G. M. YORKE.

AUTOMATIC PRINTER.

APPLICATION FILED APR. 26, 1915.

1,215,604.

Patented Feb. 13, 1917.

3 SHEETS—SHEET 1.

Fig 1.

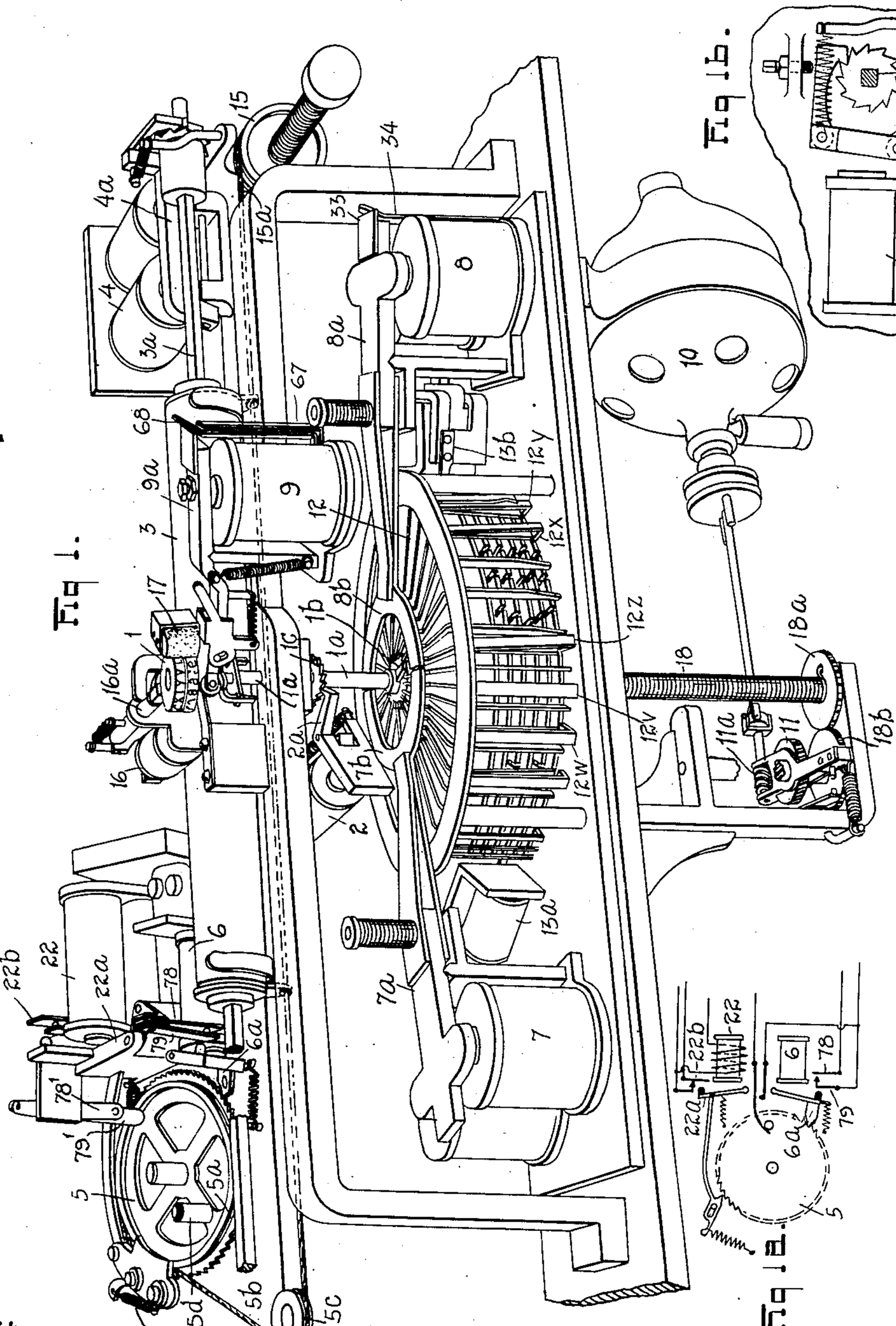

Fig 1b.

Witnesses:

J. L. Massey

Paul K. Franke

Inventor

George M. Yorke

By his Attorney

H. M. Marble

G. M. YORKE.

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3 SHEETS—SHEET 2.

Fig 2.

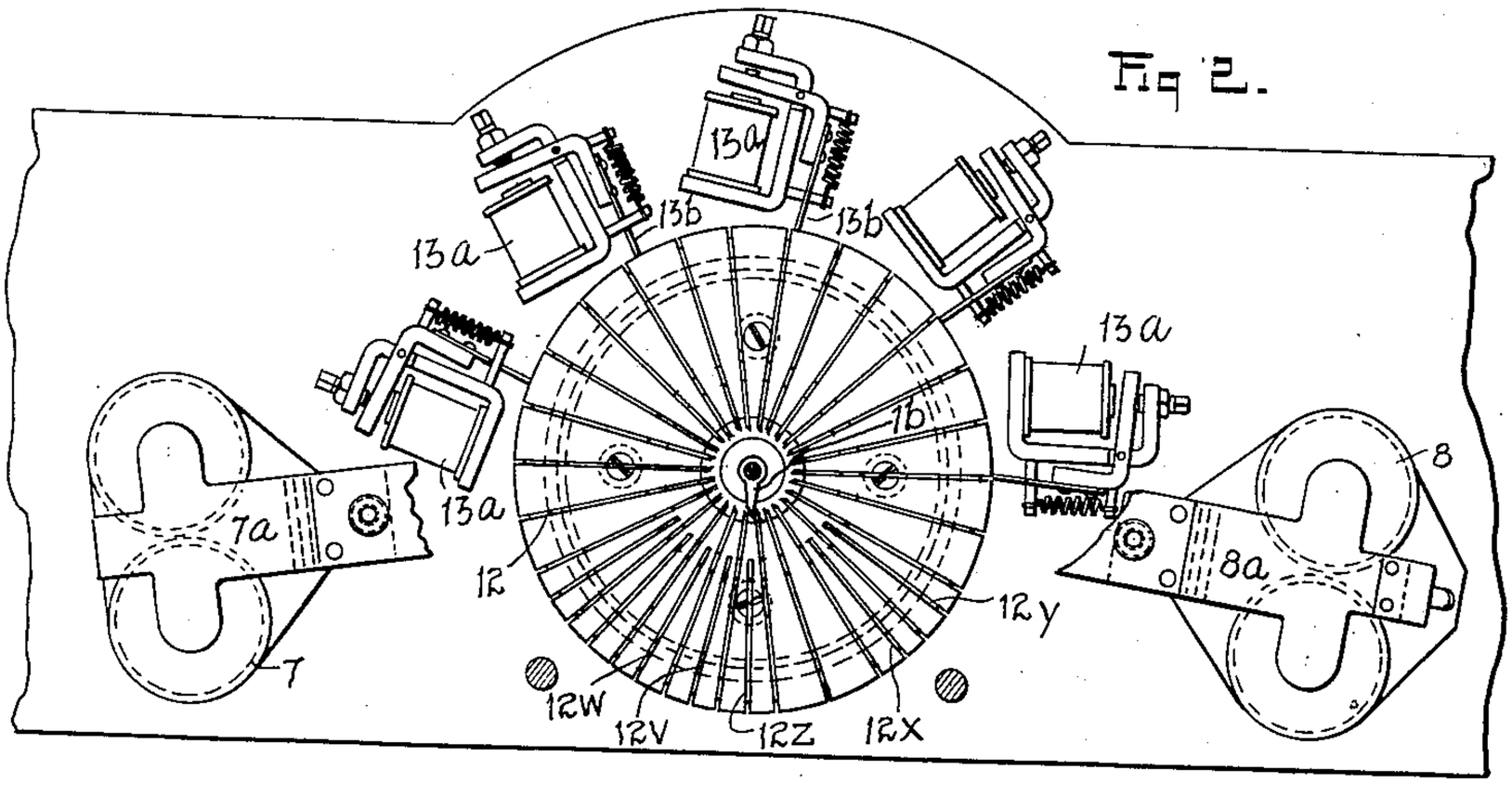


Fig 3.

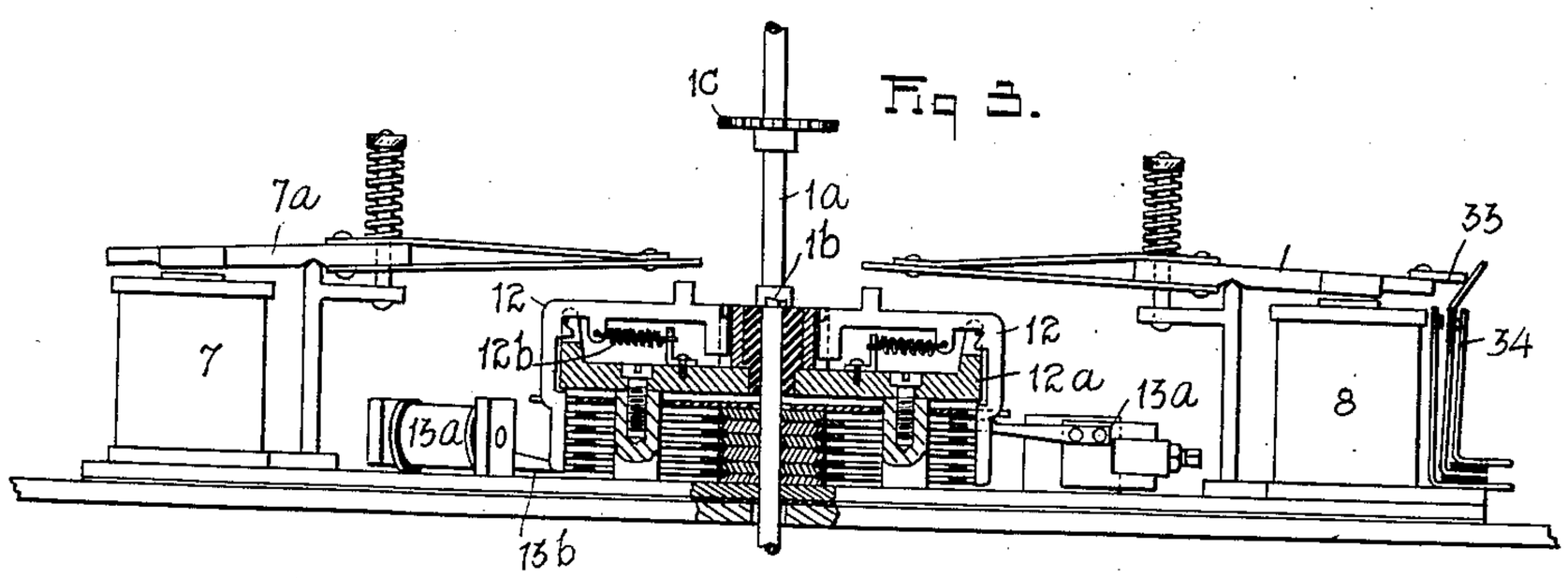


Fig 4.

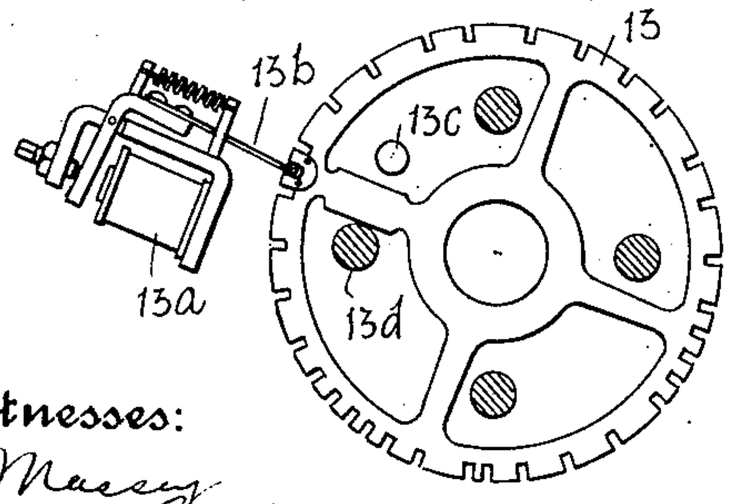
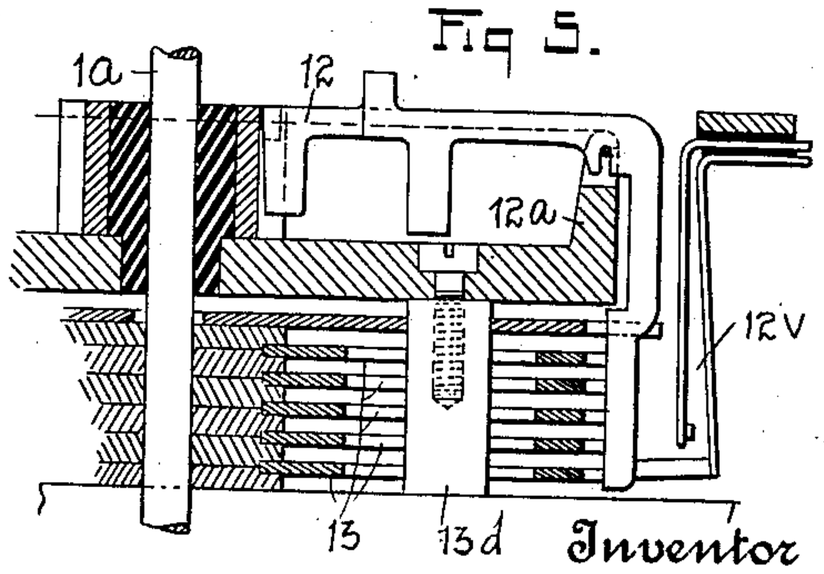


Fig 5.



Witnesses:

F. J. Massey

Paul A. Franke

Inventor

George M. Yorke

By his Attorney

H. M. Marble

G. M. YORKE.

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3 SHEETS—SHEET 3.

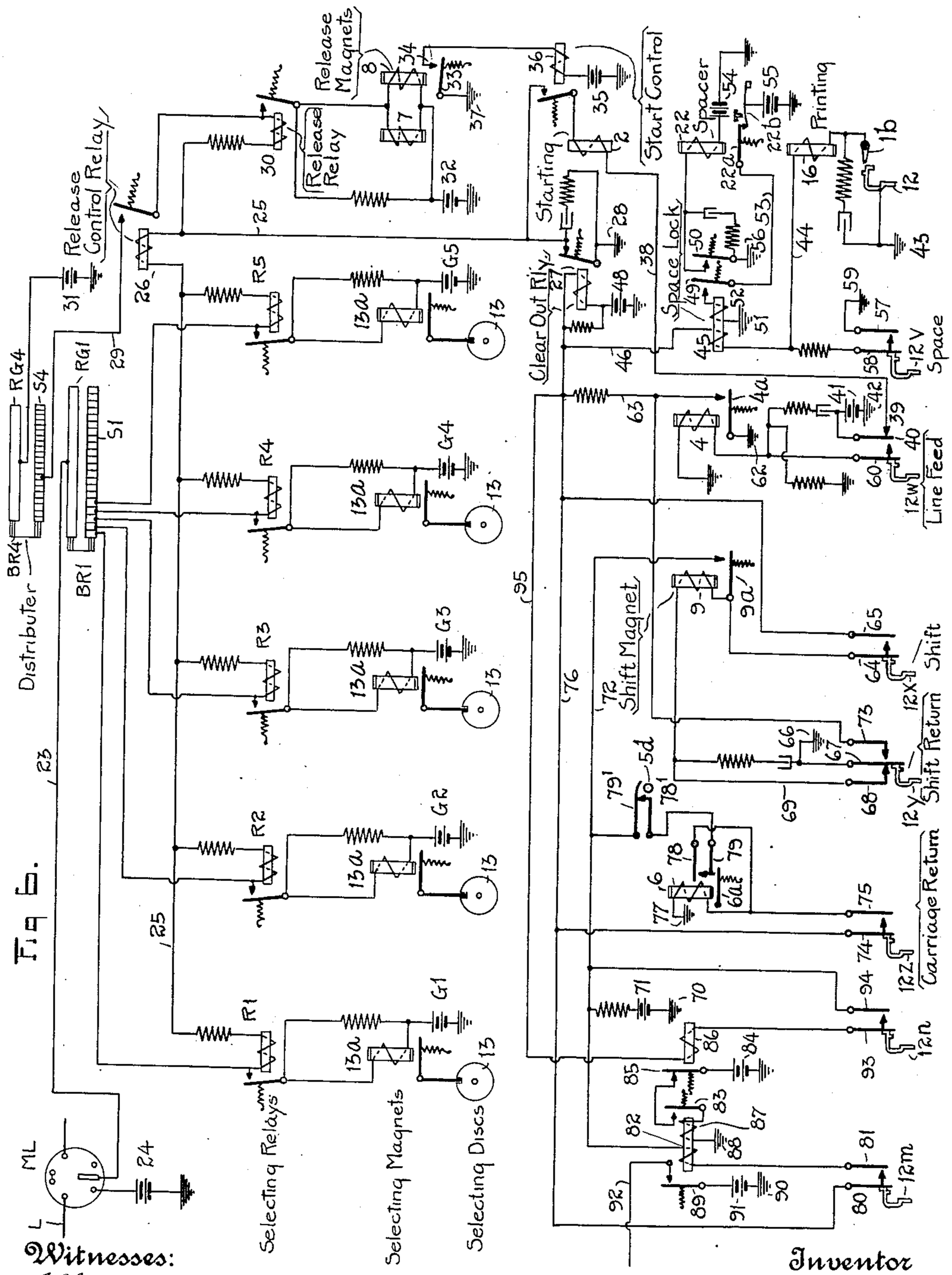

Fig 5.

Witnesses:

J. F. Massey

Paul L. Franke

Inventor

George M. Yorke

By his Attorney

H. M. Marble

UNITED STATES PATENT OFFICE.

GEORGE M. YORKE, OF NEW YORK, N. Y., ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC PRINTER.

1,215,604. Specification of Letters Patent. Patented Feb. 13, 1917.

Application filed April 26, 1915. Serial No. 23,815.

To all whom it may concern:

Be it known that I, GEORGE M. YORKE, a citizen of the United States of America, and a resident of New York, county and State of New York, have invented certain new and useful Improvements in Automatic Printers, of which the following is a specification.

My invention relates to improvements in automatic printers, particularly such printers as are employed as part of the receiving apparatus of printing telegraph systems. Such telegraph printers usually comprise selecting means for determining the particular characters to be printed, in accordance with code signals transmitted over a telegraph line; and in many cases, and desirably, such selecting means is mechanical in its nature (as distinguished from selecting means which is electrical in its nature, *i. e.*, which completes a circuit path through a successive series of electrical contacts). In the operation of such automatic printers there are various mechanical functions to be performed other than the mere determination of the particular characters to be printed; examples of such mechanical functions being spacing between letters and words, line spacing or paper feed, carriage return or resetting, type shifting (*i. e.*, shifting from "lower case" to "upper case," and vice versa) etc. My invention comprises means for the control of these various mechanical and, so to speak, auxiliary functions, in the same manner, and, preferably, by the same mechanical selecting means, as is employed for the selection of the particular characters to be printed. It will be understood that, in the operation of these printing telegraph systems, definite code signals are provided for the performance of these various mechanical or auxiliary functions, which signals are, customarily, transmitted in the same manner and by the same means as the various character signals. According to my invention I cause the particular code signals corresponding to these mechanical or auxiliary functions to operate the same mechanical selecting mechanism which is employed for the determination of the particular characters to be printed. Use of such selecting mechanism for the control of the mechanism performing these mechanism or auxiliary functions has, among other advantages, the advantage that the performance of these various auxiliary functions is determined in substantially the same manner as is the determination of particular characters to be printed. A very considerable simplification of mechanism also results.

The objects of my invention are, to improve and simplify automatic printers, particularly telegraph receiving printers; and, in particular, to improve and simplify the mechanism and means whereby the various mechanical or auxiliary functions of such printers, above referred to, are caused to be performed.

I will now proceed to describe my invention with reference to the accompanying drawings, in which—

Figure 1 shows a fragmentary perspective elevation of the principal portions of a telegraph printer embodying my invention.

Fig. 1^a is a detail diagrammatic plan view of the letter-space and carriage-release mechanism.

Fig. 1^b is a detail side elevation and partial section of the line spacing mechanism.

Fig. 2 shows a top view of the selecting device and associated parts of the printer.

Fig. 3 shows a side elevation of the parts shown in Fig. 2, the selecting device itself being shown in central vertical section.

Fig. 4 is a detail top view of one of the selecting disks and its actuating magnet.

Fig. 5 shows a fragmentary vertical section of the selector on a larger scale than that of Fig. 3, certain associated parts being also shown in elevation.

Fig. 6 is a diagrammatic view showing circuits and relays and other instruments whereby the selecting mechanism of the printer may be operated.

In an application for Letters Patent filed on January 5, 1915, by George R. Benjamin and myself, Serial No. 654, is illustrated, more or less diagrammatically, a complete telegraph system of the synchronous multiplex type, with which the automatic printer herein illustrated and described is well adapted for use; though the present invention is by no means restricted to use with that particular system, or with any synchronous system. The system of that appli-

cation is based, in many respects, upon the well known Baudot system, wherein all characters or signals comprise the same number of current impules, usually five; the permutations necessary for the distinction of the several signals from one another being obtained by making some of the current impulses of opposite direction to other current impulses; the system comprising synchronously operating distributers or commutators at the two ends of the line. In Fig. 6, for convenience, I have shown portions of one of the said distributers of the said prior application, together with the line relay customarily used in connection with that distributer, and the selecting relays and circuits therefor, customarily used in connection with that distributer; the commutator rings of the distributer there shown being shown "developed".

Referring first to Figs. 1–5 inclusive, numeral 1 designates a rotatable type wheel, mounted upon a suitable type wheel shaft 1^a, and 2 designates a so-called "starting magnet" controlling the rotation of the type wheel shaft and type wheel in a manner hereinafter described. 3 designates a paper-carrying carriage itself mounted to slide axially on a square-section guide rod 3^a and comprising the usual rotatable paper-feed roll. For line spacing or paper feed, this rod 3^a, and with it the paper-feed roll, are arranged to be rotated by the action of a magnet 4 and its armature 4^a, the armature operating a suitable pawl-and-ratchet mechanism shown in Fig. 1^b. For drawing the paper carriage 3 to the left (as in letter spacing and spacing between words) a ratchet wheel 5 is provided, also a magnet 22 and armature 22^a, and ratchet mechanism operated by said armature, for rotating ratchet wheel 5 step by step in a clockwise direction as viewed from above, (see Fig. 1^a). This ratchet wheel 5 is provided with a drum portion 5^a upon which is wound a flexible cable 5^b passing around a guide pulley 5^c and thence connected to the paper roll carriage. At the right of the machine there is a spring-drum 15 connected by a flexible cable 15^a to the paper roll carriage. The ratchet wheel 5 moves the paper roll carriage to the left against the tension of the spring of this drum 15; and at suitable times this spring drum 15 is permitted to draw the paper roll carriage back to the right, as hereinafter described.

6 designates a carriage-return magnet arranged to operate a retaining pawl 6^a. During the rotation of ratchet wheel 5 in a clockwise direction, for the step by step feeding of the paper roll carriage to the left, this pawl 6^a operates to prevent backward rotation of the ratchet wheel 5; but when magnet 6 is energized, and pawl 6^a is, in consequence, drawn out of engagement with ratchet wheel 5, the spring drum 15 is permitted to draw the paper roll carriage back to the right.

16 designates a so-called printing magnet, arranged to operate a plunger or hammer 16^a the end of which is located opposite the face of the type wheel 1, such hammer being adapted to force the paper to be printed upon against that particular type face on type wheel 1 which is opposite the end of such plunger 16^a at the time of energization of magnet 16. 17 designates an inking roller for the type wheel.

The particular construction of mechanism shown for feeding the paper roll 3 forward and backward and for causing the paper carried thereby to be pressed, at intervals, against the type wheel 1, forms no portion of the present invention; and such mechanisms are well known; hence the particular mechanism shown is not thought to require detailed description here.

The mechanical selecting device, in the particular construction shown herein, comprises a plurality of notched disks 13, (five in the construction shown) one of which is shown in Fig. 4. These disks are arranged concentrically with the type wheel shaft 1^a, and are each arranged to be rotated through a small angle whereby their peripheral notches are set up in different combinations with respect to stop bars 12 arranged around the peripheries of these selecting disks and each pivoted to a crown ring 12^a, and having bell-crank portions extending radially inward toward the shaft 1^a for a purpose hereinafter described. For each of these selecting disks 13 a corresponding operating magnet 13^a (Figs. 2 and 4) is provided, the armature of which is connected by a lever 13^b to the corresponding selecting disk 13; the construction being such that when any particular magnet 13^a is energized the corresponding selecting disk 13 is rotated through a small angle, and when that magnet is deënergized, the usual retractile spring with which the armature of the magnet is provided returns that selecting disk to its first position. Stop pins 13^c and 13^d (Fig. 4), limit the motion of the disks.

It will be apparent that, with a proper arrangement of notches in the periphery of each of the disks 13, and with a proper range of movement (constant in all cases) for each disk 13, it is possible, by moving one or more of the disks 13 selectively, to produce a large number of slot-combinations, whereby, opposite one or another of the stop bars 12, the several disks 13 may be caused to present a series of alined slots, permitting actuation of that particular stop bar; while no similar series of notches of all five disks, in line, will be opposite any of the other stop bars 12, and therefore the other stop bars will be prevented from op-

erating. It will thus be seen that the several selecting disks 13 with their operating magnets 13^a, and the stop bars 12, constitute a mechanical selecting device whereby one or another of the stop bars 12 may be selected for operation, at will. Each stop bar 12 is provided with a spring 12^b (see Fig. 3) which tends to elevate the inner or radial portion of that stop bar when all of the selecting disks 13 together present a continuous vertical row of notches opposite the front or vertical portion of such stop bar.

The type wheel shaft 1^a is provided with a projecting stop-arm 1^b, arranged to rotate with that shaft, and adapted to engage and be arrested by any stop bar 12 the inner end of which may have been raised by reason of the selection of that stop bar by the selecting disks 13. Such engagement arrests the type wheel with one of its type faces opposite the hammer or plunger 16^a. For rotating the type wheel shaft 1^a a spring 18 is provided on said shaft 1^a, which spring is kept under substantially constant torque by intermeshing gears 18^a and 18^b, the latter driven by worm gearing 11 and 11^a and a motor 10.

In order to release the stop arm 1^b of the type wheel shaft 1^a after the completion of each printing operation, and in order to depress that stop bar 12 which has been raised, two release magnets 7 and 8 are provided, having spring-retracted armature levers 7^a and 8^a with semi-circular extensions 7^b and 8^b located over the inner or radial portions of the stop bars 12. One or the other of these bars 7^a and 8^a, when they are pressed down by their springs, presses down any stop bar 12 which may have been elevated, and so releases the stop arm 1^b and also frees the selecting disks from engagement by any one of the stop bars 12.

The type wheel 1 shown, though arranged to rotate with shaft 1^a, is free for axial movement with respect to said shaft, and is provided with two circumferential rows of type faces, one or another of which rows will be opposite the end of the plunger or hammer 16^a, according as the type wheel be in elevated or depressed position. For shifting this type wheel from the one position to the other, or back, a shift magnet 9 is provided the armature lever 9^a of which is arranged to raise the type wheel when that magnet is energized, and to depress that type wheel when the magnet 9 is deënergized. The particular details of this shift mechanism form no portion of my invention, and such shift mechanisms are well known; hence description of the details of the shift mechanism shown is not thought to be required.

Certain of the so-called stop bars, designated by numerals 12^v—12^z inclusive, are employed not for determining a particular character to be printed, but for controlling the circuits of the several auxiliary-function magnets, such as the line feed magnet 4, the letter space magnet 22, the carriage return magnet 6, and the shift magnet 9. Such auxiliary-function selecting bars or stop bars, are in construction substantially the same, and are arranged to be selected for operation in the same manner, by the disks 13, as the bars 12 which determine the particular characters to be printed; except that, if desired, such auxiliary-function selecting bars need not be provided with means for engagement by the stop arm 1^b, and hence are shown, in Fig. 2, as shorter than the bars 12; and except that these bars 12^v—12^z inclusive actuate electrical contacts, as illustrated in Fig. 6, in which figure the circuits whereby the contacts controlled by these auxiliary function selecting bars control their corresponding magnets, as well as the other circuits of the machine, and related circuits, are shown.

In Fig. 6 ML designates a main line relay, L the controlling or line circuit for this relay, S^1 and RG^1 designate commutator rings of a rotary distributer, and BR^1 designates a corresponding brush adapted to connect electrically ring RG^1 with the several segments of the segmented ring S^1. S^4 and RG^4 are other commutator rings of the distributer, and BR^4 is a brush adapted to connect the several segments of the segmented ring S^4, with the ring RG^4. The commutator rings are shown "developed". R^1, R^2, R^3, R^4 and R^5 are selecting relays, the magnet coils of each of which relays are connected electrically to one of the segments of the ring S^1 and are also connected electrically to a common return conductor 25 passing through the coil of a so-called release control relay 26 to the back contact of a so-called clear-out relay 27, and thence, (when the armature of that relay is against its back contact) to ground at 28. The main line relay ML may be understood to be a quick acting polarized relay, and its armature is connected by conductor 23 to distributer ring RG^1, while a generator 24 is connected to one of the contact stops of that relay ML; the other stop of that relay being, for present purposes, an idle stop. It will be clear that, with the circuits arranged as shown, current impulses of one direction in line conductor L (positive pulses, for example) will cause relay ML to place generator 24 in circuit with conductor 23, and so, (if at such time brushes BR^1 are connecting ring RG^1 with one of the segments of the ring S^1 to which one of the five selecting relays R^1—R^5 are connected) in circuit with one or another of selecting relays R^1—R^5 inclusive; so energizing such one of the selecting relays; while current impulses

in line wire L of the opposite direction will have no effect upon the selecting relays R^1—R^5 inclusive. However, in practice, relays R^1—R^5 inclusive are usually polarized relays, and because of that fact respond to current impulses of one direction only.

Each of the selecting relays has a front contact connected to its magnet circuit, whereby when the armature of that selecting relay is attracted by closure of the magnet circuit of the relay as just described, another or holding circuit is completed through the magnet circuit of that relay, from a corresponding generator G^1—G^5 as follows: from ground, through the corresponding generator and the armature and front contact stop of the corresponding relay and through the magnet coils of that relay to conductor 25 and thence through the magnet of the release control relay 26 and armature and back stop of clear-out relay 27 to ground at 28. It will thus be seen that upon the completion of a circuit from one of the segments of distributer ring S^1 through the magnet of the selecting relay corresponding to that segment, a holding circuit for that relay is completed which will hold such armature attracted until energization of the magnet of the clear-out relay 27. At the same time that such holding circuit is completed a parallel circuit is completed from the same generator (G^1, or G^2, etc., as the case may be) through a corresponding selecting magnet 13^a; such magnets 13^a being the selecting magnets already referred to as shown in Fig. 2; and it will be clear that upon the energization of such selecting magnet 13^a, its corresponding selecting disk 13 will be operated, as already described.

It will thus be apparent that according to the number and order of positive impulses contained in any one signal, transmitted through line conductor L, selecting disks 13 corresponding in number and in order to such positive impulses will be operated.

In Fig. 6 I have shown five only of the segments of ring S^1 connected to selecting relays R^1—R^5 inclusive. In practice, other sets of five each of the segments of ring S^1 are connected similarly to other sets of selecting relays of other printers. For present purposes it has seemed sufficient, to show the circuits of one printer only; though in practice one distributer such as that of which the commutator ring S^1 forms a part, controls a number of printers.

After the last segment of ring S^1 to which a selecting relay of the set shown in Fig. 6 is connected electrically, has been passed by brush BR^1, brush BR^4 connects ring RG^4 with a segment of ring S^4 through a conductor 29 to the front contact of release control relay 26 and (the magnet of that relay having been energized and caused to attract its armature by the completion of the previously traced circuits through return conductor 25) through the armature of that relay and through the magnet coils of a relay 30 to conductor 25 and thence to ground at 28. A generator 31 is connected to ring RG^4. The magnet of relay 30 (which relay may be termed the "release relay" since it controls the circuits of release magnets 7 and 8 already mentioned) is thereby energized, and its armature attracted, thereby closing circuit from a generator 32 through magnets 7 and 8 in parallel to the armature of relay 30 and through the front contact stop of that relay and the magnet coils of that relay 30, to return conductor 25 and thence to ground at 28. As previously explained, when magnets 7 and 8 are energized, the semi-circular armature extensions 7^b and 8^b of the armatures of these magnets are raised, thereby permitting that particular stop bar or selecting bar 12 which has been selected by the operation of the selecting disks 13, to enter the alined row of notches of said disks 13 opposite it, and thereby to arrest stop arm 1^b of the type wheel shaft when that stop arm comes opposite the elevated portion of such selected stop bar 12. The movement of release lever 8^a also causes the closing of contact between contacts 33 and 34, thereby closing a circuit from generator 35 through the magnet coils of start control relay 36 to ground at 37. The magnet of start control relay 36 being thereby energized, a circuit is completed from ground at 28 through the armature of clear-out relay 27 and the rear contact of that relay, the front contact and armature of start control relay 36, starting magnet 2, and through conductor 38 and contact stop 39 and contact spring 40 to battery 41 and thence to ground at 42. Thereby the starting magnet 2 is energized, and its armature detent 2^a (Fig. 1) withdrawn from engagement with the ratchet wheel 1^c on type wheel shaft 1^a, thereby permitting spring 18 (Fig. 1) to start that shaft 1^a, and with it the type wheel, in rotation; such rotation continuing until the stop arm 1^b encounters the selected stop bar 12, as previously described.

Stop arm 1^b (shown in Fig. 6 near the lower right hand corner of that figure) is in a circuit leading from ground at 43 through the various stop bars or selecting bars 12 (of which one is shown diagrammatically in Fig. 6) and through such stop arm 1^b (when such stop arm 1^b is arrested by, and therefore is in contact with, such stop bar 12) and thence through the printing magnet 16 and conductor 44, the main energizing coil of space-lock relay 45, and conductor 46 to the coil of clear-out relay 27, and thence through battery 48 to ground. Completion of this circuit by contact of stop arm 1^b with one of the stop bars or selecting bars

12, besides energizing the printing magnet 16 and causing the hammer 16ª (Fig. 1) to move forward, energizes the magnet of space-lock relay 45 and the magnet of clear-out relay 27.

Energizing the magnet of space-lock relay 45 attracts both armatures 49 and 50 of that relay. The attraction of armature 49 closes a holding circuit for the magnet of relay 45 from ground at 51 through holding coil 52 of relay 45, armature 49 of that relay, conductor 53 and armature of spacing magnet 22 and generator 55 to ground. The attraction of the second armature 50 of space lock relay 45 closes circuit from ground at 56 through the armature 50 and through the magnet coil of spacing magnet 22 and through battery 54 to ground. Spacing magnet 22 therefore attracts its armature 22a (see also Fig. 1) causing the ratchet and pawl mechanism operated by that magnet to advance ratchet wheel 5 through the space of one tooth so advancing the paper carriage 3 to the left through one letter space against the tension of spring drum 15. The holding coil 52 of the space lock relay 45 insures the operation of the letter spacing mechanism by the spacing magnet 22; for the armatures of the relay 45 remain in attracted position until the armature 22a breaks contact with its coacting continuity preserving contact 22b, which it will not do until said armature 22ª has moved a sufficient distance to insure the completion of the letter spacing operation. The breaking of contact between 22ª and 22b breaks the circuit through the holding coil 52 of space lock relay 45, whereupon the two armatures of that relay 45 are retracted and the magnet 22 deënergized (the circuit through the main coil of the magnet of relay 45 having previously been broken, as hereinafter described).

Clear-out relay 27, which attracted its armature when the magnet of the space lock relays was energized as previously described, thereby broke the connection of the common return conductor 25 to ground, and thereby deënergized the starting magnet 2, also the magnet of release relay 30, of the release control relay 26 and of such of the selecting relays R^1—R^5 as were previously energized. The consequent retraction of the armature of relay 30 deënergized the release magnets 7 and 8 and the deënergization of magnet 8 caused deënergization of the magnet of start control relay 36; the corresponding parts therefore returning to normal. The release of the armatures of relays 7 and 8 also returned to normal that stop bar or selecting bar 12 which had previously been raised into engagement with the arm 1b of the type wheel; and the release of the armature of such of the selecting relays R^1—R^5 inclusive which were attracted, deënergizes the corresponding selecting magnets 13ª and so causes the corresponding selecting disks 13 to be returned to normal.

If it be desired to move the paper carriage for letter spacing, without printing a character, a particular signal, consisting of a particular succession of positive and negative pulses, is transmitted, which causes the selection of a particular selecting bar 12^v (Fig. 6) similar to the other selecting bars, except that there is no character on the type wheel corresponding to it; and this bar 12^v, when selected, closes contact springs 57 and 58 (Fig. 6), thereby closing a circuit through the main coil of space lock relay 45 to ground at 59. This particular selecting bar 12^v is selected and operated in precisely the same manner as is any of the other selecting bars 12; which selection method has already been described and therefore need not be described again with respect to bar 12^v. The energization of the magnet of space lock relay 45, which results from the selection and operation of this selecting bar 12^v, effects the energization of the spacing magnet 22, and the subsequent restoration of the parts to their normal position, just as previously described with reference to the regular selecting bars 12. But owing to the fact that the clear-out relay 27 receives current at practically the same instant as the start control relay 36, and that the starting magnet 2 is relatively slower in operation than is relay 36, the starting magnet does not receive current in time to cause its armature to release the type wheel shaft 1ª during letter spacing only, as described; in this respect the operation of letter spacing only differs from the operation of letter spacing which accompanies the printing of a character; for in the case of letter spacing accompanying the printing of a character, the space lock relay 45 is not energized until after the stop arm 1b has contacted with the particular stop bar 12 selected, while the starting magnet 2 is energized immediately following the energization of release magnets 7 and 8, and, necessarily, before contact is closed between the selected stop bar 12, and stop arm 1b; whereas in letter spacing only, contact is closed between 57 and 58 immediately following the energization of magnets 7 and 8, and therefore magnet 22 and the magnet of clear-out relay 27 are energized at least as soon as is magnet 2, so that relay 27 breaks the ground connection of magnet 2 before that magnet has had an opportunity to operate its armature to release the type wheel.

Line spacing is accomplished similarly, by selecting a particular selecting bar 12^w causing a contact spring 60 to close contact with contact spring 40 previously mentioned, and thereby to complete a circuit from ground at 42, through battery 41, con-

tact springs 40 and 60 to the line space magnet 4 and thence to ground. The energization of magnet 4 not only operates the line space mechanism, but also causes armature 4^a to close contact from ground at 62 through armature 4^a, and conductor 63, to the coils of clear-out relay 27, and through battery to ground; the energization of the magnet of this clear-out relay restoring the parts to normal as previously explained.

As previously explained, the type wheel 1 is provided with two circumferential rows of type faces one above the other. The upper row of type faces is the row normally in use. When it is desired to raise the type wheel to bring the lower row of type faces into operative position, a particular signal is transmitted, which causes the selection of a particular selecting bar 12^x which, when it operates, closes contact between contact springs 64 and 65 completing a circuit from ground at 66 through other contact springs 67 and 68 and a conductor 69 to the shift magnet 9 and thence through contact springs 64 and 65 to the coils of clear-out relay 27 and through battery 48 to ground. The consequent energization of the magnet 9 shifts the type wheel (the details of the mechanism by which this magnet shifts the type wheel being unimportant for present purposes, since various mechanisms for that purpose are well known) and also the magnet 9 attracts an armature 9^a.

This armature 9^a, when attracted, closes circuit from ground at 70 through a generator 71 and conductor 72 through the front contact and armature 9^a of magnet 9 and the magnet coils of that magnet to conductor 69, and thence through contact springs 68 and 67 to ground at 66. Thereby the magnet 9 is held energized (and, consequently, the type wheel 1 is held in elevated position) until a subsequent special release signal deenergizes magnet 9 as will next be described.

To deënergize magnet 9 and so to restore the type wheel to its lower position, a special selecting bar 12^y is selected. This bar, when it operates, moves contact spring 67 out of contact with spring 68, thus breaking the ground connection from generator 71 through magnet 9, thereby deënergizing magnet 9 and so permitting the type wheel to drop. At the same time, selecting bar 12^y closes contact between contact spring 67 and another contact spring 73, whereby a circuit is completed from battery 48 through the coils of clear-out relay 27 and conductor 63 and through contact springs 73 and 67 to ground at 66; the apparatus being thereby cleared for actuation by another signal transmitted through the line.

For carriage-return another selecting bar 12^z is selected by transmission through the line of an appropriate signal, and thereby contact is closed between contact springs 74 and 75; a circuit being thereby closed from generator 48 through the coils of clear-out relay 27 and conductor 76 and thence through contact springs 74 and 75 and magnet coils of carriage-return magnet 6 to ground at 77. Energization of the magnet 6 causes its armature 6^a to release the ratchet wheel 5, and the spring drum 15 then returns the carriage to the right; and at the same time the attraction of the armature 6^a closes contact between contact points 78 and 79, completing a circuit from ground at 70 through generator 71 and contact springs 78′ and 79′ (which at the instant are in contact with one another) and through contact points 78 and 79 and the coils of magnets 6 to ground at 77. While the clear-out relay 27 is operated immediately upon the closing of contact between 74 and 75, magnet 6 operates sufficiently quickly to attract its armature 6^a before the circuit through the coils of magnet 6 is broken through the return to normal position of selecting bar 12^z; and the closing of the holding circuit through the coils of magnet 6 retains the armature 6^a in attracted position, and therefore leaves the ratchet wheel 5 free to rotate backward until contact between 78′ and 79′ is broken. Contacts 78′ and 79′ are carriage contacts which are opened by a stud 5^d on the ratchet wheel 5 when the paper carriage 3 has returned clear to its right hand position; and when such contacts 78′ and 79′ are so opened by the carriage, magnet 6 is deënergized and the apparatus is ready for the reception of another signal.

The various selector bars 12^v—12^z inclusive, constitute all the selector bars which are needed ordinarily for the performance of the various auxiliary functions of the printer; and I have shown above how, by the operation of the mechanical selecting device of the printer, each of these selector bars is selected in the same way as are the various regular selectings bars which determine the particular characters to be printed. In connection with these printers, however, a so-called reperforator is frequently used; the reperforator being an automatic instrument whereby tape is perforated for the repetition of the signals which actuate the printer, into another circuit. I do not deem it necessary to illustrate this reperforator herein, but merely to illustrate the relay and contacts by which it is thrown into and out of operation. In Fig. 6, 80 and 81 designate contacts which, when closed, cause energization of the magnet of relay 82 by which this reperforator is thrown into action; and 12^m designates a selecting bar of the selecting mechanism previously described, which, when selected in the manner previously described, closes contact between 80 and 81. The circuit is then completed from ground through generator

48, the magnet coils of clear-out relay 27, conductor 76, contacts 80 and 81, the main magnet coils of relay 82 and conductor 72, to the front contact and armature 9^a of the shift magnet 9 (which magnet must previously have been energized by selection of the shift selecting bar 12^x and actuation of that selecting bar 12^x) the magnet coils of magnet 9, conductor 69, and contacts 68 and 67, to ground at 66. Energization of magnet 82 causes the attraction of the armature 83 of that magnet, thereby closing a holding circuit from ground through generator 84, the armature 85 of another magnet 86, the rear contact for that armature 85, the front contact for armature 83, said armature 83, the holding coils 87 of magnet 82, to ground at 88. The actuation of clear-out relay 27, which immediately follows, will result in the restoration to normal of those selecting relays which have been operated to cause the selection and actuation of selecting bar 12^m; and consequently contacts 80 and 81 will open almost immediately after they have closed contact; but in the meantime the holding coils 87 of relay 82 will have been energized, and the other armature 89 of relay 82 will have been attracted, thereby closing circuit from ground at 90 through generator 91, armature 89 and the corresponding front stop of relay 82 to conductor 92, and thence to a suitable magnet of the reperforator, not shown. It will be seen that, to throw the reperforator into operation, the shift magnet 9 must first be energized through selection (by transmission of a suitable signal) of the selecting bar 12^x; after which, by transmission of a suitable signal, selecting bar 12^m is selected, thereby actuating relay 82 and closing circuit through conductor 92, as just above described. Shift magnet 9 may then be deënergized by transmission of a suitable signal to select selecting bar 12^y, whereby contact will be broken between contacts 67 and 68 and the magnet 9 deënergized.

To throw the reperforator out of action a suitable signal is transmitted to select selecting bar 12^x, and thereby close a circuit through shift magnet 9 as previously described. Another selecting bar 12^n is then selected and actuated, by transmission of a suitable signal, whereby contact is closed between contacts 93 and 94, thereby closing a circuit from ground through generator 48, the magnet coils of clear-out relay 27, conductor 95, the magnet coils of relay 86, contacts 93 and 94, and conductor 72, to the front contact and armature 9^a of magnet 9, the magnet coils of that magnet, conductor 69, and conductors 68 and 67, to ground at 66. The amature 85 of relay 86 being thereby attracted, the circuit through the holding coils 87 of relay 82 is broken, thereby releasing the armature 89 of relay 82, and breaking the circuit through conductor 92. The practically simultaneous operation of the clear-out relay 27 restores the selecting relays to normal position, and so causes restoration to normal of selecting bar 12^n. Another suitable signal whereby selecting bar 12^y is selected and actuated, is then transmitted, thereby breaking contact between contacts 68 and 67, and so deënergizing magnet 9.

From what has been said above, it will be clear that the selecting device may be provided with as many selecting bars such as selecting bars 12^v—12^z, as may be required for momentary energization of any magnets required or convenient for use on or in connection with the printer; also, that when more than momentary energization of magnets is required, other bars, such as 12^m and 12^n, may be provided, together with suitable relays such as 82 and 85, the circuits of these relays being controlled by the shift selecting bar 12^x and the shift return selecting bar 12^y and their associated parts.

In Fig. 6 I have shown shunted condensers, or shunted resistances, or both shunted condensers and resistances, around the contacts and in some cases around the coils of various of the relays shown; the shunted condensers have the well known quality of reducing sparking and the resistances facilitate the adjustment of the action of the magnets.

What I claim is:—

1. A printing telegraph receiver comprising selecting magnets, selecting disks controlled thereby, and each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, an auxiliary-function mechanism and means controlled by the permutation means of said selecting disks controlling the operation of such auxiliary-function mechanism.

2. A printing telegraph receiver comprising selecting magnets, selecting disks controlled thereby, and each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, an auxiliary-function mechanism comprising an operating magnet, and contact means controlled by the permutation means of said disks controlling such magnet.

3. A printing telegraph receiver comprising selecting magnets, selecting disks controlled thereby, and each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, an auxiliary-function mechanism comprising an operating magnet, contact means controlled by the permutation

means of said disks for closing a circuit through such magnet, means operated by such magnet when energized for closing a holding circuit through said magnet, and means controlled by said disks for breaking such holding circuit.

4. In a printing telegraph receiver the combination of a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for cooperation with the permutation means of the other disks for selection purposes, means for causing said disks to select, a longitudinally movable paper carriage, carriage feed means and means controlled by the permutation means of said disks for returning said carriage.

5. In a printing telegraph receiver the combination of a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for cooperation with the permutation means of the other disks for selection purposes, electromagnetic means for causing said disks to select, a longitudinally movable paper carriage, carriage feed means, contacts controlled by the permutation means of said disks, and means controlled by said contacts for returning said carriage.

6. In a printing telegraph receiver the combination of a shiftable type wheel, means for shifting said wheel, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, means for causing said disks to select, and means controlled by the permutation means of said disks for controlling said type wheel shifting means.

7. In a printing telegraph receiver the combination of a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for cooperation with the permutation means of the other disks for selection purposes, electromagnetic means for causing said disks to select, a shiftable type wheel, a shift magnet for shifting said wheel, means controlled by the permutation means of said disks for causing the energization of said shift magnet, and contacts actuated by said shift magnet for closing a locking circuit therefor.

8. In a printing telegraph receiver the combination of a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for cooperation with the permutation means of the other disks for selection purposes, electromagnetic means for causing said disks to select, a shiftable type wheel, a shift magnet therefor, contacts controlled by the permutation means of said disks for causing the energization of said shift magnet, contacts actuated by said shift magnet, a holding circuit including said shift magnet and said contacts, and unshifting means controlled by said disks for opening said holding circuit.

9. In a printing telegraph receiver the combination of a paper carriage, means for advancing said carriage, an electromagnet for controlling the return of said carriage, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, and means controlled by the permutation means of said disks for energizing said electromagnet.

10. In a printing telegraph receiver the combination of a paper carriage, means for advancing said carriage, a magnet for controlling the return of said carriage, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, contacts controlled by the permutation means of said disks for actuating said magnets, and contacts actuated by said magnet for completing a holding circuit therefor.

11. In a printing telegraph receiver the combination of a rotating type wheel, a starting magnet controlling said wheel, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, a rotatable paper carriage, a line-feed magnet for rotating said carriage, and means controlled by the permutation means of said disks for completing an operating circuit for said line-feed magnet and preventing the operation of said starting magnet.

12. In a printing mechanism the combination of a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, electromagnetic means for causing said disks to select, a clear-out relay for returning said electromagnetic means to normal, a rotating paper carriage, a line-feed magnet for rotating said carriage, said magnet being controlled by the permutation means of said disks, and contacts closed by said line-feed magnet for completing a circuit for said clear-out relay.

13. In a printing telegraph receiver, the combination of a paper carriage, spacing means therefor arranged to cause said carriage to move for letter spacing and for spacing between words, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purpose,

means for causing said disks to select, means controlled by the permutation means of said disks for operating said spacing mechanism to cause spacing between words, and carriage return mechanism comprising controlling means also controlled by said disks.

14. In a printing telegraph receiver, the combination of a paper carriage, spacing means therefor arranged to cause said carriage to move for letter spacing and for spacing between words, a plurality of selecting disks, each having permutation means, the permutation means of each disk adapted for coöperation with the permutation means of the other disks for selection purposes, means for causing said disks to select, means controlled by the permutation means of said disks for operating said spacing mechanism to cause spacing between words, and carriage return mechanism comprising a controlling magnet and contact means controlled by said disks for operating said magnet.

15. In a printing telegraph receiver, the combination of a paper carriage, spacing means therefor arranged to cause said carriage to move for letter spacing and for spacing between words, a plurality of selecting disks, means for causing said disks to select, means controlled by said disks for operating said spacing mechanism to cause spacing between words, and carriage return mechanism comprising a controlling magnet and contact means controlled by said disks for energizing said magnet, means operated by energization of said magnet for closing a holding circuit therethrough, and means operated upon return of such carriage for breaking such holding circuit.

16. In a printing telegraph receiver, the combination of a plurality of peripherally serrated selecting disks, means for causing said disks to select, a plurality of movable selecting members arranged about said disks to coact therewith, and to be caused to be operated selectively under control of said disks, printing means arranged to have characters to be printed determined by the selection and consequent operation of certain of said selecting members, and an auxiliary-function mechanism arranged for control by another of said selecting members and to be operated by the operation of such other selecting member consequent upon the selection thereof by said disks.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE M. YORKE.

Witnesses:

ROBERT E. CHETWOOD,

GEORGE R. BENJAMIN.