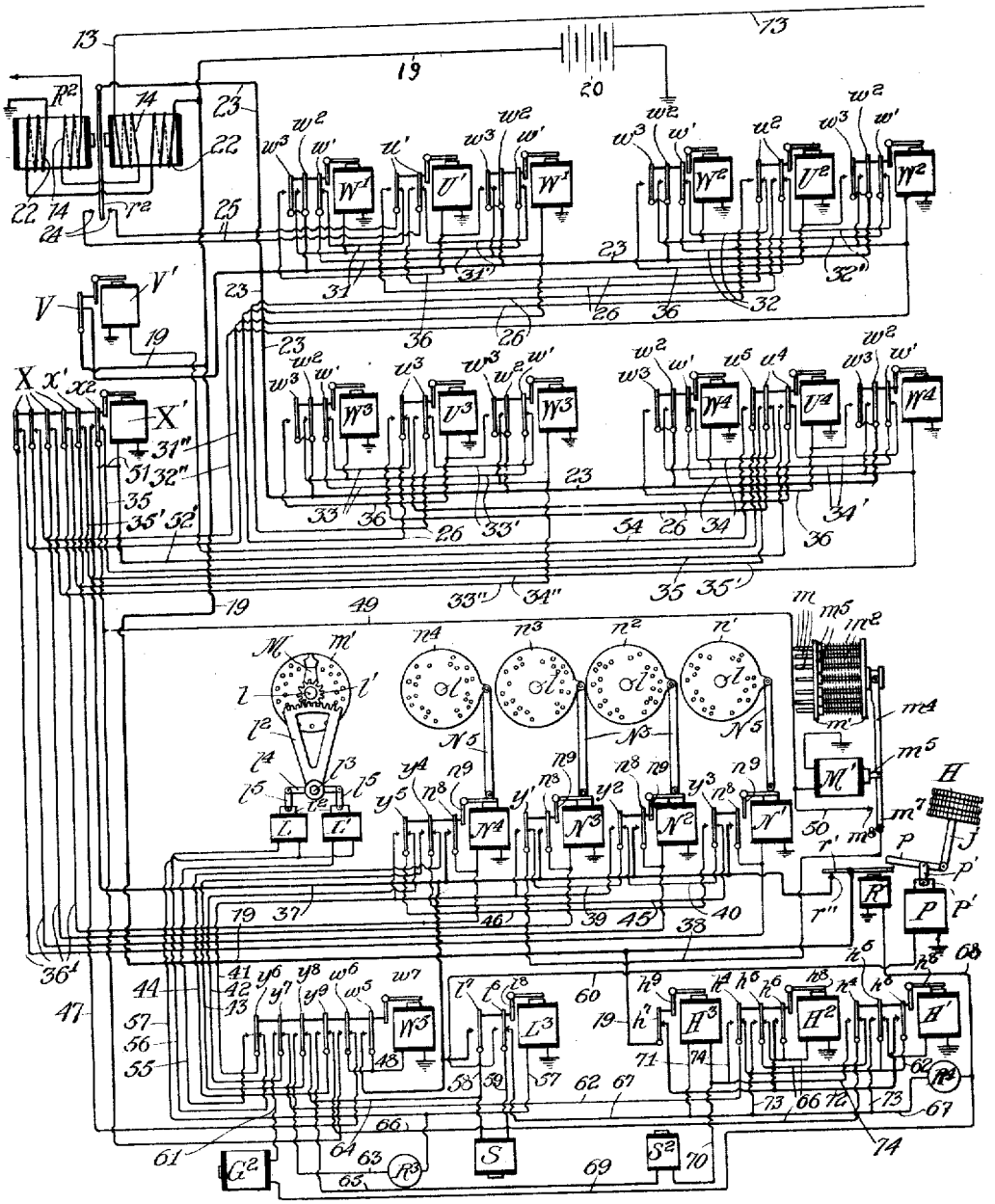
C. L. AND H. L. KRUM.

PRINTING TELEGRAPH.

APPLICATION FILED JUNE 29, 1917.

1,305,225.

Patented May 27, 1919.



Witnesses:

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UNITED STATES PATENT OFFICE.

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PRINTING-TELEGRAPH.

1,305,225. Specification of Letters Patent. Patented May 27, 1919.

Original application filed November 29, 1909, Serial No. 530,455. Divided and this application filed June 29, 1917. Serial No. 177,838.

To all whom it may concern:

Be it known that I, CHARLES L. KRUM and HOWARD L. KRUM, citizens of the United States, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

The present application is a division of an earlier application filed by us in the United States Patent Office November 29, 1909, Serial No. 530,455.

The present improvement relates to printing telegraphs and more particularly to receivers for printing telegraphs and seeks to provide improved means whereby a character signal may be received at the time the character corresponding to a preceding signal is being printed.

The invention consists in the features of improvement hereinafter set forth, illustrated diagrammatically in the accompanying drawing, and more particularly pointed out in the appended claims.

The drawing illustrates diagrammatically the circuits and apparatus of the improved receiver.

A line conductor 13 extends from the distant station through opposed coils 14 of a line relay R^2. A branch of a conductor 19 extends from a local battery 20 through another pair of opposed coils 22 of the line relay R^2 to ground. The coils 22 balance each other and normally hold the relay armature r^2 in central position between two contacts 24. The characters are represented by permutations of a definite number of line impulses of opposite polarity and, in accordance with the preferred plan, each character or complete signal is represented by a particular permutation of 5 positive and negative impulses. A line impulse passing through the coils 14 of the relay R^2 weakens or neutralizes one of the coils 22 and strengthens the other and the relay armature r^2 is shifted into engagement with one or the other of the contacts 24 in accordance with the polarity of the impulse.

A conductor 23 is connected to local battery 20 through a normally closed unlocking switch V and conductor 19, and like wire 19, is shown in heavy lines and has a number of branches. Armature r^2, when shifted connects conductor 23 to one or the other of a pair of conductors 25. The flow of current through conductors 25 selectively controls a set of selecting relays W^1, W^2, W^3, W^4 and W^5. In the arrangement shown, there are two relays W^1, W^2, W^3 and W^4, and a number of pairs of transfer switches u^1, u^2, u^3 and u^4 are operated respectively by relays U^1, U^2, U^3 and U^4 to successively connect the selecting relays W^1, W^2, W^3, W^4 and W^5 to conductors 25 as the impulses of the permutation are received. The switches u^1 of the transfer relay U^1 are connected to the main local conductors 25. The switches u^2 of the second transfer relay U^2 are connected by conductors 26 to the normally disengaged contacts of switches u^1. Similarly, the switches of the third and fourth transfer relays are connected to the normally disengaged contacts of the switches of the preceding transfer relay by conductors 26. A pair of branch conductors 31 and 31′ lead from the normally engaged contacts of the first pair of transfer switches u' to the coils of the relays W^1, a normally closed switch w^1 being interposed in each of these branch conductors, and the second, third and fourth pairs of selecting relays W^2, W^3 and W^4 are similarly connected to the normally engaged contacts of the transfer switches u^2, u^3 and u^4 respectively, by pairs of branch conductors 32 and 32′, 33 and 33′, and 34 and 34′. Each selecting relay opens the normally closed switch w^1 in the circuit of the other relay of the same pair, so that, when any one relay is operated, the circuit of the other relay of the same pair is opened. A fifth pair of branch conductors 35 and 35′ are connected to the normally disengaged contacts of the transfer switches u^4.

Each of the selecting relays operates a pair of locking switches w^2 and w^3 that are connected to the battery wire 23. The contacts of the switches w^2 are connected to the coils of the respective relays so that, when any one of these relays is energized, its circuit is held in closed condition. The switches w^3 of selecting relays w^1 are connected by conductors 36 to the coil of the corresponding transfer switch relay U^1, so that, when either of the relays W^1 is operated, relay U^1 is also operated and its circuit held in closed condition to shift switches u^1 and hold them in shifted position. In

a similar manner, the operation of either one of the pairs of selecting magnets W^2, W^3, or W^4 energizes the corresponding transfer switch relay U^2, U^3 or U^4. The branch conductors 31, 32, 33 and 34 have extensions 31″, 32″, 33″, and 34″, leading to the contacts of a set of switches X of a relay X^1. For the sake of clearness, all of the relays are shown as grounded on one side, but it will be understood that, if desired, they could be connected to the local battery 20 by a suitable return wire.

The first impulse of any permutation energizes line relay R^2 and shifts its armature r^2 in one or the other direction. Current will flow from local battery 20 by conductor 19, normally closed unlocking switch V, battery wire 23, armature r^2 to one of the main conductors 25, thence by one of the switches u^1, to one of the branch conductors 31 or 31′, through the switch w' therein, to the coil of one or the other of the first pair of selecting relays W^1 and then back to local battery 20 through the ground or by a suitable return wire. If the first line impulse is positive, the selecting relay W^1 in branch conductor 31′ is energized and if negative, relay W^1 in the branch conductor 31 is energized and this branch conductor, together with its extension 31″ thereof is locked in closed condition at this point. The operation of either of the relays W^1 shifts the corresponding switches w', w^2 and w^3. Switch w' cuts out the other relay of the pair and switch w^2 closes the locking circuit from battery wire 23 through the coil of the selected relay and this circuit is held closed independently of the line relay R^2. The switch w^3 of either of relays W^1, closes the local battery circuit through the first transfer switch relay U^1 by connecting the battery wire 23 to conductor 36, and relay U^1 then operates the transfer switches u^1 to disconnect the first pair of branch conductors 31 and 31′ from the main conductors 25 and connect the second pair of branch conductors 32 and 32′ thereto through the second pair of transfer switches u^2 and the conductors 26 that lead from the normally disengaged contacts of the switches u^1.

In a similar manner, the second line impulse shifts the line relay armature r^2 in one or the other direction and closes the local operating circuit from the battery wire 23 and armature r^2 to one of the main conductors 25 to one of the switches u^1, thence by one of the conductors 26 to one of the switches u^2 and by branch conductors 32 or 32′ to one or the other of the second pair of selecting and locking relays W^2 which is thereby operated and its circuit locked in closed condition. The operation of either of these relays operates relay U^2 and disconnects the branch conductors 32 and 32′ from the main conductors 25 and connects the branch conductors 33 and 33′ thereto, so that the third impulse of the permutation operates either one of the two magnets W^3 and locks its circuit in closed condition. Similarly, the fourth impulse selects one of the relays W^4. The fifth impulse selects one of the branch conductors 35 or 35′. The selecting and locking relays or magnets thus connect one or more of the extension conductors 31″, 32″, 33″ and 34″ and one of the conductors 35 or 35′ to the local battery 20 as the signal is received, and the flow of current through the selected conductors controls the printing mechanism.

Preferably, as set forth in the application of Howard L. Krum, filed May 31, 1910, Serial No. 564,120, the set of transfer-switch and selecting relays are timed to operate in synchronism with the speed of transmission of the succeeding impulses of any permutation or signal. That is to say, the signals are rapidly transmitted without pauses or breaks between succeeding line impulses, and, when the operation of the selector is initiated by the first impulse of a permutation, the selecting and locking relays are successively connected to the line relay as the succeeding impulses of the permutation are received and in synchronism therewith.

The printing mechanism comprises a type wheel H mounted on a short vertical shaft j. The latter is connected by an arm p and a link p' to the core P′ of a striker magnet P. When the type wheel is oscillated by magnet P, the arm P′ opens a normally closed switch r' and thereby opens a locking circuit for the printer. The switch is also shifted by a release magnet R. The type wheel is rotated by a shaft l having a pinion l' thereon meshing with a segment l^2 on a shaft l^3. Crank arms l^4 on the shaft are connected by links l^5 to the cores L^2 of a pair of magnets L and L′ which rotate the shaft l in opposite directions. Operating magnets S, S^2 and G^2 effect the letter space, carriage return and line space operations respectively of the printer, and a pair of magnets H^1 and H^2 control the capital and figure shift mechanism.

The operation of the printer is effected by a set of controlling or actuating devices which correspond to and are in turn controlled by the set of selecting and locking relays W^1, W^2, W^3, W^4 and W^5. Relay W^5 controls a switch operating armature W^7. The other locking relays control a set of magnets N^1, N^2, N^3 and N^4, the cores of which actuate switch operating members n^9 and are connected by links n^5 to a set of oscillating selector plates or disks n^1, n^2, n^3 and n^4 on the type wheel rotating shaft l. A drum m' axially movable on the shaft l, carries a series of pins m which are yieldingly held in place by springs m^2 that engage collars m^3 thereon. The drum is

shifted by a lever m^4 to project the stop pins through holes in the selector plates and into the path of an arm M on the shaft l. In any setting of the selector plates, which are controlled by the first four impulses of each signal or permutation, two pins on opposite sides of the arm M are projected, and the type wheel actuating shaft l is then rotated in one or the other direction in accordance with the polarity of the fifth impulse of the signal, until arrested by the engagement of the arm with one of the pair of projected pins. Lever m^4 is connected by a link m^5 to the core of an operating magnet M^1. The lever also controls a pair of contacts m^7 and m^8.

The details of the printer are more fully set forth in the above noted application and need not be more fully described here.

The four conductors 31'', 32'', 33'' and 34'' are connected to the set of switches X and, as described, are variably selected by the first four impulses of any permutation. Switches X are connected respectively by conductors 36' to the magnets N^1, N^2, N^3 and N^4, so that the variable operation of the relays W^1, W^2, W^3 and W^4 variably selects these operating magnets to effect the different settings of the selective plates or disks n^1, n^2, n^3 and n^4. These magnets operate normally open locking switches n^8 connected to the coils of respective magnets and the contacts of which are connected to a branched conductor 37, shown in heavy lines in the diagram. This conductor forms a printer locking circuit and connects different parts of the printing apparatus to the local battery 20 through the normally closed unlocking switch r' and the battery wire 19. When one of the operating magnets N^1, N^2, N^3 and N^4 is energized, this locking circuit is closed through its coil from battery 20 through wire 19, unlocking switch r', conductor 37, switch n^8 of the selected magnet to the coil thereof and thence by ground or by a suitable return wire back to battery 20. If the first impulse of any permutation is negative, the first operating magnet N^1 is energized and selector plate n' moved to shifted position. If the first impulse is positive, magnet N^1 is not energized and plate n' remains in normal position. Similarly, the other selector plates n^2, n^3 and n^4 are moved to shifted position or left in normal position, in accordance with the polarity of the second, third and fourth impulses of the permutation.

Magnets N^1, N^2, N^3 and N^4 also control a contracted fan circuit to select any one of a series of conductors 41, 42, 43 and 44 through the medium of a set of switches y^1, y^2, y^3 y^4 and y^5. Switch y^1 of magnet N^3 is connected by a conductor 38 to switch-arm m^7 that is brought into engagement with its contact m^8 by the operation of pin shifter magnet M^1. Switch y^2 of magnet N^2 is connected to the normally engaged contact of switch y^1 by a conductor 39. Switch y^3 of magnet N^1 is connected to the normally engaged contact of switch y^2 by a conductor 40. Switches y^4 and y^5 of magnet N^4 are connected by conductors 45 and 46 to the contacts of switch y^3. A conductor 41 is connected to the normally disengaged contacts of switches y^1, y^2 and y^5. A conductor 42 is connected to the normally engaged contact of switch y^5, and conductors 43 and 44 are connected to the contacts of switch y^4.

The fifth impulse of any permutation selects, as stated, one of the branch conductors 35 and 35', which are connected respectively to the normally engaged contacts of two switches x' and x^2 operated by the magnet X^1. Switch x' is connected by a conductor 47, a normally closed switch w^6 and a conductor 48 to the coil of a selecting relay W^5 which is thus energized whenever the fifth impulse is negative and selects conductors 35'. Switch x^2 is connected by a conductor 49 to the coil of the magnet M' which operates the stop-pin carrier, and by a conductor 51 to the coil of the magnet X^1. The coils of magnets M^1 and X^1 are grounded or connected by return wire to local battery 20, and these magnets are thus energized when the fifth impulse is positive and closes the circuit through the branch conductor 35. A normally disengaged contact of switch x^2 is connected to local battery 20 by wire 19, unlocking switch r' and a branch of conductor 37, and, when magnet X^1 is operated, the local battery circuit is closed through magnet X^1 and M^1 and is held closed until opened by the shift of the unlocking switch r'.

Relay W^5, which, as stated, is energized when the fifth impulse of any permutation is negative, shifts switch w^6 and thereby disconnects its coil from conductor 47 and also shifts a lock switch w^5. Current then flows from battery by conductor 19, switch r', conductor 37, switch w^5 and conductor 48 through the coil of relay W^5 and back to battery by ground or by a suitable return wire. Switch w^5, when shifted, also closes a circuit from the battery by conductor 19, switch r' conductor 37, switches w^5 and w^6, a conductor 52, and conductors 49 and 51 to the coils of magnet or relay X^1 and magnet M^1. These two magnets are thus operated when the fifth impulse of any signal is received, whether positive or negative.

The first four impulses of any permutation select one or more of the branch extensions 31'', 32'', 33'' and 34''. The locking switches w^2 of the corresponding relays W^1, W^2, W^3 and W^4, connect the selected branch conductors to the local battery through the normally closed unlocking

switch V and conductor 23 of the selector locking circuit, and so that the selected relays thus remain energized independently of the line relay and until unlocking switch V is opened. Then, when magnet X^1 is deënergized and switches X are in engagement with their contacts, the selector actuator magnets N^1, N^2, N^3 and N^4 are variably operated. The fifth impulse, as stated, if negative, operates magnet W^5, and whether positive or negative, operates magnets X^1 and M^1. Locking switches n^8, x^2 and w^6 connect the magnets N^1, N^2, N^3, N^4, X^1, M^1 and W^5 to the local battery through the unlocking switch r' and conductor 37 of the printer locking circuit, so that these magnets, when operated, remain energized independently of the line relay and of the selecting magnets W^1, W^2, W^3 and W^4 until unlocking switch r' is opened by striker magnet P or leasing magnet R. When magnet X^1 is operated by the fifth impulse of any permutation, a circuit is closed from local battery 20, conductor 19, switch r', conductor 37, switch x^2 to conductor 51 and thence by a conductor 52′ to a normally open switch u^5 of the fourth transfer switch relay U^4. At this time, relay U^4 is energized and the circuit is further traced from switch u^5 by a conductor 54 through the coil of unlocking magnet V^1 and back to local battery by ground or by a return wire. Unlocking switch V is then opened to disconnect the conductor 23 of the selector locking circuit from local battery, and the selecting and locking relays W^1, W^2, W^3 and W^4 return to normal condition and are ready to receive the next signal or permutation. Switch V also returns to normal condition, since the circuit through magnet V^1 is opened when the relays W^4 and U^4 are deënergized. But the selecting and locking relay W^5, if operated, the selected actuating magnets N^1, N^2, N^3, N^4, relay X^1 and magnet M^1 remain energized, since they are connected to battery through unlocking switch r' of the printer locking circuit.

Magnet M^1 shifts the pin carrier to project two of the pins m through the selector plates n^1, n^2, n^3 and n^4, in accordance with the setting of these plates. At the same time, switch contacts m^7 and m^8 are engaged and a circuit closed from battery 20, by conductor 19, unlocking switch r', battery wire 37, switch x^2 of magnet X^1, conductors 49 and 50, contacts n^8 and n^7 to conductor 38, thence through the set of switches y^1, y^2, y^3, y^4 and y^5 to one of conductors 41, 42, 43 and 44, in accordance with the varied operation of the magnets N^1, N^2, N^3 and N^4. Conductor 41 is connected to a switch y^6 of magnet W^5 and, if a character is to be printed, a circuit is closed through this conductor to switch y^6 and by one or the other of a pair of conductors 55 and 56 in accordance with the polarity of the last impulse of the permutation, which operates relay W^5, only if it is negative. Thence the circuit is traced to one of the rotating magnets L or L′ and thence by a common conductor 57 to the coil of a relay L^3 and back to battery by ground or by a return wire. One of the magnets L or L′ is thus operated to rotate the type-adjusting shaft l in one or the other direction until stop-arm M engages one of the projected stop pins m, to bring the selected type on wheel H opposite the printing point. At the same time, relay L^3 is energized and shifts two switches l^6 and l^7 and a circuit is closed from battery 20 by conductor 19, unlocking switch r', conductor 37, switch l^7 and a conductor 58 through the coil of letter-space magnet S, thence by a conductor 59, switch l^6, a conductor 60 through the coil of striker magnet P and back to battery by ground or by a return wire. Magnet P then shifts type-wheel H to print the selected type, and arm p opens the locking switch contacts r' and r'' to disconnect the printer locking circuit conductor 37 from battery. All parts of the printing apparatus then return to normal position.

The fifth impulse of any permutation causes the operation of magnet X^1 and thereby disconnects the printer from the selector. At the same time, magnet V^1 is energized to open unlocking switch V, and the selector, except the selecting and locking relay W^5, is restored to normal condition, but the printer locking circuit is not broken, since it is connected to the local battery through unlocking switch r'. Therefore, as soon as the fifth impulse of any permutation is received, the selecting circuits and relays W^1, W^2, W^3 and W^4 are in condition to receive the first four impulses of the next signal before the printing apparatus completes its operation. It is only necessary that unlocking switch r' shall break the circuit of magnet X^1 and permit its switches x' and x^2 to drop back into engagement with their back contacts before the fifth impulse of the next signal is received. In other words, the next signal may be built up while the character corresponding to the signal just received is being printed. When the operation of the printing apparatus is completed, switch r' is opened, the magnet X^1 is deënergized, so that the switches controlled thereby drop back into engagement with their contacts. Magnets N^1, N^2, N^3 and N^4 are then properly operated in accordance with the signal that has been built up by the selective operation of the relays W^1, W^2, W^3 and W^4, and switches x' and x^2 are in proper position to receive the fifth impulse that selects one of the conductors 35 or 35′ and the printing apparatus is operated, as before, to print the character corresponding to the signal. As the magnets which operate the printing apparatus, particularly the rotating magnets L and L^1,

striking magnet P and letter-space magnet S are necessarily strong magnets and somewhat slow in operation, this separation of the selector and printer, by what may be termed the dividing magnet X^1, greatly increases the speed at which the signals may be received and the corresponding characters printed.

As set forth in the above noted application, the switches y', y^2, y^3, y^4 and y^5 connect the conductor 38 to one of a set of conductors 41, 42, 43 and 44 in accordance with the varied operation of the magnets N^1, N^2, N^3, and N^4, and the local battery is connected to the selected conductor when contacts m^7 and m^8 are engaged by the operation of the magnet M^1. These conductors lead to a set of switches y^6, y^7, y^8 and y^9 of the selecting and locking relay W^5, and which remain in normal position or are shifted in accordance with the polarity of the last impulse of the permutation. Twenty six of the possible thirty-two permutations select the conductor 41 and one of the other of the conductors 55 and 56 and operate one or the other of the rotating magnets L or L^1. The remaining six permutations select one of a set of six conductors leading from the contacts of the switches y^7, y^8 and y^9. A selection of conductor 61 closes a circuit through the line space magnet G^2 and thence by conductors 69 and 68 through releasing magnet R. If conductor 63 is selected, the circuit is closed through a resistance coil R^3, conductor 57 and relay L^3 which operates as described, to close the circuit of the letter space magnet S and striker magnet P to thereby print the center letter on the type wheel. The selection of conductor 64 closes a circuit through the letter space magnet S, conductor 59, switch l^6, and conductor 67 and resistance coil R^4 and thence by a conductor 68 through the releasing magnet R, to thereby form the spaces between words. If conductor 65 is selected a circuit is closed through the carriage wheel magnet S^2, thence by a conductor 70 through a releasing magnet H^3 and thence by conductors 71, 67 and 68 through a releasing magnet R. Resistance coils R^3 and R^4 prevent the operation of the releasing magnet R before the letter spacing and striking operations are completed.

The conductors 62 and 66 control the capital and figure shift magnets H^1 and H^2. The selection of conductor 66 closes a circuit through a normally closed switch h^4 of magnet H^1 and through the normally closed switch h^5 of magnet H^2 and through the coil of the latter magnet. The selection of conductor 62 closes a circuit through the switch h^4 of magnet H^2 and switch h^5 of magnet H^1 and through the coil of the magnet H^1. Each of these magnets has a locking switch h^6 connected to the coils thereof and the contacts of which are connected by a conductor 72 to the normally closed unlocking switch h^7 of the releasing magnet H^3. When the shift magnet H^1 is operated, it shifts its switch h^5 and the circuit is closed from conductor 62 through switch h^4 of magnet H^2 and through switch h^5 of magnet H^1 to conductors 73 and 67, through resistance R^4 and by conductor 68 through releasing magnet R. Similarly, when the shift magnet H^2 is energized, the circuit is closed from conductor 66 through switch h^4 of magnet H^1 and switch h^5 of magnet H^2 through conductors 73 and 67, resistance R^4, conductor 68 and releasing magnet R. The selected shift magnet also remains energized, since the locking circuit is closed through its coil by one of the switches h^6. Thus if magnet H^1 is operated, the locking circuit is closed through its coil from battery wire 19, unlocking switch h^7, conductor 72, locking switch h^6 and through the coil of magnet H^1. The releasing magnet H^3 which operates the unlocking switch h^7 has it coil connected by conductors 74 to the normally disengaged contacts of the switches h^4 so that, when one of the conductors 62 or 66 is selected to operate one of the shift magnets, the other conductor is connected by one of the switches h^4 to the coil of relay H^3. Then, if this other conductor is selected, it does not operate its shift magnet but instead, operates the releasing magnet H^3. In this way, by sending two permutations in one order or another, either the capital or the figure shift mechanism can be operated and released. That is to say, conductor 62 is selected by one special permutation or signal representing, for example, the capital shift, and conductor 66 is selected by another special permutation or signal representing the figure shift. If the capital shift signal is sent over the line, it will select conductor 62, operate shift magnet H^1 and connect conductor 66 to the releasing magnet H^3. If, then, the figure shift signal or permutation is transmitted, it operates the releasing magnet H^3 and restores the shift mechanism to normal. On the other hand, if the figure shift signal is first transmitted, it selects the conductor 66, operates figure shift magnet H^2 and connects the release magnet H^3 to the conductor 62, so that, under such circumstances, the shift mechanism is released by transmitting the capital shift signal. In this way, by the use of two special signals only, either the capital or the figure shift mechanism can be operated and maintained in operative condition as long as desired and then released. The shift magnets H^1, and H^2 are provided with switch operating armatures h^8 and the magnets H^3 and L^3 are provided with operating armatures h^9 and l^8 respectively.

It is obvious that changes may be made in the details set forth without departure from the essentials of the invention as defined in the claims.

We claim as our invention:

1. In printing telegraphs in which the signals are represented by permutations of a definite number of modified line impulses, the combination of a printer, a set of selecting devices controlling all operations of said printer, a line circuit, means for bringing said selecting devices successively into operative relation with the line circuit as the impulses of each signal are received, means for maintaining said selecting devices in changed condition independently of the line circuit, and means for freeing a portion only of said set of selecting devices for further operation before the operation of said printer is completed.

2. In printing telegraphs in which the signals are represented by permutations of a definite number of different line conditions, the combination of a printer, a set of selectors coöperating to control all operations of said printer, a corresponding set of selecting and locking magnets responsive, respectively, to the successive impulses of the permutations for controlling the operation of said selectors, means for successively bringing said selecting and locking magnets into operative relation with the line as the impulses of each signal are received, and means for releasing a portion only of said set of selecting and locking magnets for further operation before the operation of said printer is completed.

3. In printing telegraphs in which the signals are represented by permutations of a definite number of different line conditions, the combination with a line circuit, of a recording mechanism, a set of selecting and locking magnets corresponding in number to the number of different line conditions of each signal and arranged to control all operations of said recording mechanism, means for successively bringing said selecting and locking magnets into operative relation with the line circuit as the impulses of each signal are received, means for maintaining said magnet in changed condition independently of the line circuit, means acting at the end of each signal for releasing a portion only of said magnets for each succeeding selecting operation before the operation of the printer is completed, and means acting at the end of the printing operation for releasing the remaining of said magnets.

4. In printing telegraphs in which the signals are represented by permutations of a definite number of modified line impulses, the combination with a line circuit, of a printer, a set of selecting and locking magnets, means for successively bringing said set of magnets into operative relation with the line as the impulses of each signal are received, a locking circuit for a portion of said selecting and locking magnets, a second locking circuit for the remainder of said magnets and for said printer, and means for successively opening said locking circuits.

5. In printing telegraphs in which the signals are represented by permutations of a definite number of modified line impulses, the combination of a line circuit, of a recording mechanism, a set of operating selectors controlling all operations of said recording mechanism, a corresponding set of electric selecting devices for controlling said operating selectors, means for successively bringing said electric selector devices into operative relation with the line circuit as the impulses of each signal are received, means for placing a portion only of said electric selecting devices in condition for further operation before the operation of said recording mechanism is completed, and means for subsequently placing the remainder of said selecting devices and said printer in condition for further operation.

6. In printing telegraphs in which the signals are represented by permutations of a definite number of modified line conditions, the combination with a line circuit, of a recording mechanism, a set of selecting circuits, a corresponding set of circuits controlled, respectively, by said selecting circuits and arranged to effect all operations of said printer, means for successively bringing said set of selecting circuits into operative relation with the line circuit as the impulses of each signal are received, and automatic switch mechanism for disconnecting a portion only of said selecting and operating circuits before the operation of said printer is completed.

7. In printing telegraphs in which the signals are represented by permutations of a definite number of impulses of opposite polarity, the combination of a recording mechanism, a set of selectors variably operated in different combinations for controlling the operation of said recording mechanism, means initiated in operation by the first impulse of each signal, but otherwise locally controlled, for bringing said selecting devices successively into operative relation with the line as the impulses of each signal are received, and means for placing said selecting devices in condition for further operation before the operation of said recording mechanism is completed.

8. In printing telegraphs in which the signals are represented by permutations of a definite number of different line conditions, the combination of a printer comprising a type wheel, striker mechanism, a

series of stop devices for arresting said type wheel, and a set of operating selectors for controlling said type wheel stop devices and said striker mechanism, and a set of electric selecting devices corresponding to and controlling said set of operating selectors and responsive, respectively, to the successive line conditions of the signals, said electric selecting devices being operative to initiate the selection of a character before said type wheel and striker mechanism completes the printing of the preceding character.

CHARLES L. KRUM.
HOWARD L. KRUM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."