(No Model.) 3 Sheets—Sheet 1.

C. G. BURKE.

PRINTING TELEGRAPH.

No. 306,056. Patented Oct. 7, 1884.

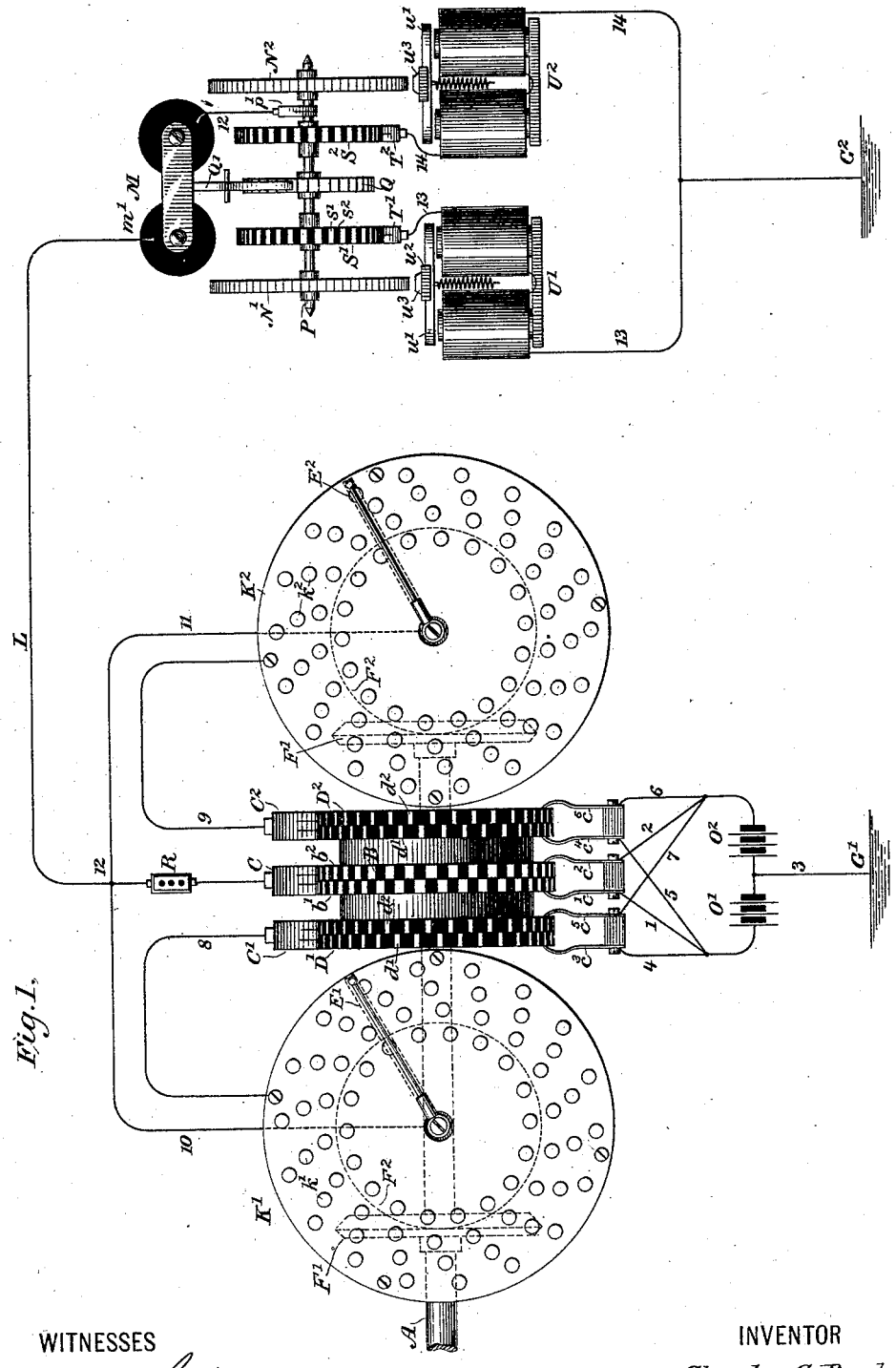

Fig. 1.

WITNESSES

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Fig. 5.

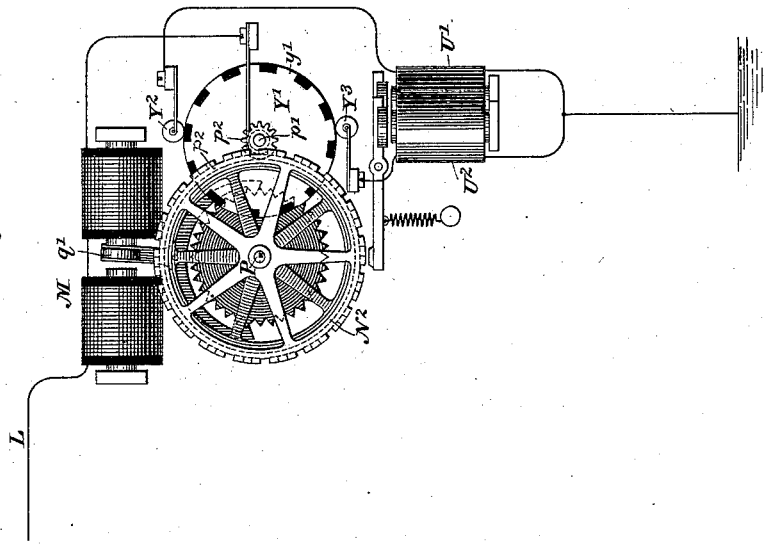

Fig. 2.

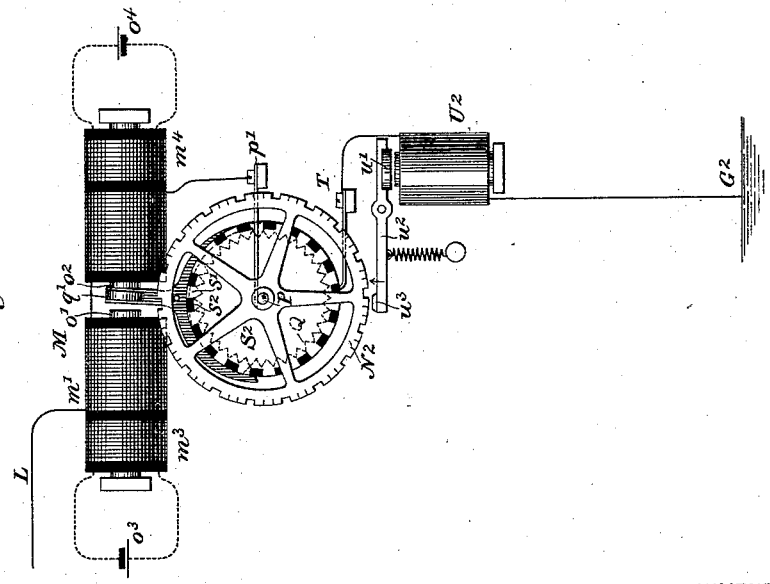

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Fig. 4.

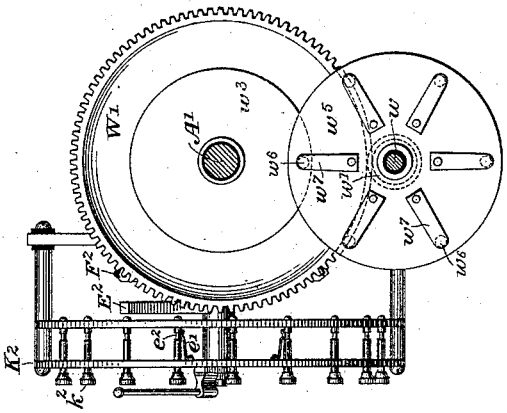
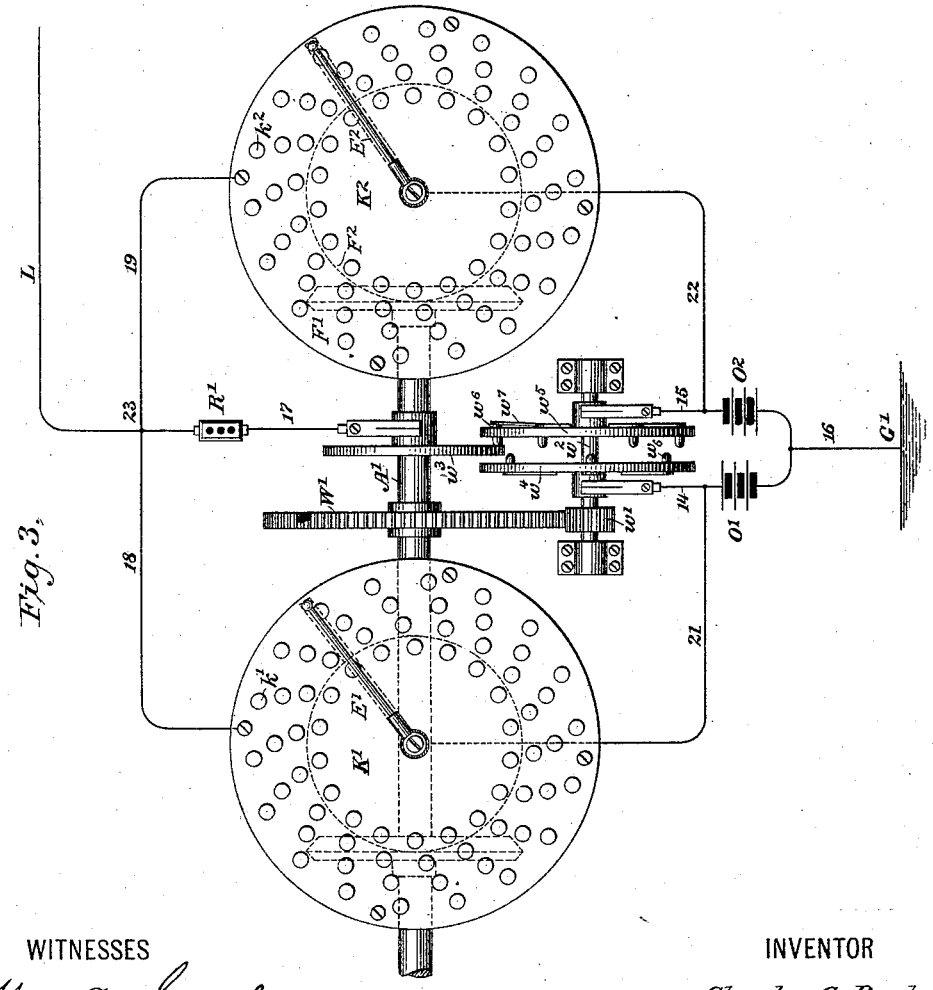


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES G. BURKE, OF RICHMOND HILL, NEW YORK.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 306,056, dated October 7, 1884.

Application filed March 18, 1884. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. BURKE, a citizen of the United States, residing at Richmond Hill, in the county of Queens and State of New York, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

The invention relates to the class of electrical apparatus which is employed for telegraphically transmitting messages or dispatches over a single main-line conductor, and obtaining a record of the same in the form of impressions of the characters constituting or embodying the messages or dispatches imprinted from one or more type-wheels; and it also relates to the method of transmitting and receiving the electrical impulses whereby the communications are conveyed.

The object of the invention is to provide means for transmitting upon a single main-line conductor electric impulses adapted to actuate the type-wheels of a printing-telegraph instrument located at a distant station, and to so organize the apparatus that impressions may be taken from either of the type-wheels at will, and in such a manner as to constitute two distinct records, the operation of transmitting and receiving two messages being carried on at the same time.

In carrying out the invention, it is preferred to construct the apparatus in substantially the following manner, and to operate the same in a manner which will be described in connection with the apparatus.

For the purpose of obtaining alternate electric currents adapted to actuate the escapement device of the receiving-instrument, a pole-changing device is employed at the transmitter, which is adapted to alternately connect the poles of two opposing batteries with the main line. The impulses thus transmitted are preferably caused to traverse an artificial resistance, which in effect, to a certain extent, diminishes their strength.

Two transmitting key-boards are employed in connection with the pole-changing device, which are adapted at the proper times to complete the connections of a shunt-circuit around the artificial resistance, provided a key of one of the key-boards be depressed. An increase in the strength of the current occasioned in this manner is employed for effecting an impression from one or the other of the receiving type-wheels, accordingly as the key employed for effecting the increase is located upon one or the other of the transmitting key-boards. It is obvious, however, that some means must be provided for causing the impulses of increased strength to be distributed between the press-magnets of the two receiving type-wheels in their proper order, so that the impulses of increased strength occasioned by depressing the keys of the respective key-boards shall be caused to traverse only the electro-magnet designed to effect an impression from the type-wheel corresponding to that key-board. To accomplish this result, means are provided for causing the circuit at the receiving-station to be completed from the main line first through one of the press-magnets and then the other for each reversal in the polarity of the current transmitted for actuating the escapement. There are also provided at the transmitting-station means for occasioning the completion of the shunt-circuit around the resistance, first by means of a key upon the key-board corresponding to the first of the type-wheels, and then by means of a key upon the second of the key-boards—that is to say, the one corresponding to the second type-wheel. In other words, for each reversal of the polarity of the currents employed for actuating the escapement the circuit will be completed independently of the resistance from the one key-board to the main line and through the corresponding press-magnet, and then from the second key-board through the main line to the second press-magnet. If, therefore, a transmitting-key upon the first board be depressed, and the circuit-connections be completed through that key-board at the moment the first-named system of circuits are connected with the main line, then an impression from a type upon the first wheel will be effected, and, likewise, if the key upon the second transmitting key-board be depressed at the moment the second system of circuits are connected with the main line, then an impression will be effected from the second type-wheel.

It is evident that by properly adjusting the circuit-closing devices of the transmitting key-

boards an impression from one type-wheel will be effected immediately after an impression has been taken from the other, and that two such succeeding impressions may be taken during the transmission of an electric current of one polarity only. For the purpose of thus insuring that the circuits shall be complete at the transmitting-station first through the one and then through the other of the two transmitting key-boards, two additional pole-changing devices may be employed, each having its conducting-segments of approximately half the width of the segments of the main pole-changing device. These additional pole-changing devices are respectively applied to the two transmitting key-boards, the contact-brushes being respectively connected with the keys, while the circuit-closing arms which are designed to revolve beneath the keys are connected with the main line around the artificial resistance. The conducting-segments of the additional pole-changing device which is applied to one of the transmitting key-boards are so connected that they will make contact with their contact-brush at the same time the corresponding segments of the main pole-changing devices make their successive contacts with their contact-brush. The contact-segments of the second additional pole-changing device are, however, so placed with respect to the contact-brush applied thereto that the contact between the same and the brush will be during the latter half of the period of contact which is made between the corresponding segments of the main pole-changing device and its brush.

The keys which are employed for completing the connections of the branch circuits around the resistance are preferably constructed so that they may be independently thrust into the path of a revolving circuit-closing arm, and they are also so constructed that this arm will, by striking against them, not only complete the circuit-connections, but, without having its movement interrupted, will return them to their normal position. It will appear, however, that it will not at any time be necessary for both circuit-closing arms to be simultaneously in contact with their respective keys. It is preferable, therefore, that the one contact-arm should be at such a distance behind the other with reference to their respective series of keys that the contact of one of the circuit-closing arms with any key may occur immediately after the other contact-arm has separated from the corresponding key upon the other key-board. In other words, while one contact-arm is passing beneath a key upon its key-board the remaining arm will be between two of the keys upon the remaining board, so that it is impossible for both arms to simultaneously make contact with any of the circuit-closing keys.

The type-wheels of the receiving-instrument are preferably similar to each other, each consisting of a large wheel bearing any desired number of characters, preferably one hundred and forty-four. These characters are preferably, moreover, arranged in a sequence, and are repeated with a frequency depending upon the order of succession and the frequency with which they are usually employed in the class of work in connection with which the instruments are designed to be employed. A single escapement is employed for conveying a step-by-step movement of these type-wheels, and this escapement is actuated by means of the alternating electric impulses transmitted by the main pole-changing device.

Upon the shaft carrying the type-wheels are carried two circuit-controlling devices, each consisting of a series of alternating conducting and non-conducting segments, in number corresponding to the number of segments employed in the main pole-changing devices of the transmitter. The contact-segments are connected with the main line, while the contact-brushes which are applied to these circuit-controlling devices are respectively connected with the coils of two press-magnets, which are respectively designed to effect impressions from the two type-wheels. These circuit-controlling devices are so applied to the shaft of the type-wheels that they will act alternately to complete the main-line connections, first through the one electro-magnet and then through the other, and they are also so organized that the moment of completion through the first electro-magnet will be at the commencement of an alternating current of the character employed for actuating the escapement, and through the second electro-magnet during the period occupied by the latter half of that same impulse, so that each incoming current of a given polarity will find its way to the earth, first through one electro-magnet and then through the other. If the strength of such a current be increased by shunting the resistance at the transmitting-station, the electro-magnet which it traverses will be vitalized, and an impression will be effected from the corresponding type-wheel. Such an impression will be effected, as has already been shown, from the particular type-wheel corresponding to the key-board through which the increase in strength was occasioned, and, the type-wheel being organized to revolve in unison with the circuit-closing arms, the particular type printed will correspond to the particular key depressed.

The escapement device employed for permitting the step-by-step movement of the type-wheels is such that the type-wheels will advance continuously during the movement of the escapement-anchor from one limit to the other of its vibration. When, therefore, an electric impulse of the character employed for actuating the same is first transmitted through the coils of the escapement-controlling electro-magnet, the type-wheels, and also the circuit-controlling devices, advance, and they continue to so advance until the armature has

completed its entire movement in a given direction.

The circuit-controlling devices are so organized that the completion of the main-line connections will be through one of the printing-magnets during the first portion of this movement, and through the second printing-magnet during the latter half of its movement. It will appear, therefore, that the impressions from at least one of the type-wheels must be effected while the type-wheels are in motion. This is, in fact, accomplished; and for the purpose of so doing without retarding the movement of the type-wheels and without blurring the impressions it is preferable to construct the platen and its supporting-lever in such a manner that its direction of motion shall be the same as that of the revolution of the type-wheels, instead of in the opposite direction.

It will be understood that characters may be printed from either type-wheel without reference to the other, and that it is not necessary that impressions should be taken from the two alternately; but either type-wheel may be printed from continuously. When records are being made by both type-wheels during the same time, this is accomplished without lessening the speed of operation of either type-wheel. For considering, for instance, that all the keys upon both transmitting-boards were depressed in succession, each printing-lever would operate to effect an impression from the corresponding type-wheel of each character upon the same in succession, and the time which must necessarily be allowed for the downward movement of each lever, after an impression has been made, will be occupied by the upward movement of the other lever, so that while impressions are being taken alternately from the two type-wheels the impressions from the second type-wheel will be taken during the time which must necessarily be consumed by the movement of the first printing-platen away from its type-wheel, and vice versa.

In the accompanying drawings, which illustrate the invention, Figure 1 is a diagram showing the general organization of apparatus and the circuits therefor. Fig. 2 is a side elevation of the receiving-instrument, and Fig. 3 is a plan view of the transmitting devices. Fig. 4 is a side elevation of a particular form of circuit-closing device, which is also shown in connection with Fig. 3. This figure also shows an elevation of the key-board, illustrating the construction of the keys. Fig. 5 is a side elevation of the type-wheel, and of a particular form of circuit-closing device for determining through which printing-magnet the circuit of the main line shall be completed.

Referring to the figures, A represents a shaft, which is mechanically revolved by any suitable means. Upon this shaft is carried a pole-changing device, B, which is provided with two insulated series of contact-segments, b' and b^2.

Against the surface of the two series of contact-segments b' and b^2, respectively, rest two contact-brushes, c' and c^2, and these brushes are respectively connected, by means of conductors 1 and 2, with the positive and negative poles, respectively, of two batteries, O' and O^2. The remaining poles of these batteries are connected with the earth at G' by means of a conductor, 3. A contact-brush, C, rests against the periphery of the pole-changing device B, and this brush makes alternate contact with the segments of the two series b' and b^2, thereby causing electric impulses of alternating polarity to be transmitted upon a main line, L, through an artificial resistance, R. These electric impulses are employed for actuating an escapement device applied to the receiving-instrument in a manner hereinafter described.

Two transmitting key-boards, K' and K^2, are respectively located near the pole-changing device B. These key-boards are respectively provided with any desired number of vertically-movable transmitting-keys k' and k^2, respectively, and these keys are preferably constructed in a manner shown in Fig. 4, so that when depressed they will remain so until caused by the contact of a circuit-closing arm, E' or E^2, to again resume their normal position. For this purpose the keys are preferably rounded at their lower extremities, and they are provided with frictional springs e', which fit into grooves e^2 when the keys are in their normal position. When, however, the keys are pressed downward, the grooves are moved from beneath the ends of the springs, and the springs rest against the surfaces of the keys. The circuit-closing arms E, however, by striking against the extremity of any depressed key, k, will raise the same without arresting the motion of the arm.

The circuit-closing arms are actuated and moved in unison with the shaft A and pole-changing device B by systems of gearing F' and F^2. The parts are so adjusted that for each revolution of the pole-changing device B each of the arms E' and E^2 will also complete a revolution beneath the keys k. The number of keys upon each board is equal to the entire number of contact-segments b' and b^2 of the circuit-changing devices B.

The keys and the corresponding circuit-closing arms E are designed to cause an increase in the strength of current normally transmitted to line whenever it is desired to print a letter from the corresponding type-wheel of the receiving-instrument For this purpose two additional pole-changing devices, D' and D^2, are applied to the shaft A, and they revolve in unison with the pole-changing device B.

The devices D' and D^2 are constructed with contact segments d' and d^2, which respectively correspond to but are of less width than the corresponding segments, b' and b^2, of the pole-changer B. The segments d' and d^2 of the de-

vice D′ are, moreover, so located with reference to the contact-brush C′, which is applied thereto, that they will make contact with that brush at the moment the corresponding segment, b' or b^2, of the device B makes contact with its brush C. Since, however, the segments d' and d^2 are of less width than the contact-segments b' and b^2, any particular segment d' will have passed from beneath its brush C′ when only a portion, preferably one-half, of the corresponding contact, b', has passed its contact-brush C.

The contact-segments d' and d^2 of the pole-changing device D^2 are so located with reference to the contact-brush C^2 applied thereto that that will be brought into contact therewith at the moment the corresponding segments d' and d^2 of the pole-changing device D′ pass out of contact with the corresponding brush, C′. In other words, the parts are so adjusted that during the first half of the contact of any segment b with the brush C a corresponding segment, d, of the device D′ will be in contact with its brush C′, and during the latter half of the contact of the brush C with the segment b the corresponding contact-segment d of the pole-changing device D^2 will be in contact with the contact-brush C^2, so that there will be for each alternate contact of the brush C two alternating contacts of the brushes C′ and C^2.

The series of contact-segments d' are connected with the positive pole of the battery O′ by means of two contact-brushes, c^3 and c^4, and the conductors 4 and 5, while the segments d^2 are connected by means of the brushes c^5 and c^6 and conductors 6 and 7 with the negative pole of the battery O^2. The contact-brushes C′ and C^2 are respectively connected, through conductors 8 and 9, with the series of keys k, carried by the two transmitting key-boards K′ and K^2. The contact-arms E′ and E^2 of these two key-boards are respectively connected, through conductors 10 and 11, with the main line L at a point, 12, beyond the resistance R. Two open branch circuits are thus formed around the resistance R. Either of these circuits may be completed by means of a key, k, being depressed at the proper moment. When such a circuit is completed, an increase in the strength of the current reaching the main line L will be occasioned by reason of the shunting of the resistance R, and, as has already been shown, the circuit which is thus completed will be from the same battery as that which is connected with the main line at the same time through the pole-changing device B. It will also be understood that the increase in the strength thus occasioned by the depression of any particular key will continue for one-half the time occupied by the impulse itself, and it will occur during the first or the last half of the impulse, accordingly as it is occasioned by a key upon the board K′ or the board K^2.

The only remaining point which it is necessary to observe with reference to the transmitting key-boards is that the positions of the arms E′ and E^2 with reference to the keys k' and k^2, respectively, are such that when the arm E′ is passing beneath any one of the keys of the board K′ the arm E^2 is passing across the space intervening between two keys k^2 of the board K^2, so that whatever keys upon either of the boards be depressed both arms will not simultaneously make contact with any of these keys. Each arm, however, will be in a position to make such contact at the moment the connections of the corresponding branch circuit are completed therewith by means of the corresponding pole-changing device, D′ or D^2.

It will be found convenient to arrange the transmitting-keys in the manner illustrated in Fig. 1—that is to say, in curved radial lines or series, each series containing any convenient number—say four keys. The number of keys in each board is preferably equal to the number of type or corresponding characters carried upon the corresponding type-wheel, and they are for convenience arranged in an order of succession which, in practice, is found best suited to secure the greatest speed in operating—that is to say, the letters which are found to succeed each other most frequently in the class of work to which it is designed to apply the instrument are made to succeed each other in the transmitter and upon the type-wheel, and each letter is repeated a number of times proportionate to the frequency of its use. The distances between the radial lines which pass through the centers of the respective keys of each board are preferably equal, so that the time occupied by the circuit-closing arm in passing from one key to the next is the same through the board, and, as already stated, the circuit-closing arms are preferably so arranged that when one of the same is passing beneath any given key, the other circuit-closing arm is midway between two of the keys on its board.

The receiving-instrument is provided with two type-wheels, N′ and N^2, respectively, corresponding with the key-boards K′ and K^2. These wheels are mounted upon a shaft, P, which may be propelled by a spring or weight, or in any other suitable manner. Upon the shaft P is placed a star-wheel, Q. The movements of the star-wheel, and thus of the shaft P, are controlled by means of an anchor-escapement, Q′, and an electro-magnet, M, which is provided with an armature, q', capable of being vibrated by means of alternating electric impulses transmitted by the pole-changing device B.

The electro-magnet M is constructed with a set of coils, m', which are wound in the manner usually adopted for producing magnetism of opposite polarity in the confronting poles of the cores o' and o^2. The conductor L leads to one terminal of the coils m' of the electro-magnet M, and the remaining terminal of these coils

is connected with the shaft P through a brush, p', resting thereon. Each set of cores o' and o^2 is, however, preferably provided with additional coils m^3 and m^4, respectively, which are connected with the opposite poles of corresponding local batteries, o^3 and o^4, respectively. The currents from these batteries normally induce in the cores a given amount of magnetism, and the currents from the main line tend to increase the strength of the magnetism induced in one set of cores, o', and to decrease or neutralize the amount in the opposite cores, o^2, or vice versa, accordingly as the currents are of one polarity or the other. There will therefore be an excess of attraction exerted upon the armature q' by one set or the other of the cores, accordingly as the current from the main line is in one direction or the other, and this excess will cause the soft-iron armature to vibrate in a manner well understood. The movements of the armature thus occasioned permit a step-by-step movement of the type-wheels; but owing to the construction of the teeth of the scape-wheel and the pallets of the escapement-anchor, the movements of the type-wheel shaft will be continuous during the movement of the escapement-armature from one extremity to the other of its vibration.

Upon the shaft P are carried two circuit-controlling devices, S, each consisting of a series of contact-segments, s', which alternate with intervening non-conducting segments s^2. The segments s' are of such a length that they will be in contact with a corresponding brush, T' or T², during the revolution of the type-wheel, through a period corresponding to the time during which a corresponding contact-segment, d', of both D' and D² of the transmitting-instrument is in contact with its contact-brush. The brushes are, moreover, so applied to the circuit-controlling devices S' and S², respectively, that contact will be made through one and then through the other, but at no time with both simultaneously. The brushes T' and T² are respectively connected with the earth through conductors 13 and 14, in which are included two electro-magnets, U' and U², respectively. The circuit will therefore be completed during the revolution of the type-wheel shaft, first through one and then through the other of the electro-magnets U' and U², and the times during which such completion occurs are made to correspond to the times when the connections of the branch circuits of the transmitter are completed by the devices D' and D² with the key-boards K' and K², respectively. If any key upon the board K' be depressed, the moment the circuit-closing arm E' strikes that key the connections of the battery O' or O², which may be connected with the main line through the device B, will be completed around the resistance R and at the receiving-station through the shaft P, segment s', brush T', and electro-magnet U', and an impression will be taken from the type-wheel corresponding to the key which is depressed, it being assumed that the devices have been so placed that the position of the circuit-closing arm with reference to the keys of its key-board correspond to the position of the type upon the type-wheel with reference to the printing-platen. In like manner any key upon the key-board K² may be employed for effecting an impression of a character corresponding thereto from the type-wheel N².

The electro-magnets U' and U² are designed to respond only to electric impulses of increased strength, such as are occasioned by shunting the resistance R, and they will therefore act to effect impressions only when a transmitting-key has been struck by the corresponding arm, E.

It may here be observed that in order to occasion the desired movement of the circuit-controllers S' and S², for the purpose of placing the two electro-magnets U' and U² successively in circuit during each impulse of alternating polarity, it is not only necessary that the type-wheel shaft should be moved, but, unless other special means are provided, it will be also necessary that the type-wheels themselves shall change their position during the continuance of each electric impulse.

In practice it is desirable to so construct the apparatus that the type-wheel N' will be in position to print when the armature q' is in a position about midway between the confronting cores o' and o^2, while the type-wheel N² will be in position to print when the armature is adjacent to either of the cores o' or o^2. It will, moreover, appear that the impression must be taken while the type-wheel is in motion. This may be readily accomplished, especially from a wheel of the diameter which it is proposed to employ in this instrument—namely, about four and one-quarter inches—without difficulty. The armatures u' of the electro-magnets U' and U² are carried upon levers u^2, and these levers carry the printing-platen u^3. When either electro-magnet U is vitalized, the corresponding platen will be moved in the direction indicated by the arrow, and the direction of the curve which it describes will be in the same direction as the direction of revolution of the wheel. By reason of this construction no material retardation of the wheel will be occasioned, but, on the contrary, an accelerating force will be applied thereto. Since, however, it is necessary that the type-wheel N² shall be in a position more advanced than that in which it is when an impression is taken from the type-wheel N', it will be necessary to place the printing-platen u^3, which is applied to the type-wheel N², in a position correspondingly advanced, so that it may strike the type.

In practice it may be found desirable under some circumstances to dispense with the pole-changing devices D' and D², and to rely merely upon the contact of the arms E with the respective keys k for obtaining an increase in the strength of current of the required duration when it is desired to print. In practice

the duration of the increase of the strength of the current thus obtained would be sufficiently short to effect the same results as are insured by the use of the pole-changing devices D, it being understood that the circuit-closing arms act to force the keys upward out of their path automatically, thereby breaking contact without interrupting the movement of the arm.

Referring now to Figs. 3 and 4, a description will be given of a particular form of circuit-closer which is sometimes employed in connection with the transmitting-instrument.

Upon the shaft A′ is carried a toothed wheel, W′, which gears with a pinion, w', carried upon a suitable arbor, w^2. A contact-disk, w^3, is also carried upon the shaft A′, and against the opposite surfaces of the same rest two insulated contact-disks, w^4 and w^5, respectively. Each of these disks is provided with a series of contact-pins, w^6, projecting from the surface toward the intervening disk, w^3. Upon the revolution of the shaft A′ the disks w^4 and w^5 are also caused to revolve, and the pins w^6 are successively placed in connection with the disk w^3. The relative rates of revolution of the two disks depend upon the relative sizes of the wheel W′ and pinion w'. When seventy-two keys are employed, it is preferable to cause the disks w^4 and w^5 to complete six revolutions for each revolution of the disk w^3. There should then be six contact-pins w^6 upon each of the disks w^4 and w^5, so that for every revolution of the shaft A′ there will be seventy-two contacts made with the disk w^3. The positions of the contact-pins w^6 upon the disk w^4 alternate with those of the pins upon the disk w^5, and the positions of the disks w^4 and w^5 with reference to the intervening disk w^3 are such that only one pin is in contact with the disk w^3 at any time. The positive and negative poles of two batteries, O′ and O^2, are respectively connected with the disks w^4 and w^5, and by means of conductors 14 and 15 the remaining poles of those batteries are connected with the earth at G′ by means of a conductor, 16. The disk w^3 is connected by a conductor, 17, including the resistance R′, with the main line L, and alternating electric impulses are thus transmitted to line in the same manner as described with reference to the pole-changing device B.

For the purpose of completing the shunt-connections around the resistance R′ when it is desired to print, the keys k' are connected by means of conductors 18 and 19, respectively, with the main line L at a point, 23, beyond the resistance R′, while the circuit-closing arms E′ and E^2 are connected through conductors 21 and 22, respectively, with the conductors 14 and 15. The conductors 21 and 22 may, however, if desired, lead directly to the conductor 17. The contact of either of the arms with a key will cause the impulse being transmitted to line to be increased in strength by reason of the shunting of the resistance R′ in the manner already described. The additional pole-changing devices D′ and D^2 are in this instance dispensed with, and the contacts of the arms with the keys are relied upon for determining the length of the increase in strength of the impulses, as already described.

The advantages secured by this construction of pole-changing device consists, especially, in the long surface-contact secured between the disk w^3 and the points w^6. The pins w^6 may, if desired, be mounted upon yielding springs w^7, for the purpose of permitting them to yield slightly when brought in contact with the disk w^3.

A form of circuit-controlling device which it may be found convenient to employ at the receiving-station consists of a disk, Y′, carried upon an arbor, p', which is connected through a system of gearing, p^2, with the shaft P. This disk is provided with a series of contact-segments, y', which are sufficient in number to afford seventy-two contacts with each of two contact-rollers. Y^2 and Y^3, for each revolution of the shaft P. Two contact brushes or rollers, Y^2 and Y^3, are respectively connected, through the electro-magnets U′ and U^2, in the manner described with reference to Fig. 1. These brushes are so located that the one is brought into contact with a conducting-segment or contact-point at the moment a corresponding segment is carried out of contact with the other brush.

The operation of this pole-changing device is in other respects similar to that described in connection with Fig. 1.

In the foregoing description the number of type carried by the type-wheel, as also the number of keys in each key-board, has been referred to as seventy-two, and the other related parts have been described as adapted thereto; but the employment of one hundred and forty-four keys upon each key-board and the same number of type upon each type-wheel, or in fact any desired number, is contemplated.

Any suitable form of unison device may be employed for securing synchronism between the transmitting and receiving instruments.

It is evident that any desired number of instruments may be placed in circuit. For instance, the conductor leading to the earth at G^2 in Fig. 1 might be led to and through another instrument, which would operate in the same manner as that described.

In another application for Letters Patent filed by me April 18, 1884, Serial No. 127,065, and entitled "improvement in multiplex telegraphs," I have shown and described certain organizations of apparatus which in some particulars resemble the devices, apparatus, and method of operating the same shown and described in this present application, and I do not therefore herein claim anything shown, described, and specifically claimed in the said other application and not specifically claimed herein.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a series of transmitting-instruments, a series of receiving-instruments, a device adapted to transmit alternating electric currents to said receiving-instruments, and a circuit-changing device actuated by said alternating currents, and adapted to complete the connections of said main line successively through each of said receiving-instruments during the transmission of each of said alternating currents.

2. The combination, substantially as hereinbefore set forth, of a telegraph main line, two transmitting devices, two receiving-instruments, means for placing said transmitting devices alternately in connection with one terminal of said main line, a pole-changing device transmitting an electric impulse for each repetition of the said connections, two type-wheels actuated by said impulses, two press-magnets respectively applied to said type-wheels, and means, substantially such as described, for completing the connections of said main line through the coils of said electro-magnets successively during each of said impulses.

3. The combination, substantially as hereinbefore set forth, of a telegraphic main line, means, substantially such as described, for transmitting electric impulses of alternating polarity upon said main line, two transmitting-instruments alternately connected with said main line, which instruments, when actuated, serve to vary the strength of the impulse being transmitted during a portion of its continuance, and two receiving-instruments, which are respectively alternately connected with the remaining terminal of said main line during the continuance of each alternating impulse.

4. The combination, substantially as hereinbefore set forth, of a main line, means, substantially such as described, for transmitting alternating electric impulses thereto, means, substantially such as described, for varying the strength of different portions of each of said impulses, and two or more receiving-instruments respectively actuated by such variations.

5. The combination, substantially as hereinbefore set forth, of a main line, a pole-changing device for transmitting alternating electric impulses upon said main line, two revolving circuit-closing arms, two key-boards, to which said circuit-closing arms are respectively applied, means, substantially such as described, for causing the keys of either of said boards to occasion a variation in the strength of the impulse being transmitted to line when they are placed in the path of the corresponding circuit-closing arm, and two receiving-instruments respectively adapted to respond to the variation of current caused by the two key-boards.

6. The combination, substantially as hereinbefore set forth, of a main line, a pole-changing device adapted to transmit electric impulses of alternating polarity upon said main line, two transmitting key-boards, two supplementary pole-changing devices respectively adapted to place said key-boards successively in circuit with the said main line during the transmission of each of said impulses, and means, substantially such as described, for continuing the connections thus formed from either key-board to one or more batteries.

7. The combination, substantially as hereinbefore set forth, of a main line, a pole-changing device adapted to transmit alternating electric impulses to said main line, an artificial resistance, through which said impulses are transmitted, two shunt-circuits around said resistance, and means, substantially such as described, for completing the connections of either or of both of said shunt-circuits at will during the transmission of any one of said alternating electric impulses.

8. The combination, substantially as hereinbefore set forth, of a main line, a battery, a pole-changing device adapted to transmit alternating electric impulses from said battery upon said main line, an artificial resistance through which said impulses are transmitted, two open branch circuits extending from said battery around said resistance, means, substantially such as described, for completing the connections of each of said branch circuits successively during the transmission of any one of said alternating electric impulses.

9. The combination, substantially as hereinbefore set forth, with a telegraphic main line, means for transmitting alternating electric impulses of a given strength upon said main line, and means, substantially such as described, for varying the strength of different portions of each of said impulses, of two or more receiving electro-magnets, an escapement device serving to place said instruments in circuit with said main line successively during the transmission of a single of said impulses.

10. The combination, substantially as hereinbefore set forth, with a telegraphic main line, means, substantially such as described, for transmitting alternating electric impulses upon said main line, and for varying the strength of different portions of each of said impulses, of two receiving electro-magnets, two type-wheels to which said magnets are respectively applied, an escapement device actuated by said alternating impulses, and a circuit-controlling device operating to connect said main line through one or the other of said electro-magnets during the transmission of each of said impulses.

11. The combination, substantially as hereinbefore set forth, of two electro-magnets, two printing-platens actuated by said electro-magnets, two type-wheels to which said printing-platens are respectively applied, an escapement device for said type-wheels, and a circuit-controlling device serving to complete a circuit-connection through each of said elec-

tro-magnets in succession during the movement of said escapement device in one direction.

12. The combination, substantially as hereinbefore set forth, of a main line, means, substantially such as described, for transmitting alternating electric impulses upon said line, an escapement device actuated by said impulses, two type-wheels, two electro-magnets for respectively effecting impressions from said type-wheels, a circuit-controlling device actuated by said escapement device, and serving to complete the connections of said main line through each of said electro-magnets in turn during the transmission of a single electric impulse.

13. The combination, substantially as hereinbefore set forth, with an escapement device, electro-magnets for actuating the same, means, substantially such as described, for transmitting electric impulses through the coils of said electro-magnets, thereby actuating said escapement device, two type-wheels, two electro-magnets for effecting impressions therefrom, which electro-magnets are adjusted not to respond to the impulses normally employed for actuating said escapement device, and means, substantially such as described, for completing the circuit-connections from said escapement-magnets to said type-wheel magnets successively during the transmission of a single impulse, and means, substantially such as described, for varying the strength of a portion of said impulse when it is traversing the coils of either of said type-wheel magnets.

14. The combination, substantially as hereinbefore set forth, of a telegraphic main line, two transmitting key-boards, means for placing the same alternately in connection with said main line, two type-wheels, and means, substantially such as described, for actuating them, two electro-magnets for effecting impressions from said type-wheels, respectively, and means, substantially such as described, for completing the connections of said main line through the coils of said electro-magnets alternately and simultaneously with said transmitting key-boards.

15. The combination, substantially as hereinbefore set forth, of a telegraphic main line, two revolving circuit-closing arms connected therewith, two series of keys respectively applied to said circuit-closing arms, and adapted to complete circuit-connections with said main line, a pole-changing device consisting of a contact-plate moving with said arms, two contact-disks revolving upon opposite sides of said plate, and a series of contact-points carried upon each of said disks, which contact-points are alternately placed in connection with said contact-plate.

16. The combination, substantially as hereinbefore set forth, of one or more revolving circuit-closing arms, a series of keys applied to each of said circuit-closing arms, a pole-changing device consisting of a contact-plate revolving with said arm or arms and two insulated series of yielding contact-points revolving upon opposite sides of said plate, which contact-points are alternately placed in connection with said contact-plate.

17. The combination, substantially as hereinbefore set forth, with a revolving circuit-closing arm and a series of transmitting-keys to which said arm is applied, of a pole-changing device consisting of a contact-plate revolving with said arm and two series of contact-points, which series are revolved at a greater rapidity than said contact-plate, and which are caused to make alternate contact with the opposite sides of the same, substantially as described.

18. The combination, substantially as hereinbefore set forth, of an escapement device, a type-wheel shaft, two type-wheels moving with said escapement device, two electro-magnets for effecting impressions from said type-wheels, and a circuit-controlling device for completing the connections of an electric circuit alternately through said electro-magnets, which device consists of a segmental wheel connected with and revolving at a greater rapidity than said shaft, and two contact-rollers, which are respectively connected with the coils of said electro-magnets.

In testimony whereof I have hereunto subscribed my name this 13th day of March, A. D. 1884.

CHARLES G. BURKE.

Witnesses:
DANL. W. EDGECOMB,
CHARLES A. TERRY.