June 2, 1925. 1,540,107

A. G. DAMM

APPARATUS FOR THE PRODUCTION OF CIPHER DOCUMENTS ESPECIALLY FOR TELEGRAPHIC DISPATCH

Filed March 1, 1922 2 Sheets-Sheet 1

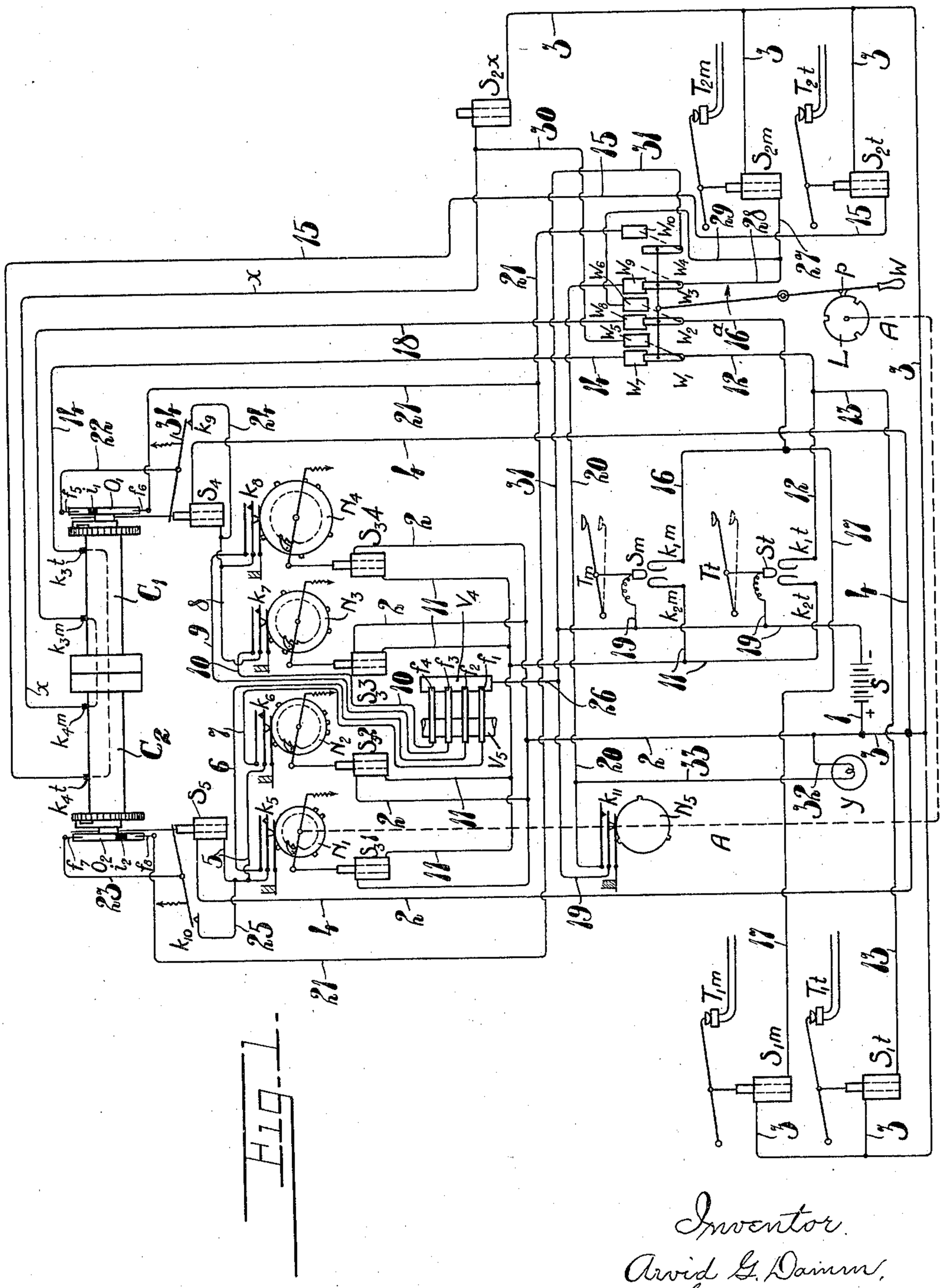

Fig. 1.

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Fig. 8.

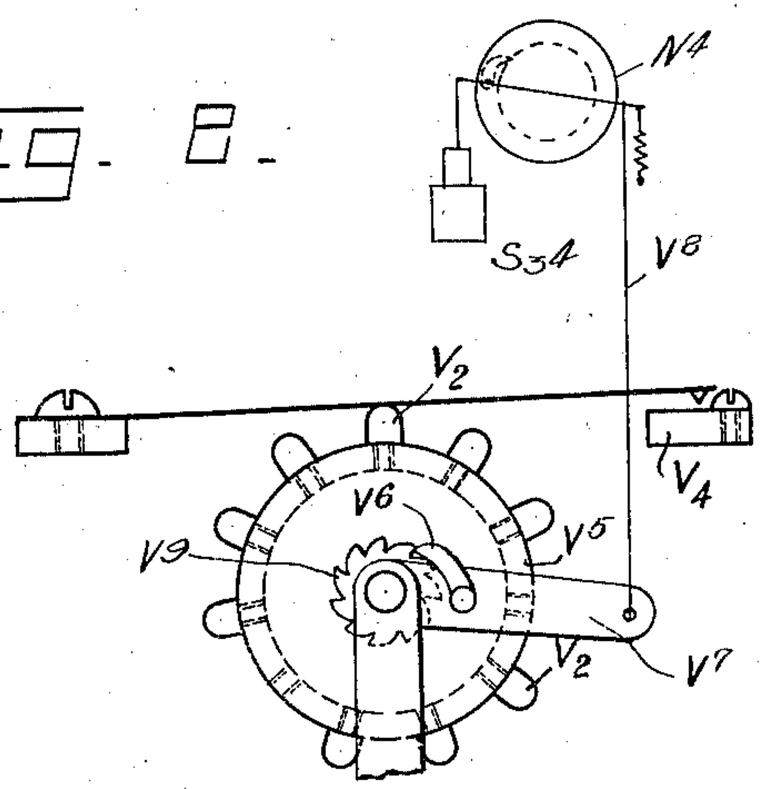
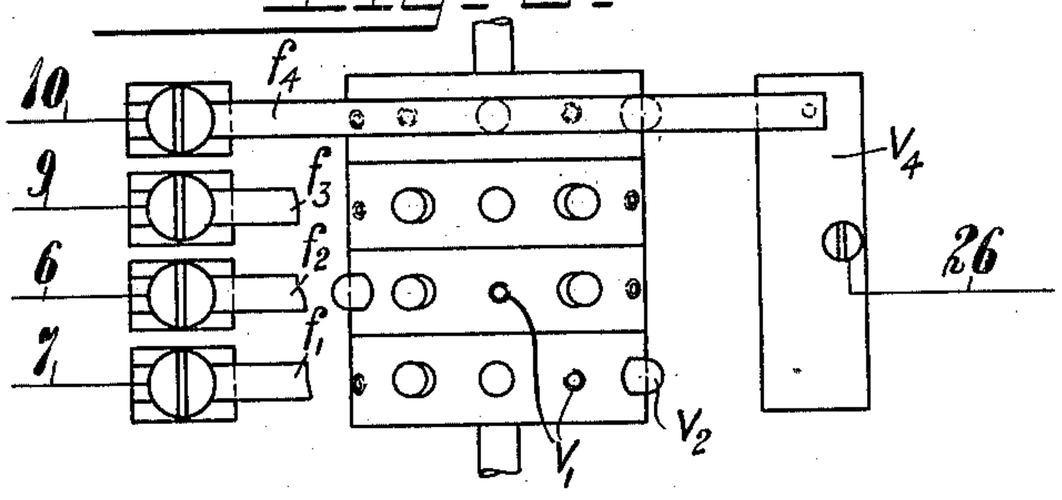


Fig. 3.



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Patented June 2, 1925. 1,540,107

UNITED STATES PATENT OFFICE.

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APPARATUS FOR THE PRODUCTION OF CIPHER DOCUMENTS ESPECIALLY FOR TELEGRAPHIC DISPATCH.

Application filed March 1, 1922. Serial No. 540,234.

To all whom it may concern:

Be it known that I, ARVID GERHARD DAMM, a citizen of the Kingdom of Sweden, residing at Ronninge, Sweden, have invented new and useful Improvements in or Relating to Apparatus for the Production of Cipher Documents Especially for Telegraphic Dispatch, of which the following is a specification.

This invention relates to improvements in or relating to such apparatus as are described in my copending application Ser. No. 370,708 for producing cipher documents, especially adapted for telegraphic dispatch, and for deciphering such documents.

The object of the invention is to complete aforementioned apparatus, so as to make them meet all demands subject to their application in practical telegraphic service.

The mechanism herein illustrated is at one station only, and its object is to record or write simultaneously on two sheets of paper, one of these sheets containing the text of the telegram in plain language and the other containing all or part of the same matter in cipher. The cipher record is then delivered by post, telegraph or radio, in any of the customary ways. The recipient of the cipher message will then decipher it by the machine and in the manner described in my co-pending application Serial No. 370,708.

In order to admit of regular telegraphic service, every cipher telegram dispatched must consist of the following parts:

(*a*) A group of unciphered signs, indicating the position of the key mechanisms at the close of the preceding telegram;

(*b*) Address and ordinary service remarks, in plain language, as usually divided into words or corresponding groups of signs;

(*c*) The telegram proper in cipher, divided into groups of an equal number of signs, for instance five, and comprising complete groups of signs only;

(*d*) Indication in plain text of the number of groups of signs in the telegram.

In order to admit of continuous dispatch of such telegrams, without special adjustment of the key mechanisms for every telegram, the following arrangements have been provided:

(1) The division of the cipher into groups of an equal number of signs and the ciphering of the space between words;

(2) The sending of plain language and cipher alternately;

(3) The automatic re-adjustment of the ciphering members to a certain starting-point.

The devices in question are described in the following with reference to the accompanying drawing, in which Fig. 1 shows diagrammatically a ciphering apparatus of the kind above referred to, while Figs. 2 and 3 show on a larger scale a detail in side view and plan view respectively.

The connections existing between, on one side, the keys T*t* (only one shown on the drawing) of a key board, herebelow referred to as the sender key board, the keys of which are actuated according to the text to be ciphered, and, on the other side, the keys T_1t of a typewriter, which renders a copy of the original telegram text, and the keys T_2t of a typewriter, which renders the cipher to be dispatched, are identical in principle to the apparatus described in the patent application above referred to.

Through the depression of a key T*t* of the sender key board, a conducting member S*t*, linked to key T*t*, is brought into contact with two contact springs k_1t and k_2t, whereby the following circuits are closed;

(I) From the positive pole of the source of current S through conductors 1, 2, the windings of solenoids S_31, S_32, S_33 and S_34 which are connected in parallel, conductors 11, contact spring k_2t, conducting member S*t* and conductor 19 to the negative pole of the source of current S;

(II) From the positive pole of the source of current S through conductors 1, 3, the windings of solenoid S_1t, conductors 13, 12, contact spring k_1t, conducting member S*t* and conductor 19 to the negative pole of the source of current S;

(III) From the positive pole of the source of current S through conductors 1, 3, the windings of solenoid S_2t, conductor 15, contact k_4t, the two commutator-shaped ciphering members C_2, C_1, contact k_3t, conductor 14, contacts W_7, W_1 of a switch more particularly described herebelow, conductor 12, contact spring k_1t, conducting mem-

ber S*t* and conductor 19 to the negative pole of the source of current S.

Upon the excitation of the solenoids $S_3$1, $S_3$2, $S_3$3 and $S_3$4 through the closing of the circuit described under (I) the movable armature of each solenoid actuates the driving mechanism of a key disk N_1, N_2, N_3 and N_4 respectively, said driving mechanisms, as indicated in Fig. 1, being arranged so as to turn the key disks by the action of springs, when the circuit described under (I) is interrupted and the attraction of the armatures of said solenoids ceases upon the release of the key T*t* which chances to be depressed on the sender key board.

The closing of the circuit described under (II) effects the excitation of a solenoid S_1t, the movable armature of which actuates that key of the copy typewriter, which carries the same sign as the key T*t* of the sender key board which chances to be depressed and records the message in plain language.

When the circuit described under (III) is closed, the solenoid S_2t is excited and its movable armature simultaneously actuates a key T_2t of the cipher typewriter. The signs thus obtained on this typewriter depend, according to my patent application above referred to upon the chance position of the two commutator-shaped ciphering members C_1, C_2, relatively to one another.

This position is determined by the key disks N_1, N_2, N_3, N_4 (the primary keys), of which N_1 and N_2 influence the ciphering member C_2 and N_3 and N_4 the ciphering member C_1, and moreover by a secondary key V_5, shaped as a cylinder and provided with projections as detailed further on and shown in Figs. 2 and 3.

The interruption of the circuit described under (I) will cause the key disks to turn a certain part of a revolution so that their projections will close one or more of contacts k_5, k_6, k_7, k_8.

Depending upon the arrangement and the chance positions of the projections of the key disks N_1, N_2, N_3, N_4 and of the secondary key V_5, by the influence of which last-mentioned key one or more of contacts f_1, f_2, f_3, f_4 may be closed, circuits are closed, passing through conductors 19, 26, one or more of conductors 6, 7, 10, 9, one or more of contacts k_5, k_6, k_7, k_8, conductors 5, 8, either or both of solenoids S_4, S_5 and conductors 4, 3 and 1. The current passing through one or the other or several of these circuits will excite the one or the other or both of solenoids S_4, S_5, the movable armatures of which will effectuate a rotary movement of one step of the one or the other or both ciphering members C_1, C_2.

Evidently it is possible that the arrangement and the chance positions of the key members may be such as to close none of the circuits just detailed, in which case neither of the ciphering members will be brought into movement.

Upon every depression of a key on the sender key board one sign is consequently obtained on the copy typewriter and one sign on the cipher typewriter.

The secondary key V_5 shown in Figs. 2 and 3 is shaped as a cylinder and receives, by means of mechanical devices of a known kind, a rotary movement of a certain part of a revolution, for instance 1/11, as soon as the movable armature of any of the solenoids $S_3$1—4 is excited.

For this purpose the driving mechanism of any one of the discs N_1, N_2, N_3, N_4 for instance N_4 as is shown in Fig. 2, may be connected by a link V_8 to an arm V_7 freely journaled on the axle of the secondary key V_5 and carry a ratchet V_6 engaging a ratchet wheel V_9 secured to the axle of the secondary key V_5.

Said cylinder V_5 is provided with holes V_1, into which protruding knobs V_2 may be inserted. Said holes are disposed in a number of rows, peripherically corresponding to the number of movements during one revolution of the cylinder, for instance 11, and longitudinally to the number of primary keys used, for instance 4.

Above each of the peripherical rows is placed a spring f_1, f_2, f_3, f_4 respectively which may form contact with a conducting member V_4, connected to conductor 26.

When a knob V_2 gets into such a position as to lift one of the springs f_1, f_2, f_3, f_4, the engagement between such spring and the member V_4 is broken, and consequently the corresponding contact arrangement k_{5-8}, connected by one of conductors 6, 7, 9, 10, remains inactive, even if it is closed by the corresponding primary key.

As mentioned above, the cipher signs must be uniformly divided into groups of, for instance, five signs each. For this purpose a spacing key T_2m, influenced by the armature of a solenoid S_2m, which key is actuated upon every fifth depression of a key on the sender board, is provided in the cipher typewriter. The excitation of said solenoid S_2m is, in the construction described, effected by the following device. One of the key disks, for instance N_1, is mechanically connected to a disk N_5 in such a way that both disks turn simultaneously and at equal angles. The connection between said two disks N_1 and N_5 is indicated in Fig. 1 by the dash line A. Disk N_5 is arranged to actuate by means of projections on its circumference a contact k_{11}. According to Fig. 1 the key disk N_1 is supposed to turn a fifteenth part of a revolution after every depression of a key on the sender key board, and accordingly three projections are placed at equal distance

from each other on the periphery of disk N_5, so that contact k_{11} is closed after every fifth depression of a key on the sender key board. Contact k_{11} is connected to the circuit of solenoid S_2m, thus causing the cipher typewriter to make a division space in the cipher every time contact k_{11} is closed. The circuit in question is as follows: from the positive pole of the source of current S through conductors 1, 3, solenoid S_2m, conductors 27, 28, contacts W_3, W_9 in a switch described herebelow, conductor 20, contact k_{11} and conductor 19 to the negative pole of the source of current S. Independently of the division into groups of the cipher obtained it must be possible to obtain on the copy typewriter the clear text with the usual space between words. This is effected in the following manner. A spacing key Tm on the sender board, when depressed, closes the circuit of a solenoid S_1m, the movable armature of which actuates a spacing key T_1m on the copy typewriter. The circuit of this solenoid S_1m is as follows: from the positive pole of the source of current S through conductors 1, 3, solenoid S_1m, conductors 17, 16, the contact spring k_1m, the conducting metal member Sm, which is linked to the spacing key Tm and connected to conductor 19, to the negative pole of the source of current S. The depression of the spacing key Tm which effects an electric connection by means of the member Sm between the contact springs k_1m and k_2m, however, also closes another circuit, corresponding to the one described above under (I), whereby the solenoids $S_3$1, $S_3$2, $S_3$3 and $S_3$4 are excited and actuate the key discs N_1, N_2, N_3 and N_4; and a third circuit, corresponding to the one described above under (III), from the positive pole of the source of current S through conductors 1, 3, the windings of any one of the solenoids of the cipher typewriter, for instance S_2x, conductor x, contact k_4m, the ciphering members C_2, C_1, contact k^3m, conductor 18, a switch-contact W_8, W_2, conductor 16^a, contact spring k_1m, member Sm and conductor 19 to the negative pole of the source of current S. Which one of the solenoids of the cipher typewriter will become excited at the depression of the spacing key Tm depends upon the chance relative position between the ciphering members C_1, C_2. Thus, upon depression of the spacing key Tm on the sender key board, the conducting member Sm of which is connected to contact k_{11}, as is the case with all other similar members St of the other keys on the sender board, one division space on the copy typewriter and one cipher sign on the cipher typewriter are simultaneously obtained, the sign last mentioned being comprised in a group of five cipher signs, formed by means of the contact k_{11} and the spacing-key T_2m of the cipher-typewriter, the solenoid S_2m of which is not connected to any conductor leading to the ciphering members C_1, C_2.

In order to admit of the sending of clear text and cipher alternately and to prevent the sending of clear text, before a whole group of cipher signs has been completed, the following device is provided: The contact spring k_1t of each key on the sender board is connected to a switch-contact W_1 (only one shown on the drawing), while the contact spring k_1m of the spacing key on the sender board is connected to a movable switch contact W_2. The contacts W_1 and W_2 are, as is the case with two other contacts W_3 and W_4, mechanically connected to each other and to a lever W. Upon the switching-over of contacts W_1 and W_2 to the positions indicated by dash lines in the drawing, these contacts get into touch with fixed contacts W_5 and W_6 respectively, of which each contact W_5 (only one shown in the drawing) is connected by conductor 30 to the solenoid of that key of the cipher typewriter, which carries the same sign as the key of the sender board, whose conductor 12 is connected to the contact W_1 in question, while contact W_6 is connected by a conductor 29 to solenoid S_2m of the spacing key on the cipher typewriter. When in the position of the contacts shown by dash lines a sign key of the sender key board, for instance, Tt, is depressed, the following circuit is closed: from the positive pole of the source of current S through conductors 1, 3, solenoid S_2x of that key on the cipher typewriter, which carries the same sign as the key depressed on the sender board, conductor 30, switch contacts W_5, W_1, conductor 12, contact spring k_1t, conducting member St and conductor 19 to the negative pole of the source of current S, while at the depression of the spacing key Tm on the sender board the following circuit is closed: from the positive pole of the source of current S through conductors 1, 3, solenoid S_2m of spacing key T_2m on the cipher typewriter, conductors 27, 29, switch contacts W_6, W_2, conductors 16^a and 16, contact spring k_1m, conducting member Sm and conductor 19 to the negative pole of the source of current S. Thus, as soon as contacts W_1 and W_2 are brought into touch with contacts W_5 and W_6 respectively, clear text is obtained on the cipher typewriter. The switching-over of contacts W_1 and W_2 for the sending of clear text must, however, not be possible, before a whole group of cipher signs has been completed. In order to prevent this the switch lever W is related to a stopping device, which releases same after every fifth depression of a key on the sender board, said device illustrated consisting of a disk L, rotating

synchronically with disks N_5 and N_1 (the mechanical connection between disks N_5 and L being indicated on the drawing by dash-line A). Disk L has at equal distances on its circumference three incisions of the same depth as a tooth p on the switch lever W, said tooth p, when sliding against the periphery of disk L, preventing lever W from being switched over to the left on the drawing. Moreover, disk L is adjusted relatively to disk N_5 so that one of its grooves will be placed exactly opposite the tooth p every time contact k_{11} is closed, that is after every fifth depression of a key on the sender board. Consequently the switching-over of lever W for sending of clear text cannot take place before a whole group of five cipher signs has been completed. If the ciphered part of a telegram should end, say with two signs in the last group, it must be completed by three signs, which is done by three consecutive depressions of the spacing key of the sender board.

In order to enable the manipulator of the apparatus to control, whether the last group of the ciphered part of a telegram is complete or not, a signal lamp y is inserted between conductors 2, 32 and 33, 20, which lamp consequently is lighted every time contact k_{11} is closed.

If this lamp is not lighted at the end of the ciphering, the operator has only to depress spacing key Tm on the sender board one or several times till the lamp is lighted.

When contacts W_1 and W_2 are switched over for clear text on the cipher typewriter, switch contact W_3 is disengaged from the fixed contact W_9, whereupon the connection of solenoid S_2m with contact k_{11} is interrupted, and the spacing key T_2m will then be actuated only when the spacing key Tm on the sender board is depressed.

When the ciphering is finished and the adjustment for service remarks and the like in clear text takes place, the ciphering members C_1, C_2 should return to a certain starting-position. For this purpose the following device is arranged.

For each of the members C_1, C_2 and participating of their rotary movement a metal disk O_1, O_2 respectively is provided, which has on its periphery an insulating sector i_1, i_2 respectively, the extension of which corresponds to the angle, which members C_1, C_2 turn at every excitation of solenoids S_4, S_5. Against the periphery of disk O_1 two contact springs f_5, f_6 press, two similar springs f_7, f_8 pressing against disk O_2. Springs f_6 and f_8, which are in metallic contact with their respective disk even though the insulating sectors i_1 and i_2 are passing underneath same, are connected to a conductor 21, connected in its turn to a fixed contact W_{10}. The other springs f_5, f_7, whose contact with the disks O_1 and O_2 is interrupted by the insulating sectors i_1 and i_2, when same pass under the springs, are connected by conductors 22 and 23 respectively each to a contact k_9, k_{10} respectively. The contact k_9 is connected by conductors 24, 8, to the solenoid S_4. The contact k_{10} is connected by conductors 25, 5 to solenoid S_5.

Contacts k_9, k_{10} are actuated by the movable armatures of solenoids S_4, S_5 in such a way as to be closed, when said armatures occupy their uppermost positions, and to be opened, when said armatures upon excitation of the solenoids reach their bottom positions and have effected the turning of members C_1, C_2.

The device of re-adjustment described above works as follows: When contacts W_1, W_2, W_3 and W_4 are switched into the position indicated by dash lines, in which position contact W_4 gets connected to the fixed contact W_{10}, current will pass, provided both of the contact springs f_5, f_7 are not insulated from their disks O_1, O_2, by the sector i_1, i_2 respectively, from the source of current S through conductors 1, 3, 4, solenoids S_4, S_5, conductors 24, 25, contacts k_9, k_{10}, conductors 22, 23, contact springs f_5, f_7, disks O_1, O_2, contact springs f_6, f_8, conductor 21, contacts W_{10}, W_4 and conductors 31, 19 back to the source of current. Thus solenoids S_4, S_5 are excited and their movable armatures turn members C_1, C_2. When contacts k_9, k_{10} are opened, the movable armatures of the solenoids resume their uppermost positions, a new excitation of solenoids S_4, S_5 is effected and so forth, until both members C_1, C_2 reach a position in which the insulating sectors i_1, i_2 are placed beneath the contact springs f_5, f_7.

Having now described my invention, what I claim is:

1. In an apparatus of the kind set forth for the production of cipher documents especially adapted for telegraphic dispatch, means for dividing the cipher into groups each containing a predetermined number of signs, a cipher typewriter, a sender keyboard, means for connecting the cipher typewriter to the sender key board in such a manner that the depression of a key of the sender key board will effect the depression of a key of the cipher typewriter having the same sign as the said key of the sender key board, and means for preventing the cipher typewriter from being connected to the sender key board in the said manner until a group of cipher signs has been completed, substantially as and for the purpose set forth.

2. In an apparatus of the kind set forth for the production of cipher documents especially adapted for telegraphic dispatch, the combination of commutator shaped cipher-

ing members with means for automatically returning the same into a predetermined starting position, substantially as and for the purpose set forth.

3. In an apparatus for converting plain language text into cipher; a main keyboard, a ciphering mechanism operated from said keyboard, mechanism operated from said keyboard to record plain language text, electric recording mechanism also operated from said keyboard dependent on the chance position of said ciphering mechanism and means to directly operate said electrical recording mechanism without the interposition of said ciphering mechanism to record plain language text or cipher, at will.

4. In an apparatus for converting plain language text into cipher; a main keyboard, a ciphering mechanism electrically operated from said keyboard, a recording mechanism also electrically operated from said keyboard in dependence upon the chance position of said ciphering device, mechanism to directly connect said recording mechanism to said keyboard to record plain language text, and means to simultaneously return the ciphering mechanism to zero position upon effecting said connection.

5. In apparatus for converting plain language text into cipher; a main keyboard, a ciphering mechanism operated from said keyboard, a recording mechanism electrically operated from said keyboard under control of said ciphering mechanism, means to automatically space the recorded signs into groups containing a predetermined number of signs, means to directly connect said recording mechanism to said keyboard and thereby disconnect said ciphering mechanism, whereby plain language text may be recorded.

6. In apparatus for converting plain language text into cipher, a main keyboard, plain language recording mechanism operated from said keyboard, a second recording mechanism and a cipher mechanism also operated from the keyboard, means to permit the operation of said second recording mechanism under the influence of said cipher mechanism, and means to cause the recorded signs on said second recording mechanism to be recorded in groups each of a definite number of signs and irrespective of the groups of signs in the plain language text.

In testimony whereof I have hereunto set my hand at Stockholm, Sweden, this eighth day of February 1922.

ARVID GERHARD DAMM.