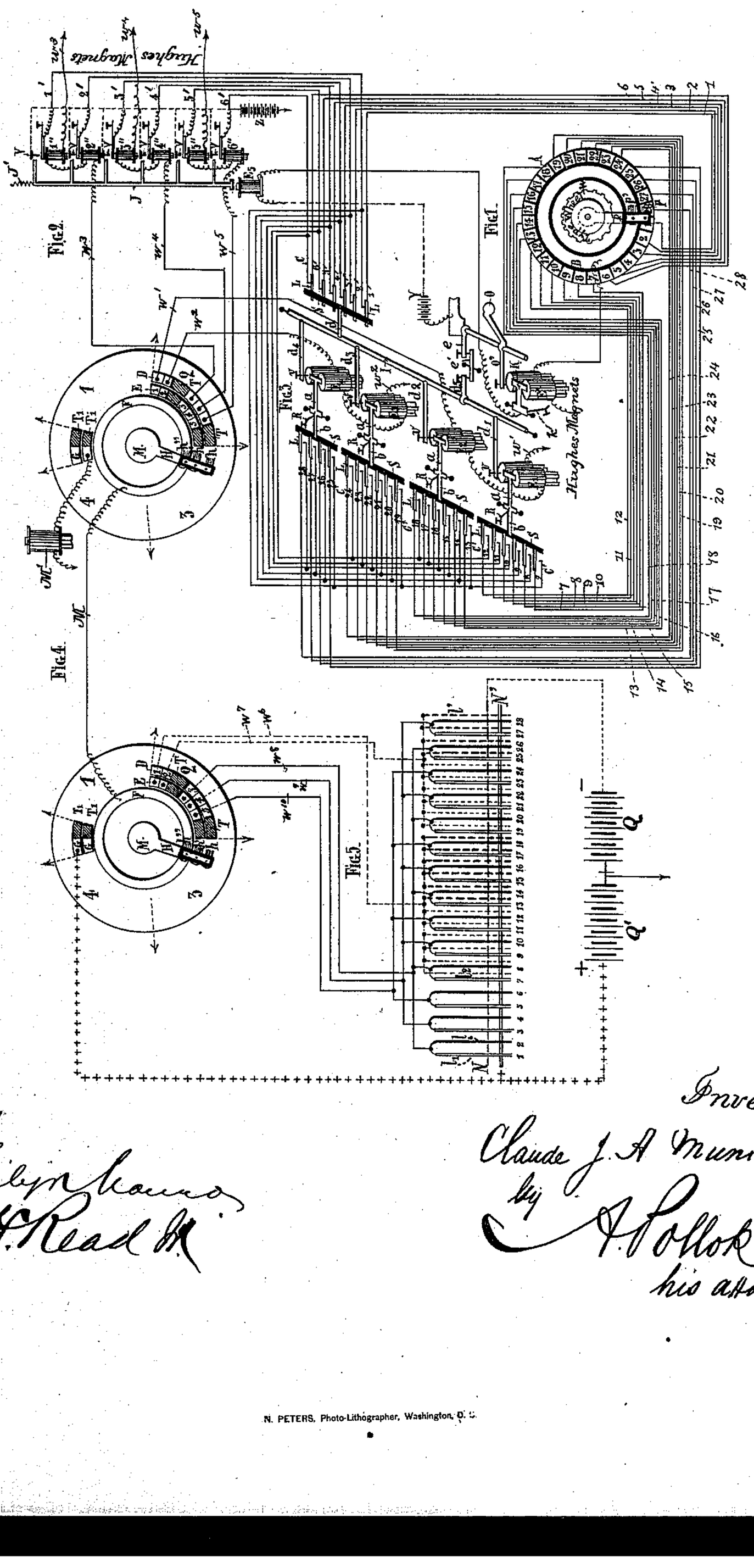
(No Model.) 2 Sheets—Sheet 1.

C. J. A. MUNIER.

PRINTING TELEGRAPH SYSTEM.

No. 402,099. Patented Apr. 23, 1889.



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(No Model.) 2 Sheets—Sheet 2.

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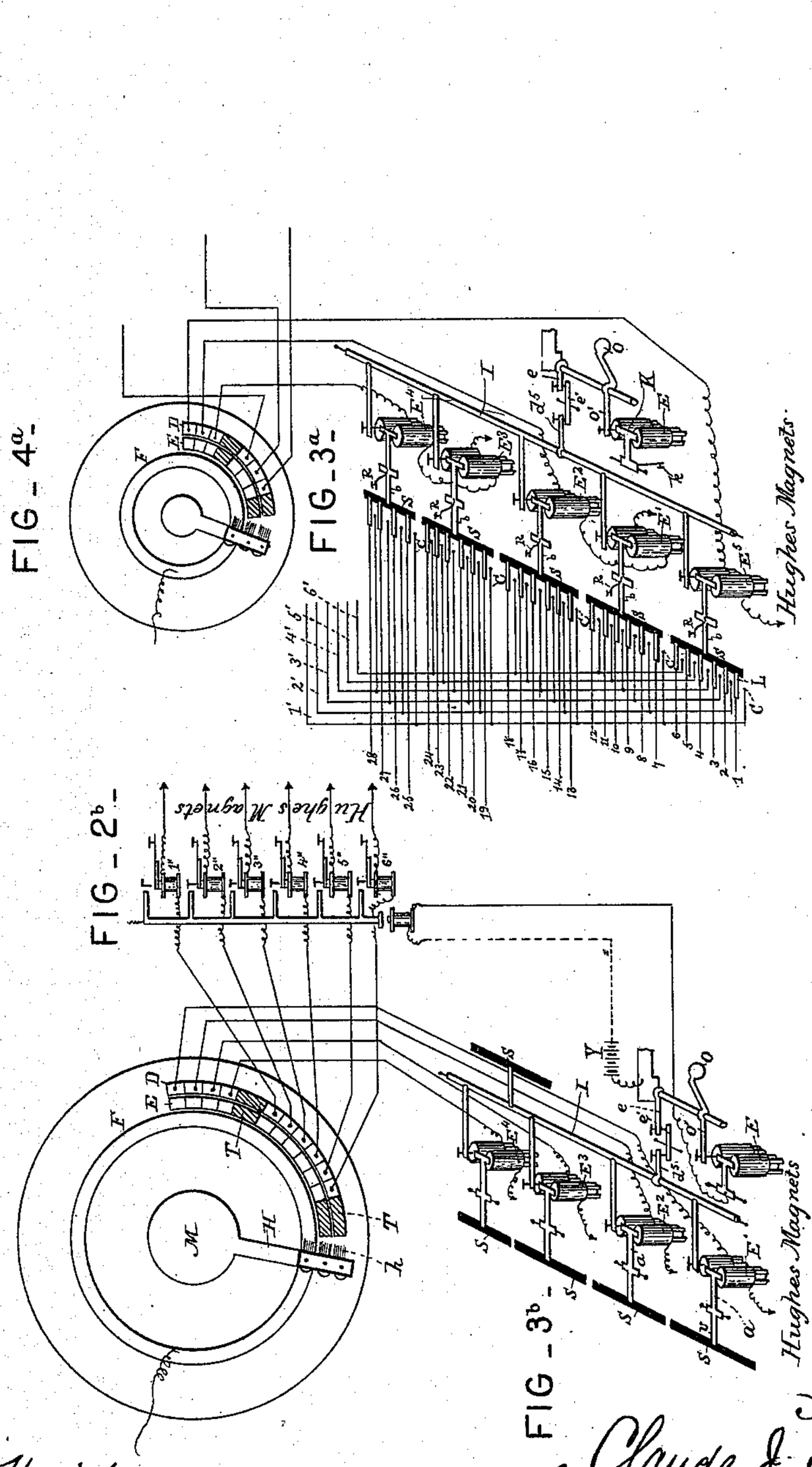

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UNITED STATES PATENT OFFICE.

CLAUDE JOSEPH AUGUSTIN MUNIER, OF PARIS, FRANCE.

PRINTING-TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 402,099, dated April 23, 1889.

Application filed October 27, 1888. Serial No. 289,352. (No model.) Patented in France March 9, 1888, No. 189,254.

To all whom it may concern:

Be it known that I, CLAUDE JOSEPH AUGUSTIN MUNIER, a citizen of the Republic of France, and a resident of Paris, in the said Republic, have invented a new and useful Multiple-Printing Telegraph System, (which has been patented in France by Letters Patent dated March 9, 1888, No. 169,254,) of which the following specification is a full, clear, and exact description.

This invention relates to a new system for telegraphing by printing-instrument—such, for example, as that of Hughes—and the new appliances used therein. It enables several printers to be operated over the same wire.

In the ordinary Hughes system there are at the two stations traveling contact-makers, which revolve synchronously past as many contacts as there are characters to be printed, and by which a circuit is completed through the appropriate contact, in order to send a current for printing at the proper time.

According to the present invention synchronously traveling or revolving contact-makers are also employed; but only a comparatively small number of contacts are used—five being sufficient for printing the twenty-eight characters of the Hughes instrument, but the number being variable according to circumstances. By repeating the series of contacts as many times as there are instruments to be used on the line the traveling contact-makers sweep over them successively, and many messages may be printed over the same wire during the same time, each with reasonable rapidity. The system may be used to give impression in stylographic, stenographic, or typographic characters of the letters, figures, and signs utilized generally in telegraphy. It requires but a single line-wire, and, at most, only two currents, for any character, whatever may be the duration of these currents, and by a special arrangement of key-board is adapted to print any character at the receiving-station by touching a single key of the transmitting-instrument.

In the accompanying drawings a complete diagram of the system is represented in Figures 1 to 5, Fig. 1 illustrating the collector of the receiving-instrument; Fig. 2, the receiving-relays; Fig. 3, the electro-magnetic multiple-circuit controllers for the receiver; Fig. 4, the distributers; Fig. 5, the transmitter. Figs. 3^a and 4^a represent modified arrangements of the multiple-circuit controllers and the distributer; and Figs. 2^b, 3^b, and 4^b modified circuit-connections for the relays and multiple-circuit controllers and a modified arrangement of the distributer for use therewith.

The collector.—This instrument, Fig. 1, receives the currents from the wires 1, 2, 3, &c., up to 28, (hereinafter termed "sub-branches,") terminating in contacts similarly numbered, by means of a rotating arm, P, carrying the brushes p p', insulated from the arm, but electrically connected with each other, the brush p rubbing over the contacts 1 to 28, which, insulated from each other, make up the ring A, and the brush p' over the solid ring B, which is electrically connected with the magnet E* of, say, a Hughes printer. The rotating arm P thus connects the magnet E* successively in circuit with branches 1 to 28. The type-wheel W of the printer rotates synchronously with the traveling contact-maker or arm P and brushes p p', and has a character for each of the contacts 1 to 28, which is brought into position to print when the brush p touches the corresponding contact. The armature K operates the lever O O′ by the said armature flying up under the influence of its retractile spring k and striking the set-screw in the arm O′ of said lever, so as to effect the printing in the usual manner, when a current passes through the magnet E* and causes it to release the armature K.

The relays.—Of these there are six, marked from 1″ to 6″, inclusive, their circuit-changers being formed by movable armatures connected with branches 1′ to 6′ of the circuit of a printing-battery or electrical generator, Z, and contacts V, and is closed at the points V by the proper movement of the armature, which movement, as shown, is away from the magnet. The relay-armatures are such that they remain in the position to which they are moved until a new force is applied. By using magnets and armatures of the well-known Hughes type, as indicated in the drawings, the desired action is secured. When a proper current passes through the coils of any of the relay-magnets, the armature flies back and closes the corresponding branch circuit. It

(or all that have been released) is returned by the rod J, which has a lateral arm over each armature, and which is drawn down by the electro-magnet E^5 and retracted by the spring J′ when released from the attraction. The magnet E^5 is in the local circuit of battery Y, through the lever O O′ and armature K, so as to be energized when the armature K is released to print a character. The branches 1′ to 6′ are each subdivided into the sub-branches, namely—the branch 1′ into the sub-branches 1, 7, 13, 19, and 25; the branch 2′ into the sub-branches 2, 8, 14, 20, and 26; the branch 3′ into the sub-branches 3, 9, 15, 21, 27, and so on for the other branches, the branches 5′ and 6′ being, however, divided into only four sub-branches, because there are only twenty-eight of these, as shown.

The multiple-circuit controllers.—In each of the sub-branches 1 to 28 is a circuit-changer composed, as shown, of a spring-plate, L, and a contact, C, and these circuit-changers are arranged in groups of six (except the last group, which has four only) in such a way that each group contains the consecutively-numbered sub-branches. Each group of circuit-changers is opened and closed together by a bar, S, of insulating material, which extends over all the spring-plates L of the first group and under all the spring-plates of the other groups, so as to press them away from their contacts C, or allow them to press thereon, only a slight movement of the plates L being necessary, so that the change from open to closed is quickly effected. When the circuit is closed through the circuit-changers L C of any group, then the branches 1′ to 6′ are connected through the sub-branches of that group to the corresponding terminals or contacts of the ring A. If then the sub-branches 1 to 6 are closed, the others being open, which is the condition illustrated in the drawings, the operation of any of the relays—say the relay 5″—will close the circuit of battery Z through the branch 5′ and sub-branch 5, and so soon as the brush *p* rubs on the corresponding contact 5 in ring A a current will pass into the magnet E* and cause an impression of the corresponding character on the type-wheel W. If the sub-branches 7 to 12 are closed, the others being open, the operation of relay 5″ will close the circuit of battery Z through the branch 5′ and sub-branch 11, so that a different character would be printed, and so on for the different groups. In other words, each multiple-circuit controller, composed of a bar, S, and its group of circuit-changers L C, completes the group of branches 1′ to 6′ through one or another group of the several groups of sub-branches 1 to 6, 7 to 12, 13 to 18, 19 to 25, 26 to 28, (the latter group corresponding of course only to the branches 1′ to 4′,) so that by completing the branches through the proper group of sub-branches and operating the appropriate relay the current from battery Z can be sent to any desired contact in the ring A and any character on the type-wheel W be printed.

The multiple-circuit controllers are operated by electro-magnets, of which there might be one to each group of sub-branches, E^5 E′ E^2 E^3 E^4, as shown in Fig. 3ª, but of which four only, E′ E^2 E^3 E^4, are employed in the arrangement shown in Fig. 3. Each of these magnets has its armature fixed to a lever, *a b*, by which the appropriate bar S is operated. As indicated on the drawings, the magnets are of the Hughes type, the armature being normally attracted by a permanent magnet and released by the passage of the current through the coils on soft-iron pole-pieces, so that the spring R may retract the armature, depress the bar S, and allow the group of spring-plates L to make contact at C and close the sub-branches.

In Fig. 3ª the bar S for the first group of sub-branches is carried by the armature of the electro-magnet E^5, and operates the same as the bar S for the other groups; but in Fig. 3 the spring-plates L of the first group of sub-branches, 1 to 6, normally press against their contacts C, so as to close said sub-branches, and consequently, if it is wished to print any one of the first six characters, it is sufficient to operate the appropriate relay, 1″ to 6″. The bar S of the first group is in Fig. 3 carried by an arm, *d*, of a rock-shaft, I, which has arms *d d′ d² d³ d⁴*, provided with adjusting-screws *v*, over the armatures of the magnets E^1 E^2 E^3 E^4, respectively, so that when any of these armatures is released the spring R not only lifts the armature and closes the corresponding group of sub-branches, but also turns the rock-shaft I, depressing the bar S of the first group and opening sub-branches 1 to 6. The rock-shaft I also has an arm, d^5, which is acted upon by the lever O O′, through the arm *e* and lever *e′*, whenever a character is printed, so as to restore the bars S and armatures *a b* to their normal positions.

The distributers.—These are each composed of a rotating arm, H, which carries brushes *h h′ h″*, insulated from the arm H, but electrically connected with one another, the brush *h″* passing over the solid ring F, which is connected to line M, the brush *h′*, over the sector E, which is divided into a number of contacts insulated from each other, and the brush *h* over the sector D, which is similarly divided. The sectors E and D are repeated as many times as there are transmitting and receiving instruments to be served. Only one pair of sectors is shown, and one transmitting and receiving instrument; but the positions for three additional pairs of sectors are indicated on the distributer-dial. They would be connected with the transmitting and receiving instruments, the same as the sectors shown. The brushes *h h′* also rub over the contacts G T, whose purpose will be explained below. The contacts of the outer sector, D, are connected, part of them with the

electro-magnets E^1 E^2 E^3 E^4 of the multiple-circuit controllers, (or in Figs 3^a and 4^a with the electro-magnets E^5 E^1 E^2 E^3 E^4,) and part of them with the relays 1″ to 6″. The contacts which are connected with the magnets of the multiple-circuit controllers are placed in advance of those connected with the relays, so that the multiple-circuit-controller magnets are first connected in succession to line, and afterward the relay-magnets. It is evident that there might be a separate contact for each of the relay and multiple-controller magnets, as shown in Figs. 2^b, 3^b, and 4^b; but by the use of polarized magnets and transmitting-currents of both polarities it is possible to use only half the number. This arrangement is shown in the first and principal sheet of the drawings, to which reference will hereinafter be exclusively made, the contacts on the distributer being severally connected with two magnets of opposite polarity.

The magnets E^1 E^2 are included in the wire w', running from the first contact of the sector D in such way that one is operated by plus (+) currents, the other by minus (−) currents. For this purpose they may be wound alike and have opposite ends of their coils connected with the line side of the wire, so that the currents will traverse them in opposite directions. If, therefore, a plus current be sent over the line when the brush h is in the first contact of the sector D, it will release the armature of magnet E^1 and close the branches 1′ to 6′ of the relay-circuit through the sub-branches 7 to 12. The second contact of sector D is connected by wire w^2 with the magnets E_3 E_4, which respond respectively to plus and minus currents. The next contact, T, is grounded so as to discharge the line before the arm H connects the line with the wires w^3, w^4, and w^5, which run to the relays 1″ to 6″. The magnets of relays 1″ and 2″ are of opposite polarity by having the coils connected in the wire w^3, so as to be traversed by the current in reverse direction. In like manner the relays 3″ and 4″ in the wire w^4 and the relays 5″ and 6″ in the wire w^5 are of opposite polarity relatively to each other. The second contact, T, is grounded for discharging the line. The contacts of the sector E are connected by the wires w^6 w^7 with the transmitter, the next contact is left unconnected, or is connected to ground, the next three contacts are connected by the wires w^8 w^9 w^{10} with the transmitter, and the last contact is left unconnected or is connected to ground. At each station the connections of one sector, D or E, only are shown.

The arms H, or traveling contact-makers of the two distributers, revolve synchronously. It is easy to see, therefore, that if the arms H have their brushes h h' on the first contacts of the sectors D E a current sent from a suitable battery by the transmitter over the wire w^6 will be received by the wire w' at the receiving-station and will operate the electro-magnet E and close the branches 1′ to 6′ through the sub-branches 7 to 12 if the current be plus, or will operate the electro-magnet E^2 and close the branches 1′ to 6′ through the sub-branches 13 to 18 if the current be minus. If, therefore, the arms H further revolve, so as to bring the brushes onto the contacts connected with the wires w^8 and w^3, a current sent by the transmitter over the wire w^8 will be received by the wire w^3 and will operate the relay 1″ if it is plus and the relay 2″ if it is minus.

Assuming that the electro-magnet E′ has been operated by a previous impulse, the plus impulse over the wire w^8, line M, and wire w^3 will close the branch 1′ at V and complete the circuit of battery Z, by way of branch 1′ and sub-branch 7, to its terminal contact 7 in the ring A, and when the rotating arm P passes over that contact the current from said battery Z will pass by the brushes p p' and ring B to the magnet E*, which will immediately release its armature K and cause the operation of the lever O O′, and through it of the printing mechanism of a Hughes printer, so as to take an impression from the seventh character on the type-wheel W. Under the same condition a minus current over the wire w^8, line M, and wire w^3 will close the branch 2′ and establish an electrical connection from the battery Z by way of the branch 2′ and sub-branch 8 to the eighth contact in the ring A, and as soon as this is touched by the brush p of the revolving arm P the magnet E* will operate and the eighth character be printed.

If it be assumed that the electro-magnet E_2 has been operated, then the current over wire w^8, line M, and wire w^3 will operate the relay 1″, if plus, so as to close the circuit of battery Z by way of sub-branch 13 to the thirteenth contact of the ring A, and if minus will operate the relay 2″ and close the circuit of battery Z by way of the sub-branch 14 to the fourteenth contact of the ring A.

The effect of sending appropriate currents in other positions of the arms H or traveling contact-makers can easily be traced. By omitting to send a current by the wires w^6 and w^7 any of the first six characters of type-wheel W can be printed by sending a plus or a minus current, as the case may require, over the proper one of the wires w^8, w^9, and w^{10}. It is thus possible to print any of the twenty-eight characters by at most two currents of the proper polarity sent over the proper wires of the five connected with the distributers.

So soon as the armature K is released to print a character the circuit of the local battery Y is closed by the armature K striking the lever O O′, and the current from said battery Y energizes the magnet E^5, pulling down the bar J and restoring the armature of whichever one of the relay-magnets 1″ to 6″ has operated. The lever O O′ on its return by the printing machinery also restores the armature of the magnet E^1, E^2, E^3, or E^4, if any of these has been operated, and closes the branches 1′

to 6′ through the sub-branches 1 to 6. By having the first group of sub-branches (1 to 6) normally closed it is possible to operate any of the first six characters by a single impulse, and as it enables one less magnet to be used it dispenses also with an additional contact on the distributer.

The transmitter.—Since it is only necessary to send at most two impluses in the successive positions of the arms H of the distributers, the simplest sending apparatus may be used. A simple apparatus would have, say, ten keys—four (two for plus and two for minus currents) for the magnets E^1 E^2 E^3 E^4 of the multiple-circuit closers and six (three plus and three minus) for the relay-magnets 1″ to 6″—and by depressing any two of them (or any one of the six in case of the first six characters) the proper currents would be sent in proper order by the rotation of the arms H while the keys were depressed. It is preferred, however, to employ a key-board in which there are one or two circuit-closers for each character of the type-wheel, the circuit-closers for the characters requiring two currents for printing being placed close together, or otherwise adapted to be operated by the depression of a single key. An arrangement of circuit-closers for such a key-board is shown in Fig. 5. Each of the wires w^8, w^9, and w^{10} is branched and the branches connected each with a pair of circuit-closers, l^1 l, which are arranged alternately throughout the key-board, the circuit-closers l^1 being shown in double light lines and the circuit-closers l in a single heavy line. In connection with the circuit-closers l is a conducting-strip, N, (shown as a broken line,) which is connected with the negative (—) pole of line-battery Q, so that each of said circuit-closers when operated puts the negative pole of said battery to line through the wire w^8, w^9, or w^{10} which is connected with the particular circuit-closer operated. In like manner the circuit-closers l^1 when operated make contact with the strip N′, (shown in double light lines,) which is connected with the positive pole (+) of second line-battery, Q′, so that each of said circuit-closers l^1 closes and puts the positive pole to line through the wire w^8, w^9, or w^{10} which is connected with the particular circuit-closer operated.

In describing the receiving apparatus it was explained how a current over the wire w^3 might cause an impulse for printing over the first or second sub-branch in any of the five groups of sub-branches—namely, over the sub-branch 1 or 2 in the first group of six, the sub-branch 7 or 8 in the second group, the sub-branch 13 or 14 in the third group, and so on. Dividing the circuit-closers l^1 l in like manner into groups of six, the wire w^8 is connected with the first and second of each of the five groups—(the last group containing, of course, only four circuit-closers, because there are but twenty-eight characters)—namely, with the first and second of the first group of six, with the seventh and eighth of the second group, with the thirteenth and fourteenth of the third group, and so on.

In describing the receiving apparatus it was also explained that the current over the wire w^3 would cause the impulse for printing to pass over the first sub-branch in the group, if said current were plus and over the second sub-branch in the group if said current were minus. By having the circuit-closers l^1 l alternate with each other the sending key-board is made to correspond with the sub-branches at the receiving-station, so that by depressing an even-numbered key a negative current will always be put to line, and by operating an even-numbered relay will cause the printing-impulse to be sent over an even-numbered sub-branch to the collector A B P. In like manner the wire w^9 is connected with the third and fourth of each group of six circuit-closers l^1 l, and the wire w^{10} with the fifth and sixth of each group.

By operating any one of the circuit-closers l^1 or l, therefore, a current will be sent over the proper wires w^8 M w^3, w^9 M w^4, or w^{10} M w^5, in the proper direction to operate the relay 1″ to 6″ appropriate to send the printing-current over the corresponding sub-branch in one or another of the groups of sub-branches.

In order that the printing impulse may be sent into the proper group of sub-branches, it is necessary properly to operate the electro-magnets E^1 E^2 E^3 E^4 of the multiple-circuit controllers by currents over the wires w^6 M w' or w^7 M w^2 in the proper direction. To effect this there is associated with each of the circuit-closers l^1 l (except the first six, which determine the passage of the printing-current through the first group of sub-branches) a second circuit-closer, l^2 or l', as the case may require, the circuit-closers l^2 (shown as light dotted lines) being arranged to make contact with the strip N′ for sending a positive or plus current to line from the battery Q′, and the circuit-closers l' (shown as heavy dotted lines) being arranged to make contact with the strip N for sending a negative or minus current from the battery Q. As the second group of six circuit-closers, l^1 l, corresponds with the second group of six sub-branches, 7 to 12, which are connected in the circuit of the printing-battery Z by a positive current over the wire w', a positive circuit-closer, l^2, is associated with each of the second group of circuit-closers, l^1 l, and the group of six positive circuit-closers l^2 is connected with the wire w^6. In like manner a negative circuit-closer, l', is associated with the third group of circuit-closers l^1 l, and as the third group of sub-branches, 13 to 18, are connected in the printing-circuit by a negative current over the wires w^6 M w^2, the six negative circuit-closers l' are connected with the wire w^6. The wire w^7, for similar reasons, is connected with six positive circuit-closers l^2, associated with the fourth group of circuit-closers l' l and with four negative circuit-closers l', asso-

ciated with the fifth group of circuit-closers l' l. In operation, therefore, the sending-operator depresses a key corresponding to the character he wishes to print from the type-wheel W at the receiving-station—say the twelfth key for the twelfth character. This will operate the twelfth circuit-closer of the series l' l to connect the negative pole of battery Q with the wire w^{10}, and will also operate its associate circuit-closer of the series l^2 l' to connect the positive pole of battery Q′ with the wire w^6. As soon, therefore, as the arms H or traveling contact-makers in their synchronous movements connect the wires w^6 and w' with the opposite ends of the line-wire, a positive current is sent from battery Q′ through the sixth circuit-closer l^2 and over the wires w^6 M w' into the magnets E′ E², operating the magnet E and closing the branches 1′ to 6′, through the second group of sub-branches 7 to 12, to the corresponding numbered terminals in contacts in the ring A of the collector. The arms H continuing their rotation pass over the contacts T, discharge the line, and afterward connect the wires w^{10} and w^5 with opposite ends of the line-wire M, so that the current from the negative pole of battery Q passes by way of the twelfth circuit-closer of the series l' l over the wires w^{10}, M, and w^5 into the relay-magnets 5″ and 6″ and operates the magnet 6″ to complete the circuit of the printing-battery Z, by way of the branch 6′ and sub-branch 12, to the corresponding contact in the ring A of the collector, and as soon as the arm P of said collector passes over said contact the current from the battery Z passes into the magnet E*, releases the armature K, and through the action of said armature on the lever O O′ effects the printing of the twelfth character on type-wheel W through the ordinary Hughes mechanism.

It will be understood that the two circuit-closers of the sending key-board are kept closed during the passage of the arms H over the sectors E D of the distributers, but they need be held no longer, as the multiple-circuit controller, operated by the magnet E′, and the armature of relay 6″, remain in position until the printing is effected by the passage of the arm of the collector over the twelfth contact of the ring A.

When the armature K rises, it closes the circuit of the battery Y through the magnet E^5, which draws down the bar J and restores the armature of the relay 6″, breaking the connection of the branch 6′ with the printing-battery Z.

When the printing is finished, the lever O O′, being returned to its normal position by any ordinary or suitable means—such, for example, as heretofore employed for that purpose in the Hughes printer—operates through the arm e, lever e', and arm d^5, to rock the shaft I, and the shaft I, being thereby turned in the direction to depress the arms d' d^2 d^4 d^4, forces down the armature of magnet E′, and therefore lifts its bar S, so as to open the sub-branches 7 to 12, by raising their springs L away from the contacts C. The rocking of the shaft I also raises the arm d and bar S carried thereby, so as to allow the spring L of the first group of sub-branches, 1 to 6, to close said sub-branches by pressing against their respective contacts C, thus putting the branches 1′ to 6′ through the sub-branches 1 to 6 in electrical connection with the first six contacts of the ring A of the collector. The lever O O′ also forces down the armature K, which, being attracted by the magnet E, breaks contact with lever O O′ and interrupts the circuit of battery Y, causing the magnet E^5 to release the bar J, which flies up, under the force of the spring J′, into position to allow the relay-armatures to operate when a current is sent into them from over the line. When the arms H pass over the contacts G, they complete the circuit of battery Q′ through a correcting-magnet, M′, and as they pass over the contacts T′ the line is discharged. The governor and organs for correcting may be the same as in the Hughes system, and need no description here.

As shown, the contacts in the distributers from the wires w' to w^{10} occupy only a sector of the circle. This is advantageous, by requiring the circuit-closers l' l l^2 l' to be held only for the short time occupied by the arms H in passing that sector; but it also enables more than one key-board and printer to be used on the same line-wire, it being evident that another pair of sectors, E D, placed in advance of or behind those shown, and similarly connected with a second key-board and receiving apparatus, would transmit in the manner already described independently of the first key-board and receiver. The number of such sectors which can be used on a distributer, and consequently the number of key-boards for independent transmission over the same line, is indefinite, for there is no question of principle involved which would forbid their multiplication, and the latter is only limited by the minimum duration which it is possible or expedient under all the circumstances to give to the line-currents, or, in other words, by the smallest angle which must be reserved to each division of the distributing circumference. The number and extent of the sectors would naturally be adjusted to the conditions of the line or the needs of the service.

Whatever may be the number of the key-boards, the receiving apparatus remains the same, and the speed of rotation of the arms of the distributers depends only on the length of the line or its electrical condition.

The invention has been shown as applied to print twenty-eight characters, and the number and grouping of the branches, sub-branches, relays, magnets, distributer-contacts, and transmitting-keys have been adapted to this end; but the invention is not limited to these numbers and groupings, but extends to the

new means described, irrespective of the details, and it is evident that, whatever may be the number of characters or divisions of the type-wheel, the other parts of the apparatus can be adapted thereto without changing the principle, for an indefinite number of primary branches can be connected with an indefinite number of multiple-circuit controllers, so as to connect the branches with any group of sub-branches out of an indefinite number. The apparatus can be adapted to work with currents of one direction.

I claim as my invention or discovery—

1. The system of transmitting messages by telegraphic printers, characterized by the combination, with an electro-magnetic printer, of a collector having contacts corresponding to the different characters, and a traveling contact-maker for completing the circuit from the different contacts to the printer-magnet, a printing-battery or electrical generator, a series of branches and sub-branches over which the current to operate said printer-magnet is sent, the sub-branches being connected with the respective contacts of said collector, and electro-magnetic circuit-changers in the branches and sub-branches for establishing the connection of said branches collectively with individual groups of said sub-branches and of the individual branches with the printing-battery, so that the printing of a character is effected over a selected group of sub-branches and a selected branch and sub-branch in the selected group, substantially as described.

2. The combination of electro-magnetic multiple-circuit controllers, relays, branches connected with the circuit-changers of said relays, and groups of sub-branches connected with the said branches and with the circuit-changers of the multiple circuit-controllers, so that by operation of said circuit-controllers the branches are completed through a set of sub-branches, and by the operation of the relays a circuit is established through an individual branch and sub-branch in the selected group, substantially as described.

3. The combination of the line-wire, a distributer having two sets of contacts, the electro-magnetic multiple-circuit controllers having their magnets electrically connected with one set of said contacts, the relays having their magnets electrically connected with the other set of contacts, the branches connected with the circuit-changers of said relays, and the sub-branches connected with the said branches and with the circuit-changers of the said multiple-circuit controllers, substantially as described.

4. The combination of a line-wire, a distributer electrically connected with the line-wire and having two sets of contacts, the electro-magnetic multiple-circuit controllers having their magnets electrically connected with one set of distributing-contacts, the relays having their magnets electrically connected with another set of distributing-contacts, the branches connected with the circuit-changers of said relays, the sub-branches connected with the said branches and with the circuit-changers of said circuit-controllers, the collector having its contacts connected with the sub-branches, and the printing-magnet in circuit with said collector, substantially as described.

5. The combination, with the line-wire, the distributers connected therewith at a transmitting and a receiving station and having two sets of contacts, and a battery or electrical generator and circuit-closers for sending currents to line through the distributer at the transmitting-station, of the following apparatus at the receiving-station, namely: electro-magnetic multiple-circuit controllers having their magnets electrically connected with one set of contacts of the distributer, relays having their magnets electrically connected with another set of contacts, branches connected with the circuit-changers of the relays, and sub-branches connected with the branches and by groups with the multiple-circuit changers of the multiple-controllers, substantially as described.

6. The combination, with the line-wire, the distributers connected therewith at transmitting and receiving stations and having two sets of contacts, and a battery or electrical generator and circuit-closers for sending currents to line through the distributer at the transmitting-station, of the following apparatus at the receiving-station, namely: electro-magnetic multiple-circuit controllers having their electro-magnets connected with one set of the distributer-contacts, relays having their magnets electrically connected with another set of contacts, branches connected with circuit-changers of the relays, sub-branches connected by groups with the circuit-changers of the multiple-circuit controllers, the collector having contacts connected with the sub-branches, and the printer-magnet in circuit with said collector, substantially as described.

7. The combination, with the relays, multiple-circuit controller, branches, sub-branches, collector, and printing-magnet, of the replacers for the relay-armatures and for the multiple-circuit controllers, substantially as described.

8. The combination, with the branches and sub-branches, of a normally-closed multiple-circuit controller in one group of sub-branches, a normally-open circuit-controller in another, and an electro-magnet which opens the first when it closes the second of said multiple-circuit controllers, substantially as described.

9. The collector turning synchronously with a type-wheel and composed of, first, a solid contact-ring which is electrically connected with the electro-magnet of a Hughes printer; second, a ring divided into separate contacts corresponding to the characters on the type-wheel, which contacts are connected in circuit with circuit-changers; third, two brushes passing over the rings for successively con-

necting each contact in the divided ring with the printer-magnet, and, fourth, a carrier for said brushes, substantially as described.

10. The distributer divided into sectors equal in number to the transmitting key-boards which it is desired to employ at one time on the same line-wire, and composed of a solid ring connected with the line, two others similarly divided into separate contacts and provided for each sector with seven divisions, the first two divisions of the outside sector being electrically connected with the electro-magnets of the multiple-circuit controllers, the next division with the earth, the next three divisions with the electro-magnets of the relays, and the last of the seven divisions with the earth, so that an earth-contact is interposed between the contacts for the multiple circuit-controllers and the relay-contacts, and the interior divided sector having its first two divisions connected with the circuit-closers of the transmitting key-board for operating the multiple-circuit controllers, and three succeeding divisions connected with the circuit-closers of the transmitting key-board for operating the relays, substantially as described.

11. The relays formed by six polarized magnets connected in pairs, of opposite polarity, with different contacts of the distributer and having their armatures arranged to close a local circuit when they move away from their magnets, in combination with the replacer, its magnets included in circuit with a local battery, and the printing-lever, the branches controlled by said relays being connected each with one of the circuit-changers in each of the multiple-circuit controllers, substantially as described.

12. The electro-magnetic multiple-circuit controllers composed of, first, four polarized electro-magnets connected in pairs of opposite polarity; second, an armature-lever for each magnet; third, a bar carried by each of said levers, and, fourth, a series of six circuit-changers operated simultaneously by the respective bars of the first three electro-magnets and four circuit-changers by that of the fourth; fifth, the rock-shaft having arms above other armatures of said magnets and on the opposite side two arms; sixth, a bar carried by one of the last-mentioned arms, the other arm being acted on by the printing mechanism, and, seventh, six circuit-changers operated simultaneously by the last-mentioned bar to open their circuits when any of the other groups of circuit-changers are operated by their magnets to close their said circuits, the said circuit-changers being connected with the contacts of the collector, substantially as described.

13. In combination with the distributer and line-batteries, the key-board provided with two strips and two series of circuit-closers, one strip being connected with the positive pole of one line-battery and the other strip with the negative pole of another line-battery, and half the circuit-closers in each series making contact with one of said strips and the other half of said circuit-closers making contact with the other strip, and wires extending from the distributer-contacts and each connected with a number of positive and a number of negative circuit-closers, substantially as described.

14. The combination, with a distributer having two sets of contacts and a traveling contact-maker, of a series of circuit-closers arranged in groups and having one circuit-closer in each group connected with a contact of one set, and a second series of circuit-closers associated each with a circuit-controller of the first series and connected in groups with the contacts of the other set, substantially as described.

15. The combination, with a line and distributers on said line at transmitting and receiving stations, said distributers having synchronously-traveling contact-makers and being each provided with two sets of contacts, of a key-board provided with a series of circuit-closers arranged in groups and having one circuit-closer in each group connected on the transmitting-distributer with a contact of one set, and a second series of circuit-closers associated each with a circuit-controller of the first-mentioned series and connected on the transmitting-distributer in groups with the contacts of the other set, and the following receiving apparatus, namely: electro-magnetic multiple-circuit controllers having the magnets connected on the receiving-distributer with the contacts of the set corresponding to the last-mentioned series of circuit-closers, relays connected on the receiving-distributer with contacts of the set corresponding to the first-mentioned series of circuit-closers, branches controlled by said relays, sub-branches controlled in groups by the multiple-circuit controllers, the collector having contacts connected with said sub-branches, and the printing-magnet in circuit with collector, substantially as described.

16. The combination of the polarized relays connected in pairs of opposite polarity, the electro-magnetic multiple-circuit controllers having polarized magnets connected in pairs of opposite polarity, the branches connected with the circuit-changers of the relays, and the sub-branches connected with the branches and the circuit-changers of the multiple-circuit controllers, substantially as described.

17. The combination, with the line-wire and the distributer having two sets of contacts, of the polarized relays connected in pairs of opposite polarity with the distributer-contacts of one set, the electro-magnetic multiple-circuit controllers having polarized magnets connected in pairs of opposite polarity with the distributer-contacts of the other set, the

branches connected with the circuit-changers of the said relays, the sub-branches connected with the branches and the circuit-changers of the said multiple-circuit controllers, and the collector having a series of contacts connected with the sub-branches, substantially as described.

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

CLAUDE JOSEPH AUGUSTIN MUNIER.

Witnesses:

PAUL GIRAL,

R. J. PRESTON.