the other and draws one part toward the other. A sleeve 67, similar to sleeve *n*, is arranged to slide along the rod 64 and engages therewith, so as not to be rotatable independently thereof. Rod 64 is shown as triangular in section, and the sleeve 67 engages therewith in a manner similar to that in which the sleeve *n* engages with the shaft *o*. The sleeve 67 has two L-shaped arms 68, fast thereto at the angles thereof, and these arms have their upper ends forked at 69. The forks 69 pass over and under the sleeve *n* and engage with the ends of the hub of the type-wheel *t*. The width of or the distance between the prongs of each fork is greater than the diameter of the sleeve *n* for a purpose set forth hereinafter.

At some distance below the shaft *o* is a shaft 70, which is journaled in brackets 71, detachably secured to the plates *b d*. The shaft 70 has drums 72 73 fast thereto at its ends and also a ratchet-wheel 74 fast thereto at one end thereof. The plates *b d* have pulleys 75 journaled thereon or on brackets attached thereto. A cord or other ligament 76 has one end fast to drum 72, leads about the adjacent pulley 75, and has its other end knotted inside the arm 68 on that side. A similar ligament 77 has one end fast to drum 73, passes about the adjacent pulley 75, and through that arm 68 on that side, and has its end knotted as in the case of the cord 76. The cords 76 77 wind in opposite directions upon their respective drums, so that one winds up as the other winds off, and the two move the type-wheel to and fro along its shaft through the medium of the sleeve 67, arms 68, and sleeve *n*.

The shaft 4, above named, has an arm 78 fast thereto at the right of the plate *d*, which arm extends forwardly horizontally and has parallel jaws 79, between which a pawl 80 is pivoted at one end. The working end of the pawl 80 engages with the ratchet-wheel 74, being kept in such engagement by means of a spring 81, fast at its ends to the arm or lever 78 and the pawl 80. The wheel 74 and shaft 70 are turned by the space of one tooth of the wheel 74 at every operation of the lever 78 by the magnet 34 aforesaid. A detent 82 engages with the ratchet-wheel 74 and prevents reverse motion thereof, said detent being pivoted to an arm 83, connected with plate *d*, and being held in engagement with the wheel 74 by a spring 84. The spring 84 has one end connected with an extension of the detent 82 and its other end caught on a hook 85 of a wire spring 86. The spring 86 is connected with a round pin 87 in a manner similar to that in which the spring 39 is engaged with its pin 40 and for like purposes.

A spiral spring 88 surrounds the shaft 70 loosely and has its projecting ends caught—one against a pin 89, projecting laterally from a collar 90, fast on shaft 70, and the other end caught against a pin 91, which projects laterally from the plate *b*. Said spring 88 is arranged to be put under increased tension by the rotation of the shaft 70 during the feeding of the type-wheel toward the right of the machine. The shaft 70 and drums 72 73 form a single drum in effect.

Platen-operating mechanism.—The platen shown in the drawings comprises a metal roller *p*, which is journaled in ears 92, secured to a flat bar 93. (See Fig. 3.) The bar 93 is attached to or is formed with arms 94, which are pivotally connected at 95 to the plate *d* and to a bracket 96, detachably and adjustably connected with the plate *b* at a cut-away portion or recess therein. The pivots 95 are so placed that the platen tends to fall away from the type-wheel or printing-point by its own weight. At one end the bar 93 has an arm 97 attached thereto, said arm 97 being bent at right angles and passing through a

suitable opening in the plate *d* and being provided at its end with a tooth 98. A shaft 99 is journaled in the plate *d* and in a bracket 100, detachably connected with the plate *c*, and is provided with two ratchet-wheels 101 102 at the left of plates *d* and *c*, respectively. The shaft 99 passes through a large hole in the plate *c* in order to reach the bracket 100. These ratchets 101 102 have an equal number of teeth, and the ratchet 101 coacts with the tooth 98 to lift the arm 97, and thus to move the platen *p* and the paper against the type-wheel. The ratchet 102 is actuated at suitable times by means of a pawl 103, pivotally connected to a lever 104, fast on a journaled shaft 105. A spring 106, connected with pawl 103 and with lever 104, keeps the pawl in contact with the ratchet 102. The shaft 105 is journaled in lugs or ears detachably connected with plates *c d* and has an arm 107 fast thereto, said arm 107 carrying the armature 108 of an electromagnet 109. The armature 108 is drawn away from its magnet by a spring 110, hooked to arm 107 and to a spring-arm 111. The spring-arm 111 is adjustably connected with a pin 112, which projects rearwardly from plate *g* in the manner above set forth with respect to the spring 39 and its pin 40. Whenever the magnet 109 is energized, the armature 108 is moved downwardly, thus lifting the pawl 103 and turning the ratchet-wheel 102 the space of one tooth and turning the shaft 99 and ratchet-wheel 101 by an equal angular distance, thus causing the ratchet 101 to lift the tooth 98 momentarily and to let it fall into the next kerf of the wheel 101. This momentary lifting of the tooth 98 and the arm 97 is sufficient to propel the platen *p* and the paper thereon against the type-wheel *t* and to cause the taking of an impression therefrom. In order to regulate the distance the platen *p* is thrown, as above described, a stop 113 is provided for the tooth 98, said stop being pivoted to the plate *d* at 114 and being adjusted to and held in any desired position by means of two screws 115, which engage with threaded holes in lugs 116 on the plate *d* and the ends of which bear against the top of the stop-piece 113 at opposite sides of the pivot 114. The best results are obtained when there is just space enough between the stop 113 and the uppermost tooth of the wheel 101 for the tooth 98 to just touch the stop 113 as the point of the wheel-tooth passes the point of the tooth 98. In order to compensate for the effects of wear upon the tooth 98, which wear disturbs the action of the platen, and to secure a correct adjustment in the first instance, the arm 97 is bifurcated for a short distance at 117, and a screw 118 passes freely through the shorter arm of the bifurcated part and engages with a threaded hole in the longer arm. By drawing the arms of the bifurcated part toward each other the said tooth 98 is caused to approach the center of the wheel 101 and so raise the platen *p*, or rather to move the platen when in normal position nearer the type-wheel. The reverse action takes place when the screw 118 is turned to allow the arms of the bifurcated part to spring farther apart. The screws 115 and 118 can be reached with ease from the top of the machine by a screw-driver, so that the described adjustments thereof may be made without disturbing any part of the mechanism. The axis of shaft 99, the pivots 95, and the printing-point are three fixed points in the machine, so to say, and the described means for adjusting the position of the platen so that the platen, when in its normal position, shall be at a sufficiently fixed distance from the printing-point, whereby it makes the same throw always in causing the taking of impressions from the type upon the paper.

Paper holding and feeding mechanism.—The paper used in this apparatus is in the form of a web wound to form a roll, the web being several inches wide, and the writing is done transversely of the web. The web 119 is wound on a wooden bobbin or cylinder 120, which is bored through longitudinally to receive a shaft 121, by which the roll is supported in the machine. At one end the shaft 121 sets into a socket in a shaft 122 (see Fig. 3) of a large ratchet-wheel 123 and at its other end is held in an open bearing 124 in a pivoted spring-arm 125. A collar 126 on the shaft 121 prevents said shaft from sliding out of the bobbin as long as the arm 125 engages with the end of the shaft. The arm 125 is held up by a tooth 127, which is slanting on its under side to cause a wedging-off action on the arm 125 as the latter is lifted into position for holding the shaft 121. The web 119 passes from the under side of the roll up in front of platen *p*, against which it bears, and thence upward and backward between feed-wheels 128 and pressure-rolls 129. The wheels 128 are loosely mounted upon a shaft 130, which is journaled in a lug on top of plate *d* and in a detachable bearing-piece 131 on the plate *b*. The shaft 130 is provided with two circumferential grooves 132, and the hubs of the wheels 128 have screws 133 engaging with threaded holes therein and extending into said grooves 132, thus permitting the wheels 128 to move circumferentially, but not to move longitudinally, of the shaft 130. The hub of each wheel 128 is also provided with a circumferential groove 134, arranged to receive one end of a coiled wire spring 135, there being a spring 135 for each wheel 128. About its middle the shaft 130 is provided with two circumferential grooves 136 for receiving the other ends of said springs 135. The springs 135 grip the hubs of the wheels 128, but do not touch the shaft 130 until near the grooves 136, where they grip the shaft and have their ends resting in the grooves 136. The springs 135 are wound in reverse directions and each is by preference set to have its coils increased in diameter as the spring is put under more ten-

sion, as hereinafter set forth, so that when said tension reaches a certain maximum the ends of the springs slip on the shaft 130 and overwinding of the springs is prevented. The means shown in the drawings for putting the springs 135 under tension comprise a worm-wheel 137, loose on the shaft 130, a worm 138, meshing with wheel 137, a ratchet-wheel 139, fast on shaft 130, a pawl 140, pivoted on worm-wheel 137, a spring 141, fast to wheel 137 and bearing on pawl 140 to press it into engagement with ratchet 139, a ratchet-wheel 142, fast on the shaft 143 of the worm 138, and a spring arm or pawl 144, fast on the shaft 44 above named and coacting with the ratchet 142. The shaft 143 is journaled in lugs or ears 145 on or detachably connected to the plate *d*, and there is a fly-wheel 146 fast to said shaft 143, the fly-wheel acting to continue the winding action by continuing the motion of the shaft 143 after pawl 144 ceases to turn it. The worm 138 turns the worm-wheel 137, and the motion is communicated to the shaft 130 through the described connections between the shaft 130 and the worm-wheel 137. The shaft 130 puts the springs 135 under tension when turned by said devices. The pressure-rolls 129 are rotatably mounted in forked arms 147, and these are pivoted at 148 in lugs or ears 149, fast to the plates *b d*. Each arm 147 is formed with an angular part or corner 150, against which springs 151 bear to hold the rolls 129 against wheels 128 or away from them, according to which side of the corners 150 the said springs bear. The springs 151 are fast at one end to the ears 149. The rolls 129 are faced with soft rubber on their peripheries and coact with the toothed peripheries of the said wheels 128, thus giving the feeding devices a good grip upon the web 119 near the edges thereof. The shaft 130 has a disk 152 fast thereto between the said grooves 136, said disk being equal in diameter to wheels 128 and supporting the web 119 at a point intermediate the feed-wheels. The shaft 130 also has a hand-wheel 153 secured thereto at a point overlying the plate *b*, which is recessed to provide room therefor. (See Fig. 4.) The hand-wheel is used for putting the springs 135 under tension when a fresh roll of paper is put in the apparatus, as the springs 135 run down of themselves as soon as the resistance due to the letting-off mechanism ceases. The springs 135 are wound continually during the operation of the apparatus, as will appear hereinafter, and tend to turn the wheels 128 and so draw the web 119 forward. The web is held against forward motion and is released from time to time by automatically-acting mechanism, such as that shown in the drawings and now to be described.

The bobbin 120 has a pin 154 projecting from that end thereof which comes against the wheel 123, said pin projecting between two of the spokes of said wheel and turning the wheel when the springs 135 are allowed to draw the paper between the wheels 128 and rolls 129, and said wheel 123 is released for that purpose. The wheel 123 is prevented from turning under the pull of the springs 135 and the web 119 by a detent 155, which engages with the wheel. The detent 155 is fast on a shaft 156, (see Figs. 2, 6, and 7,) which is journaled in the plates *c d*. The detent 155 is extended beyond its pivot and lies in proximity to the extended end of the detent 82 for a purpose set forth hereinafter. The shaft 156 is provided with an arm 157 thereon outside of plate *c*. A spring 158 bears against said arm 157 in such wise that the shaft 156 is turned to keep the detent 155 in engagement with the wheel 123. The spring 158 is fast at one end to the arm 157 and at its free end bears in a groove in a pin 159, projecting from plate *c*.

The ratchet-wheel 123 and the detent 155 form part of an escapement mechanism, by means of which the web 119 is permitted to be unwound from the roll by the pull exerted thereon by the springs 135. A lever 160 (see Fig. 7) is pivoted or fulcrumed intermediate its ends on a pin 161, projecting from the side of plate *d* and is connected with the detent 155 by a link or rod 162, pivotally connected with both lever and detent. The rear end of the lever 160 has an arm 163 pivoted thereto by a pin 164. A spring 165, fastened to lever 160 and hooked to the arm 163, acts to move the arm in a plane parallel to the plane of the wheel 123 and away from the detent 155. A stop-screw 166, adjustable in a standard 167, rising from the base *a*, serves to limit the rearward motion of the arm 163 under the influence of the said spring 165. The arm 163 has a parallel-sided through-slot 168 extending from its lower end vertically, and a pawl-carrier 169, I-shaped in section, is guided in said groove or slot and is held up by a spring 170, which connects the carrier and the arm 163 and draws the carrier 169 to the upper extreme of its motion. The working tooth 171 on carrier 169 is normally out of engagement with the teeth of the wheel 123, as shown in Fig. 7. Whenever the shaft 156 is moved against the force of spring 158, the detent 155 is moved down out of engagement with the wheel 123 and through the link 162, lever 160, arm 163, spring 170, and carrier draws the pawl 171 up into engagement with the teeth of wheel 123. The spring 170 allows of the disengagement of the detent 155 from wheel 123 after the pawl 171 is in position to engage with or has engaged with a tooth of wheel 123. As soon as detent 155 is out of engagement with the wheel 123 the web 119 is drawn upward by the action of the springs 135 until the arm 163 is arrested in some manner. Inasmuch as the roll decreases in size as the paper is drawn therefrom it is requisite that the pawl 171 have a variable throw in order that the lines of writing may be uniformly spaced upon the paper. According to this feature of the present invention the devices

for governing the motion of the pawl 171 circumferentially of the said wheel 123 to cause the pawl to have a variable throw are themselves controlled in their action by the roll of paper, so that as the diameter of the roll decreases the throw of the pawl increases. In the instance shown in the drawings the said throw of pawl 171 is controlled by a slide 172, which has an arm 173 adapted to rest on the top of the roll of paper, and a stop-arm 174, adapted for coaction with the arm 163 to limit the motion thereof toward the detent 155 as the paper is drawn from the roll by said springs 135 and the mechanism operated thereby. The slide 172 moves in a vertical groove 175 in the side of the plate *d*, being held in place by bars 176, secured by screws to the plate *d*. The slide 172 and its stop-arm 174 move in a direct vertical line, while that surface of arm 163 which coacts therewith is straight, but is inclined to the vertical and gets farther and farther away from the guideway 175 toward the bottom of the machine, said pawl 171 being at the under side of the wheel 123. From this arrangement of parts it results that as the stop 174 moves down the arm 163 has more and more throw before it is arrested by the stop 174, and thus the decreasing diameter of the roll of paper does not result in the crowding together of the lines. On the contrary, the lines are at substantially uniform distances apart, the slight error introduced by giving the stop 174 a straight course and the back of arm 163 (that coacting with the stop 174) a straight edge not being perceptible, or at least not causing any disadvantageous crowding together of the lines. The motion downwardly of the stop 174 is governed by the diameter of the roll of paper, since the arm 173 rests on the roll directly over the axis thereof and follows the roll as the diameter thereof decreases, so that as the roll decreases in size the pawl 171 has more and more throw before it is arrested by the stop 174.

No claim is made herein to any combination drawn upon the above-described "paper holding and feeding mechanism," since the said mechanism forms the subject-matter of a divisional application for Letters Patent of the United States, filed July 17, 1901, Serial No. 68,649.

Tongue-shifter for centering shift device.—The tongue-shifter arm 14 is operated, in the instance shown in the drawings, by means of oppositely-placed polarized electromagnets 177, fast to the steel bars *e* aforesaid, which bars form part of the magnetic circuits, a rock-shaft 178, to which the arm 14 is rigidly fastened, and the vibratory armatures 179 between the poles of said magnets 177, said armatures being fast on the shaft 178. The shaft 178 is of steel, is polarized, and is pivoted at its ends on bearings in the plate *c* and on a screw engaging with a threaded hole in the plate *b*. The arm 14 is bent to pass through a suitable opening in the plate *d* to bring its fork 13 in position for engaging with the pin 12 aforesaid.

Release mechanism.—The pawl 80 and detent 82 are thrown out of engagement with ratchet-wheel 74 in order to permit the spring 88 to reverse the direction of motion of the type-wheel *t* along its shaft *o* by means of an arm 180 on the shaft 186 and a pin 181 on said arm, which engages with pawl 80, and by an extension 182 of the detent 155, which engages, when the shaft 156 is turned in the proper direction, beneath the tail 183 of the detent 82, thus freeing the shaft 70 and permitting the spring 88 to exert the power stored therein in rotating the shaft 70 and so reverse the direction of travel of the type-wheel *t* by winding cord 76 on drum 72 and unwinding cord 77 from drum 73. At the same time the platen-operating mechanism is rendered inoperative to prevent the platen from being thrown against the type-wheel as the last runs back to the beginning. (The reason for rendering the platen-operating mechanism inoperative will appear hereinafter.) This inoperativeness is secured, in the instance shown in Figs. 1 to 20 of the drawings, by disengaging pawl 103 from its ratchet-wheel 102 by means of the arm 157 and a screw or pin 184 therein, which strikes against the tail 185 of the pawl 103 and pushes it so as to disengage the working part of the pawl 103 from the ratchet 102. The shaft 156 is operated at the desired times by means of an arm 186, projecting downwardly from the shaft 44, said arm or lever having a pawl or catch 187 pivoted to it at its lower end and a rabbet 188 at the upper end of the arm or lever 157. The arm 186 is vibrated each time the magnet 47 is energized and deënergized; but the pawl 187 is prevented from engaging with rabbet 188, except under a given combination or sequence of operations, so that there shall be no accidental release of the pawls 80 and 103 and detent 155. The pawl in the instance shown in the drawings is held in position such that it cannot engage with the rabbet 188 by means of an extension 189 thereof at substantially right angles to the working part of the pawl, two pins 190 on said extension or tail, and a wire spring 191. The spring 191 passes through a hole in pin 37 on lever 25 and is held fast in a hole in a disk 192, fastened to lever 25 by a screw or otherwise and extends between said pins 190, said spring 191 in the normal position of the parts (see Fig. 2) being under no tension. The spring 191 bears against a stop 193, which is adjustable on plate *c* by means of a slot therein, and a screw 194, which passes through said slot and engages with a threaded hole in the plate. If now the lever 25 be lifted, the wire 191 prevents the pawl 187 from being moved into position for engagement with the rabbet 188. In order to disengage the spring 191 from the stop 193 when desired, the spring is extended and bent outward at 195 beyond the face of the stop, and an extension 196 on the arm or

lever 104 passes between the bend 195 and the face of the stop 193. The extension 196 is shown as a wire, which is secured to arm 104 in a manner similar to that in which the spring 191 is secured to lever 25. The lifting of the arm 196 frees the spring 191 from the stop 193 by camming or wedging the incline 195 outwardly or away from plate *c*. As will be seen from the description of the operation of the apparatus hereinafter given, the incline 195, stop 193, and arm 196 are provided in order to meet a certain contingency that may happen during the operation of the apparatus and that but for said contingency these parts could be omitted altogether.

Inking apparatus.—The type-wheel *t* is inked by a roller *i*, which is journaled in the arms 68. By preference this inking-roller consists of soft rubber in the form of a disk having a flange 197 at the periphery thereof. (See Fig. 20.) The hub of the disk is mounted on a metal roller or shaft 198, which is journaled in the arms 68. The flange 197 coacts with the type on the wheel *t* and provides a very light, soft, and efficient inker which readily yields to any inequalities in the heights of the type on the wheel *t* and which also recovers its normal shape or position very quickly, so that the type are always surely inked. Ink is supplied to the inker *i* from time to time by means of a reservoir 199 and a capillary feed device 200 thereon. The reservoir 199 comprises a closed tube and is detachably secured to the plate *b* by means of a screw 201, which passes through a hole in said plate and engages with a threaded hole in an arm 202, (see Fig. 3,) projecting from one end of the reservoir. A tube 203, open at both ends and opening into the reservoir, projects from the upper side of the reservoir and is filled with bristles or equivalent means to form said capillary feed 200. Said feed 200 projects beyond the upper end of the tube 203 and into the path of the inker *i* as this moves to and fro with the type-wheel *t* and is struck by said inker *i*, and one or both of said inker and feed parts yields as the inker moves along. The feed 200 is so placed that the type-wheel in one position of rest in its letter-space-feed movement will be opposite the feed with the inker in contact therewith, whereby the inker will be supplied with ink as the type-wheel rotates the inker as the former moves to bring some other type to or adjacent to the printing-point. By preference the feeder 200 is so located as that the inker *i* will pass thereover twice during the printing of a complete line and the return of the type-wheel to position for beginning a new line. The position of the ink-roller *i* relatively to the type-wheel *t* may be varied or adjusted within the limits afforded by the clearance between the prongs of forks 69 (see Fig. 4) and the sleeve *n* by loosening the screw 66, turning shaft 64 in its bearings to secure the desired relation between the type-wheel and the ink-roller *i*, and then tightening up screw 66 and so reclamping the shaft 64.

Unison device.—In so far as many features of the present invention are concerned any suitable form of unison device may be employed; but for reasons connected with obtaining increased speed of operation and simplicity of construction of the whole apparatus that form of unison shown in the drawings is preferred. In said form of unison the device is only operative when the type-wheel is at the extreme left-hand limit of its motion along its shaft *o*. Said unison device consists of an arm 204, (see Figs. 3, 5, and 7,) preferably in the form of a wire spring frictionally held in place on the shaft 4 by coiling one end thereof about the shaft, having its free end bent at substantially right angles to its main length to form a working part 205 for coaction with the pin *x* aforesaid when moved into the path thereof. A wire 206 is clamped between a bar 207 (see Fig. 3) and the plate *h* and extends vertically, then inclines to the right at 208, then extends horizontally, and then downwardly and forwardly into position such that its end may be struck by the type-wheel hub or an arm 68 just before the type-wheel reaches the limit of its motion to the left for the beginning of a new line. The arm 204 normally moves in a plane to the right of the end of the pin *x* in order to permit of the free rotation of the scape-wheel *s*, and the incline 208 is in close proximity to said arm 204 when the latter is moving in its normal plane. When, however, the wire 206 is struck by the type-wheel or its carriage or arm 68 and is moved to the left, said incline 208 is moved into position such that the arm 204 as it descends will strike it and be bent to the left, thus moving its working end 205 into the path of the pin *x*. Then while the arm 204 is in its down position, with its end 205 in the path of the pin *x*, the scape-wheel *s* and type-wheel *t* are rotated until the pin *x* strikes the stop 205, whereby the scape-wheel *s* and type-wheel *t* are arrested at the unison position. After it reaches the unison point the type-wheel is moved one letter-space to the right by striking the proper key, and so rocking the shaft 4 to lift and lower the arm 204 and to cause a letter-space feed by the type-wheel to the right to take place through the lever 78 and the parts operated thereby. When the type-wheel has moved one letter-space to the right from its extreme left-hand position, the arm 206 is permitted to spring to the right to its normal position, thus removing the cam 208 out of the path of the arm 204, which therefore descends in its normal plane of motion on the release of the said key.

Arrangement of circuits.—The escapement-magnets 60 and the releasing-magnet 47 are in one circuit and the printing-magnet 109 is normally out of circuit, while the centering shift-magnet 34 and the tongue-shifting magnets 177 are in another circuit. (See Fig.

9.) The magnets 47 and 60 are in series, while the printing-magnet 109 may be thrown into circuit in series or in parallel with them or into an independent or local circuit. The magnets 34 and 177 are in series in their circuit. The magnets 60 and 177 are quick-acting or respond to short impulses in their respective circuits, while magnets 34 and 47 are sluggish or respond only to prolonged impulses. The magnet 109 is preferably quick-acting. Four binding posts or bars 209, 210, 211, and 212 are secured to the base *a* near one edge thereof and another post 213 is secured to the base at the front of the machine. The two posts 209 and 213 are connected by a wire, and the post 213 is connected by a wire with one side of the escapement-magnets 60. The other side of the magnets 60 is connected electrically with a binding-post 214 on base *a*, and the last-named post is electrically connected with one side of the magnet 109. The other side of magnet 109 is electrically connected with a binding-post 215 on the base *a*, and post 215 is electrically connected with one side of magnet 47. The other side of magnet 47 is connected by a wire with the post 210.

In the arrangement of the circuits shown in Figs. 1, 2, 3, 6, 9, 10, 11, and 12 the magnet 109 is cut into circuit in series with the magnets 47 and 60 by the following means: The binding-post 214 has a metal arm or contact-carrier 216 pivoted thereto at 217, which arm has a contact-point 218 at the upper side thereof. The post 215 has a metal arm 219 pivotally connected therewith by a pin 220, and said arm 219 has a contact-point 221 at its under side for coaction with the point 218. A leaf-spring 222 is secured to the under side of the arm 219 and is provided with a piece of insulation 223, which bears against the under side of the arm 216 and presses the two arms 216 and 219 toward each other to bring points 218 and 221 into contact with each other for the purpose of completing the circuit through them. The arms 216 and 219 form a short circuit, whereby the magnet 109 is normally cut out of the circuit through the magnets 47 and 60. The arm 216 is held stationary or even moved downward at the required times by a rod 224, which is insulated from the arm and which has a slotted head 225, engaging with a groove in the pin 49, by which the pawl 42 is connected with arm or lever 43. The head 225 is adjustably connected with the rod 224, whereby the length of the connection between pin 49 and arm 216 may be varied. In the normal positions of the parts (see Fig. 1) there is some clearance between the bottom of the slot in the head 225 and the pin 49 to provide a lost motion for the purpose of securing a proper timing of the action of certain parts, as will appear. The arm 219 is connected with the arm or lever 25 by a flexible connection, as by a wire loop 226 passing through the arm 219, a normally slack cord or other ligament 227, and an arm 228, which is fast on and adjustable circumferentially of the pin 37 aforesaid, the upper end of the cord 227 being fast to the arm 228. The said connection between the arms 25 and 219 provides that the spring 222 shall not maintain the points 218 221 in circuit-making contact beyond a certain point, as when the rod 224 holds down the arm 216 and the arm 219 is raised by the said connection, which actions occur when magnets 47 and 34 are energized; or both the arm 216 and arm 219 may be moved to break the circuit at 218 221. The wires forming the connections between magnets 47, 60, and 109 and the posts 209 210 are marked 229. The wires connecting magnets 34 and 177 with each other and with posts 211 212 are marked 230.

Transmitting devices.—The transmitting means used by me in practice are not shown in the drawings, since they form no part of the present invention and may form the subject-matter of a subsequent application for Letters Patent. The mode of operation and the timing of the various steps thereof will be understood readily, however, from the arrangement shown in dotted lines in Fig. 9, where there are shown two pole-changing keys 231 232, connected with the posts 209 210, and two pole-changing keys 233 234, connected with the posts 211 212. Batteries for and connected with the keys 231 232 are also shown.

Operation: The operation of the apparatus will now be described in connection with the drawings. The type-wheel *t* is shown as being at the extreme left-hand limit of its letter-feed motion, and the scape-wheel *s* is shown as arrested by the unison device. The springs 20 and 135 are supposed to be under sufficient tension for driving the type-wheel and for keeping the web of paper taut. The pin *y* and the scape-wheel are first released by depressing and releasing one of the keys 233 234 to cause the magnet 34 to lift arm 204 out of the path of the pin *x* and the pawl 80 to turn the wheel 74 the distance of one tooth thereof, and so to move the type-wheel one letter-space to the right. The motion of the type-wheel to the right frees the arm 206, which thereupon moves to the right, and so moves cam 208 out of the path of the arm 204 as it descends on the deënergizing of the magnet 34. The arm 204 therefore springs to the right beyond the extremity of the pin *x* and above the pin *y*, leaving the scape-wheel free to revolve under the action of the pallet 3 and the transmitting mechanism. By preference the pin *x* is so set in wheel *s* and the end 205 of arm 204 is so placed that the pin and wheel are arrested in going to unison at a point which causes the pallet 3 to be about midway between two successive teeth of the scape-wheel. This arrangement secures, when a key 233 or 234 is operated for the purposes stated, that the scape-wheel and its pin *x* will be moved by the spring 20 when the arm 204 is lifted on

the depression of the key until the next tooth of the wheel *s* is arrested by the pallet 3, which motion of the wheel is sufficient to move pin *x* to the rear of the arm 205, so that should the arm 204 not spring to the right in time to take the end 205 out of the path of the end of the pin *x* the scape-wheel will nevertheless be released from the unison-stop 205. Assuming that it is desired to print a word beginning with the syllable "UN," the keys 231 232 are depressed in alternation the proper number of times to bring that tooth of the scape-wheel *s* which corresponds to that kerf of wheel *w* which is in line (axially of the shaft *o*) with the interval between the type "UN" into contact with the pallet 3, thus arresting the type-wheel with that pair of type adjacent to the printing-point, as shown in Fig. 10, whereupon that one of the keys 231 232 last depressed—say key 231—is kept down, and the magnet 47 is thereby energized. The magnet 47 draws its armature against its core-stop, thus moving the arm or lever 43 to the position thereof shown in Fig. 14 and causing the pawl 42 to give a quick sharp motion to the ratchet-wheel 24, whereby the spring 20 is wound to a certain extent by the action of the pawl and the momentum device aforesaid. The said motion of the arm 43 moves the pin 49 to the bottom of the slot of the head 225 in order to prevent the arm 216 from being lifted when the arm 219 is drawn upward later. At the same time the pawl-arm 144 actuates the ratchet-wheel 142 and its shaft 143, thus causing the worm 138 to turn the worm-wheel 137, and so to put springs 135 under yet greater tension, (or to slip on their shaft, as the case may be,) as hereinbefore set forth. Next the key 233, say, is depressed, thus energizing the magnets 177 and 34. The magnets 177 act more quickly than the magnet 34 and cause the arm 14 to shift the tongue to the position thereof shown in Fig. 10, (if it is not already in that position,) after which the magnet 34 lifts the arm 5 and the centering shift-arm 6 to the position thereof shown in Fig. 11. As the arm 6 is raised by lever 5 it moves relatively to pin 8, and a face of the V-point of tongue 9 strikes this pin, and the V-point of the arm is thereby swung toward the front of the machine, if not already in that forward position, but not before said point of arm 6 is within the circle through the points of the teeth of the star-wheel *w*. For convenience of reference any tooth of the wheel *w* which may be arrested in front of the plane through the axis of the shaft *o* and pin 8 and in position to be acted upon by the arm 6 will be referred to by the numeral 235 and any tooth in rear of said plane and in position to be acted upon by arm 6 by the numeral 236. In the case assumed the V-point of the arm 6 strikes against the rear face of tooth 235 in front of said plane through the axis of shaft *o* and turns the star-wheel *w*, shaft *o*, and type-wheel *t* in the direction in which they are driven by the spring 20 and then arrests and locks them, when the tooth 236 is struck by the other face of the V-point, at which time the type "U" is at the printing-point 15. The drawing down of the armature of the magnet 34 causes the lever 25 and pawl 26 to give a sharp quick stroke which is transmitted by the wheel 24 to shaft 19 and so to the momentum device 23, whereby the spring 20 is again wound, as set forth; also, the lever 78 is lifted and pawl 80 drawn back over a tooth of the ratchet 74. The lifting of the lever 25 causes the arm 228 to first take up the small amount of slack in the cord 227 and then to lift the arm 219, thereby breaking the circuit 229 at the contacts 218 221 and cutting the magnet 109 into circuit, the arm 216 being held stationary at such time by the rod 224 and pin 49. Magnet 109 draws down its armature 108 and lifts lever 104 and pawl 103, and the last named turns the ratchets 102 101 and their shaft 99 the space of one tooth of the ratchets. The ratchet 101 acts on the tooth 98 and momentarily lifts the arm 97 and so throws the platen *p* and paper against the type at the printing-point, which in the case taken is the type "U." It will be noted that the platen after the impression is taken falls away from the type on wheel *t* under the influence of gravity and the pull of the web 119 thereon. It will be noted that the arm 187 during the described operation does not engage with the rabbet 188, for the motion of the armature 26 and lever 186 moves the pawl 187 to the position thereof shown in Fig. 14, where the pawl rests on or is adjacent to the higher part of the end of the arm 157. The raising of the arm 196 releases the spring 191 from the stop 193 by the action of the arm and the cam portion 195, of course; but this action occurs too late for the pawl 187 to engage with the rabbet 188. The letter "N" may now be imprinted alongside the "U" without releasing the depressed key 231 by releasing the key 233 and then depressing the key 234, for on the release of the depressed key 233 the circuit through the magnets 34 and 177 is broken, and the levers 5, 25, and 78 are thereby released to be returned to normal positions by the said spring 36, thus withdrawing the arm 6 from the wheel *w* altogether, moving pawl 26 back over one or more teeth of the wheel 24, and moving pawl 80 down and turning the wheel 74 and shaft 70, and thus causing drums 72 73 to rotate and one to pay off and the other to wind up the cords connected therewith, and so to move the type-wheel one letter-space distance toward the right of the machine. The dropping of lever 25 to normal position causes a slacking up of the cord 227, whereupon the spring 222 closes the circuit at the points 218 221 by drawing arm 219 toward arm 216 and the magnet 109 is cut out and deënergized, whereupon lever 104 falls and pawl 103 is drawn back over a tooth of the wheel 102, the tooth 98 acting as a detent to wheel 101 at such time. The springs 1 2 return the type-wheel to

the position thereof shown in Fig. 10 as soon as the arm 6 frees the wheel *w*. The key 234 is now struck and the magnets 177 and 34 charged, but with or by current of the opposite polarity, the magnets 177 move the shaft 178 and arm 14, and the fork 13 moves the tongue 9 rearwardly of the machine before the magnet 34 raises the lever 5 to cause the arm 6 to engage with the wheel *w*. The result is that when the lever 5 and arm 6 are raised the tongue 9 is in position such that the V-point of arm 6 strikes first against the tooth 236 in rear of the plane through the axis of the shaft *o* and pin 8 and turns the wheels *w* and *t* rearwardly until the type "N" is on or at the printing-point, as shown in Fig. 12, by which time the V-point of arm 6 comes in contact with the tooth 235 and so arrests and locks the type-wheel against further turning motion. When the magnet 34 draws lever 25 up again, the arm 228 first tautens cord 227 and then lifts the arm 219 and breaks the circuit at 218 221, thus cutting magnet 109 into the circuit 229 again, and thereupon the lever 104 and parts actuated thereby are operated, as hereinbefore set forth, and the letter "N" is imprinted on the paper alongside the letter "U." On the release of the depressed keys 231 234 the type-wheel is fed one letter-space distance along its shaft *o*, as above described, the arm 6 is withdrawn from wheel *w*, the circuit 229 is again closed at the contacts 218 221 by the return of levers 25 and 43 to normal positions, and the magnet 109 is deënergized and lever 104 and its pawl 103 drop down. The motion of shaft 44 causes the pawl 144 to move back over the ratchet 142, and the springs 1 2 return the type-wheel *t* to the position thereof shown in Fig. 10. The letters "UN" may be alternated many times by holding down the key 231 and alternately operating keys 233 234, and these letters may be printed in the order "NU" by merely depressing the keys 234 233 in the order named after key 231 has brought the group of type "UN" to the position shown in Fig. 10, and the like is true of the members of all other pairs of type on the wheel *t*, which are represented by a kerf of the wheel *w*. It is remarked that no detents save detent 82 (see Figs. 1, 4, and 5) are shown for the various ratchet-wheels above named, since the momentum of the various parts actuated by the pawls 26, 42, 103, and 144 suffices to prevent the friction of these pawls on the backs of the teeth of their respective ratchet-wheels from dragging them backward during the return of these pawls to their normal positions. The printing of characters across the web or page is continued until the end of the line is reached or until it is desired to return the type-wheel for the beginning of a new line. It is not necessary to move the type-wheel to a given position or to the end of a line before it can be returned to the left, for it may be released at any point in its forward traverse, to be returned by the action of the spring 88 and the described connections between said spring and the type-wheel.

When it is desired to return the type-wheel to the left from any position thereof to the right of its initial position at the left the following are the operations that take place: After the last letter has been printed the circuit in the line through the escapement-magnets 60 is broken, while that through the magnets 34 and 177 is kept closed, whereupon the parts at the left outside the plate *c*, which are operated by magnets 47 and 109, return to the positions thereof shown in Fig. 15, in which the apparatus is ready to release the type-wheel and other parts to permit the wheel *t* to return to the left and the paper to be fed forward one line-space. It will be observed in Fig. 15 that the arm 186 is sufficiently far to the right to permit the arm 191 to move the pawl 187 down into position for engaging the rabbet 188 when the lever 43 is drawn to the left again. Upon again closing the circuit through the magnets 47 and 60 the magnet 47 draws its armature to it, and so draws the lower end of lever 43 to the left, thus causing the pawl 187 to engage with rabbet 188 and move the arm 157 to the left and move the shaft 156 on its axis. The said motion of the shaft 156 causes the arm 180 and pin to disengage the pawl 80 from the ratchet-wheel 74, the screw 184 to disengage the pawl 103 from the wheel 102, and the tails 182 183 of pawls 82 and 155 to disengage the detent 82, while the detent 155 is disengaged from the wheel 123 at the same time. The release of the wheel 74 allows the spring 88 to act, whereby the shaft 70 is rotated in the direction that causes the cord 76 to wind on drum 72, and the type-wheel is moved to the left to its extreme left-hand limit of motion along the shaft 70, where it strikes the wire 206 and causes the incline 208 to be moved into the path of the then upraised arm 204. On the release of the depressed keys the arm 204 descends and strikes against the cam 208 and is bent thereby and so is caused to move into the path of the end of the pin *x*, ready to engage the same upon the operation of the escapement to bring the parts to unison. The platen is prevented from striking the paper against the type-wheel during the return of the latter to the left by the disengagement of the pawl 103 from the wheel 102, which takes place the moment the magnet 47 draws its armature to itself, since pawl 187 is then in position to engage with the rabbet 188, as above stated. This disengagement of the pawl 103 takes place before the magnet 109 is cut into the circuit by the opening of contacts 218 221, and this pawl simply moves up and down without touching wheel 102 on the energizing and deënergizing of the magnet 109 thereafter by the opening and closing of said contacts. The wheels 102 101 are not turned, therefore, and tooth 98 is not lifted to operate the platen. It is thus apparent that the particular combination of opera-

tions by which the type-wheel is released is one that happens only by design or intention in the normal operation of the machine. The contingency that the cam 195, stop 193, and arm 196 are intended to meet can only arise through the energizing of magnet 34 before or simultaneously with the magnet 47 or through the energizing of magnet 34 too soon after the energizing of the magnet 47, in either of which cases the pawl 187 would be swung into position for engaging with the rabbet 188 before the arm 186 had time to move said pawl rearwardly of the apparatus over the arm 157.

The paper is fed forward for one line-space interval during the interval in which the type-wheel is being returned to the left, since the shaft 156, which carries the arm 157, also carries the detent 155 and moves the detent away from the wheel 123 at the same time that the pawls 80 and 103 are disengaged, as above set forth. The downward motion of the detent 155 draws down the link 162 and operates the lever 160, and so causes the arm 163 to rise or move endwise and draw the pawl 171 into engagement with the ratchet-wheel 123, whereupon the springs 135, acting through the described mechanism and the web 119, rotate the roll-carrier 120 and the wheel 123 until the arm 163 strikes the stop 174 and is arrested thereby. On the release of the armature 46 by its magnet 47 the spring 54 moves the shaft 156 in the other direction, thus reëngaging the detent with the ratchet-wheel 123 and disengaging the pawl 171 therefrom, whereupon the spring 165 draws the arm 163 over against the stop 166. At the same time the pawls 80 and 103 and the detent 82 are reëngaged with their respective ratchet-wheels.

It is noted that the described arrangement of keys 231 232 233 234 provides a simple though relatively slow means for actuating the receiving apparatus forming the subject-matter of this application, inasmuch as by the use of but two keys 231 232, one "+" and one "−," the current in line 229 may be reversed and any letter or type brought to or adjacent the printing-point by starting the wheel *t* at unison and counting the strokes (alternating) upon the keys 231 232 requisite to bring the first-selected type to the printing-point and thereafter counting from the last type to the next, the keys 233 234 being manipulated only after the type is brought to or adjacent to the printing-point. The type-wheel *t* may be moved to the right for letter-spacing by depressing either of keys 233 234 and energizing the magnet 34, thus raising arm 78 and pawl 80 in the manner above set forth. On the release of the depressed key the lever 78 moves down and the pawl 80 turns the wheel 74 and shaft 70, as above described, and so causes the type-wheel to be moved to the right. A regular space-key is therefore unnecessary, and the type-wheel may be moved for spacing between words whatever may be the position of the type thereon relative to the printing-point. Nor is it requisite that there be a blank space upon the type-wheel to be brought opposite the platen when it is desired to space between words and the like.

Adjustable and removable parts.—The arms or levers 5, 14, 25, 43, 46, 78, 104, 157, 180, and 228, pawl 144, and detent 155 are shown as being adjustable circumferentially and longitudinally of their respective shafts or pins by means of clamping-jaws 237 and screws 238. The references are applied to but one of these various parts, (see Fig. 14,) the purpose of the omissions elsewhere being to avoid confusion. The downward motion of the lever 104 is limited by an adjustable stop 239, secured to plate *c* by a screw 240.

The bracket 96 is detachably connected with the plate *b* in any suitable manner, as by means of a screw 241, which passes through the bracket and engages with a threaded hole in the plate *b*, and two adjustable stops 242 243 for the under side and the end of the bracket 96. The stops 242 243 are adjusted by means of slots therein and screws 244, which pass through said slots and engage with threaded holes in the plate *b*.

The shafts or bars *o*, 64, 70, 99, 130, and others, and the platen-carrier frame are separately or independently detachable from the apparatus, so that it is not necessary to dismount or disassemble other parts of the apparatus when it is desired to take out any of these parts.

In the modification illustrated in Fig. 21 the pivoted arms 216 219 are replaced by spring-arms 245 246, which are secured to the binding-posts 214 215 and are tensioned to spring away from each other. The rod 224 connects with the uppermost spring 246, and the ligament 227 connects with the lower spring 245. In the normal positions of the parts the pin 49 is at the bottom of the slot in the head 225 and the ligament 227 is taut, while the contacts 218 221 are separated by a space. The ligament 227 passes through a perforation 248 in the spring 246 and is made fast to an eye 249, attached to the spring 245. When the magnets 34 and 47 are both energized and draw down their respective armatures, the rod 224 and the ligament 227 draw the contacts 218 221 together to make or close a circuit through the magnet 109, which operates the platen, as hereinbefore set forth. The springs 245 246 and their operating parts are so arranged, however, that neither magnet 34 nor magnet 47 can operate to close the circuit at the contact-points 218 221 and so energize the magnet 109. The joint action of both magnets 34 and 47 is requisite to the closing of the circuit at said points, though this does not necessarily imply simultaneousness of action of these two magnets 34 and 47, since they may and, in fact, are intended to act in succession. The lost motion provided for in the form of the invention illus-

trated in Fig. 2 is secured in the modification shown in Fig. 21 by the yielding of the springs 245 246 after the contacts 218 221 stop each other. The current for magnet 109 may be derived from the circuit 229, as illustrated in Fig. 22, in which the magnet 109 is arranged to be thrown into circuit in parallel with the magnets 47 60 by the closing of the points 218 221.

In the modification illustrated in Fig. 23 the screw 184 and the pawl-tail 185 (see Fig. 2) are omitted and the ligament 227 has an indirect lead from the arm 228 to the spring 245 above named, said lead being about a grooved roller 250, which is journaled on the arm 157, near the upper end thereof. The ligament 227 is in the normal positions of the parts stretched taut, and the pin 49 is at the bottom of the slot in head 225. During the operation of printing the roller 250 merely revolves, being otherwise stationary, and the magnet 109 is thrown into circuit by the closing together of the contacts 218 221 when both magnets 34 and 47 are energized and draw their respective armatures to themselves. When, however, the type-carrier *t* is released to return to its initial position for the beginning of a new line of writing, the pawl 187 engages with the rabbet 188, as hereinbefore set forth, and the lever 157 is moved toward the rear of the machine, thus moving roller 250, so as to slacken up the ligament 227. The result is that although arm 43 and rod 224 move the spring 246 down, there is no closing of the circuit at the contacts 218 221, for the spring 245 also moves downward sufficiently far to prevent the contact 221 from overtaking the contact 218, and the magnet 109 is thus prevented from being energized. Consequently the pawl 103 is not lifted and the platen is not operated during the return of the type-wheel *t* to said initial position. Instead of having the spring-arms 245 246 throw the magnet 109 into circuit in parallel with the magnets 47 and 60 they may close a local circuit including a battery 247, as illustrated at Fig. 24.

The invention is susceptible of many modifications, and I have already devised several modifications of various mechanisms shown in the drawings and above described, which modifications are substantial equivalents of the mechanisms referred to, and I have built and practically tested certain of said modifications. I do not, therefore, limit this specification and the claims to the precise forms of the invention illustrated in the drawings and hereinbefore described.

What I claim is—

1. The combination of a rotatory carrier provided with a circular row of type, driving mechanism for rotating said carrier, means for arresting said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting said carrier to move about its axis independently of said driving mechanism, a member connected to said carrier to rotate the same, said member being provided with working parts whose number is equal to the number of said positions, and a pivoted member having a working part pivoted on said pivoted member on an axis parallel to that of the type-carrier and adapted to engage with the said working parts of the first-named member to rotate said carrier in each direction about its axis independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

2. The combination of a rotatory carrier provided with a circular row of type, driving mechanism for rotating said carrier about its axis, means for arresting said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting said carrier to move about its axis independently of said driving mechanism, a toothed wheel or pinion connected to said carrier to rotate the same, the teeth or working parts of said wheel or pinion equaling in number the said positions, and a pivoted arm having a working part pivoted on said arm on an axis parallel to that of said type-carrier and adapted to engage with said wheel or pinion to rotate the same in both directions about its axis independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

3. The combination of a rotatory carrier provided with a circular row of type, driving mechanism for rotating said carrier about its axis, means for arresting said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting said carrier to move about its axis independently of said driving mechanism, a star-wheel connected to said carrier to rotate the same, the teeth of said wheel equaling said positions in number, a pivoted arm having a working part pivoted on said arm on an axis parallel to that of said type-carrier and adapted to engage with the teeth of said wheel to rotate the type-carrier in both directions independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

4. The combination of a carrier movable about an axis and provided with a circular row of type, driving and arresting means for moving said carrier about said axis and for arresting it in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting said carrier to move about said axis independently

of said driving means, a member connected with said carrier to rotate the same and having working parts equal in number to said positions, and a pivoted member pivoted on said member on an axis parallel with that of the said type-carrier and adapted to engage with said working parts to rotate the first-named member and type-carrier independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

5. The combination of a carrier movable about an axis and provided with a circular row of type, driving and arresting means for moving said carrier about said axis and for arresting it in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting said carrier to move about said axis independently of said driving means, a toothed wheel or pinion connected to said carrier to rotate the same, the engaging parts of said wheel or pinion being equal in number to said positions, and a pivoted arm pivoted on said arm on an axis parallel with that of said type-carrier and adapted to engage with said wheel or pinion to rotate the type-carrier independently to bring to the printing-point type in said row that are not brought thereto or stopped thereat when said carrier is arrested by said arresting means, substantially as described.

6. The combination of a carrier movable about an axis and provided with a circular row of type, driving and arresting means for moving said carrier about said axis and for arresting said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said carrier and said means, a star-wheel connected to the carrier to rotate the same the teeth of said wheel equaling said positions in number, and an arm provided with a V-shaped engaging part having a compound motion whereby it moves into engagement with any two teeth of said wheel and rotates the carrier in either direction to bring to and lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

7. The combination of a carrier movable about an axis and provided with a circular row of type, driving and arresting means for moving said carrier about said axis and for arresting it in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member between said carrier and said means, a star-wheel connected to the carrier to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped engaging part having a compound motion into engagement with any two teeth of said wheel whereby it rotates the carrier in either direction to bring to and to lock at the printing-point type in said row that are not brought to said point or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

8. The combination of a rotatory carrier provided with a circular row of type, power driving mechanism for rotating said carrier progressively in one direction, an escapement mechanism constructed to arrest said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said mechanisms and said carrier to permit of independent rotation of the carrier about its axis, a star-wheel connected to said carrier to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped engaging part having a compound motion into engagement with any two teeth of said wheel to rotate the carrier in either direction independently of said driving mechanism to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said escapement mechanism, substantially as described.

9. The combination of a rotatory carrier provided with a circular row of type, power driving mechanism for rotating said carrier progressively in one direction, an escapement mechanism constructed to arrest said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a connection having a spring member between said mechanisms and said carriers, a star-wheel connected to said carrier to rotate the same independently of said driving mechanism, the teeth of said wheel being equal to said positions in number, and an arm provided with a V-shaped engaging part having a compound motion into engagement with any two teeth of said wheel to rotate the carrier in either direction independently of the said driving mechanism to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said escapement mechanism, substantially as described.

10. The combination of a rotatory carrier provided with a circular row of type, power driving mechanism for rotating said carrier progressively in one direction, an escape-wheel rigidly connected with a rotating part of said mechanism and having teeth the number of which is an exact divisor of the number of type-spaces in said row, yielding connections between said carrier and said escape-wheel, a star-wheel connected to said carrier to rotate the same, the teeth of said star and escape wheels being equal in number, and an arm provided with a V-shaped operating part having a compound motion into engagement with any two teeth of the star-wheel to rotate the carrier in either direction independently of said driving mechanism to bring to and to

lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said escape-wheel, substantially as described.

11. The combination of a rotatory carrier provided with a circular row of type, power driving mechanism for rotating said carrier progressively in one direction, an escape-wheel rigidly connected with a rotating part of said mechanism and having teeth the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member between said carrier and said scape-wheel, a star-wheel connected to said carrier to rotate the same, the teeth of said star and scape wheels being equal in number, and an arm provided with a V-shaped operating part having a compound motion into engagement with any two teeth of said star-wheel to rotate the carrier in either direction independently of the driving mechanism to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said scape-wheel, substantially as described.

12. The combination of a rotatory shaft, a carrier movable along and rotating with said shaft, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and arresting it and the carrier in given positions less in number than the type-spaces in said row, and supplemental means for rotating said shaft and carrier independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the said shaft and carrier are arrested by said arresting means, substantially as described.

13. The combination of a rotatory shaft, a carrier movable along and rotating with said shaft, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and carrier and for arresting them in given positions the number of which is an exact divisor of the number of type-spaces in said row, and supplemental means for rotating said shaft and carrier independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

14. The combination of a rotatory shaft, a carrier movable along and rotating with said shaft, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and carrier and for arresting them in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said shaft and said means, a member connected to said shaft to rotate the same, said member being provided with engaging parts equal in number to said positions, and a member movable into engagement with said engaging parts of the first-named member to rotate said shaft and carrier independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

15. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, and driving and arresting means for rotating said shaft and carrier and for arresting them in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said shaft and said means, a toothed wheel or pinion connected to said shaft to rotate it and the carrier, said wheel or pinion having teeth or engaging parts equal in number to said positions, and an arm movable into engagement with said wheel or pinion parts to rotate the shaft and carrier independently of said driving and arresting means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

16. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and carrier and for arresting them in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said shaft and said means, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said spaces, and an arm movable into engagement with the teeth of said wheel to rotate the shaft and carrier to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

17. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft and carrier progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row of type, a yielding connection for permitting said shaft and carrier to rotate independently of said driving mechanism, and means for rotating said shaft and carrier independently of said driving mechanism to bring to the printing-point type in said row that are not stopped thereat or brought thereto when the shaft and carrier are arrested by the normal action of

the escapement mechanism, substantially as described.

18. The combination of a rotatory shaft, a carrier movable along said shaft for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting the shaft and carrier to rotate independently of said driving mechanism, a member connected to said shaft, said member being provided with engaging parts equal in number to said positions, and a member movable into engagement with said part of said first-named member to rotate the shaft and carrier independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

19. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft and carrier progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting the shaft and carrier to rotate independently of said driving mechanism, a toothed wheel or pinion connected to said shaft to rotate the same, the engaging parts of said wheel or pinion being equal in number to said positions, and an arm movable into engagement with said wheel or pinion parts to rotate the shaft and carrier independently of said power mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

20. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft and carrier progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting the shaft and carrier to rotate independently of said power mechanism, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm movable into engagement with said wheel to rotate the carrier independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

21. The combination of a rotatory shaft, a carrier movable along the same and rotating therewith, said carrier being provided with a circular row of type, driving means for rotating said shaft and carrier, means for arresting said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, and means for rotating said shaft and carrier in each direction independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

22. The combination of a rotatory shaft, a carrier movable along the same and rotating therewith, said carrier being provided with a circular row of type, driving mechanism for rotating said shaft and carrier, means for arresting said shaft and carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting said shaft and carrier to rotate independently of said driving mechanism, a member connected to said shaft to rotate the same, said member being provided with engaging parts whose number is equal to the number of said positions, and a member having a compound motion and movable into engagement with said parts of the first-named member to rotate said shaft and carrier in each direction independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

23. The combination of a rotatory shaft, a carrier movable along the same and rotating therewith, said carrier being provided with a circular row of type, driving mechanism for rotating said shaft, means for arresting said shaft and carrier in positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection for permitting said shaft and carrier to rotate independently of said driving mechanism, a toothed wheel or pinion connected to said shaft to rotate the same, the engaging parts of said wheel or pinion equaling said positions in number, and an arm having a compound motion and movable into engagement with said wheel or pinion parts to rotate the shaft and carrier in both directions independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by the arresting means, substantially as described.

24. The combination of a rotatory shaft, a

carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving mechanism for rotating said shaft, means for arresting said shaft and carrier in given positions the number of which is an exact divisor of that of the type-spaces in said row, a yielding connection for permitting said shaft to rotate independently of said driving mechanism, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to the number of said positions, and an arm having a compound motion and movable into engagement with said teeth of said wheel to rotate said shaft in both directions independently of said driving mechanism to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

25. The combination of a rotatory shaft, a carrier movable along the same and rotating therewith, said carrier having a circular row of type thereon, driving and arresting means for rotating said shaft and for arresting it and said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member for permitting said shaft to rotate independently of said driving mechanism, and means for rotating said shaft and carrier to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

26. The combination of a rotatory shaft, a carrier movable along the same and rotating therewith, said carrier having a circular row of type thereon, driving and arresting means for rotating said shaft and for arresting it in given positions whose number is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting said shaft to rotate independently of said driving mechanism, and means for rotating said shaft and carrier to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

27. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and for arresting it and the carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting said shaft to rotate independently of said driving and arresting means, a member connected with said shaft to rotate the same and having engaging parts equal in number to said positions, and a member movable into engagement with said engaging parts to rotate the shaft and carrier independently of said means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

28. The combination of a rotatory shaft, a carrier movable along said shaft for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and for arresting it and the carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting the shaft to rotate independently of said means, a toothed wheel or pinion connected to said shaft to rotate the same, the engaging parts of said wheel or pinion being equal in number to said positions, and an arm movable into engagement with said wheel or pinion to rotate the shaft and carrier independently of said means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when said shaft and carrier are arrested by said arresting means, substantially as described.

29. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and for arresting it and the carrier in given positions whose number is an exact divisor of the number of type-spaces in said row, connections having a returning spring member for permitting said carrier to be rotated independently of said means, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm movable into engagement with said teeth to rotate the shaft and carrier independently of said driving means to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

30. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, a circular row of type on said carrier, power driving mechanism for rotating said carrier progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member for permitting the shaft and carrier to rotate independently of said driving and escapement mechanisms, and means for rotating said shaft and carrier independently as stated to bring to the printing-point type in said row that are not brought thereto or stopped there-

at when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

31. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said carrier progressively in one direction, an escapement mechanism constructed to arrest said carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member for permitting rotation of said shaft independently of said mechanisms, a member connected to said shaft to rotate the same, said member being provided with engaging parts equal in number to said positions, and a member movable into engagement with said parts to rotate the shaft and carrier independently of said mechanisms to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

32. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member for permitting the shaft to rotate independently of said mechanisms, a toothed wheel or pinion connected to said shaft to rotate the same, the engaging parts of said wheel or pinion being equal in number to said positions, and an arm movable into engagement with said wheel or pinion to rotate the shaft and carrier independently of said mechanisms to bring to the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

33. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member for permitting the shaft to rotate independently of said mechanisms, a star-wheel connected to said shaft, the teeth of said wheel equaling the number of said positions, and an arm movable into engagement with said wheel to rotate said shaft and carrier independently of said mechanisms to bring to the printing-point type in said row that are not brought thereto when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

34. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and for arresting it and the carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said shaft and said means, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped operating part having a compound motion whereby it moves into engagement with any two teeth of said star-wheel to rotate the shaft and carrier in either direction to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the carrier is arrested by said arresting means, substantially as described.

35. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, driving and arresting means for rotating said shaft and for arresting it and the carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member between said shaft and said means, a star-wheel connected to the shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped operating part having compound motion into engagement with any two teeth of said wheel to rotate the shaft and carrier in either direction to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said arresting means, substantially as described.

36. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, a yielding connection between said mechanisms and said shaft, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped operating part having a compound motion into engagement with any two teeth of said wheel to rotate the shaft and carrier in either direction independently of said mechanisms to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by the es-

capement mechanism, substantially as described.

37. The combination of a rotatory shaft, a carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, power driving mechanism for rotating said shaft progressively in one direction, an escapement mechanism constructed to arrest said shaft and carrier in given positions the number of which is an exact divisor of the number of type-spaces in said row, connections having a spring member between said shaft and mechanisms, a star-wheel connected to said shaft to rotate the same, the teeth of said wheel being equal in number to said positions, and an arm provided with a V-shaped operating part having compound motion into engagement with any two teeth of said wheel to rotate the shaft and carrier in either direction independently of said mechanisms to bring to and to lock at the printing-point type in said row that are not brought thereto or stopped thereat when the shaft and carrier are arrested by said escapement mechanism, substantially as described.

38. The combination of a type-wheel, an escape-wheel, the axes of said wheels being in line with each other and the number of teeth on said escape-wheel being less than the number of type-spaces in a circular row of type on said type-wheel, a toothed wheel or pinion connected to the type-wheel, pins projecting from said escape-wheel and one of the other of said wheels, said pins overlapping each other, and springs coacting with said pins to keep them and said wheels in given relations with each other, with means coacting with said toothed wheel or pinion to turn the same and the type-wheel independently of said escape-wheel, substantially as described.

39. The combination of a type-wheel, an escapement-wheel, the axes of said wheels being in line with each other and the number of teeth on said escapement-wheel being less than the number of type-spaces in a circular row of type on said type-wheel, a toothed wheel or pinion between said wheels and connected to the type-wheel to rotate the same, pins projecting from said toothed wheels toward the other and overlapping, springs coacting with said pins to keep them and said wheels in given relations with each other, and means coacting with the toothed wheel or pinion to rotate the same and the type-wheel independently of said escapement-wheel, substantially as described.

40. The combination of a type-wheel, an escapement-wheel, the axes of said wheels being in line with each other and the number of teeth on the escape-wheel being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, a toothed wheel or pinion on the same axis as and connected to the type-wheel to rotate the same, pins projecting from said escape-wheel and one of the other wheels, said pins overlapping each other, springs coacting with said pins to keep the same and said wheels in given relation with each other, and an arm provided with a V-shaped operating part having a compound motion into engagement with any two adjacent teeth or engaging parts of said toothed wheel or pinion to turn said type-wheel in either direction independently of said escape-wheel, and to lock said type-wheel, substantially as described.

41. The combination of a type-wheel, an escapement-wheel, the axes of said wheels being in line and the number of teeth on said escapement-wheel being an exact divisor of the number of type-spaces in a circular row of type on the type-wheel, a toothed wheel or pinion on the same axis as and between said wheels and connected with the type-wheel to rotate the same, pins projecting from said toothed wheels and overlapping, springs coacting with said pins to keep said wheels in given relations with each other, and an arm provided with a V-shaped operating part having compound motion into engagement with said toothed wheel or pinion to rotate the type-wheel independently of said escapement-wheel, and to lock said type-wheel, substantially as described.

42. The combination of a rotatory shaft, a type-wheel movable along said shaft for letter-spacing and rotating therewith, an escapement-wheel having its axis in line with that of said shaft, the teeth of said escapement-wheel being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, a toothed wheel or pinion fast on said shaft adjacent said scape-wheel, the engaging or operating parts of said wheel or pinion being equal in number to said scape-wheel teeth, overlapping pins projecting from said scape and toothed wheels or pinion toward the other wheel, springs coacting with said pins to keep said wheels in given relation with each other, and means coacting with said toothed wheel or pinion to rotate the same and the type-wheel independently of said escape-wheel, substantially as described.

43. The combination of a rotatory shaft, a type-wheel movable along said shaft for letter-spacing and rotating therewith, an escapement-wheel having its axis in line with that of said shaft, the teeth of said escapement-wheel being in number an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, a toothed wheel or pinion fast on said shaft adjacent said scape-wheel and having the same number of engaging or operating parts, overlapping pins projecting from said toothed wheel or pinion and scape-wheel, springs coacting with said pins to keep said wheels in given relations with each other, and an arm provided with a V-shaped operating part having compound motion into engagement with any two of said operating parts of the toothed wheel or pinion

to rotate the same and the type-wheel independently of said scape-wheel and to lock them, substantially as described.

44. The combination of a rotatory shaft, a type-wheel movable along said shaft for letter-spacing and rotating therewith, an escapement-wheel having its axis in line with that of said shaft, the teeth of said escapement-wheel being in number an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, a star-wheel fast on said shaft adjacent said scape-wheel, the teeth of said scape and star wheels being equal in number, overlapping pins projecting from said star and scape wheels toward the other thereof, springs coacting with said pins to keep said wheels in given relation with each other, and an arm provided with a V-shaped operating part having compound motion into engagement with any two of the teeth of said star-wheel to rotate it and the type-wheel in either direction independently of said scape-wheel, substantially as described.

45. The combination of a power-driven rotatory type-carrier with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a yielding connection between the power-driver and the carrier, a pinion or toothed wheel connected to and rotating said carrier and having working parts or teeth less in number than said spaces, a shifter, a pivoted arm to which said shifter is pivoted and by which the shifter is moved into engagement with said working parts to rotate the carrier independently of said driving and escapement mechanisms, electromagnetically-operated means for moving said arm and shifter, and polarized electromagnets in an independent circuit for actuating said escapement mechanism, substantially as described.

46. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between the driving devices and the carrier, a toothed wheel or pinion connected to rotate the carrier and having working parts less in number than said type-spaces, a shifter, a pivoted arm to which said shifter is pivoted and by which the shifter is moved into engagement with said working parts to rotate the carrier independently of the driving and escapement mechanism, electromagnetically-operated means for moving said arm and shifter, and polarized electromagnets in an independent circuit for actuating said escapement mechanism, substantially as described.

47. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a yielding connection between the power devices and the carrier, a star-wheel connected to rotate said carrier, the teeth of said wheel being less in number than the said type-spaces, a shifter provided with a V-shaped working part movable in two directions into engagement with any two of the teeth of said wheel to rotate said carrier independently of said driving devices and to lock the carrier against motion, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for actuating said escapement mechanism, substantially as described.

48. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between the driver devices and the carrier, a star-wheel connected to rotate said carrier, the teeth of said star-wheel being less in number than said type-spaces, a shifter provided with a V-shaped working part movable in two directions into engagement with any two teeth of said wheel to rotate the carrier independently of said driving devices and to lock the carrier against rotatory motion, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

49. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a yielding connection between the power devices and the carrier, a toothed wheel or pinion connected to rotate said carrier and having working parts less in number than said type-spaces, a shifter movable in two directions into engagement with said working parts to rotate the carrier independently of said driving devices, a switch device for causing said shifter to move in one of said directions, quick-acting polarized electromagnets, means operated thereby for governing said switch, a sluggish electromagnet in the same circuit as said polarized magnets, means operated by said sluggish magnet for moving said shifter in the other of said directions, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

50. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between said driving devices and said carrier, a toothed wheel or pinion connected to rotate the carrier and having working

parts less in number than said type-spaces, a shifter movable in two directions into engagement with said working parts to rotate the carrier independently of said driving devices, a switch device for causing said shifter to move in one of said directions, quick-acting polarized electromagnets, means operated thereby for governing said switch, a sluggish electromagnet in the same circuit as said polarized magnets, means operated by said sluggish magnet for moving said shifter in the other of said directions, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

51. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a yielding connection between said driving devices and said carrier, a star-wheel connected to rotate said carrier, the teeth of said wheel being less in number than the type-spaces in said row, a shifter provided with a V-shaped working part movable in two directions into engagement with the teeth of said wheel to rotate the carrier independently of said driving devices and to lock it against rotation, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

52. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between said driving devices and the carrier, a star-wheel connected to rotate said carrier, the teeth of said wheel being less in number than said type-spaces, a shifter provided with a V-shaped working part movable in two directions into engagement with said teeth to rotate the carrier independently of said driving devices and to lock the carrier against rotation, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

53. The combination of a rotatory power-driven shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said shaft and carrier in given positions less in number than the type-spaces in said row, a yielding connection between said shaft and said escapement mechanism, a toothed wheel or pinion fast on said shaft, the teeth or working parts thereof being less in number than said type-spaces, a shifter movable in two directions into engagement with said teeth or working parts to rotate said shaft and carrier independently of said driving devices and escapement mechanism, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

54. The combination of a power-driven rotatory shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said shaft and carrier in given positions less in number than said type-spaces, connections having a returning spring member between the shaft and escapement mechanism, a toothed wheel or pinion fast on said shaft, the teeth or working parts thereof being less in number than said type-spaces, a shifter movable in two directions into engagement with said teeth or working parts to rotate said shaft and carrier independently of said driving devices and escapement mechanism, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

55. The combination of a power-driven rotatory shaft, a type-carrier movable along said shaft for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said shaft and carrier in given positions less in number than the type-spaces in said row, a yielding connection between said shaft and driving and escapement mechanism, a star-wheel connected to rotate said shaft and carrier, the teeth of said wheel being less in number than said type-spaces, a shifter provided with a V-shaped working part movable in two directions into engagement with said teeth to rotate the shaft and carrier independently of said driving and escapement mechanism to lock the carrier against rotation, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for actuating said escapement mechanism, substantially as described.

56. The combination of a power-driven rotatory shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said shaft and carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between the shaft and the driving and escapement mechanism, a star-wheel connected to rotate said shaft and carrier, the teeth of the star-wheel being less in number than the type-spaces in said row, a shifter provided with a V-shaped working part movable in two directions into and out of engagement with said teeth to rotate the shaft and carrier independently of said driving and escape-

ment mechanism and to lock the carrier against rotation, electromagnetically-operated means for so moving said shifter, and polarized electromagnets in an independent circuit for operating said escapement mechanism, substantially as described.

57. The combination of a power-driven rotatory shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said shaft and carrier in given positions less in number than the type-spaces in said row, a yielding connection between said shaft and said driving and escapement mechanism, a star-wheel connected to rotate said shaft, the teeth of said wheel being less in number than said type-spaces, a shifter provided with a V-shaped working part movable in two directions into and out of engagement with said teeth to rotate said shaft and carrier independently of said driving and escapement mechanism and to lock the carrier against rotation, a switch device for causing said shifter to move in one of said directions, quick-acting electromagnets, means operated thereby for governing said switch, a sluggish electromagnet in circuit with said polarized magnets, means operated by said sluggish magnet for moving said shifter in the other of said directions, and polarized electromagnets in an independent circuit for operating said scape mechanism, substantially as described.

58. The combination of a power-driven rotatory shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, said carrier being provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, connections having a returning spring member between the driving and escapement mechanism and said shaft, a star-wheel connected to rotate said shaft and carrier, the teeth of said wheel being less in number than said type-spaces, a shifter provided with a V-shaped working part movable in two directions into engagement with said teeth to rotate said shaft and carrier independently of said driving and escape mechanism and to lock the carrier against rotation, a switch device for causing said shifter to move in one of said directions, quick-acting electromagnets, means operated thereby for governing said switch, a sluggish magnet in circuit with said quick-acting magnets, means operated by the sluggish magnet for moving said shifter in the other of said directions, and polarized electromagnets in an independent circuit for operating the said escapement mechanism, substantially as described.

59. The combination of a type-wheel, a toothed wheel or pinion connected therewith to rotate the same, the number of teeth or working parts on said wheel or pinion being less in number than the type-spaces in a circular row of type on said type-wheel, an arm movable into and out of engagement with said toothed wheel or pinion to turn the same and the type-wheel, said arm also being arranged to move circumferentially of the wheel or pinion, and switch devices for controlling said circumferential motion, whereby the arm turns the toothed wheel or pinion and the type-wheel, substantially as described.

60. The combination of a type-wheel having a circular row of type, a toothed wheel or pinion connected to and rotating said type-wheel, the number of teeth or working parts of said toothed wheel or pinion being less in number than the type-spaces in said row, an arm movable into and out of engagement with said toothed wheel or pinion to turn the same and the type-wheel, said arm being arranged also to move circumferentially of the wheel or pinion, a tongue pivotally connected with said arm and resting in a slot therein, and a fixed guide engaging with said slotted part of the arm and with the tongue, substantially as described.

61. The combination of a type-wheel having a circular row of type, a star-wheel connected to and adapted to rotate said type-wheel, the number of teeth of said star-wheel being a divisor of the number of type-spaces in said row, an arm provided with a V-shaped working part having a compound motion into and out of engagement with any two of said teeth to turn the type-wheel in either direction, and switch devices for controlling said compound motion, substantially as described.

62. The combination of a type-wheel having a circular row of type, a star-wheel connected to and adapted to turn said type-wheel, the number of teeth of said star-wheel being an exact divisor of the number of type-spaces in said row, an arm provided with a V-shaped working part having a compound motion into and out of engagement with any two teeth of said star-wheel to turn the type-wheel in either direction, a slot in said arm, a tongue in said slot, and a guide coacting with said slot and tongue to move said V-shaped part in the plane of the star-wheel, substantially as described.

63. The combination of a rotatory shaft, a type-wheel movable along the same for letter-spacing and rotating therewith, a toothed wheel or pinion fast on said shaft, the number of teeth or working parts on said wheel or pinion being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, an arm movable in two directions into and out of engagement with said toothed wheel or pinion to rotate the shaft and type-wheel, and switch devices for controlling the motion of said arm in one of said directions, substantially as described.

64. The combination of a rotatory shaft, a type-wheel movable along the same for letter-spacing and rotating therewith, a toothed wheel or pinion fast on said shaft, the number of teeth or working parts on said wheel

or pinion being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, an arm movable in two directions into and out of engagement with said teeth or working parts, a slot in said arm, a tongue in said slot, and a fixed guide for coaction with the said slot and tongue, substantially as described.

65. The combination of a rotatory shaft, a type-wheel movable along the same for letter-spacing and rotating therewith, a star-wheel fast on said shaft, the number of teeth of said star-wheel being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, an arm provided with a V-shaped working part movable in two directions into and out of engagement with any two teeth of the star-wheel to turn the same and the shaft in either direction and to lock them, and switch devices for controlling one of said motions, substantially as described.

66. The combination of a rotatory shaft, a type-wheel movable along said shaft for letter-spacing and rotating therewith, a star-wheel fast on said shaft, the number of teeth of said star-wheel being an exact divisor of the number of type-spaces in a circular row of type on said type-wheel, an arm provided with a V-shaped working part movable in two directions into and out of engagement with any two teeth of said star-wheel to turn the same and the shaft in either direction, a slot in said arm, a tongue in said slot, and a fixed guide coacting with said slot and tongue, substantially as described.

67. The combination of an escapement-controlled type-wheel, a rotatory shaft, a gear loose on said shaft and geared with the escapement-wheel, a helical spring loosely surrounding said shaft exactly at one end where it frictionally grips a round part of said shaft, a connection between the other end of said spring and said gear for rotating the latter, and electromagnetically-operated means for turning said shaft and putting said spring under tension, substantially as described.

68. The combination of an escapement-controlled type-wheel, a rotatory shaft, a gear loose on said shaft and geared with the escapement-wheel, a helical spring loosely surrounding said shaft except at one end where it frictionally grips a round part of said shaft, a connection between the other end of said spring and said gear for rotating the latter, a fly-wheel fast on said shaft, and electromagnetically-operated means for turning said shaft to put said spring under tension, substantially as described.

69. The combination of an escapement-controlled type-wheel, a rotatory shaft, a gear loose on said shaft and geared with the escapement-wheel, a helical spring loosely surrounding said shaft except at one end where it frictionally grips said shaft at a round part thereof, a connection between the other end of said spring and said gear for rotating the latter, said spring being wound to open its coils as it is put under tension thereby increasing its diameter, and means for rotating said shaft to put said spring under tension, substantially as described.

70. The combination of a rotatory shaft, a helical spring loosely surrounding said shaft except at one end where it frictionally grips said shaft at a round portion thereof, an escapement for restraining said spring from running down and releasing it from time to time, and electromagnetically-operated means for turning said shaft progressively and so winding said spring, substantially as described.

71. The combination of a type-wheel, means for moving it axially for letter-spacing, a platen-bar, a pivoted frame carrying said bar, a bifurcated arm on said frame, a tooth on one prong or part of said bifurcated arm, a screw for drawing said prongs or parts of the bifurcated arm toward each other, a ratchet-wheel with which said tooth engages, and means for rotating said ratchet-wheel in a step-by-step manner, substantially as described.

72. The combination of a type-wheel, means for moving it axially for letter-spacing, a platen-bar, a pivoted frame carrying said bar, a pronged or bifurcated arm on said frame, a tooth on one prong of said arm, a screw for drawing said prongs toward each other, a ratchet-wheel with which said tooth engages, means for rotating said ratchet-wheel step by step, and an adjustable stop for said tooth as it is operated by said ratchet-wheel, substantially as described.

73. The combination of a power-driven rotatory type-carrier provided with a circular row of type, electromagnetically-operated escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a circuit in which the electromagnets of said escapement are included, electromagnetically-operated supplemental or type-positioning mechanism constructed to rotate said carrier independently of said driving devices, a second circuit including the electromagnets for said positioning mechanism, a striking-platen, a printing-electromagnet for operating said platen, a circuit-controller, and connections from said controller operated only by the joint action of magnets in both of said circuits for throwing said printing-magnet into circuit to operate the platen, substantially as described.

74. The combination of a power-driven rotatory shaft, a type-carrier movable along the same for letter-spacing and rotating therewith, a circular row of type on said carrier, electromagnetically-operated escapement mechanism for arresting said shaft and carrier in given positions less in number than the type-spaces in said row, a circuit including the electromagnets of said escapement mechanism, electromagnetically-operated supplemental or type-positioning means con-

structed to rotate the shaft and carrier independently of said driving and escapement mechanism, a second circuit including the magnets of said positioning means, a striking-platen, a printing-magnet for operating said platen, and a circuit-controller operated only by the joint action of magnets in both said circuits for throwing said printing-magnet into circuit to operate said platen, substantially as described.

75. The combination of a power-driven rotatory type-carrier provided with a circular row of type, electromagnetically-operated escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, a circuit including the scape-magnets, electromagnetically-operated type-positioning mechanism constructed to rotate said carrier independently of the power driving devices, a second circuit including the electromagnets of said positioning mechanism, a striking-platen, a printing-magnet, and connections for operating said platen, two movable arms carrying coacting contacts, an electromagnet in circuit with said scape-magnets, and connections operated by the joint action of the last-named magnet and a magnet in said second circuit for throwing said printing-magnet into circuit to operate the platen, substantially as described.

76. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, scape-magnets as 60, a magnet 47, a circuit including said magnets, type-positioning mechanism constructed to rotate said carrier independently of said power devices, polarized magnets 177 and magnet 34 for operating said positioning mechanism, a second circuit including magnets 34 and 177, a circuit-controller, a striking-platen, a printing-magnet for actuating the platen, and connections operated by magnets 34 and 47 jointly for operating said controller to throw the printing-magnet into circuit to operate said platen, substantially as described.

77. The combination of a power-driven rotatory type-carrier provided with a circular row of type, escapement mechanism for arresting said carrier in given positions less in number than the type-spaces in said row, scape-magnets as 60, a magnet 47, a circuit including said magnets, type-positioning mechanism constructed to rotate said carrier independently of said power, magnet 34 and polarized magnets as 177 for operating said positioning mechanism, an independent circuit in which magnets 34 and 177 are included, a striking-platen, a printing-magnet for operating said platen, two movable contact-carriers, and means operated by magnets 34 and 47 jointly for operating said carriers to throw the printing-magnet into circuit to operate the platen, substantially as described.

78. The combination of a rotatory type-carrier, power driving mechanism therefor, an escapement mechanism for arresting said carrier, scape-magnets 60, magnet 47, a circuit including said magnets, a magnet 34 in an independent circuit, a centering mechanism operated by magnets 34, a platen, a printing-magnet for causing relative motion of the type-carrier and platen to take impressions, a circuit-controller, and means operated by magnets 34 and 47 jointly for throwing said printing-magnet into circuit, substantially as described.

79. The combination of a rotatory type-carrier, power driving mechanism therefor, an escapement mechanism for controlling the rotation of said carrier, scape-magnets, magnet 47, a circuit including said magnets, type-carrier-centering mechanism, magnet 34 for operating the centering mechanism, a separate circuit in which magnet 34 is included, a platen, a printing-magnet for causing relative motion of said platen and said carrier to take impressions, two movable contact-carriers, and connections between one of said carriers and magnet 47 and the other carrier and magnet 34 whereby the printing-magnet is thrown into a circuit only by the joint action of magnets 34 and 47, substantially as described.

80. The combination of a rotatory type-carrier, a platen, a printing-magnet for causing relative motion of said platen and carrier to take impressions, independent circuits each having an electromagnet, means for controlling the circuit through the printing-magnet, and means actuated only by all of said electromagnets (except the printing-magnet) for causing said controlling means to throw said printing-magnet into circuit to cause the taking of impressions, whereby the energizing of less than the whole number of said magnets in said circuits fails to operate said controlling means to cause the printing-magnet to be thrown into circuit, substantially as described.

81. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for beginning a new line, an arm or projection connected to and rotating with said carrier, a rocking stop-arm normally out of the path of said rotating arm, and means actuated by the returning carrier or a part reciprocating therewith for moving said stop-arm into the path of the rotating arm or projection, substantially as described.

82. The combination of a rotating type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an arm or pro-

jection connected to and rotating with the carrier, a rocking stop-arm normally out of the path of the said rotating arm or projection, and a cam operated by the returning type-carrier or a part reciprocating therewith and moving the said stop-arm into the path of the rotating arm or projection to arrest the same and the rotating carrier at unison, substantially as described.

83. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an arm or projection connected to and rotating with said carrier, a rocking stop-arm normally out of the path of said rotating arm or projection, and a spring-arm extending into the path of said returning type-carrier or a part moving therewith and having a cam portion adjacent said stop-arm and moved into the path thereof, whereby the stop-arm is moved into the path of said rotating arm or projection to arrest the same and the type-carrier at unison, substantially as described.

84. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an arm or projection connected to and rotating with said carrier, a rocking spring-arm having its working part normally out of the path of said rotating arm or projection, and means actuated by the returning carrier or a part moving therewith for moving said spring-arm to bring its working part into the path of said rotating arm or projection, whereby the carrier is arrested at unison, substantially as described.

85. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an arm or projection connected to and rotating with said carrier, a rocking spring-arm having its working part normally out of the path of said rotating arm or projection, and a cam operated by the returning type-carrier or a part connected to or moving therewith and moving the said stop-arm into the path of the rotating arm or projection to arrest the same and the rotating carrier at unison, substantially as described.

86. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an arm or projection connected to and rotating with the carrier, a rocking spring-arm having its working part normally out of the path of said rotating arm or projection, and a spring-arm extending into the path of said returning type-carrier or a part connected to and moving therewith and having a cam portion adjacent said rocking arm and movable into the path thereof, whereby the rocking arm is moved into the path of said rotating arm or projection to arrest the same and the type-carrier at unison, substantially as described.

87. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an escapement-wheel connected to and rotating with said carrier, a pin on said wheel, a rocking stop-arm normally out of the path of said pin, and means actuated by the returning type-carrier or a part connected to and moving therewith for moving said stop-arm into the path of said pin, substantially as described.

88. The combination of a rotatory type-carrier, mechanism for moving the same step by step for letter-spacing, means for releasing said carrier from the control of said mechanism, means for returning said released carrier automatically to an initial position for the beginning of a new line, an escapement-wheel connected to and rotating with said carrier, a pin on said scape-wheel, a rocking stop-arm normally out of the path of said pin, and a cam operated by the returning type-carrier or a part connected to and moving therewith and moving said rocking stop-arm with the path of said pin, substantially as described.

89. In a unison mechanism, the combination of a rotating member and a rocking stop member normally out of the path of said rotating member, with a type-carrier rotating with said rotating member and also moving to and fro for printing lines across a page, and means for moving said rocking member into the path of the rotating member when the carrier reaches one limit of its to-and-fro motion to arrest the rotating member and the carrier at unison, substantially as described.

90. The combination of a shaft, a type-carrier movable along the same for letter-spacing, letter-spacing mechanism, a returning-spring against the force of which said mechanism advances said carrier, two electromagnets in different circuits, a release mechanism for freeing the type-carrier from the control of said letter-spacing mechanism, a lever connected to said release mechanism, movable arms actuated by said magnets, and a catch carried by one of said arms for coaction with said lever and held out of operative position by the other of said arms when the latter is in its normal position, whereby the movement of the catch-carrying arm first does not and

the movement of the other arm first does move said catch into position to operate said lever and release mechanism, substantially as described.

91. The combination of a shaft, a type-carrier movable along the same for letter-spacing, letter-spacing mechanism, a returning-spring against the force of which said mechanism advances said carrier, two electromagnets in different circuits, a rock-shaft provided with releasing-arms for freeing the carrier from the control of said spacing mechanism, a lever on said shaft, movable arms actuated by said magnets, and a catch carried by one of said arms for coaction with said lever and held out of operative position by the other of said arms when the latter is in its normal position, whereby the movement of the catch-carrying arm first does not and the movement of the other arm first does move said catch into position to operate said lever and release mechanism, substantially as described.

92. The combination of a shaft, a type-carrier movable along the same for letter-spacing, letter-spacing mechanism, a returning-spring against the force of which said mechanism advances said carrier, two electromagnets in different circuits, a release mechanism for freeing the type-carrier from the control of said letter-spacing mechanism, a lever connected to said release mechanism, movable arms actuated by said magnets, and a catch carried by one of said arms for coaction with said lever and held out of operative position by the other of said arms when the latter is in its normal position, whereby the movement of the catch-carrying arm first does not and the movement of the other arm first does move said catch into position to operate said lever and release mechanism, with a vibratory platen, a printing-magnet for operating said platen, a circuit-controller, means actuated by said two magnets first named for throwing said printing-magnet into circuit to operate the platen, and means controlled by said lever for preventing the operation of the platen at the time the carrier is released, substantially as described.

93. The combination of a shaft, a type-carrier movable along the same for letter-spacing, letter-spacing mechanism, a returning-spring against the force of which said mechanism advances said carrier, two electromagnets in different circuits, a rock-shaft provided with releasing-arms for freeing the carrier from the control of said spacing mechanism, a lever on said shaft, movable arms actuated by said magnets, and a catch carried by one of said arms for coaction with said lever and held out of operative position by the other of said arms when the latter is in its normal position, whereby the movement of the catch-carrying arm first does not and the movement of the other arm first does move said catch into position to operate said lever and release mechanism, with a vibratory platen, a printing-magnet for operating said platen, a circuit-controller, means actuated by said two magnets first named for throwing said printing-magnet into circuit to operate the platen, and means controlled by said lever for preventing the operation of the platen at the time the carrier is released, substantially as described.

94. The combination of a rotatory type-carrier, mechanism for advancing the same step by step for letter-spacing, a returning-spring against the force of which said carrier is moved by said mechanism, two electromagnets in different circuits, a release mechanism for freeing the type-carrier from the control of said letter-spacing mechanism, a lever connected with and operating said release mechanism, a movable arm actuated by one of said magnets, a catch carried by said arm and arranged to operate said lever, a spring-arm operated by the other of said magnets and connected with said catch to hold the same normally in an inoperative position, a stop for said spring-arm, a platen, a printing-electromagnet for actuating said printing-magnet into circuit, and devices for releasing said spring-arm from said stop, said devices being operated by said printing-magnet, substantially as described.

95. The combination of a spring-driven rotatory type-carrier moved step by step for letter-spacing against the force of a returning-spring, means for releasing said carrier to be returned by said spring, a roll of paper, means for keeping the paper from said roll under tension, an escapement mechanism for controlling the unwinding of the paper, a platen, a printing-magnet and means for causing relative motion of type-carrier and platen for taking impressions, two electromagnets in different circuits, means operated by the joint action of said two magnets for throwing said printing-magnet into circuit to cause the taking of impressions, and means actuated by said two magnets when energized in a given order for operating said release and escapement mechanisms and preventing relative impression-taking motion of said platen and carrier, substantially as described.

96. The combination of a spring-driven rotatory type-carrier moved step by step for letter-spacing against the force of a returning-spring, means for releasing said carrier to be returned by said spring, a roll of paper, means for keeping the paper from said roll under tension, an escapement mechanism for controlling the unwinding of the paper, a platen, a printing-magnet and means for causing relative motion of type-carrier and platen for taking impressions, two electromagnets in different circuits, means operated by the joint action of said two magnets for throwing said printing-magnet into circuit to cause the taking of impressions, and means actuated by said two magnets when energized

in a given order for operating said release and escapement mechanisms and preventing relative impression-taking motion of said platen and carrier, with spring-winding means actuated by said two magnets, substantially as described.

97. The combination of a shaft, a rotatory type-wheel movable endwise of the shaft, a second journaled shaft parallel with the first-named shaft, a carrier movable along but not rotatable independently of said second-named shaft, an ink-roller borne by said carrier, and means for locking the second-named shaft and said carrier in any position to which they may be turned, whereby the pressure of the inker on the type-wheel may be varied, substantially as described.

98. The combination of a shaft, a rotatory type-wheel movable along said shaft, a second journaled shaft parallel with the first, an L-shaped carrier connected at its angle with the second shaft and embracing the hub of the type-wheel at its ends to move the same along the first-named shaft said carrier not being rotatable independently of said second shaft, an ink-roller borne by said carrier, and means for locking said second shaft and said carrier in any position to which they may be turned, substantially as described.

99. The combination of a shaft, a rotatory type-wheel movable along the same, a second journaled shaft parallel with the first, a carrier movable along the second shaft, an ink-roller borne by said carrier, a pair of arms forming part of said carrier provided with forked ends which bear against the ends of the type-wheel hub and limit the motion of said carrier transverse to the first shaft, and means for locking said second shaft and carrier in any position to which they may be turned, substantially as described.

100. The combination of a journaled shaft, a type-wheel movable also and rotating with said shaft, a second shaft journaled parallel with the first shaft, means for locking the second shaft against turning, a carrier movable along said second shaft and moving the type-wheel along the first shaft, an ink-roller journaled on said carrier, and means for moving said carrier along its shaft step by step, substantially as described.

101. The combination of a type-wheel, means for rotating the same, means for moving the type-wheel step by step for letter-spacing, an ink-roller moving with said wheel, and a stationary ink-feeder with which said roller coacts when the type-wheel and roller are in a given letter-space position, said roller and feeder being separated in all other letter-space positions of the type-wheel and ink-roller, substantially as described.

102. The combination of a type-wheel, means for rotating the same, means for moving the type-wheel for letter-spacing in a step-by-step manner, an ink-roller moving with said wheel during letter-spacing, and means for supplying ink to said roller while the type-wheel and roller are in a given letter-space position, said roller and feeder being separated in all other letter-space positions of the type-wheel and ink-roller, substantially as described.

103. The combination of a type-wheel, means for rotating the same, means for moving the type-wheel for letter-spacing, an ink-roller moving with the type-wheel, a stationary ink-reservoir, and a flexible capillary feed device coacting with the ink-roller in a particular letter-space position of the type-wheel to supply ink thereto from said reservoir, substantially as described.

104. In a page-printing telegraph-receiver, the combination of a rotatory type-carrier, means operated electromagnetically by one circuit for moving said carrier step by step for letter-spacing, and an electromagnetically-operated printing mechanism deriving its energy from another or independent circuit, whereby the carrier may be moved for spacing in any position thereof relative to its axis by the use of the first-named circuit, substantially as described.

105. The combination of a rotatory type-carrier, driving mechanism for rotating it, escapement mechanism for arresting said carrier, letter-space feed mechanism for moving said carrier step by step, polarized electromagnets and armature for actuating said escapement mechanism, said magnets being in one circuit, and an electromagnet in a second independent circuit for operating said letter-space feed mechanism, substantially as described.

106. The combination of a rotatory type-carrier, driving mechanism for rotating it, escapement mechanism for arresting said carrier, letter-space feed mechanism for moving said carrier step by step, polarized electromagnets and armature for actuating said escapement mechanism, said magnets being in one circuit, and an electromagnet in a second independent circuit for operating said letter-space feed mechanism, with a printing-magnet, a platen, an electromagnet in the first-named circuit, and connections operated only by the joint action of the last-named magnet and the said magnet in said second circuit for throwing the printing-magnet into circuit, substantially as described.

107. The combination of a round pin or stud, with a spring coiled thereon and held by friction and having projecting ends or arms, whereby the relative positions of the said ends and pin or stud may be varied by pressing on one or the other of said ends to open the coils of the spring and so reduce the friction, substantially as described.

108. The combination of a round pin or stud, a spring coiled thereon and held in place by friction and having projecting ends or arms, whereby the relative positions of the said ends and pin or stud may be varied by

pressing on one or the other of said ends to open the coils of the spring and so reduce the friction, an electromagnet, an armature-lever therefor, and a spring connecting said lever and one of said projecting ends or arms, substantially as described.

Signed at New York city, in the county of New York and State of New York, this 12th day of April, A. D. 1900.

JOHN BURRY.

Witnesses:
FRANK RYALL,
R. W. BARKLEY.