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PRINTING TELEGRAPH.

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982,276. Patented Jan. 24, 1911.

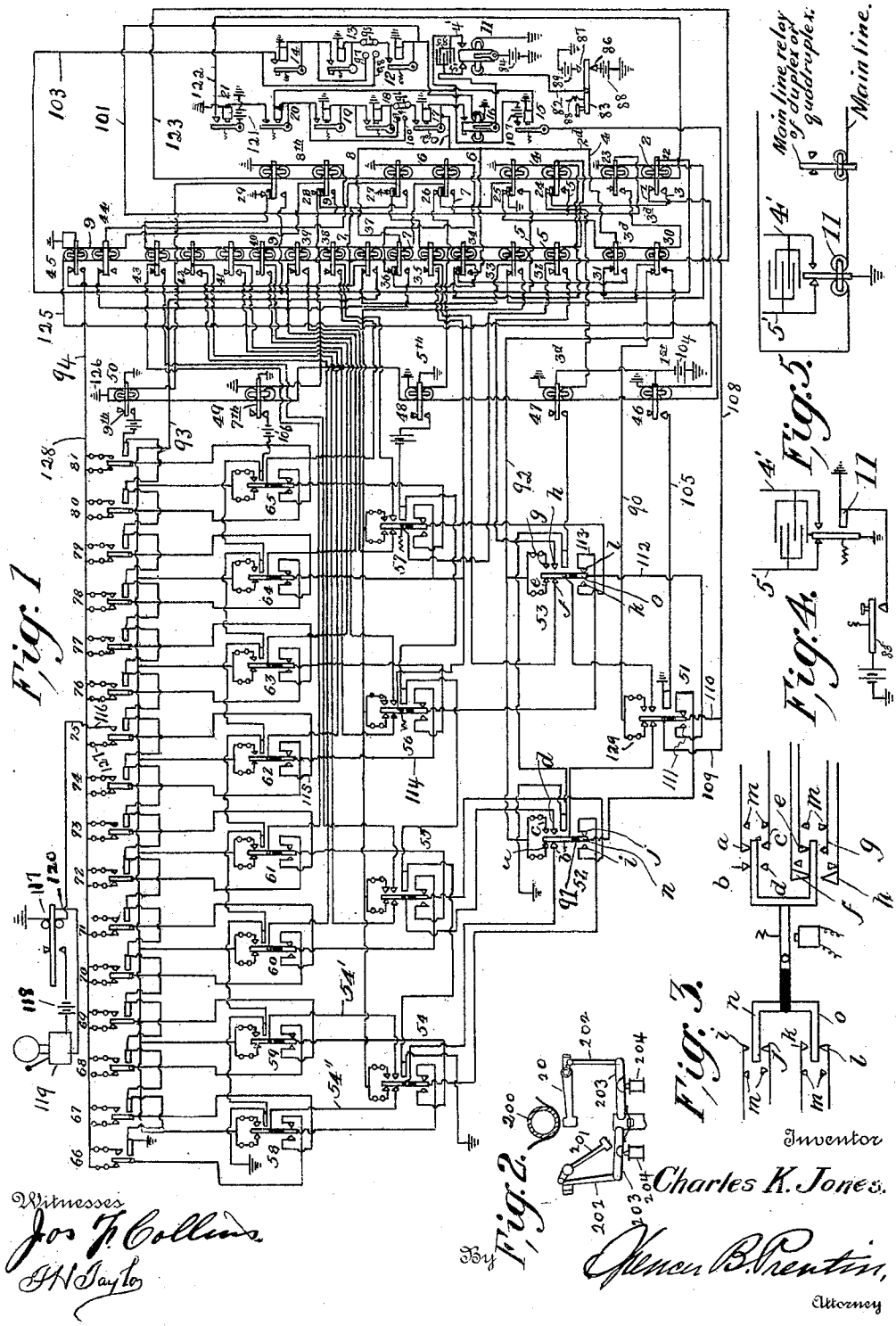

Fig. 1

Fig. 5.

Fig. 4.

Fig. 3.

Fig. 2.

Witnesses

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PRINTING-TELEGRAPH.

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To all whom it may concern:

Be it known that I, CHARLES K. JONES, a citizen of the United States, and residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

My invention relates to printing-telegraphs; and it consists in a novel arrangement of selecting-relays and associated devices whereby by the operation of a single main-line circuit controlling the selective action of the said selecting-relays any one of a plurality of type-bars or printing devices may be actuated at will and other actuations be accomplished for various operating purposes, among which is a selective circuit for causing a bell or signal device to ring continuously until a particular armature is manually restored to normal position.

My invention consists of apparatus whereby automatic protection is provided to the receiving instrument against destruction by a powerful electric energy such as is necessarily used in an instrument of this character; of apparatus whereby the receiving instrument may be adjusted to correspond with the speed of the transmitter, and generally my invention consists in the novel features hereinafter set forth, and particularly pointed out in the claims.

The objects of my invention are to improve and simplify printing-telegraph systems and apparatus, to simplify and improve the operation of printers employing type-bars or similar printing devices for the several characters, to provide apparatus whereby the ordinary dot and dash code of telegraphy may be received and translated into printed characters or to be used for any other purpose desired; to provide a receiving instrument for operation by any type of transmitter, including the slowest to the highest speed instruments. While I have shown a simple form of transmitter for placing to the main-line pulses of opposite polarity it will be understood that I do not limit myself to any particular form of transmitter and I may use any type of transmitter to operate my receiving instrument, the transmitter being no part of my invention but simply used to explain the operation of the receiving printer.

A further object of my invention is to operate selective circuits for riging a bell continuously at each office to enforce the attention of attendants. Each bell has a particular selective circuit which when operated will ring continuously until a particular armature is restored to normal position by hand. By this arrangement a printing-telegraph instrument may be operated in private offices or places of business for the receipt of telegraphic business printed upon a continuous roll of paper and upon the completion of the message the bell may be set to ringing thus giving notice of the same to those in charge of the instrument.

I will now proceed to describe my invention with reference to the accompanying drawings, in which one embodiment of the invention is illustrated and will then point out the novel features in claims.

In the said drawings, Figure 1, is a diagram showing a simple type of transmitter and the various relays, type-bar magnets, and circuits of the corresponding receiving instrument or printer. Fig. 2, illustrates one form of type-bar mechanism adapted to be actuated by type-bar magnets. Fig. 3, illustrates a relay controlling a plurality of circuits through its contacts which may be substituted for relays as shown in Fig. 1, thus one relay as shown in Fig. 3, taking the place of any number of relays operated in electrical series as shown in Fig. 1, and I claim the privilege of so operating my receiver. Fig. 4, illustrates an arrangement for operating my receiver by a neutral main-line relay. Fig. 5, illustrates an arrangement for operating my receiver in connection with the main-line relay of a duplex or quadruplex system, the main-line relay of the receiving printer being connected in electrical series with the main-line relay of the duplex or quadruplex system.

It will be obvious that if the main-line relay of the duplex or quadruplex system be provided with connections through its opposing-contacts and through its armature as illustrated in relay 11, Fig. 1, then relay 11, Fig. 5, may be dispensed with and thereby operate the receiving printer direct from the main-line relay of said duplex or quadruplex system. I claim the privilege of operating my receiver as above described.

In this system I employ for the transmission of the messages current pulses, but said pulses vary in length, a short depression or

closure of the operating-key and its release representing a dot or short pulse, and a long depression or closure of the operating-key and its release representing a dash or long pulse, and these pulses are usually, but not necessarily, alternately of opposite directions.

For transmitting the characters of the English alphabet I may employ from one to five dots or dashes or combinations of dots and dashes of the above stated number. This number of dots and dashes would give ample operating-magnets, which would be sixty-two magnets, permitting the transmission of the alphabet, figures, punctuation-marks and for the operation of spacing, carriage-return, shift mechanism, and capital shift keys, such as are used on various well-known electrical-typewriters, and leaving a margin for any other purposes that may be desired. For transmitting a less number of characters than are contained in the alphabet I may employ a fewer number of dots and dashes and for transmitting a greater number of characters than are provided for herein I may employ more than five dots and dashes.

Referring now to the drawings and at first to Fig. 1, the said figure shows one type of transmitter, which instrument will be described more fully hereinafter, and a receiving instrument comprising a main-line relay 11, and a plurality of relays hereinafter described. The receiving instrument and transmitter are connected by a line-wire 82. At the transmitting end this line-wire is connected to the operating key 83. At the receiving end the line-wire 82, passes through main-line relay 11, which in the instance shown is a polar relay, to ground. Main-line relay 11, controls two local circuits 4′ and 5′, connected to opposing contact-points of the main-line relay. A battery 84, or other suitable source of electric energy is connected to ground and to the armature of main-line relay 11. One or the other of circuits 4′ and 5′ is completed through battery 84, according as the said armature of relay 11, is in contact with the right-hand or left-hand contact of said relay, however this is not true until the first pulse actuates the armature of main-line relay 11, into the abnormal position, as will be more fully explained hereinafter, this being done for the purpose of opening a circuit between battery 84 and the instrument intervening between one complete operation of a characteristic signal and the beginning of the succeeding characteristic signal. Circuit 4′ is formed by the first actuation of main-line relay 11, which operates relay 16 into the abnormal position and relay 16 remains in such position until relay 15 is operated which operation completes a circuit passing through the restoring-coils of relay 16 and thus restoring it to normal position; the operation of relay 15 also completes the print or controlling circuit and this will be explained hereinafter. A condenser 85, is connected across the contact-points of the relay 11, to reduce sparking.

It may be well to state here that all the relays comprising the instrument except the relays of the retarding-sets and the secondary selecting-relays 51 to 81, inclusive, are polar relays and that their armatures tend to remain in contact with whatever contact-point they are in contact at the time.

Referring now to the transmitter, the same as shown in the drawings consists of an ordinary hand-manipulated telegraph-key 83, adapted for engagement with contacts 86 and 87; key 83 is held normally in one position by spring 88; the operation of key 83 places alternately on the line-circuit sources of electric energy or batteries 88 and 89, of opposite polarity, thereby producing in the line conductor 82, current pulses of opposite polarity.

The receiving instrument consists of a number of polar relays having restoring-coils, one group being designated as "selecting-relays" and shown as relays 22 to 45 inclusive; another group being designated as "primary selecting-relays" and shown as relays 46, 47, 48, 49 and 50; and one relay 16, being designated as an "entrance-relay"; and a number of neutral relays comprising two sets designated as "retarding-sets" and shown as relays 12, 13 and 14, and 17, 18, 19, 20, 15 and 21, relay 15 being designated as "controlling-relay" and relay 21 being designated as "restoring-relay"; and also a number of neutral relays 51 to 81, inclusive, being designated as secondary selecting-relays.

The numerals 1 to 9, inclusive, represent particular pulses operated by the main-line relay in the transmission of a signal, said pulses operating particular relays.

The receiving instrument as illustrated is in the normal or open-circuit position with no electric current into its parts except to the main-line relay 11, from battery 86.

The contacts of the secondary selecting-relays are connected as follows: The relay of the first cluster has six contact-points connected by conductors as follows: two contact-points each such contact-point controlling a printing or operating-magnet through wire 90, upper contact of relay 30, upper contact of relay 33, upper contact of relay 37, and upper contact of relay 45 and to ground; two other contact-points connected to the front end of the armatures of the secondary selecting-relays of the second cluster, one such contact-point connected to each such armature, said secondary selecting-relays in the second cluster comprising two relays; the remaining two contact-points con-

nected by wires to the rear ends of the armatures of the secondary selecting-relays of the second cluster, one such contact-point connected to each such armature. The ends of the armatures of the secondary selecting-relays 51 to 65, inclusive are separated by insulation 91. The two relays of the second cluster have their contact-points connected as follows: four contact-points each of which being connected by wire and controlling a printing or operating-magnet through wire 92, lower contact-point of relay 30, upper contact-point of relay 33, upper contact-point of relay 37, upper contact-point of relay 45 and to ground; relay 52 connected by wire from two contact-points to the front ends of the armatures of relays 54 and 55; two similar contact-points of relay 53 connected similarly to the front ends of the armatures of relays 56 and 57 but the conductors pass through contact-points of relays 32 and 35; the two contact-points on the rear end of relays 52 and 53 are connected by conductors to the rear ends of the armatures of the relays of the third cluster, relays 54, 55, 56 and 57. The relays of the third cluster, 54 to 57, inclusive, are connected similarly to the relays of the fourth cluster except that the conductors connected to the front ends of the armatures of the relays of the fourth cluster pass through the contact-points of relays 38 to 43, inclusive, except wires 54′ and 54″. The relays of the fourth cluster, 58 to 65, inclusive, are connected as follows: two contact-points on the front end of each relay, each contact-point of which being connected to a printing or operating-magnet and thence by wire 93 to the lower contact-point of relay 37 thence to the upper contact-point of relay 45 and to ground; two contact-points on the rear of the relays of the fourth cluster connected to the armatures of the relays of the fifth cluster, each such contact-point connected to one such armature. The relays of the fifth cluster, 66 to 81, inclusive, are connected as follows: Each armature controls a printing or operating-magnet by either of its two contact-points through conductor 94 and the lower contact-point of relay 45 and to ground.

The secondary selecting-relays are controlled in electrical series as follows: Relay 51 is controlled by primary selecting-relay 46; the relays of the second cluster are controlled by relay 47; the relays of the third cluster are controlled by relay 48; the relays of the fourth cluster are controlled by relay 49, and the relays of the fifth cluster are controlled by relay 50 The primary selecting-relays and the secondary selecting-relays are operated only by the dash or long pulses.

The printing and operating-magnets may operate shift mechanism, space mechanism, carriage-returning mechanism, or the like.

The two retarding-sets comprise relays which are operated successively, the extreme relay in each set therefore being operated only by long pulses or dashes. A switch 95 in one set and switch 96 in the other set are adapted for engagement with the contacts 97 and 98, and 99 and 100, respectively, for the purpose of cutting out of circuit one or more of the relays in said sets, thereby adapting the receiving instrument to a faster speed. Should a slower speed than is here illustrated be desired then it will be necessary to increase the number of the relays comprising said retarding-sets and I claim the privilege of so doing. The last relay 14 of the retarding-set controlled by circuit 4′, is adapted for completing circuits successively through the coils of the primary selecting-relays 46 to 50, inclusive, and thereby operating said relays, said circuits being formed successively through the contacts of the selecting-relays which will be explained hereinafter.

Selecting-relays 24, 25, 26, 27, 28, 29, 34, 36, are provided with a metallic contact-plate on their armatures for engagement with the upper contact-point and said plates are insulated from said armatures, thus controlling two separate circuits.

The selecting-relays are operated by circuits 101 and 102, which are controlled by the main-line relay 11, through circuits 4′ and 5′. The first operation of relays occurring in the selecting-relays results from the second pulse operated by the main-line relay 11, however, it will be borne in mind that the restoration leaves all the parts in proper position for the first pulse begining a signal and accordingly there is a circuit ready for completion by the operation of relay 14 should there be a dash in the first pulse, the circuit being from ground through battery 84, through armature of main-line relay 11, circuit 4′, through the coils of entrance-relay 16, through the armatures and contact-points of relays 12, 13 and 14, these relays being operated successively by the dash or long pulse, conductor 103, through the armature of relay 22 and upper contact-point, upper contact-point of relay 23 and thence by wire through the coils of relay 46 and to ground, thus operating relay 46, which in turn completes a circuit for operating the secondary selecting-relay 51; the second pulse operated by the main-line relay 11, will effect an operation of selecting-relays 22 ad 23 simultaneously, the operation of relay 23 thereby severing a circuit through its upper contact-point whereby the primary selecting-relay 46 was operated, and another circuit is formed by the lower contact-point of the same relay for the operation of relays 30 and 31 which occurs from the third pulse operated; the operation of relay 22 forms a circuit for completion

by the dash-completing relay 14, occurring in the third pulse operated by the main-line relay 11, said dash operation resulting in the operation of relay 47.

The third pulse operated by relay 11 will effect an operation of relays 30 and 31, the latter severing a circuit through its upper contact-points whereby relays 22 and 23 were operated and forming a circuit by its lower contact-points whereby relays 24 and 25 may be operated by the fourth pulse operated; the operation of relay 30 severing a circuit through its upper contact-points whereby the printing or operating-magnets controlled by secondary selecting-relay 51 are cut out of circuit, and another circuit formed by its lower contact-points whereby the printing or operating-magnets controlled by the secondary selecting-relays 52 and 53 may be operated by the fourth pulse operated by the main-line relay 11; should there be a dash in the third pulse the circuit will trace from wire 103 (the circuit from battery 84 having been traced to wire 103 in the first dash) through the armature of relay 22, through the lower contact-points of relay 22, through the upper contact-points of relay 24 and through the coils of primary selecting-relay 47 and to ground, thus operating relay 47, which in turn will complete a circuit through its contact-points which will operate the secondary selecting-relays 52 and 53 simultaneously. In like manner succeeding pulses operated by the main-line relay 11, effect operations of the various parts as will be explained in detail hereinafter in a number of signals.

The retarding-set operated by circuit 5′, is for the purpose of completing the print or controlling-circuit through the contacts of at least one of the secondary selecting-relays and the selected printing or operating-magnet followed by the operation of the final relay in said retarding-set for completing a circuit for restoring the selecting-relays and primary selecting-relays to normal position.

Either of the two printing or operating-magnets controlled by the contact-points of secondary selecting-relay 51 may be energized by two pulses operated by the transmitter or by the armature of the main-line relay 11, one of which may be energized by a short pulse followed by a long pulse, the long pulse being transmitted when the transmitter is restored to normal after the operation of the first pulse; the other magnet may be energized by two long pulses similarly operated. The second cluster of secondary selecting-relays controls four printing or operating-magnets; the third cluster of relays controls eight printing or operating-magnets; the fourth cluster controls sixteen printing or operating-magnets, and the fifth cluster of relays controls thirty-two of such magnets, thus making a total of sixty-two printing or operating-magnets controlled by selecting circuits.

It will be seen that by means of the various secondary selecting-relays, a circuit may be completed through any one of the various type-bar or operating-magnets at will.

The selecting-relays are operated by pulses operated by the transmitter or by the armature of the main-line relay 11, as follows: relays 22 and 23 by the second pulse; 30 and 31 by the third pulse; 24 and 25 by the fourth pulse; 32, 33, 34, and 35 by the fifth pulse; 26 and 27 by the sixth pulse; 36, 37, 38, 39, 40, 41, 42 and 43 by the seventh pulse; 28 and 29 by the eighth pulse, and relays 44 and 45 by the ninth pulse. The primary selecting-relays are operated by pulses as follows: relay 46 by the first pulse; relay 47 by the third pulse; relay 48 by the fifth pulse; relay 49 by the seventh pulse and relay 50 by the ninth pulse. The printing and operating-magnets are energized by pulses as follows: those of the first cluster by the second pulse; the second cluster by the fourth pulse; the third cluster by the sixth pulse; the fourth cluster by the eighth pulse and the fifth cluster by the tenth pulse.

The operation of this apparatus is as follows: Supposing for example, that the message to be transmitted consists of a dash, two dots and two dashes; the transmitter is depressed so that it makes contact with 87 and then said transmitter is released so that it will be carried back to normal position by spring 88; this operation will result in battery 89 being placed to line 82 and circuit 4′ will be completed to and including relay 14 as follows: from ground through battery 84, through the armature of main-line relay 11, through the coils of entrance-relay 16 and through the magnet of relay 12 to ground, thus operating relays 16 and 12, the former remaining in such position until restored to normal by the operation of relay 15 completing a restoring-circuit. The operation of entrance-relay 16 forms a circuit which will be completed when the armature of main-line relay 11 is returned to normal position by the second pulse operated. The operation of relay 12 forms another circuit through its contact-points and through the magnet of relay 13 to ground, thus operating relay 13 which in turn will operate relay 14 in similar manner from battery 84; the operation of relay 14 will cause the operation of primary selecting-relay 46 in a circuit from the contact-points of relay 14, conductor 103, through the armature of relay 22, upper contact-points of relay 22, upper contact-points of relay 23 and through the coils of primary selecting-relay 46, which in turn will operate secondary selecting-relay 51 in a circuit from ground through the contact-points of relay 46 wire 105, through

magnet of relay 51 to ground. The first dash being now completed the armature of main-line relay 11, is actuated into the normal position by the second pulse from battery 86 operated by the transmitter on its return to normal position, and a circuit is operated as follows: from ground through 84, through armature of main-line relay 11, circuit 5′, through armature of entrance-relay 16, and through magnet of relay 17 to ground, thus operating relay 17; the armature of main-line relay 11 will not remain in contact with circuit 5′ long enough for relays 18, 19, 20, 15, and 21 to be operated successively; simultaneously with the operation of the last described circuit, another circuit is operated as follows: from wire connected with the contact-point of relay 16 to wire 102, through the upper contact-point of relay 31, through the coils of relays 22 and 23 to ground, thus operating relays 22 and 23, thus severing the first dash circuit through the operation of relay 23 and forming circuits for the operation of other relays by the next succeeding pulse.

The operation of the third pulse by the transmitter will be similar to the operation of the first pulse except that the duration of the contact or engagement will be relatively shorter than the dash and said operation will result in the operation of main-line relay 11 into the abnormal position and thereby causing the operation of relay 12, as described in the first pulse but there will be no operation of entrance-relay 16 until the completion of the signal.

The third pulse being relatively short relays 13 and 14 will not be operated; simultaneously with the operation of relay 12 another circuit is operated as follows: circuit 4′, branch wire 101, through armature and lower contact-point of relay 23, through the coils of relays 30 and 31, through upper contact-point of relay 25 and to ground, thus operating relays 30 and 31.

The operation of the fourth pulse by the transmitter will be similar to the operation of the second pulse with the following result: Main-line relay 11 will be operated into the normal position causing a circuit from ground and through battery 84, circuit 5′ branch wire 102, branch wire to the armature of relay 31 and through the lower contact-point of relay 31, to upper contact-point of relay 34 and through the coils of relays 24 and 25 and thus operating relays 24 and 25.

The operation of the fifth pulse by the transmitter will be similar to that of the third pulse with the following result: Relay 12 will be operated as described in the third pulse and relays 13 and 14 will not be operated the pulse being a short one; simultaneously with the operation of relay 12 another circuit is operated from circuit 4′, wire 101, branch wire leading to the lower contact-point of relay 24 and through the armature of relay 24, through the coils of relays 32, 33, 34 and 35 and through the upper contact-point of relay 27 and to ground, thus operating relays 32, 33, 34 and 35.

The operation of the sixth pulse by the transmitter will be similar to that of the fourth pulse with the following result: Main-line relay 11, will be operated into the normal position and causing the operation of relay 17 as previously described and simultaneously therewith causing another operation as follows: branch wire 102 to the lower contact of relay 34, through the armature of relay 34 to the upper contact-point of relay 36 and through the coils of relays 26 and 27 to ground and thus causing the operation of relays 26 and 27.

The operation of the seventh pulse by the transmitter will be similar to that of the first pulse which was a dash and which resulted in the operation of relays 12, 13 and 14 but otherwise differing in that primary selecting-relay 49 will be operated in a circuit from wire 103, through branch wire to the lower contact-point of relay 27, through armature of relay 27, through the upper contact-point of relay 28 and through the coils of primary selecting-relay 49 and to ground, and thus operating relay 49, which in turn will operate the secondary selecting-relays 58 to 65, inclusive, which are connected in series from ground through the armature and contact-points of primary selecting-relay 49, through battery 106 through said magnets and to ground; another circuit is operated simultaneously with the operation of relay 12, via wire 101, through branch conductor to the lower contact-point of relay 26, through the armature of relay 26 and through the coils of relays 36, 37, 38, 39, 40, 41, 42 and 43 in series and to the upper contact-point of relay 29 and to ground and thus operating relays 36 to 43 inclusive.

The operation of the eighth pulse by the transmitter will be similar to that of the sixth pulse by which relay 17 was operated and another circuit will be operated as follows: wire 102, through the armature and lower contact-point of relay 36 to the upper contact-point of relay 44, through the armature of relay 44, through the coils of relays 28 and 29 to ground and thus operating relays 28 and 29.

The operation of the ninth pulse by the transmitter will be similar to that of the seventh pulse which was a dash and which resulted in the operation of relays 12, 13 and 14, but otherwise differing in that primary selecting-relay 50 will be operated in a circuit from wire 103, through branch wire to the lower contact-point of relay 29, through the armature of relay 29, through the coils of primary selecting-relay 50 to ground and

thus operating relay 50, which in turn will operate the secondary selecting-relays of the fifth cluster in a circuit from ground through the armature of relay 50, lower contact-point of relay 50 and through the coils of the magnets of the secondary selecting-relays 66 to 81, inclusive, in electrical series, and to ground.

The tenth and final pulse is operated by the transmitter being restored to normal position and the main-line relay 11, is accordingly operated into the normal position, there to remain until another characteristic signal is operated by the transmitter; a circuit is operated as follows: Relay 17 is operated similarly as heretofore explained and the armature of relay 17 remains in the abnormal position until the relays 18, 19, 20, 15 and 21 are operated; the operation of relay 17 makes a circuit from the lower contact of relay 16, through armature and contact-point of relay 17 and through the magnet of relay 18 to ground and thus operating relay 18; the operation of relay 18 makes a circuit from connection with the contact-point of relay 17, through the armature and contact-point of relay 18 and through the magnet of relay 19 and to ground and thus operating relay 19; the operation of relay 19 makes a circuit from connection with the contact-point of relay 18, through the armature and contact-point of relay 19, through the magnets of relays 20 and 15 in series and to ground and thus operating relays 20 and 15 simultaneously; the operation of relay 20 makes a circuit from connection with the contact-point of relay 19, through the armature and contact-point of relay 20 and through the magnet of relay 21 to ground and thus operating relay 21. The operation of relay 15 completes a circuit as follows: from ground through the restoring-coils of entrance-relay 16, through battery 107, through contact-point and armature of relay 15, wire 108, branch 110, through the armature and contact-point 111, of relay 51, wire 112, through armature and contact-point of relay 53 to wire 113, through the armature and contact-point of relay 56 to wire 114, through the armature and contact-point of relay 62 to wire 115, through the armature and contact-point of relay 75, wire 116, through the coils of polar relay 117 and to ground and thus operating relays 16 and 117. The operation of polar relay 117 closes a local circuit through the contacts of said relay, through battery 118, call-bell or signal device and wire 120 and thus setting call-bell 119 to ringing continuously until the armature of relay 117 is restored by hand to normal position. Immediately following the operation of relay 15 relays 16 and 21 are operated, the operation of relay 16 thereby severing circuit 5′, and the operation of relay 21 operating a restoring-circuit as follows: from ground through battery 121, through the armature and contact-point of relay 21, wire 122, through the restoring-coils of the selecting-relays and the primary selecting-relays via wires 123 and 125 and to ground at 126 and thereby restoring the selecting-relays and the primary selecting-relays to normal position. The operation of the primary selecting-relays breaks the circuits controlling the operation of the secondary selecting-relays and such relays as were operated are thereby restored to normal position through the action of their rectractile springs.

The operation of one dash, two dots, one dash and one dot will energize the printing or operating-magnet 127, this combination only differing from the one just described in the last signal, the former ending with a dash. We will therefore trace the circuit from the armature of the secondary selecting-relay 75, through conductor 128, through the lower contact-point and armature of relay 45 and to ground; it will be observed that relay 45 is operated by the ninth pulse and the energization of the printing or operating-magnet 127 is effected by the tenth or final pulse. The energization of magnet 127 operates a type-bar and a print therefore follows the energization of said magnet.

To energize the magnet 129, the operation of one dot is necessary which would be accomplished by one short pulse followed by a long pulse operated by the transmitter and the selecting circuit controlling this magnet would trace from wire 108, branch 109, through the armature and contact-point of relay 51, through printing or operating magnet 129 wire 90, through the upper contact-point and armature of relay 30, through the upper contact-point of relay 33, through the upper contact-point of relay 37, through the armature of relay 37, through the upper contact-point and armature of relay 45 and to ground.

It will be observed from the foregoing description that the receiving instrument is operated by the armature of the main-line relay through the contact-points of said main line relay, thereby closing a circuit in said instrument in either of the positions of said main-line relay and thereby relaying to said instrument the pulses received by it from the transmitter and it therefore follows that the receiving instrument may be operated by the main-line relay of a duplex or quadruplex or neutral relay if a similar connection be made with such relay as is shown in the illustration of the main-line relay in Figs. 1, 4 and 5 and I claim the privilege of so operating when desired.

In Fig. 2, I have shown mechanism for operating type-bars by electromagnets, the parts there shown being an ordinary type-

writer roll or platen 200, type-bars 201, connected by links 202 to armature-levers 203, adapted to be operated by the printing-magnets 204; but it will be understood that I do not limit myself to any particular printing mechanism and that the mechanism of any of the well-known electrical type-writers may be used. Further it will be understood that certain of the magnets 204 may operate shift, spacing, and carriage-return mechanism and such like, such as are commonly used in electrical type-writers, such magnets acting directly or as relays to complete the circuit of other magnets.

Fig. 3 illustrates a relay controlling a plurality of contact-points through which a like number of circuits may be controlled and one relay of such type may therefore be substituted for two relays where said relays are operated in series or simultaneously. It is also obvious that one such relay as is shown in Fig. 3, may be extended on the same lines as is illustrated so that one such relay may be substituted for any number of relays where said relays are operated in series or simultaneously and I claim the privilege of so operating if desired.

Like letters in the illustrations represent like parts.

The letters *a*, *c*, *e*, *f*, *g*, and *h*, etc., represent spring-contacts and *m* represents stop contacts which limit the movement of the spring-contacts.

It is apparent that polarized magnets may be used for secondary selecting-relays and for the relays comprising the retarding-sets and it is equally obvious that the neutral as well as polarized magnets may be used for selecting-relays and that any suitable mechanical means might be employed to reset their armatures.

It will be obvious that my invention is susceptible of many variations and modifications without departing from the principles herein set forth, and I do not limit myself to the details of construction and arrangements of the parts herein illustrated and described, or to a particular number of batteries or relays for the operation of the instrument.

What I claim is—

1. In a printing-telegraph, the combination with an electrically-controlled plurality of selecting-relays, of a plurality of selecting-circuits controlled thereby and a plurality of corresponding primary selecting-relays, one for each such circuit, a plurality of secondary selecting-circuits controlled by said primary selecting-relays, secondary selecting-relays in said secondary selecting-circuits arranged in clusters, the relays in each cluster succeeding the first connected for simultaneous operation, each such secondary selecting-relay of each cluster but the last controlling the circuits through the contacts of a plurality of relays of the next cluster, printing or operating-magnets in circuits connected to the contacts of each secondary selecting-relay, an electrically-controlled retarding-set comprising relays arranged to be operated successively, the final relay of said retarding-set operated only by long pulses, a restoring-circuit operated by the final relay of said retarding-set, said restoring-circuit passing through the selecting-relays and the primary selecting-relays, and means operated by said retarding-set before the operation of said final relay for completing a circuit through the contacts of at least one of said secondary selecting-relays to the selected printing or operating-magnet, and for operating the restoring-relay.

2. In a printing-telegraph, the combination with an electrically-controlled plurality of polar selecting-relays, of a plurality of selecting-circuits controlled thereby and a plurality of corresponding primary polar selecting-relays, one in each such circuit, said selecting and primary selecting-relays having restoring-coils, of a plurality of secondary selecting-circuits controlled by said primary selecting-relays, secondary selecting-relays in such secondary selecting-circuits arranged in geometrical progression, printing and operating-magnets controlled by said secondary selecting-relays, an electrically-controlled retarding-set comprising relays arranged to be operated successively, the final relay of said retarding-set being operated only by long pulses, a restoring-relay and a circuit therefor including the restoring-coils of the selecting and primary selecting-relays, and means operated by the retarding-set before the operation of said final relay for completing a circuit through the contacts of at least one of the secondary selecting-relays to the selected printing or operating magnet, and for operating the restoring-relay.

3. In a printing-telegraph, the combination with an electrically-controlled plurality of selecting-relays, of a plurality of selecting-circuits formed successively by the contacts of said selecting-relays, and a corresponding plurality of primary selecting-relays, one such relay in each such circuit, a plurality of secondary selecting-relays arranged in clusters corresponding to and controlled by the primary selecting-relays, the contacts of said secondary selecting-relays of each cluster succeeding the first connected to contacts of relays of the preceding cluster, printing or operating-magnets controlled by each of the secondary selecting-relays, an electrically-controlled retarding-set embracing relays arranged to be operated successively, the final relay of said retarding-set being operated only by long

pulses, and means operated by the retarding-set before the operation of said final relay for completing a circuit through the contacts of at least one of the secondary selecting-relays and the selected printing or operating-magnet, and for restoring the primary selecting-relays and the selecting-relays.

4. In a printing-telegraph, the combination with an electrically-controlled plurality of selecting-relays, of a plurality of selecting-circuits formed successively by the contacts of said selecting-relays, and a corresponding plurality of primary selecting-relays, one such relay in each such circuit, a plurality of secondary selecting-relays arranged in clusters corresponding to and controlled by the primary selecting-relays, the contacts of said secondary selecting-relays of each cluster succeeding the first connected to contacts of relays of the preceding cluster, printing or operating-magnets controlled by each of the secondary selecting-relays, an electrically-controlled retarding-set comprising relays arranged to be operated successively, the final relay of said retarding-set being operated only by long pulses, a controlling-relay for completing a circuit closed through contacts of at least one of the secondary selecting-relays, and a restoring-relay and means operated thereby for restoring the primary selecting-relays and the selecting-relays, both said controlling-relay and said restoring-relay controlled by said retarding-set.

5. In a printing-telegraph, the combination with an electrically-controlled plurality of polar selecting-relays controlling a plurality of selecting-circuits arranged for formation successively, of a corresponding plurality of primary selecting-relays each in circuit with one of said selecting-circuits, a plurality of secondary selecting-relays arranged in clusters, the relays of each cluster corresponding to and controlled by one of said primary selecting-relays, each primary selecting-relay arranged when operated by its selecting-circuit to complete a circuit through the secondary selecting-relays of the corresponding cluster, printing and operating-magnets in circuits controlled by the secondary selecting-relays, a controlling-relay and a restoring-relay, the former controlling the circuit through contacts of at least one of the secondary selecting-relays and the printing or operating-magnets, the latter controlling a restoring-circuit of the primary selecting-relays and the selecting-relays, a retarding-set comprising relays arranged for operation successively, both the controlling-relay and the restoring-relay operated at the end of the operation of said retarding-set.

6. In a printing-telegraph, the combination of an electrically-controlled plurality of polar selecting-relays, primary polar selecting-relays having separate actuating-circuits controlled by said selecting-relay circuits and having also a restoring-circuit embracing the selecting-relays, secondary selecting-relays in clusters connected in geometrical progression, each cluster of such relays operated by a circuit controlled by one of said primary selecting-relays, printing and operating-magnets controlled by the secondary selecting-relays, and a controlling-relay and a restoring-relay, both in circuits controlled by a retarding-set, said retarding-set comprising relays arranged for operation successively.

7. In a printing-telegraph, the combination with a main-line relay, a plurality of selecting-relays, an entrance-relay and two retarding-sets comprising relays arranged for operation successively and the final relays of which are operated only by relatively long pulses, the final relay of one of said retarding-sets controlling the completion of selecting-circuits formed by the contacts of said selecting-relays, said selecting-circuits arranged to be formed successively, a plurality of primary selecting-relays controlled each by one of said selecting-circuits of the selecting-relays, of secondary selecting-relays arranged in clusters corresponding each to one of said primary selecting-relays, the relays of each cluster controlled by a circuit controlled by the corresponding primary selecting-relay, printing and operating-magnets controlled by contacts of at least one of the secondary selecting-relays and also controlled in circuits operated successively by the selecting-relays, said entrance-relay cooperating with said main-line relay to control the circuits of all said relays, a controlling-relay and a restoring-relay in the other of said retarding-sets arranged for completing each a circuit, one such circuit being through the circuit selectively formed by the secondary selecting-relays to whichever of the printing or operating-magnets is selected and for restoring the entrance-relay, and the other said circuit for restoring the primary selecting-relays and the selecting-relays.

8. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having a separate printing or operating-magnet for each letter of the alphabet and for each character of the code, selecting-relays comprising relays having their contacts connected in geometrical progression for selecting and energizing the particular printing or operating-magnet corresponding to whichever letter or character is transmitted, and means arranged to be con-

trolled by a single line-circuit connecting the transmitter and receiver, controlling the action of said selecting-relays; and the said line-circuit.

9. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having a separate printing or operating-magnet for each letter of the alphabet and for each character of the code, said printing and operating-magnets arranged in geometrical progression, selecting-relays comprising relays in geometrical progression for selecting and energizing the particular printing or operating-magnet corresponding to whichever letter or character is transmitted, and means controlled by a single line-circuit connecting the transmitter and receiver, controlling the action of said selecting-relays; and the said line-circuit.

10. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having a separate printing or operating-magnet for each letter of the alphabet and for each character of the code, said printing and operating-magnets arranged in geometrical progression, an electrically-controlled plurality of selecting-relays, primary and secondary selecting-relays in branch circuits controlled by said selecting-relays and comprising relays connected in geometrical progression corresponding to said printing and operating-magnets, said relays arranged to select the particular magnet corresponding to whichever letter or character is transmitted, and means controlled by a single line-circuit for controlling said selecting-relays; and the said line-circuit.

11. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having printing and operating-magnets corresponding to the several characteristic signals, said printing and operating-magnets arranged in geometrical progression, an electrically-controlled plurality of selecting-relays, primary selecting-relays controlled by said selecting-relays, secondary selecting-relays arranged in clusters corresponding to the several primary relays, each cluster in a circuit controlled by one of said primary relays, the contacts of the secondary selecting-relays of the different clusters connected to contacts of the next succeeding cluster and to individual printing or operating-magnets, and means for operating said selecting-relays controlled by a single line-circuit connecting the transmitter and receiver; and the said line-circuit.

12. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having printing and operating-magnets corresponding to the several characteristic signals, said printing and operating-magnets arranged in geometrical progression, an electrically-controlled plurality of selecting-relays, primary selecting-relays controlled by said selecting-relays, secondary selecting-relays arranged in clusters corresponding to the several primary selecting-relays, each cluster in a circuit controlled by one of said primary selecting-relays, the contacts of the secondary selecting-relays of each cluster succeeding the first connected to contacts of relays of the preceding cluster and to individual printing or operating-magnets, a dash-completing relay controlling the circuits of the primary selecting-relays, and a main-line relay controlling the selecting-relays and the dash-completing relay; and a line-circuit connecting the transmitter and said main-line relay of the receiver.

13. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet, and other characteristic signals corresponding to each character of a code, of a receiving instrument having printing and operating-magnets corresponding to the several characteristic signals, said printing and operating-magnets arranged in geometrical progression, an electrically-controlled plurality of polar selecting-relays which control by their contacts a plurality of selecting-circuits, primary selecting-relays corresponding in number to the number of selecting-circuits and each controlled by one of said selecting-circuits, secondary selecting-relays arranged in clusters corresponding to the several primary selecting-relays, each such cluster in a circuit controlled by one of said primary relays, the contacts of the secondary selecting-relays connected to contacts of the relays of the next succeeding cluster and also connected to individual printing or operating-magnets, an electrically-controlled polar entrance-relay and a main-line relay controlling in conjunction said receiving in-

strument, a plurality of electrically-controlled retarding-sets comprising relays arranged for operation successively the final relays of which being operated only by pulses of one character, said main-line relay controlling said selecting-relays and said entrance-relay and said retarding-sets, a controlling-relay preceding the final relay of one of said retarding-sets arranged to complete a circuit through contacts of at least one of the secondary selecting-relays and through the contacts of at least one of said selecting-relays and the printing or operating-magnets selected thereby and for restoring the entrance-relay, and the final relay of said retarding-set arranged to complete a circuit for restoring the selecting-relays, the final relay of the other of said retarding-sets arranged to complete the selecting-circuits controlling the primary selecting-relays, and a line-circuit connecting said transmitter and the main-line relay of the receiver.

14. In a printing-telegraph system, the combination with a transmitter arranged to produce in a line-circuit when said transmitter is operated a characteristic signal corresponding to each letter of the alphabet and other characteristic signals corresponding to each character of a code, of a receiving instrument having printing and operating-magnets corresponding to the several characteristic signals, selecting-relays connected by their contacts for selecting and energizing the particular printing or operating-magnet corresponding to whichever letter or character is transmitted, an electrically-controlled signal device in a circuit controlled by the contacts of a relay, said relay being controlled by two selecting-circuits, an entrance-relay, a main-line relay controlling said selecting-relays and said entrance-relay, said entrance and main-line relays controlling said receiving instrument, and a line-circuit connecting said transmitter and the main-line relay of the receiver.

15. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of a main-line relay, selector mechanism controlled directly by said main-line relay, a plurality of selective circuits controlled thereby, and a plurality of selecting-relays arranged in clusters in geometrical progression controlled by said circuits, the relays of each cluster having their contacts connected to contacts of relays of the next succeeding cluster and to individual printing or operating-magnets.

16. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of a main-line relay selector mechanism controlled directly by said main-line relay, a plurality of selective circuits controlled thereby, and a plurality of selecting-relays having contacts arranged in clusters in geometrical progression, said relays controlled by said circuits and the contacts of each cluster connected to contacts of the next succeeding cluster and to individual printing or operating-magnets.

17. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of selector mechanism and a plurality of selecting-circuits controlled thereby, a plurality of selecting-relays arranged in clusters in geometrical progression controlled by said circuits, the relays of each cluster having contacts connected to contacts of relays of the next succeeding cluster and directly to printing or operating-magnets, and return circuits for said printing or operating-magnets completed through contacts controlled by said selector mechanism.

18. In a printing-telegraph, the combination with a plurality of printing and operating magnets, of selector mechanism comprising an electrically-controlled plurality of selecting-relays arranged for successive operation, a plurality of selective-circuits controlled by said selecting-relays, a plurality of secondary selective-relays arranged in clusters in geometrical progression controlled by said circuits, the relays of each cluster having contacts connected to contacts of relays of the next succeeding cluster and to printing or operating-magnets, and return circuits for said printing or operating-magnets completed through contacts controlled by relays of said selector mechanism.

19. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of selector mechanism and a plurality of selective-circuits controlled thereby, a plurality of primary selecting-relays, one such relay controlled by each such circuit, a plurality of secondary selecting-relays arranged in clusters in geometrical progression, each cluster controlled by one of said primary selecting-relays and the relays of each cluster having contacts connected to contacts of relays of the next succeeding cluster and to printing or operating-magnets, said primary selecting-relays being operated only by long pulses, and return circuits for said printing or operating-magnets completed through contacts controlled by said selector mechanism.

20. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of selector mechanism comprising an electrically-controlled plurality of selecting-relays arranged for successive operation, a main-line relay, means controlled by said main-line relay for supplying to said selecting-relays successive electrical impulses, selective circuits and apparatus coöperating with said selecting-relays for completing the selection of a printing

or operating-magnet, said selecting-relays having contacts connected to said circuits for opening the preceding relay operating circuit of the succession and closing a circuit for the next succeeding pulse.

21. In a printing-telegraph, the combination with a plurality of printing and operating-magnets, of selector mechanism comprising an electrically-controlled plurality of selecting-relays arranged in groups for successive operation, a main-line relay, means controlled by said main-line relay for supplying to said selecting-relays successive electrical pulses, selective circuits and apparatus coöperating with said selecting-relays for completing the selection of a printing or operating-magnet, the relays of each group of selecting-relays controlling the circuits controlling the relays of the next succeeding group and the relays of the groups succeeding the first group also controlling the circuits controlling the relays of their immediate preceding group.

22. In a printing telegraph, the combination with a plurality of printing and operating magnets, of selector mechanism, a plurality of selective circuits controlled thereby, a plurality of selecting-relays controlled by said circuits and having contacts arranged in clusters of increasing numbers, each cluster having contacts connected to contacts of the next succeeding cluster and to individual printing or operating-magnets, and a main-line relay having contacts controlling the circuits of said selector mechanism and said selecting-relays.

23. In a printing telegraph, the combination with a plurality of printing and operating-magnets, a plurality of selective circuits, a plurality of selecting-relays, controlled by said circuits and having contacts arranged in clusters in progression, each cluster having certain contacts connected to contacts of the next succeeding cluster and contacts connected to printing or operating magnets, and selector mechanism comprising a plurality of individual relays operable in predetermined sequence for controlling said selective circuits and through contacts of which the energizing circuit of a selected printing or operating magnet is completed.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES K. JONES.

Witnesses:
Mrs. W. I. Jochum,
Mrs. G. E. Jones.