E. BLOS.

TRANSMITTER FOR TELESELECTORS.

APPLICATION FILED SEPT. 27, 1909.

970,367.

Patented Sept. 13, 1910.

2 SHEETS—SHEET 1.

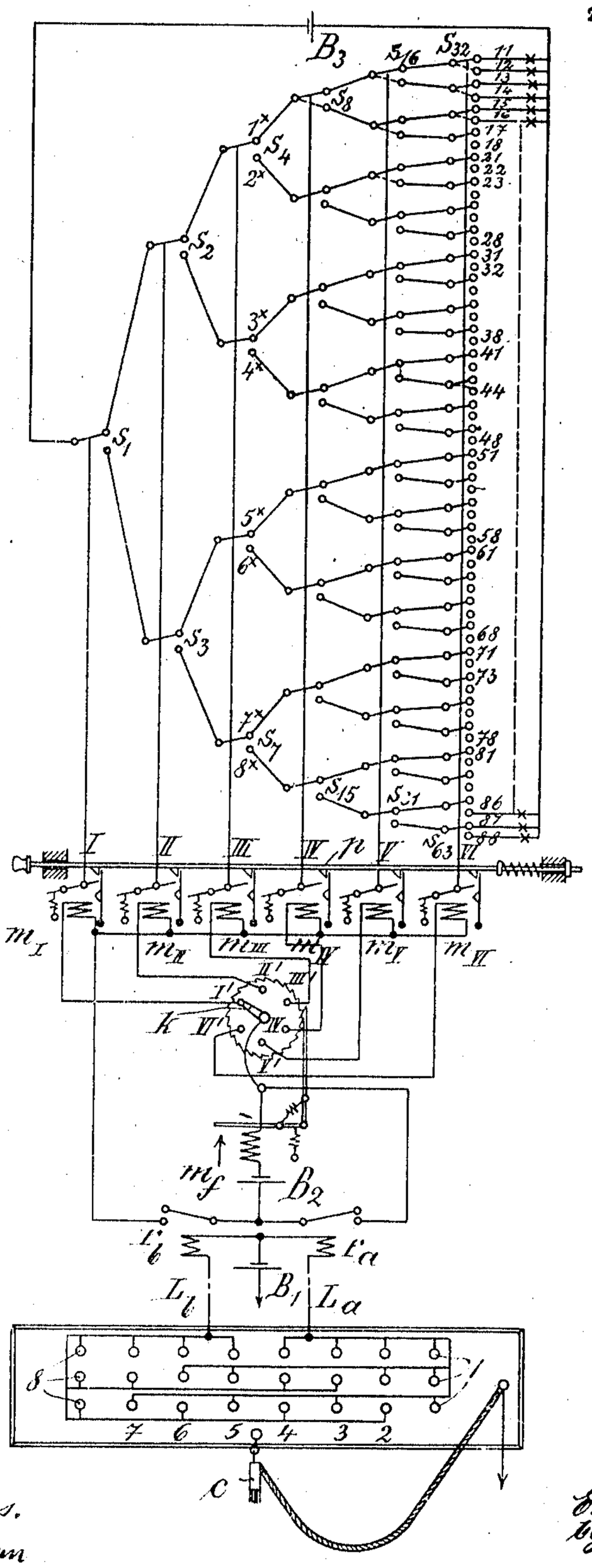

Fig. 1.

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3 SHEETS—SHEET 2.

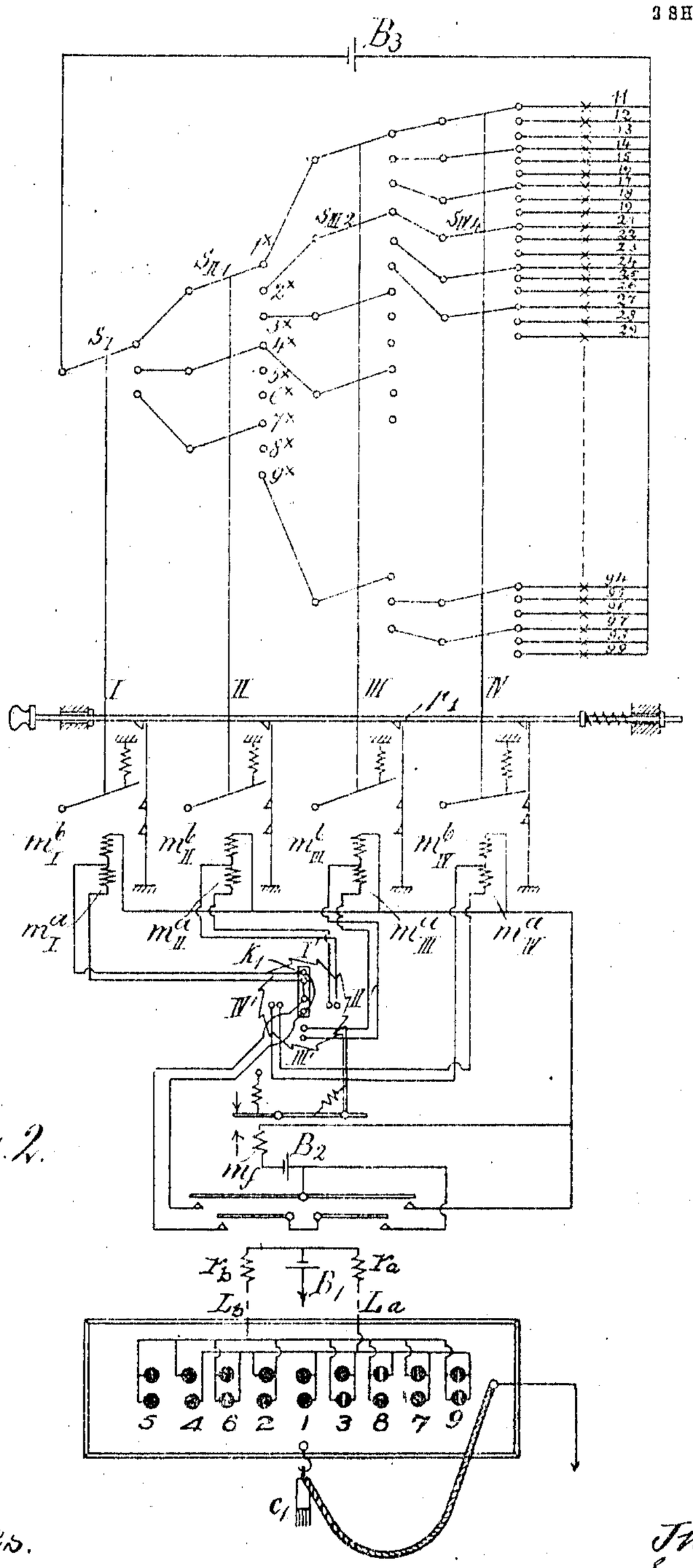

Fig. 2.

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UNITED STATES PATENT OFFICE.

ERNST BLOS, OF SCHÖNEBERG, NEAR BERLIN, GERMANY.

TRANSMITTER FOR TELESELECTORS.

970,367. Specification of Letters Patent. Patented Sept. 13, 1910.

Application filed September 27, 1909. Serial No. 519,706.

To all whom it may concern:

Be it known that I, ERNST BLOS, of 10 Königsweg, Schöneberg, Germany, engineer, a citizen of the German Empire, have invented certain new and useful Improvements in Transmitters for Teleselector of which the following is a specification.

This invention relates to transmitters to teleselectors.

It is the special object of my invention to produce a new arrangement of the transmitting station, which allows of the reduction of the number of the transmitting contacts to a minimum, independent of the objects to be selected whereby new effects of a high commercial usefulness are obtained.

The novel transmitter for teleselectors is particularly well adapted for use in automatic telephone exchanges. Furthermore the principle of "variation" has been embodied in the novel device by virtue of the simple arrangement of the sender or transmitting station and other novel features have been introduced, all as will be fully described hereinafter with reference to the accompanying drawing in which:

Figure 1 represents in diagrammatic form a tele-selector embodying in desirable form the present improvements, a device being shown using two kinds of current impulses; and Fig. 2 is a similar view of a teleselector using three kinds of current impulses.

Similar characters of reference denote like parts in both the figures.

The novel transmitter for teleselectors relates to that type which allow of selecting, by means of combination of different current impulses, any desired object out of any number of numbered objects from a distance.

For numbering the objects of selection, a system of numbers having any desired basis may be employed, for instance a basis 8 or 16 as powers of 2, or 9 or 27 as powers of 3. Since the existing system of numbers does not contain more than 10 numerals, namely, 0—9, it is not advisable to go beyond the basis 10 in composing the numbers required in carrying out this invention. But, if a basis smaller than 10 is chosen, then one or more numerals must be dispensed with. For instance, in the case of the basis 9, it is advisable to dispense with all the numbers containing the numeral 0. Similarly with the basis 8, all numbers containing one of the numerals 0 and 9 should be dispensed with.

In carrying out the present invention it is sufficient to provide, at the transmitting station, according to the base of numbers chosen, only eight, nine, ten, sixteen or twenty-seven groups or series of contacts. These groups are numbered 1 to 8, or 1 to 9, or 0 to 9, etc., as the case may be, and they are brought into operation alternately and successively according to the number of the selected object. Each of these groups of contacts has apportioned to it, a determined current signal by means of which magnets are energized at the receiving station, for the purpose of making circuits for the objects of selection. If these current signals are to be produced each by means of a single current impulse, this will require the provision, at the receiving station, of complicated devices which are uncertain in working. Thus, for instance, for the basis 10, ten resistance bridges will have to be connected in parallel to a line, and relays inserted in their branches which lose their current when impulses of certain strengths are sent, and thereby close local circuits.

In order to avoid the deficiencies attendant on the above arrangement, the current signals are produced, according to the present invention, by combining a few kinds of current impulses. Generally, only two kinds of current impulses are available at the transmitting station, such as for instance positive and negative impulses, or long and short impulses, or in the case of a double line, impulses produced by the earthing of each of these lines. In this case, for example $2^3=8$ current signals can be produced by composing each signal of three current impulses. It is possible to produce also a third kind of current impulses, namely, by earthing simultaneously the single leads of a double line, so that with only two current impulses per signal, nine current signals can be formed. These last mentioned current impulses, produced by earthing simultaneously the single leads of a double line, may preferably be called double or multiple current impulses, in contradistinction to a simple impulse produced by earthing but one of the leads of such line. If, in accordance with the ordinary existing base 10, it is desired to have ten current signals composed of two or three kinds of current impulses four or three current impulses must be employed for each signal. Then, of the possible number (2^4 or 3^3) of variations, six or

seventeen must remain unused, so that the basis 10 is not advantageous for the present purpose.

In the example hereinafter given the basis 8 is used for numbering the objects of selection. In this case, therefore, eight series of contacts must be provided at the transmitting station for eight current signals, and each current signal must be composed of three current impulses, if, as is assumed hereinafter, only two kinds of current are available at the transmitting station, and these are to be produced by means of an *a*-line and a *b*-line.

The current impulses which are transmitted by operating successively the eight rows of contacts of the transmitter may follow on one another in the following series of variation:—

No. 1=*a a a*
No. 2=*a a b*
No. 3=*a b a*
No. 4=*a b b*
No. 5=*b a a*
No. 6=*b a b*
No. 7=*b b a*
No. 8=*b b b*

that is to say, by operating successively the contacts of the row 1 the line L_a, L_a, L_a will be earthed in succession, and by operating the series 7 the lines L_b, L_b, L_a will be successively earthed, and so on.

In order to establish the circuits of the selector at the receiving station, use is made of the arrangement of a local battery circuit branching off in succession at several points. But the improved transmitting apparatus may also comprise selectors constructed on another principle, so long as such selectors can be operated by combinations of current impulses of different character.

The branching off of the circuits takes place through switches S_1, S_2, S_3, . . . , or through their stationary and working contacts as shown in Fig. 1. The two positions of the switches are controlled by the rest and working positions of magnet armatures. Each switch does not require a separate magnet, and, in fact, all the switches of one vertical series may be coupled together and operated by a single magnet.

The objects to be selected are preferably signal lamps which are numbered from 11—18, 21—28, etc., up to 81—88. The reason why a commencement is made with 11, will be clear from the following explanation: The contacts in series III are marked 1^x—8^x, and to each contact there corresponds a determined position of the series of switches I to III. For instance, to the contact 4^x, there correspond the positions: rest position of I, operating position of II, and operating position of III. To each of the contacts III there are connected eight contacts VI, for instance to the contact 1^x the contacts 11—18. To these eight contacts there correspond again determined positions of the series of switches IV, S^8 . . . S^{15}, V, S^{16} . . . S^{31}, VI, S^{32} . . . S^{63}, Fig. 1. These are the same combinations of positions as for the contacts of III; for instance, for the contacts 14 of VI the positions: rest position of IV, operating position of V, and operating position of VI. These first eight contacts of VI are given first the numeral 1, because they are all connected to contact 1 of III, and further, the numerals 1 to 8 for characterizing their positions in the first group of eight. This gives the numbers 11, 12, 13—18. Then for lamp No. 14 for example, the following positions are required:—*a*, *a*, *a*, *a*, *b*, *b*, corresponding to the above table of series of variations. Analogously, the next eight contacts of VI are marked 21, 22, 23—28 because they are all connected to contact 2^x of III. In this case also, the same combinations of positions of the series of switches IV, V, VI are repeated as in the case of the first contact and of the contacts of series III. The same applies to all following groups of contacts of VI. For lamp No. 44 for instance, the combinations of positions *a*, *b*, *b*, *a*, *b*, *b*, are necessary. The energization of the magnets m_I to m_{VI}, as they correspond to the several combinations of positions, is produced by the connections shown in Fig. 1 by means of the battery B_2, the relays r_a and r_b, and the switching-on magnet m_I with the respective switching wheel, contact disk, and the switch arm *k* fixed to the switching wheel, the arrangement being such that the magnets remain unenergized when the relay r_a operates, and current impulses of the character *a* are transmitted by earthing the line L_a. But, the magnets are energized when current impulses of the character *b* are produced by earthing the line L_b. To the *a*-position of a series of switches there corresponds therefore an *a*-current impulse, and to the *b*-position there corresponds a *b*-current impulse. Consequently for lamp 44, for instance, there the current impulse *a*, *b*, *b*, *a*, *b*, *b*, must be transmitted.

The arrangement of the switching magnets m_I . . . m_{VI} is such that the armature of the magnet if once attracted by the magnet, remains in this active position till it is returned to the position of rest which, for instance, can be done by hand. For this purpose there is indicated an elastic hook at the right end of every magnet armature, which keeps the armature in the lower position if once it has been attracted by the magnet. For restoring the armatures to their position of rest, there is arranged a bar which crosses all the magnet armatures, and which possesses noses opposite to each armature. If, then, the bar is pushed, its noses actuate at the same time all the arma-

tures of the shifting-magnets m_I . . . m_{VI} which reëstablishes the position of rest for all parts. The subsequent actuation of the shifting magnets m_I . . . m_{VI} has effected the shifting of the levers S_1, S_2 . . . S_{31}, in order to bring the desired number, for instance lamp 44, in the active position and to close the circuit for the lamps over the battery B_3.

The transmitter shown in Fig. 1 consists of eight vertical rows of contacts which are connected alternately according to the previously constructed series of variations with the lines L_a and L_b. The contacts of the row 4, for instance, reading from top to bottom, are connected with L_a, L_b, L_b. Therefore if an earthed contact c be moved along this row, the current impulses a, b, b, will be transmitted in succession to the receiving station.

The path of the current in selecting the lamp No. 44 will now be described more in detail. The contact of the earthed contact piece c with the first contact of the contact series 4, produces a current impulse through L_a, r_a, and B_1 to earth. Then by energizing r_a a circuit is closed from B_2 through the armature of r_a to the switching magnet m_I. The hook fixed to the armature rubs up along the teeth of the switching wheel without moving the switching wheel with it, and without moving the switching arm k from its position on I^1. The magnet m_I is also not energized, because its current circuit through the armature is open in front of r_b. On the cessation of the current impulse, as the armature of the magnet m_I descends, the switching arm is moved from I^1 to II^1. The next following current impulse b now causes an energization of r_b, and thus closes a circuit from B_2 through m_I, m_{II} and the armature of r_b, whereby the armature of m_{II}, and with it the switches S_2 and S_3, are moved into the operative position. On the cessation of the current impulse, the switch arm is moved along into the position III^1. The next following current impulse b then energizes m_{III} in a similar manner. These three current impulses, and their effects, are repeated when a contact piece is moved again over the current series 4 of the transmitter, so that finally the combination of positions a, b, b, a, b, b, corresponding to lamp No. 44, is produced by the energization of the magnets m_{II}, m_{III}, m_V, m_{VI}. Fig. 1 shows clearly that in these positions the circuit is not closed for any other lamp except the lamp No. 44. The lamp 44 is fed by the battery B_3 until the armatures of the magnets m_I . . . m_{VI} are restored by pushing the returning bar p. Similarly to lamp 44, for lamp 73, for example, it will be necessary to move the contact piece over the contact series 7 and 3 in succession, so as to produce the current impulses b, b, a, a, b, a, which energize the magnets m_I, m_{II}, m_V and thus produce the combinations of positions b, b, a, a, b, a, of the series of switches which are necessary for the lamp No. 73. The formation of any other circuits is also excluded with this combination.

Fig. 2 shows, in a diagrammatic illustration, an arrangement according to which, besides the above discussed current impulses a and b, still a third kind of impulse c is produced by earthing simultaneously L_a and L_b without allowing the relays r_a and r_b to act, for which purpose any suitable means may be employed, for instance that shown in Fig. 2. Then, with only two current impulses for each numeral of the transmitter, the following variations can be produced:

No. 1: $a\ a$	No. 4: $b\ a$	No. 7: $c\ a$
No. 2: $a\ b$	No. 5: $b\ b$	No. 8: $c\ b$
No. 3: $a\ c$	No. 6: $b\ c$	No. 9: $c\ c$

Similarly, the transmitter comprises nine series of contacts, each series having two contacts, which are connected according to these series of variations to the lines L_a and L_b, and each switch S_1, S_2, S_3 . . . has three positions which are controlled by additional magnets m_I, m_{II} . . . , the upper armatures of which are actuated by earth-connection of the conduit L_b. This actuation brings the dependent three-plug switches into their medium position. The earth-connection of conduits L_a and L_b actuates at the same time both magnets m^a and m^b which results in the lowest position of the magnet armature, and likewise the lowest position of the dependent three-plug-switches. Earth connection of conduit L_a actuates none of the magnets m_I, m_{II} . . . , and in consequence the magnet armatures, and the dependent three-plug-switches, remain in their upper position of rest. The forwarding magnet m_f is included in a circuit with battery B_2 in such a way that this magnet is actuated as often as earth-connection is made by L_a. Since each of the three contacts of the first switch has connected to it a switch having three contacts, there are now nine contacts, 1—9 in row II. If now two further vertical rows are added, then over each contact of II there will pass nine contacts of IV and the row II containing nine contacts, the row IV will contain $9 \times 9 = 81$ contacts in the whole.

If all the contacts of IV are divided into groups of nine contacts each, they may be marked with the numbers 11—19, 21—29, up to 91—99. Each numeral or digit of these numbers corresponds in turn to a determined combination of positions of the series of switches, this combination being produced by moving a contact piece c over that series of contacts of the transmitter that has a similar numeral. If therefore, for instance, the lamp 18 is to be lighted, then by running with the earth-connecting contact-plug over

the contact columns of row 1, and thereupon of row 8, earth-connection is made first to the line L_a and again to line L_a, then to the lines L_a and L_b at the same time, then to the line L_b alone. Earthing of the line L_a energizes the relay r_a. Both armatures are attracted and close their working contacts. The closing of the lower contact is ineffective, but over the upper contact the forwarding magnet m_f is energized. Consequently the switch S_I remains in its upper position.

On the cessation of the earthing the switch arm k_1 is moved to the position II^1, as already explained with relation to Fig. 1. This operation is repeated when the contact piece runs over the second contact of the group 1 of the transmitter. Therefore, also the switches of II remain in their upper position and the switch arm steps forward to the position III^1. If now, for transmitting the digit 8 the lines L_a and L_b are simultaneously earthed the lower armatures of the relays r_a and r_b close their working contacts, while the upper two contacts remain open, both upper armatures being rigidly coupled. In consequence of this, current flows from the battery B_2, over the working contacts of the lower armatures, and the switch arm k_1 which is in the position III^1, to the magnets $m_{III}{}^a$, $m_{III}{}^b$ and the forwarding magnet m_f. Therefore, the switches of III get into their lowest position, and arm k_1 is forwarded to the position IV^1 after earthing having ceased. The now following earthing of L_b energizes r_b, and therefore closes the working contact of its upper armature, whereby a circuit is closed to $m_{IV}{}^b$ and m_f. The switches S_{IV} consequently reach their medium position, and the switch arm k_1 steps forward to its initial position. Now, the circuit of the lamp 18 indeed, as Fig. 2 shows, is closed. The lamp lights until the armatures of the magnets m_I, m_{II}, etc., are restored by pushing the restoring bar p_1.

It is obvious that the number of series of switches, and therefore the number of lamps capable of being selected, can be increased as desired. An important feature is that the transmitter does not require to be altered for this purpose, because with the peculiar numbering of the objects of selection there are always only eight or nine variations of current impulses which are produced by the series of contacts of the same transmitter. If for example it is desired to add to the above described apparatus of Fig. 1, three more rows of switches, then the numbering will begin preferably with 111 and will end with 888, leaving out all numbers that contain one of the numerals 0 and 9. Then, for example, if it is required to select lamp No. 581, the contact piece is moved over the series of contacts 5, 8, 1, at the transmitting station in succession. It is therefore not necessary to provide the transmitter with more rows than the eight rows which it already contains. If, on the other side in the above detailed three-impulse system, a greater number than 81 lamps is required, then as the next unit can be provided the number of $9^2=729$ contacts or lamps, and it is essential that in this case likewise the number and arrangement of the contact columns in the sender may remain unaltered; only the selecting device in the station is to be altered, and the numbering of the lamps or subscribers may be advantageously as follows: 111 . . . 119, 121 . . . 129, 131 . . . 139; 211 . . . 219, 221 . . . 229, 231 . . . 239, and so on to 991 . . . 999. In the same way a still further increase of subscribers in the whole system can be provided, without altering the sender devices, by a mere alteration of the selecting organs in the station.

In order to realize the progress in the art made by the present invention, it must be borne in mind that each combination of current impulses must not necessarily be transmitted as a whole; but each of these combinations may be regarded as consisting of a restricted number of simple base variations which can be transmitted one after the other successively without interfering thereby with the special arrangement of the receiver, the only necessity consisting in a proper numbering of the objects of selection.

I claim as my invention:

1. In an apparatus for electrically transmitting signals by separate current impulses, the combination with the signals to be operated, and electrical controlling mechanism therefor, of a transmitter comprising a divided local starting circuit for said controlling mechanism, a relay magnet in each branch thereof, a plurality of groups of fixed contacts in the starting circuit, the contacts of the several groups being connected with one or the other or both branches of the starting circuit to produce a different succession of impulses for each group of contacts, and a movable contact element connected in said circuit and arranged to successively engage the fixed contacts of any group upon manual operation thereof.

2. In an apparatus for electrically transmitting signals by separate current impulses, the combination with the signals to be operated, and electrical controlling mechanism therefor, of a transmitter comprising a grounded divided starting circuit for said controlling mechanism, a plurality of groups of fixed contacts in the separate branches of the starting circuit, and a movable earthed contact element arranged to successively engage the fixed contacts of any group, the contacts of each group being arranged in a row and the number of such contacts corresponding to the number of current impulses

required to transmit each digit of the signal's number, the several contacts of the respective groups being also connected with one or the other or both branches of the starting circuit to produce a different succession of impulses for each group of contacts.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ERNST BLOS.

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.