Feb. 27, 1934. P. G. G. BEYER 1,949,140

CRYPTOGRAPHIC APPARATUS

Filed Jan. 25, 1932 4 Sheets-Sheet 1

Fig 1.

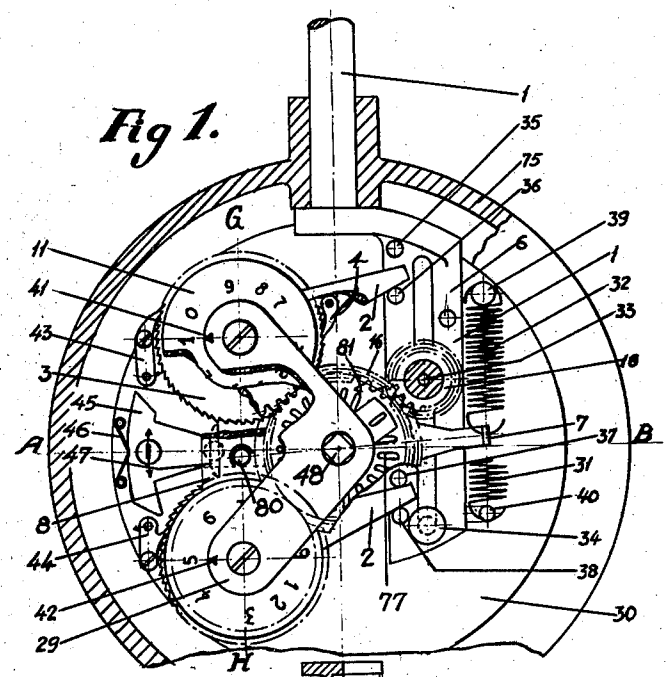

Fig 3.

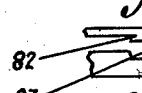

Fig 2.

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Feb. 27, 1934. P. G. G. BEYER 1,949,140

CRYPTOGRAPHIC APPARATUS

Filed Jan. 25, 1932 4 Sheets-Sheet 2

Fig 4.

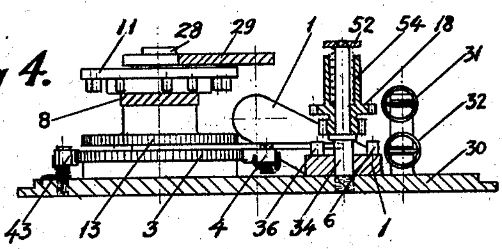


Fig 5.

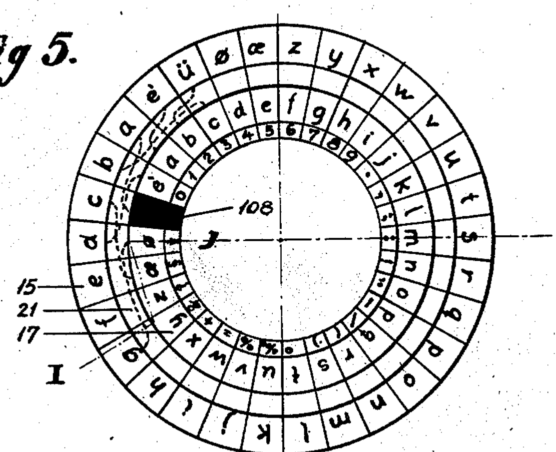


Fig 6.

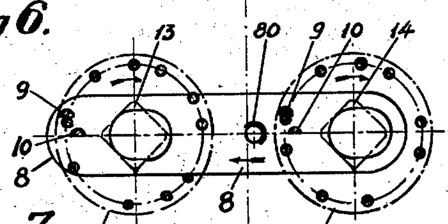
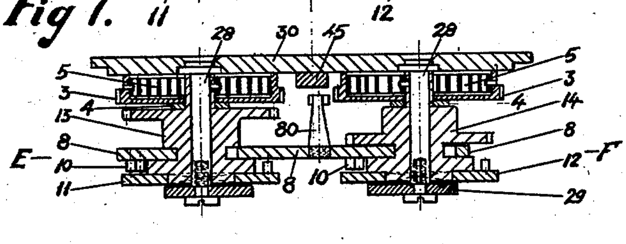


Fig 7.



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CRYPTOGRAPHIC APPARATUS

Filed Jan. 25, 1932 4 Sheets-Sheet 3

Fig. 8

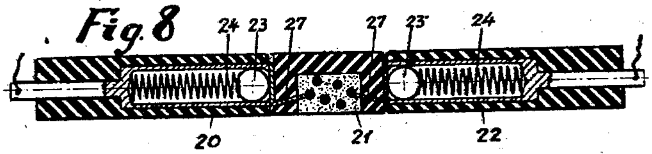


Fig. 9.

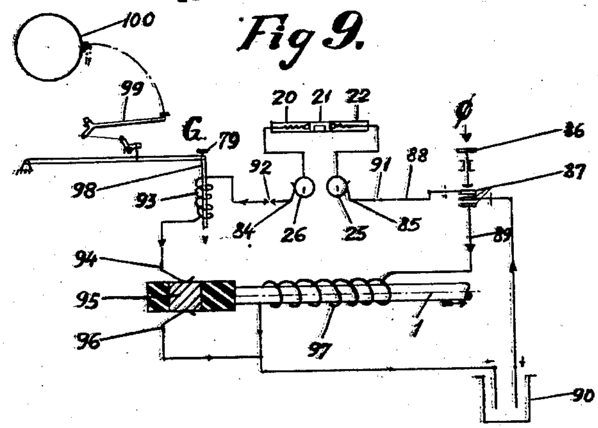
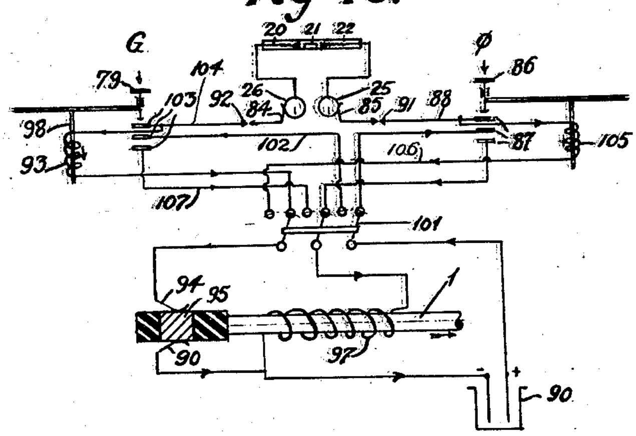


Fig 10.



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CRYPTOGRAPHIC APPARATUS

Filed Jan. 25, 1932 4 Sheets-Sheet 4

Fig 11.

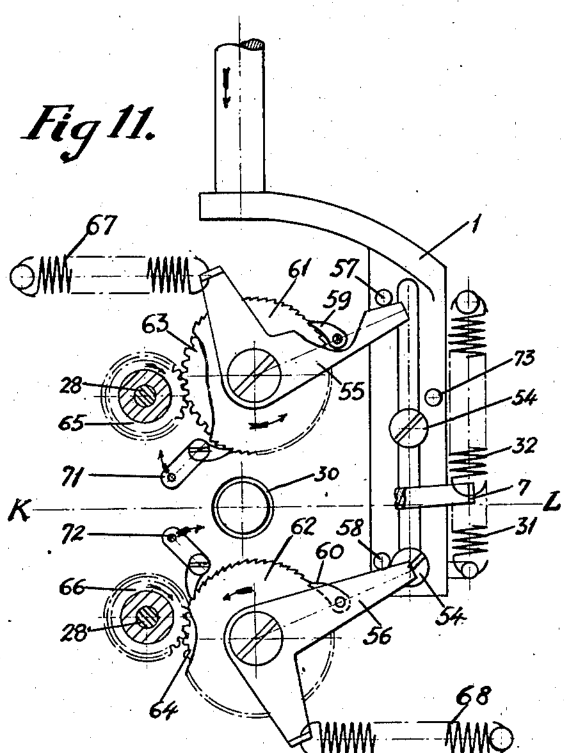


Fig 12.

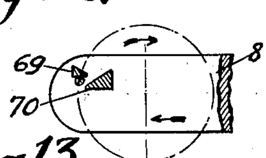
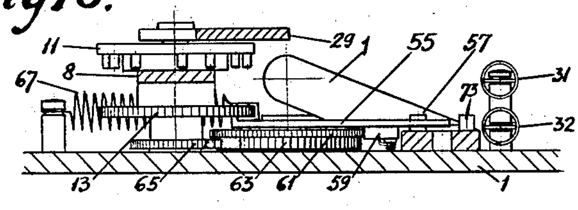


Fig 13.



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Patented Feb. 27, 1934

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UNITED STATES PATENT OFFICE

1,949,140

CRYPTOGRAPHIC APPARATUS

Peter Georg Grove Beyer, Copenhagen, Denmark

Application January 25, 1932, Serial No. 588,795
In Denmark January 24, 1931

12 Claims. (Cl. 197—4)

(Granted under the provisions of sec. 14, act of March 2, 1927; 357 O. G. 5)

This invention relates to cryptographic apparatus and more particularly has reference to a device for electrically interconnecting typewriting machines in such a manner as to effect cryptographic transcriptions.

The present invention resides in a device comprising three concentrically arranged annular discs mounted in a suitable housing. Letters, numbers and symbols are provided on the inner disc and the exterior annular disc is provided with letters exclusively. Between the inner and outer annular discs is a rotatable cross-field ring which is fixed to a rotatable gear having letters or symbols disposed thereon which aid in setting the cross-field ring in any relative starting position previously determined. The inner and outer discs are adapted to be rotated either separately or simultaneously in the same or opposite direction in a regular or irregular manner.

The movements of the three annular discs are stopped by two pin-wheels, which are simultaneously released. The pin-wheels are provided with pins, the number of and mutual distance between which may be changed, one independently of the other, so that the pin-wheels and the annular discs rotated together with them, by a release operation brought about by every pressing down upon a shifting arm, are turned an equal or unequal number of degrees away from their previous position.

The tension of the springs that rotate the pin-wheels is automatically and simultaneously attained with the release of the pin-wheels.

The discs are divided into sectors. Each of the sectors on the inner annular discs is formed like laminæ and are electrically connected to a spring contact and to a solenoid or electromagnet beneath its corresponding key in a hand operated typewriting machine, and each of the exterior annular disc's sectors is likewise adapted like laminæ and electrically connected to spring contacts and to a solenoid or electromagnet beneath its corresponding key in another typewriting machine. Thus when a key is pressed down in one of the typewriting machines, a key will be simultaneously struck in the other typewriting machine.

It depends upon the relative position of the three annular discs which key is struck in the other typewriting machine.

Once the key is released, all of the three annular discs are moved, and those letters which before were adjacent often cease to be, as a result of the rotation of the annular discs in leaps of unequal length.

By striking the key "ϕ", for instance, in one of the typewriting machines energy is passed to a solenoid beneath the key "G" in the other typewriting machine in which the letter "G" on its exterior annular disc has cross-field connection with the letter "ϕ" on its inner annular disc. Thus the energy pulls the key "G" in the second typewriting machine whereupon both annular discs are displaced, and from this point it depends upon their new positions which letter shall be struck in the other typewriting machine as the result of a given key being struck in the first typewriting machine.

In the drawings.

Figure 1 is a plan view of the apparatus, the back cover being removed.

Fig. 2 is a cross-sectional view taken on the line A—B, Fig. 1.

Fig. 3 shows the dowel between the ebonite rings and the annular discs.

Fig. 4 is a cross-sectional view taken on the line A—B, Fig. 1, seen from below.

Fig. 5 is a plan view of the rotatable annular discs and the cross-field ring in the middle.

Fig. 6 is a plan view of the releaser in drawn-back position and of the two pin-wheels, on the line E—F, in Fig. 7.

Fig. 7 is a cross-sectional view taken on the line G—H, in Fig. 1.

Fig. 8 is a cross-sectional view of the annular discs and the cross-field ring, on the line I—J, in Fig. 5.

Fig. 9 is a diagram of connections between the apparatus and two typewriting machines.

Fig. 10 is a full diagram of an enciphering and deciphering system, in both directions.

Fig. 11 is a plan view of a modified winding construction.

Fig. 12 is a detail showing the stop knobs on the releaser for the modified construction.

Fig. 13 is a cross-section on the line K—L in Fig. 11.

The apparatus consists of a casing 75 provided with a back cover 76 and a removable front cover 74.

On the shifting arm 1, which is guided in its support by pivots 33, 34, Fig. 1, are disposed two sets of tholepins 35, 36 and 37, 38 which, when the shifting arm is depressed, move two reciprocating levers 2, whereby two corresponding spiral spring-casings 3, each having 90 teeth, are rotated because a click or ratchet 4 on each lever 2 pulls them along, thus giving tension to spiral springs 5 in the casings 3, Figs. 1 and 7.

One of the springs 5 (Fig. 7) is attached to a

blockading wheel 13 carrying a pin-wheel 11, and the other spring to a blockading wheel 14, carrying a pin-wheel 12. A releaser 8 is movable into and out of the paths of movement of the pins carried by the pin-wheels.

Axles 28 are mounted on the supporting plate 30 and a yoke 29 is attached to the free ends of the axles. Blockading wheels 13 and 14 are rotatably mounted on the axles and are independently impelled by individual spiral springs 5, the other ends of which are attached to the casings 3.

The pin-wheel 11 has 10 pins, while the pin-wheel 12 has but 9 pins; the blockading wheel 13 carries 62 teeth and the blockading wheel 14 carries 58 teeth, so that the movements which they transmit are not synchronous. The blockading wheels 13 and 14 are provided with squared hubs whereon the pin-wheels are mounted, thus rotating together with the former.

During the last tenth of the depressing of the shifting arm 1, a pin 6 disposed on the shifting arm presses down a swingbar 7 that is connected by a stud 80 to the releaser 8 which is displaced in a direction opposite that of the shifting arm. This displacing effects the first part of the release, which is intermittent in two rates.

On the releaser 8 are mounted two sets of stop pins 9 and 10, Figs. 6 and 7, and by the depressing of the shifting arm 1 the stop pin 9 in both sets releases a pin on the pin-wheel 11 and a pin on the pin-wheel 12, while the next following pins on both wheels are retained by the stop-pins 10. When the shifting arm 1 is released and therefore raises, then the releaser 8 is moved in opposite direction, whereby a pin on the pin-wheels 11 and 12 leaps or slips around the stop-pins 10 in both sets although they will be retained by the stop-pins 9.

In Figs. 1 and 2 is shown a pawl releaser 45 turning about the axle 48 of the apparatus and having a catch or ear 46 and a stop-tooth 47 which, during the adjustment of the apparatus, is changed over to catch between the teeth of the blockading wheel 13 or of the blockading wheel 14, but once the adjustment of the combination is done then it is set idle.

In the example shown in Fig. 1 it does not obstruct any of the blockading wheels 13 or 14 in either of the two sets of works.

When the releaser 8 by advancing releases a pin on pin-wheel 11, then the blockading wheel 13 is rotated a fraction of the distance corresponding to the distance between that pin on the pin-wheel 11, which before release is obstructed by the stop-pin 9 and the following pin on the pin-wheel 11. The remaining distance is rotated when the releaser recedes, which happens when the shifting arm raises by being released after the depressing.

When releaser 8 recedes, stop pin 10, which has moved into the path of the following pin on the pin-wheel 11, is shifted and the pin on the pin-wheel 11 held thereby is engaged by stop pin 9.

The shifting arm 1, Fig. 1 is raised by a coil spring 31 which is attached to a pin 39 on the supporting plate 30, Fig. 1, and simultaneously therewith the swingbar 7 and the releaser 8 are pulled back by a helical spring 32 that is attached to the same pin 39.

The tholepins 35, 37 press both reciprocating levers 2 down, respectively, 36 and 40 degrees by each depressing of the shifting arm 1. For a complete rotation of 360 degrees 10 depressings for the blockading wheel 13 and 9 depressings for the blockading wheel 14 are required.

The spring casings 3 are rotated one entire revolution by respectively 10 and 9 depressings, and as a release takes place by every depressing none of the spiral springs shall have lost or gained tension after said depressings.

When the pin-wheels 11 and 12, Fig. 7, have finished one turn, then the spiral springs 5 are wound one turn. A number corresponding with each pin on these pin-wheels 11 and 12 is disposed exteriorly and adjacent to indicating marks 41 and 42 on the yoke 29, Fig. 1. Pawls 43 and 44 held under spring action ensure the casings 3 against revolving back.

An exterior annular disc 15, Fig. 2, provided with a cogwheel which meshes with teeth on the blockading wheel 13 rotates together with it. An interior annular disc 17 provided with a catch cogwheel 19 meshes with the large cogwheel of a change gear 18, and in additon meshes with the cogwheel of the blockading wheel 14.

Both these annular discs 15 and 17 rotate equal or unequal degrees determined by the distances between the pins of each set that has been in function.

The interior annular disc 17 is fastened to an axle 48, Fig. 2, which carries the catch cogwheel 19 which is idle and provided with 30 catch grooves 77 into one of which the catch spring 49 seats itself. This catch spring 49 turns with the axle 48 due to pins 50, and a bushing 51 keeps the several parts together on the axle.

Between these annular discs 15 and 17 is mounted a crossfield-ring 16 provided with a cogwheel which, by the small cogwheel of the change gear 18, receives movement from the catch cogwheel 19 of the interior annular disc 17 in the proportion 1:2.

The two cogwheels of the change gear 18 have respectively 10 and 24 teeth.

The annular discs 15, 16 and 17 are divided in 30 sectors, each of which on the disc 17 being provided with a letter and a number and those of the disc 15 with a letter, as shown in Fig. 5.

Ebonite-rings 20, 21 and 22 are respectively kept mounted on the discs 15, 16 and 17 by dowels 82 and holes 83, shown in Fig. 3. These ebonite-rings 20, 22, Fig. 8, are divided into 30 sectors each carrying a contact ball 23 and a spiral spring 24, or equivalent structure.

From each ball 23 in the ebonite ring 20, Figs. 8 and 2, leads a wire to a contacting ring on a drum 26 which is joined to the ebonite ring, and from each ball 23 in the ebonite ring 22 leads a wire to a contacting ring on a drum 25 joined to the ebonite ring, both the drums carrying each 30 rings, which are insulated from each other as well as from the surroundings and correspond to the 30 sectors of the ebonite rings. Each of the contacting or slip rings has a brush associated therewith.

The ebonite ring 21 mounted on the cross-field ring 16 carries 30 contact pieces 27 on each side, Fig. 8, connected in pairs, either crossed or opposite to each other.

The drums 25 and 26 Fig. 2, carry each a scale with 30 divisions, each provided with a letter corresponding to the letters on the sectors of the annular discs 15 and 17 and ebonite rings 20, 22.

The cogwheel on the cross-field ring 16 is divided in 30 sections (numbered on the outside) and the cogwheel 19 which carries 30 catches has an indicating mark 81 for reading off.

Before starting an enciphering or a decipher-

ing the pawl releaser 45, Fig. 1 is put over to one side, so that the stop tooth 47 engages, for instance, with the teeth of the blockading wheel 14, thus the pawl 44 is raised or released, whereupon the adjustment of the blockading wheel 13 may be effected without affecting the wheel 14 and without increasing the tension of the spring for rotating wheel 14.

By depressing several times on the shifting arm, the pin wheel 11 is rotated until that number agreed upon, for instance, "0", stands adjacent to the indicating mark 41, then the pawl releaser 45 is swung towards the opposite side whereby the blockading wheel 13 is stopped by the stop tooth 47, and simultaneously the pawl 43 of the blockading wheel 13 is released, so that it is possible by the depressing of the shifting arm 1 to rotate the blockading wheel 14 and the pin wheel 12 so that the number "1"—or any other number agreed upon—stands adjacent to the indicating mark 42, while the spiral spring 5 in the casing 3 shall swing to and fro and the pin wheel 11 and its blockading wheel 13 remain immovable, because the stop tooth 47 engages it.

Now, when the axle 48 is turned by a proper key or wrench fitting on its square end, the drum 25 follows because the ebonite ring 22 follows due to the dowel 82 and hole 83, similar to that shown in the Fig. 3.

Then the axle is turned until two letters agreed upon, for instance, "ϕ" on the drum 25 and "G" on the drum 26, stand adjacent to each other.

Finally, the change gear 18, Figs. 1 and 4, is pulled out against an abutment 52 thus releasing the catch cogwheel 19, then the cogwheel of the cross-field ring 16, which yet is engaged with the small cogwheel of the change gear 18 is turned until the indicating mark 81 on the catch cogwheel 19 stands adjacent to the cipher which has previously beer agreed upon, for instance, "8", on the cogwheel of the crossfield ring 16, and finally the change gear is slipped down so that both cogwheels again engage.

The key agreed is thus: 0.1.ϕ.G.8. and it is the starting adjustment.

In Fig. 5 are shown paper dial discs on the annular discs 15 and 17, used when the apparatus is to operate without electrical connection; they are uncovered by taking off the casing 75 from the front cover 74 and thus separating the ebonite rings 20, 21 and 22 from the parts 15, 16 and 17.

In the Fig. 5 is shown how to dispose the wires in the ebonite ring 21, covering the cross-field ring 16.

As the spiral spring 5 may be overloaded by not carrying out the last tenth of the depressings of the shifting arm in the Fig. 11 is shown a modification in which helical springs 67 and 68 are employed. The shifting arm 1 which in this instance is guided by screws 54 moves the reciprocating levers 55 and 56 by means of the pins 57 and 58, whereby clicks 59 and 60 engage the ratchet wheels 61 and 62, which are fastened to the cogwheel 63 and 64.

When the shifting arm is released the helical spring 31 pulls it back, while the clicks 59 and 60 rotate the ratchet wheels 61 and 62, due to the helical springs 67 and 68 and together with them turn the cogwheels 63 and 64, as well as the engaged cogwheels 65 and 66. These drive the blockading wheels 13 and 14 provided with the pin wheels 11 and 12, which owing to the described operations leap to the next pin.

The release is realized at the last tenth of the movement, that is, when a pin 73 on the shifting arm 1 presses upon the swingbar 7, whereby the releaser 8, Fig. 12, is displaced towards one side, that is, upwards in Fig. 1.

A stop knob 70, Fig. 12, on the releaser 8 allows one of the pins on the pin wheels 11 to rotate, and when the shifting arm 1 is released, then the helical spring 67 may act upon the reciprocating lever 55, the click 59, the ratchet wheel 61, the cogwheel 63 and the cogwheel 65, and consequently the pin on the pin wheel is released and may be rotated until the next pin abuts against the second stop knob 69. The reciprocating lever 56 receives tension by a helical spring 68, and the pawls 71 and 72 here act like the pawls 43 and 44 in Fig. 1.

In the schematic drawings Fig. 9 showing the passage of the electrical current, the G-sector of the ebonite ring 20 corresponds through the ebonite ring 21 with the ϕ-sector in the ebonite ring 22. The G-sector is shown connected to its G-contacting ring on the drum 26, while the ϕ-sector in the ebonite ring 22 is connected to its ϕ-contacting ring on the drum 25.

A trail contact 84 is provided for every one of the 30 contacting rings on the drum 26, and in a similar manner there is disposed a trail contact 85 for each contacting ring on the drum 25.

By striking a key 86, which is the letter "ϕ" key in a hand operated typewriting machine, a circuit is closed from a source of current 90, through the spring contacts 87, through the wire 89, a solenoid 97 back to minus, whereby the shifting arm 1 is pulled down (though it is shown by the arrow towards the right for convenience sake).

Another branch of the current simultaneously passes over the spring contacts 87, giving energy to the line 88 from where it passes through a connecting plug contact 91, through a trail contact 85, to the ϕ-contacting ring on the drum 25, through the ϕ-sector in the ebonite ring 22, through the ebonite ring 21 of the cross-field to the G-sector in the ebonite ring 20, then through the G-contacting ring on the drum 26, through a trail contact 84, a plug contact 92, a solenoid 93, a trail contact 94, a contact section 95 of the shifting arm 1, through a trail contact 96 and back to minus.

The current, which passes the solenoid 93 during the first $\frac{9}{10}$ part of the depressing, acts upon an electromagnetic core 98, which is fastened to the G-keybar of an electrically operated typewriting machine, and strikes the G-typebar 99 against the platen 100. Before the shifting arm 1 has reached the last tenth of its movement, its contact section 95 slides away from the trail contacts 94, 96, whereby the first mentioned circuit is deprived of current and the G-typebar 99 then falls back, before the ebonite rings 20, 21 and 22 are rotated.

The movement of the shifting arm winds the spiral springs 5 and releases the pin wheels 11 and 12 in the apparatus.

The ϕ-key 86 is attached to the hand driven typewriting machine operated on, and the electrically operated typewriting machine which is connected with the first, works simultaneously, whereby it is possible to control what has been written both in spelled and in enciphered texts.

In order to enable immediate enciphering and deciphering, two typewriting machines Fig. 10, are required, respectively provided with contacts 87, 103 and solenoids 93, 105.

These two machines are then connected by wires passing through the sectors in the ebon-

ite rings 20, 21, 22 and to the contacting rings on the drums 25 and 26.

In the Fig. 10 is shown a double diagram provided with a commutator which is shown in the enciphering position for the hand operated typewriting machine, but by sliding the commutator over upon the other contacts then the cryptogram received may be deciphered by the other typewriting machine.

It is possible to exchange the letters on the sectors in the annular discs 15 and 17 of the hand operated typewriting machine; changes are thus possible by interchanging the connecting plug contacts 91 and 92.

In Fig. 5 is shown an extra sector 108 which is reserved for a letter such as "ü" not used in many languages, and this sector may be used to indicate that instead of letters, the numbers and symbols shown on the interior annular disc 17, should be read off.

By changing the commutator 101, Fig. 10, the function of the typewriting machine is changed, so that the one which before was hand operated becomes electrically operated and vice versa.

In this case the current passes from the source of current 90 through the commutator 101 to a wire 102, over three spring contacts 103, through a wire 104, the plug contact 92, the trail contact 84, the contacting ring on the drum 26, the ebonite rings 20, 21 and 22, the contacting ring on the drum 25, the trail contact 85, the plug contact 91, the line 88, a solenoid 105, a wire 106, through the commutator 101 to the trail contact 94, the contact section 95, the trail contact 96, and back to minus.

The other branch of the current, which previously has set the shifting arm into motion, passes from the spring contacts 103, through a wire 107, the commutator 101 to the solenoid 97 and back to minus in the source of current 90.

What I claim is:

1. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other disc with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, means for rotating said discs with respect to each other, said circuit completing means including drums carried by the outer and inner discs, contact rings on the drums, and means for connecting the contact elements of the discs with the contact rings of the drums.

2. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, spring motors tending to constantly rotate said outer and inner discs, and escapement means for limiting the rotation of the discs to a step-by-step movement.

3. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft tending to constantly rotate, escapement means for limiting movement of each shaft to step-by-step rotation, the number of steps necessary for rotating one shaft through 360° being different from that of the other shaft, and means for connecting one shaft to the inner disc and the other shaft to the outer disc.

4. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft tending to constantly rotate, escapement means for limiting movement of each shaft to step-by-step rotation, the number of steps necessary for rotating one shaft through 360° being different from that of the other shaft, means for connecting one shaft to the inner disc and the other shaft to the outer disc, and means for adjusting the position of one disc relative to the spring motor shaft for driving the same.

5. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with

the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft tending to constantly rotate, escapement means for limiting movement of each shaft to step-by-step rotation, the number of steps necessary for rotating one shaft through 360° being different from that of the other shaft, means for connecting one shaft to the inner disc and the other shaft to the outer disc, and means for rotating the intermediate disc in a predetermined relation to one of the other discs.

6. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft tending to constantly rotate, escapement means for limiting movement of each shaft to step-by-step rotation, the number of steps necessary for rotating one shaft through 360° being different from that of the other shaft, means for connecting one shaft to the inner disc and the other shaft to the outer disc, and means for rotating the intermediate disc in a predetermined relation to one of the other discs, said means including a coupling for effecting connection between the intermediate disc and said other disc so that the intermediate disc may assume varied positions relative to said disc.

7. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to release the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, and means for connecting one shaft with the outer disc and the other shaft with the inner disc.

8. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to release the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, means for connecting one shaft with the outer disc and the other shaft with the inner disc, and means operable on shifting of said element for winding the spring motors to compensate for rotation of their shafts.

9. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermedate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to release the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, means for connecting one shaft with the outer disc and the other shaft with the inner disc, means operable on shifting of said element for winding the spring motors to compensate for rotation of their shafts, and means for adjusting the position of one disc relative to the spring motor shaft for driving the same.

10. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and

the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to relese the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, means for connecting one shaft with the outer disc and the other shaft with the inner disc, means operable on shifting of said element for winding the spring motors to compensate for rotation of their shafts, and means for rotating the intermediate disc in a predetermined relation to one of the other discs.

11. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to release the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, means for connecting one shaft with the outer disc and the other shaft with the inner disc, and means operable on shifting of said element for winding the spring motors to compensate for rotation of their shafts, said means including a coupling for effecting connection between the intermediate disc and said other disc so that the intermediate disc may assume varied positions relative to said disc.

12. A cryptographic apparatus comprising three concentrically arranged annular discs, the inner and outer discs being divided into sectors, an electrical contact element in each sector, means for connecting the contact elements of one disc with a plurality of keys, means for connecting the contact elements of the other discs with typewriter operating solenoids, the intermediate disc being divided into sectors, each of which carries two contact points, one adapted to cooperate with the contact elements of the inner disc and the other adapted to cooperate with the contact elements of the outer disc, means for connecting the contact points cooperating with the outer disc in a predetermined manner with the contact points cooperating with the inner disc, means for completing a circuit through said discs, keys and solenoids and a source of electrical energy, a pair of spring motors each having a driven shaft, a shiftable element, means associated with the shiftable element for preventing rotation of said shafts in one direction and operable upon shifting of the element to release the shafts to effect partial rotation thereof, the degree of rotation of one shaft being different from that of the other, means for connecting one shaft with the outer disc and the other shaft with the inner disc, means operable on shifting of said element for winding the spring motors to compensate for rotation of their shafts, said means including a coupling for effecting connection between the intermediate disc and said other disc so that the intermediate disc may assume varied positions relative to said disc, and electromagnetic means operable upon depressing a key for actuating said shiftable member.

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