

Oct. 29, 1929.

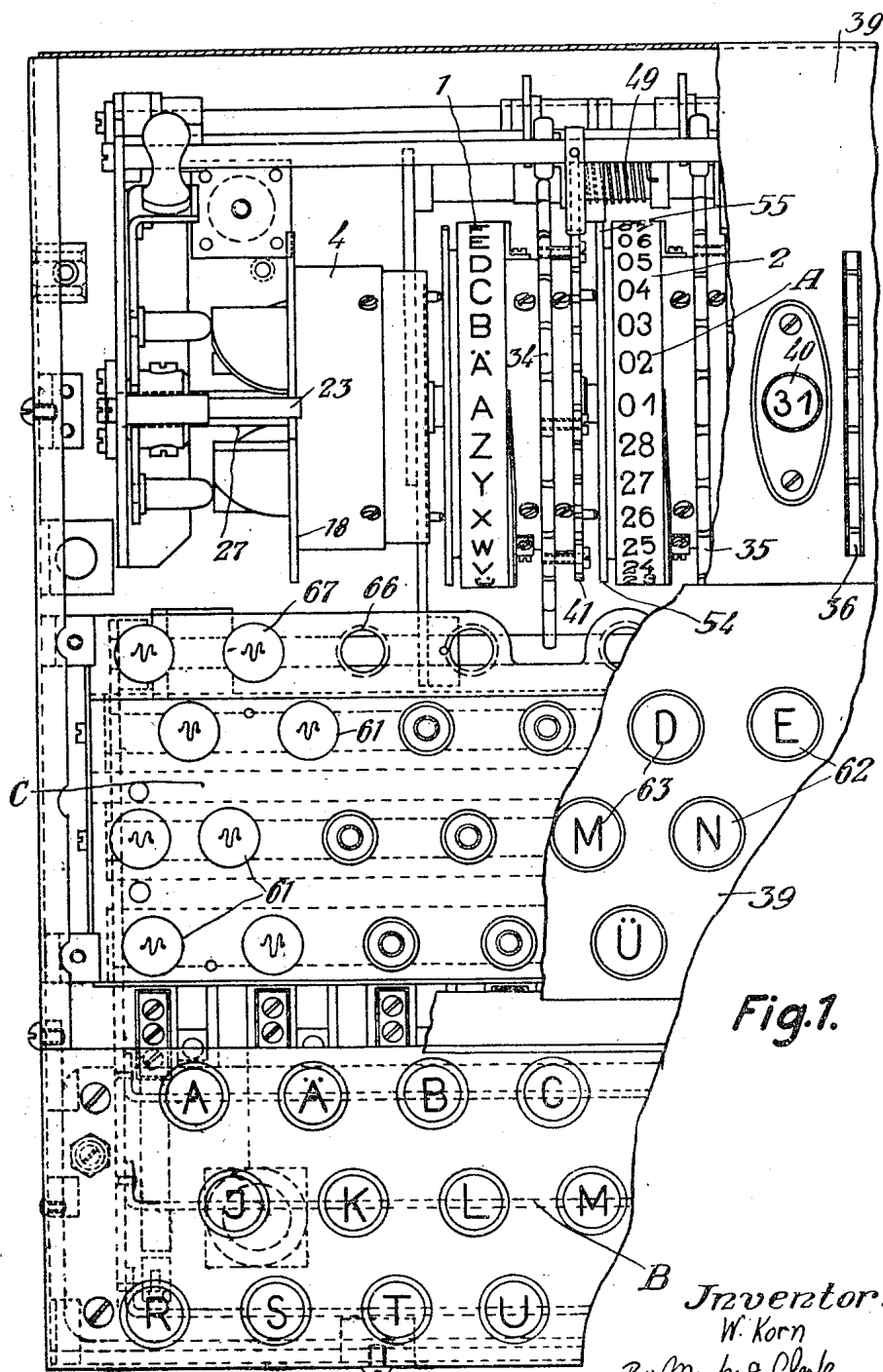
W. KORN

1,733,886

DEVICE FOR CODING AND DECODING

Filed May 21, 1926

4 Sheets-Sheet 1



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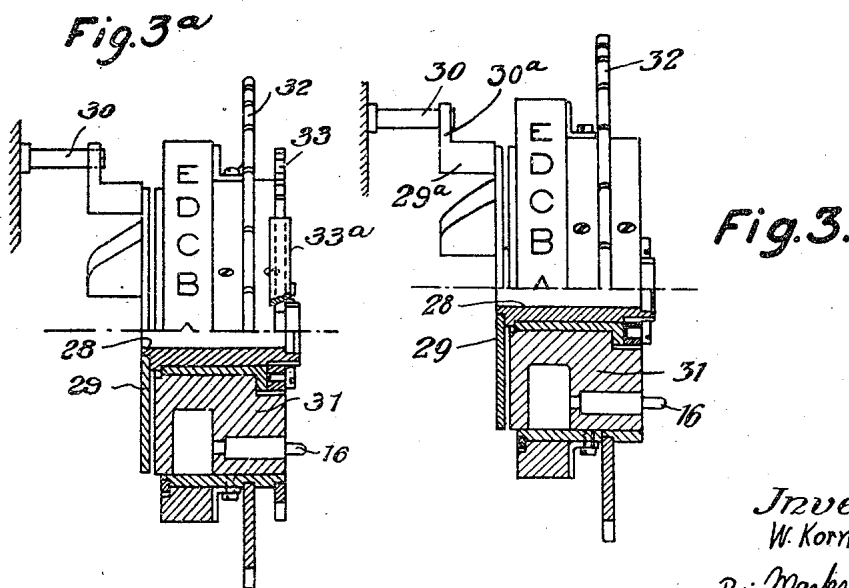
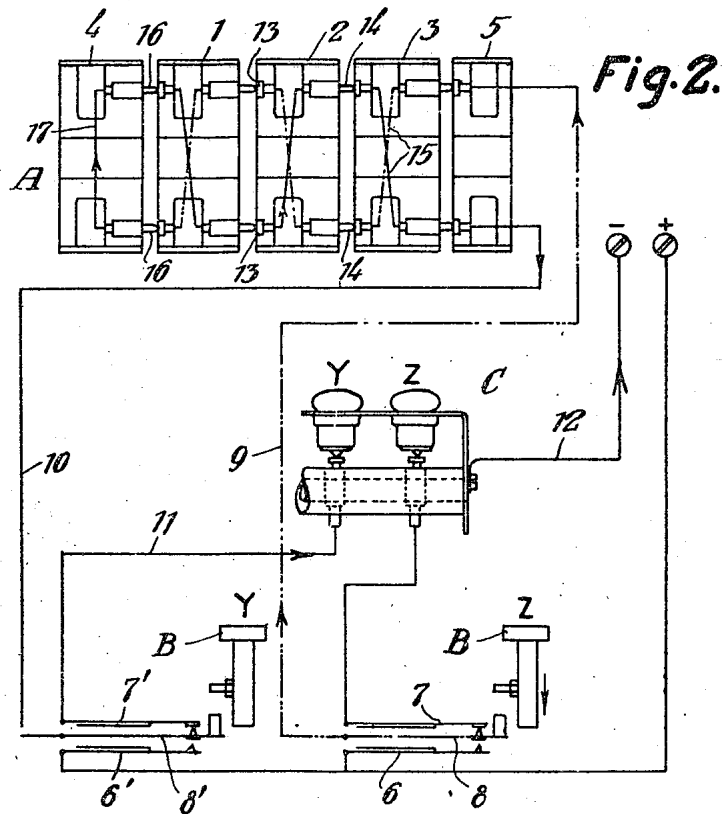
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4 Sheets-Sheet 2



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DEVICE FOR CODING AND DECODING

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4 Sheets-Sheet 3

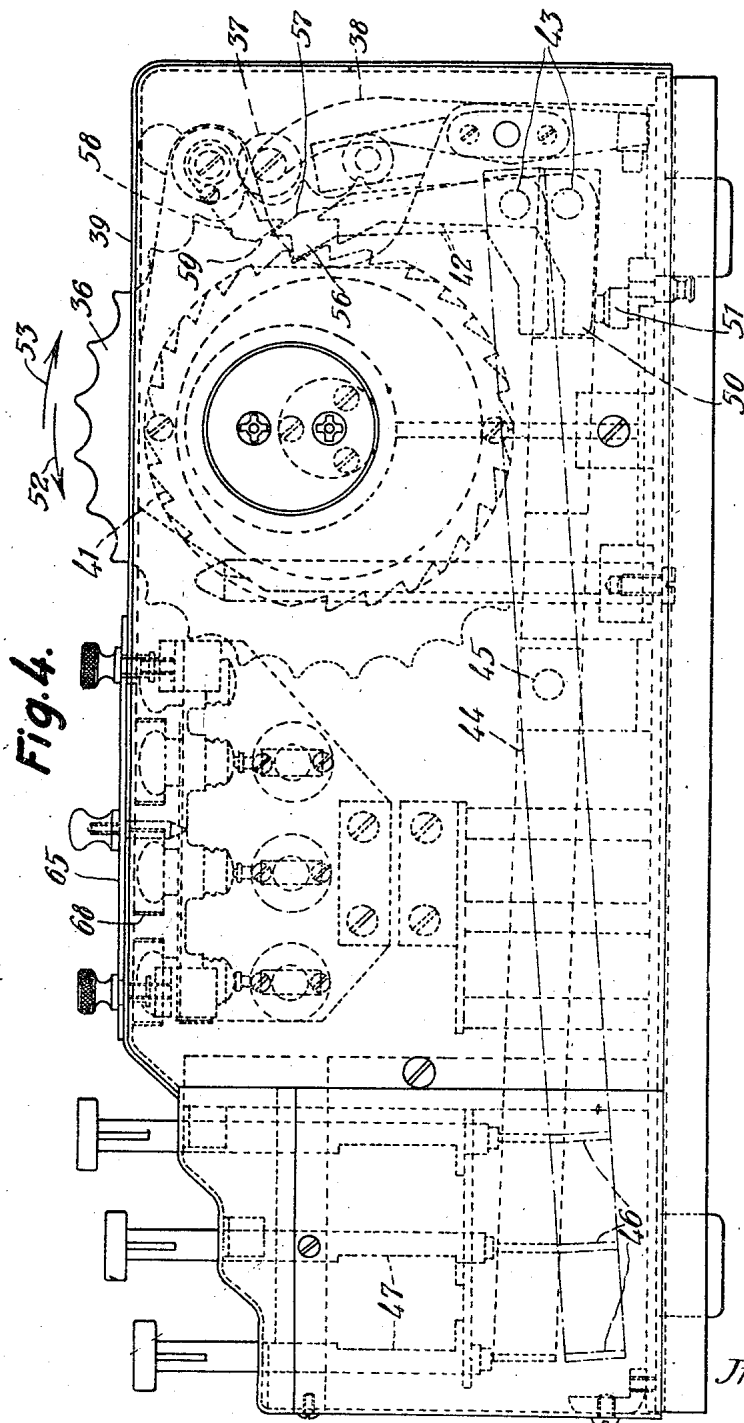


Fig. 4.

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4 Sheets-Sheet 4

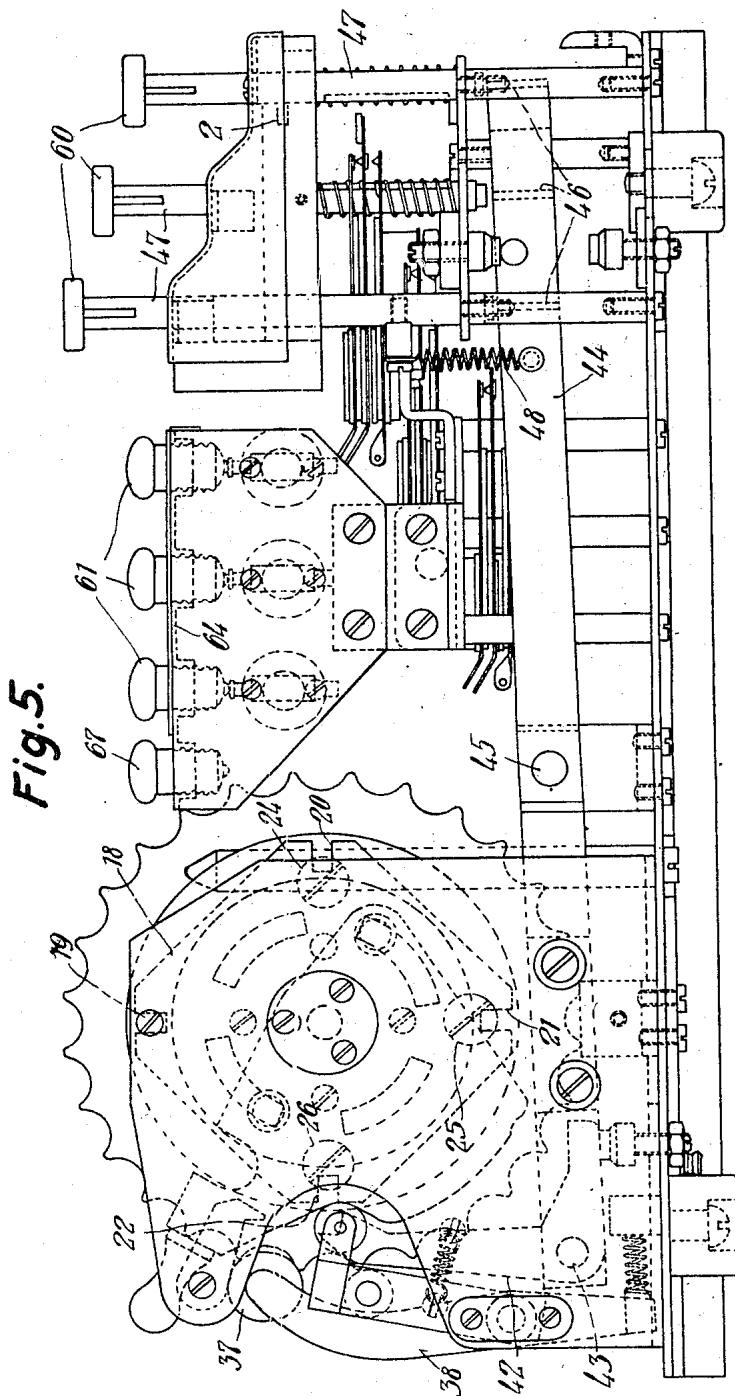


Fig. 5.

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# UNITED STATES PATENT OFFICE

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## DEVICE FOR CODING AND DECODING

Application filed May 21, 1926, Serial No. 110,809, and in Germany March 20, 1926.

Electrical coding devices or machines are known in which rows of contact keys are employed as transmitting points and a changing device in the form of relatively rotatable coding cylinders and a typewriting machine with type levers or rotating type wheel as indicating points. In such coding machines the rotatable coding cylinders have usually been arranged between stationary end cylinders, and the passage of the current has been such that it enters at the end of the set of coding cylinders through one stationary end cylinder and leaves through the other stationary end cylinder. For the transposing of the coding machine from coding to decoding and conversely a special switch was provided which caused the electric current to traverse the set of coding cylinders in the reverse direction to that taken when coding.

It has also been proposed to employ glow lamps with suitable inscriptions as indicating points. In these devices the rows of glow lamps were arranged between the individual rows of keys in order that the lettering on the glow lamps or on the keys might serve simultaneously for both, i. e. the glow lamps and the keys. Such coding machines are very complicated in their construction, bulky in their form, expensive to manufacture, and not simple to operate. In the coding devices with glow lamps as indicating points, the operating is rendered particularly difficult by the fact that upon the individual keys being depressed the individual glow lamps with their inscriptions are covered by the operator's hand and thereby easily give rise to errors and delays.

The invention overcomes these disadvantages by providing a device which is particularly simple and also clear, besides affording satisfactory security against the deciphering of the code. In consequence of its small size, easy manipulation and low price this device is adapted for extensive use, not only for commercial or diplomatic purposes, but also for military and naval use.

The invention is illustrated by way of example in the accompanying drawings wherein:—

Fig. 1 is a partial plan of the device with cover partly removed,

Fig. 2 is a diagram of the connections for the circuits of two keys and glow lamps,

Fig. 3 is a side elevation with a partial section through a detail showing a special constructional form,

Fig. 3<sup>a</sup> is a side elevation with a partial section through a detail similar to Fig. 3 showing a modification.

Fig. 4 is a side elevation of the device seen from the right with the box covering the device, and

Fig. 5 is a side elevation of the device seen from the left without the box covering the device.

The device consists of a set of coding cylinders A, a set of keys B as transmitting points, and a set of glow lamps C as indicating points.

The set of coding cylinders consists of individual coding cylinders 1, 2, 3 between end cylinders 4 and 5. The end cylinder 5 serves as the so-called entrance cylinder for the electric current and is preferably fixedly arranged. The actual coding cylinders 1, 2, 3 are so arranged as to be rotatable relatively to one another and to the end cylinders, and during the coding they are rotated, preferably irregularly, by any convenient device.

According to the invention the end cylinder 4 is constructed as a so-called return cylinder. In Fig. 2 the course of the electric current is illustrated for two keys. In order to render this current path possible the contacts of the individual keys are constructed as so-called exchange contacts, that is to say a movable contact 6 is combined with a stationary contact 7 and an intermediate spring 8, and it will be seen that upon the key being depressed a current flows from the positive pole of the battery through the working contact 6, the intermediate spring 8 and a conductor 9, into the entrance cylinder 5, traverses the set of coding cylinders as far as the end cylinder 4, is here returned, travels back through the set of coding cylinders, and through a conductor 10 to the corresponding intermediate spring 8' and the stationary contact 7', from there through a conductor 11

to the corresponding glow lamp, in this case the lamp *y*, and returns through a conductor 12 to the battery.

The course of the current when decoding is as follows: If the letter Y of the coded text is to be decoded, the Y key is depressed without having to move any special reversing key when changing from coding to decoding. When depressing the Y key, the contact between the intermediate spring 8' and the stationary contact 7' will be broken and in substitution thereof the contact between the intermediate spring 8' and the movable contact 6' will be established. The current now flows from the positive pole of the current source over 6' 8' through the conductor 10 to the fixed cylinder 5, passes through the coding cylinders 3, 2, 1 in the direction opposite to the arrows in Fig. 2, returns to the returning cylinder 4, passes back through the coding cylinders 1, 2, 3, passes out through the end cylinder 5, passes through the conductor 9, to the intermediate spring 8 and over the contact 7 and over the glow lamp *z* which therefore illuminates and passes through the conductor 12 to the negative pole.

The coding cylinders 1, 2 and 3 have at their end surfaces corresponding contacts, as indicated at 13 and 14, for the coding cylinder 2. The contacts on one end face are connected with the contacts of the other end face in a known manner by as irregular an arrangement as possible of the conductors, as indicated at 15. The return cylinder has on one end face similar contacts, as indicated at 16. These contacts are connected among themselves by corresponding conductors, as indicated at 17. The construction of the end cylinder 4 as a return cylinder, as well as the construction of the key contacts as exchange contacts, presents the important advantage that in the case of the device according to the present invention, a special switch, such as has been required hitherto for the change of such a coding device from coding to decoding and conversely, is entirely omitted. This advantage becomes particularly evident when taking into consideration the fact that such a special switch must have a number of contacts equal to the number of contacts of the coding cylinders, twenty-six for example. In one constructional form of the return cylinder the same can be adjusted into various positions, into four positions in the case of the constructional example illustrated, owing to four notches 19, 20, 21 and 22 being provided on a plate 18 connected with the return cylinder and a holding pin 23 being secured in the frame work of the device. According to which one of the notches 19, 20, 21 and 22 engages with the holding pin 23 (Fig. 1 and Fig. 5), one particular position of the return cylinder is given. In order to prevent an incorrect adjustment of the return cylinder by

the operator, blocking screws 24, 25 and 26, which with their heads cover the said slots and only leave one slot free, are provided in the plate 18. These screws can be transposed in such a way as to enable the other slots to be employed, but they always leave only one slot free. Owing to the four different positions, the combining power for the number of possible coding combinations is increased. In one special constructional form the return cylinder is rotatably supported like the other coding cylinders. For this purpose, a sleeve 28 is secured, for example, riveted to a plate 29 and together with this plate slidably mounted on the shaft 27. The plate 29 is held in its angular position by a pin 30 secured in the casing of the machine. The said pin 30 engages in a corresponding slot 30<sup>a</sup> of a member 29<sup>a</sup>, which is secured to the plate 29. Thus during the sliding movement of the sleeve 28 with the plate 29 on the shaft 27 the plate 29 is always kept in the same position and secured against displacement. The plate 29 (Fig. 5) corresponds to plate 18 of Fig. 1 and the pin 30 of Fig. 3 corresponds to pin 23 of Fig. 1.

There is rotatably mounted on the sleeve 28 the cylinder body 31, which forms the return cylinder and can consequently be adjusted in any contact position with respect to the adjoining coding cylinder. The adjustment is effected by means of a notched wheel 32 with a corresponding locking device which secures the notched wheel in the adjusted position.

In a further constructional form, illustrated in Fig. 3<sup>a</sup>, there is secured upon the return cylinder a driving wheel 33, in which a pawl or the like 33<sup>a</sup> (partly shown) engages when the keys are depressed, and rotates the return cylinder during the coding relatively to the coding cylinders in a manner similar to the known manner of rotating the coding cylinders themselves.

To the individual coding cylinders 1, 2 and 3 are secured notched discs 34, 35 and 36. Into the notches of these discs there enter catch rollers for the purpose of holding the coding cylinders fast in the correct contact position, as may be seen at 37. These contact rollers are mounted upon a spring-actuated lever 38. It will be seen from Fig. 4 how these notched discs project outwards over a casing 39 covering the parts of the coding device for the purpose of this adjustment, and in this casing are provided windows 40 which enable the existing adjustment of the individual coding cylinders to be inspected.

To the coding cylinders are secured in a known manner ratchet wheels 41 with which there engage pawls 42 capable of producing a small angular rotation of the coding cylinders. These pawls are rockably supported at 43 in a driving stirrup 44, which is rockable about the point 45. In this stirrup are arranged bars 46 which are located within

reach of key rods 47 of the key bank B, so that upon any key being depressed, the driving stirrup, which is held in its normal position by a spring 48, is moved. The pawls 42 of any individual coding cylinder are, as already mentioned, rotatably supported about a pivot 43 in the driving stirrup 44 and are subject to the influence of a spring 49 which constantly presses the pawls against the ratchet wheels. These pawls have a projection 50, and in the framework of the machine is provided a stop 51 which in the normal position of the driving stirrup 44 holds every pawl with its pawl tooth out of reach of the teeth of the ratchet wheel. Compare Fig. 4. This enables the individual coding cylinders, in the position of rest of the device, to be rotated by means of the notched discs 34, 35 and 36 not only forwards, that is to say in the direction of the teeth, (the direction of the arrow 52), but also in the opposite direction (the direction of the arrow 53), which considerably facilitates the adjustment.

Besides the notched wheel and the ratchet wheel there is also secured to each coding cylinder a feed disc 54 with one or more deep notches 55. Now when one coding cylinder is moved by the pawl on the driving stirrup, in order to prevent an adjacent coding cylinder from being carried round with it by the contact pressure between the individual coding cylinders, as a result of which the adjusted coding combination would be disturbed, the following provision is made:—

On the outer edge of the pawl 42 opposite to a pawl tooth 56 is provided an oblique surface 57 and in the framework of the device a blocking tooth 58 with an edge 59 is rigidly secured. Now if by the depressing of a key the pawl tooth 56 of the pawl 42 of one coding cylinder enters a gap between the teeth of the ratchet wheel 41 and this ratchet wheel and with it the associated coding cylinder, is thereby rotated through a certain angle, the pawl teeth 56 of the other pawls likewise enter the gaps between the ratchet teeth of the associated ratchet wheels. Since in this movement the surface 57 of the pawl moves along the surface 59 of the blocking tooth 58, and consequently the pawl cannot yield outwards, the other coding wheels are locked against any undesired driving during the rotation of one coding cylinder.

The arrangement of the drive of the coding cylinders is thus preferably so provided that one coding cylinder, for example the coding cylinder 3, located next to the entrance cylinder 5, is continuously fed forward at each key depression, in which case, as described in the preceding paragraph, it is also locked at the same time against being turned further unintentionally. The other coding cylinders are only fed forward periodically. As will be seen from Figs. 1, 4 and 5, the keys 60 are united to form a bank of keys B.

Besides the bank of keys B glow lamps 61 are united to form an independent bank C of glow lamps. Over these glow lamps are arranged in the casing 39 transparent windows 62, upon which are painted or cut out the code signs 63. The marking of the windows with the code signs is preferably symmetrical with the marking of the keys in the bank of keys. In a specially convenient constructional form, as shown in Figs. 4 and 5, the lamps are secured to a lamp plate 64, and the windows 62 are arranged above the lamps in a cover plate 65 releasable from the casing. By these means the advantage is obtained that the entire device in its essential parts is completely enclosed by the casing 39, that this casing can be secured by locks in such a way that unauthorized persons and even the operators cannot alter anything in the adjustment of the individual parts of the coding machine, whereas the bank of lamps C on the other hand is at all times accessible for the purpose of changing the lamps. In the lamp plate 64 are provided seatings 66 for reserve lamps 67.

On the under side of the lid of the casing, or, in the case of the constructional form illustrated, on the under side of the cover plate 64, are fitted screening sleeves 68, which concentrate the light of an individual lamp on the associated window and keep it away from the windows of the other lamps. Instead of such a bank of glow lamps a bank of separate relays with switch flaps or the like may be employed as indicating points.

In the device according to the invention, a special reversing switch is not necessary for deciphering but it is only necessary for deciphering to press the cipher letter on one key, the letter of the clear text appearing illuminated through a glow lamp.

What I claim is:—

1. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, end cylinders forming with the individual coding cylinders a device for the conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinder and the other end cylinders, contacts upon both sides of said cylinders being in the individual positions of the cylinders in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed, the contact keys each co-operating with one working contact and one stationary contact (exchange contact), a set of transparent windows bearing the code signs

and individually illuminated by the lamps of a set of glow lamps as receiving points, united in a bank separate from the set of coding cylinders and the set of contact keys, the signs marked on the windows of the transmitting points being symmetrical with the signs marked on the keys.

2. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, end cylinders forming with the individual coding cylinders a device for the conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinder and the other end cylinders, means connected with the return cylinder for the adjustment thereof into a plurality of positions, contacts upon both sides of said cylinders being in the individual positions of the cylinders in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed, the contact keys each operating one working contact and one stationary contact (exchange contact), a set of transparent windows bearing the code signs and individually illuminated by the lamps of a set of glow lamps as receiving points, united in a bank separate from the set of coding cylinders and the set of contact keys, the signs marked on the windows of the transmitting points being symmetrical with the signs marked on the keys.

3. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, end cylinders forming with the individual coding cylinders a device for the conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinder and the other end cylinders, the return cylinder being likewise rotatably arranged, means for displacing the same upon individual keys being depressed, contacts upon both sides of said cylinders being in the individual positions of the cylinders in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed, the contact keys each operating one working contact and one stationary contact (exchange contact); a set of transparent windows bearing the code signs and individually illuminated

by the lamps of a set of glow lamps as receiving points, united in a bank separate from the set of coding cylinders and the set of contact keys, the signs marked on the windows of the transmitting points being symmetrical with the signs marked on the keys.

4. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, a ratchet wheel upon each coding cylinder, end cylinders forming with the individual coding cylinders a device for the conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinder and the other end cylinders, the return cylinder being likewise rotatably arranged, means for displacing the same upon individual keys being depressed, contacts upon both sides of said cylinders being in the individual positions in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed by means of pawls, a stirrup being at one end within reach of the individual contact keys and carrying at the other end the pawls, a blocking tooth blocking the coding cylinders against unwanted further movement during the rotation, the contact keys each operating one working contact and one stationary contact (exchange contact), a set of transparent windows bearing the code signs and individually illuminated by the lamps of a set of glow lamps as receiving points, united in a bank separate from the set of coding cylinders and the set of contact keys, the signs marked on the windows of the transmitting points being symmetrical with the signs marked on the keys.

5. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, a ratchet wheel upon each coding cylinder, a notched wheel upon each coding cylinder projecting with one part out of a casing enclosing the device for the adjusting of the coding cylinders at the commencement of the coding or decoding process, resilient catch levers entering the notches of said notched wheels and fixing the positions of the coding wheels relative to one another with their contacts in contact, end cylinders forming with the individual coding cylinders a device for the irregular conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinders and the other end cylinder, the return cylinder being likewise



rotatably arranged, means for displacing the same upon individual keys being depressed, contacts upon both sides of said cylinders being in the individual positions in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed by means of pawls, a stirrup being at one end within reach of the individual contact keys and carrying at the other end the pawls, a blocking tooth blocking the coding cylinders against unwanted further movement during the rotation, the contact keys each operating one working contact and one stationary contact (exchange contact), a plate releasable from the casing of the device exhibiting a set of transparent windows bearing the code signs and individually illuminated by the lamps of a set of glow lamps.

6. An electrical device for coding and decoding, comprising in combination rotatable individual coding cylinders with suitably irregular intermediate connections, a ratchet wheel upon each coding cylinder, a notched wheel upon each coding cylinder projecting with one part out of a casing enclosing the device for the adjusting of the coding cylinders at the commencement of the coding or decoding process, resilient catch levers entering the notches of said notched wheels and fixing the positions of the coding wheels relative to one another with their contacts in contact, end cylinders forming with the individual coding cylinders a device for the irregular conducting of electric current through the cylinders, one end cylinder being constructed as a return cylinder for returning the electric current through the individual coding cylinders and the other end cylinder, the return cylinder being likewise rotatably arranged, means for displacing the same upon individual keys being depressed, contacts upon both sides of said cylinders being in the individual positions in contact with one another and forming the path for the electric current through the coding cylinders, a set of individual contact keys as transmitting points in a bank separate from the set of coding cylinders rotating the coding cylinders relatively to one another upon a key being depressed by means of pawls, a stirrup being at one end within reach of the individual contact keys and carrying at the other end the pawls, a blocking tooth blocking the coding cylinders against unwanted further movement during the rotation, the contact keys each operating one working contact and one stationary contact (exchange contact), a plate releasable from the casing of the device exhibiting a set of transparent windows bearing the code signs and individually illuminated by the lamps of a set of glow lamps, screening sleeves

on said plate concentrating the light of the individual lamps upon the associated window and keeping it way from the other windows.

7. Electric device for coding and decoding comprising in combination rotary individual coding cylinders with irregular intermediate connections, end cylinders constituting together with the individual coding cylinders a device for passing the electric current through the cylinder, one end cylinder constructed as return cylinder for returning the electric current through the individual coding cylinders, and the other end cylinder whereby decoding without using a special reshifting device is possible, contacts on both sides of said cylinders being in the individual positions of the cylinders in engagement with the contacts of the other cylinders and forming the way for the electric current through the coding cylinders, a set of individual contact keys as senders, said contact keys co-operating each with one movable contact and an stationary contact, both forming an exchange contact and a set of glow lamps as receiving apparatus.

In testimony whereof I have signed my name to this specification.

WILLI KORN.