

March 30, 1937.

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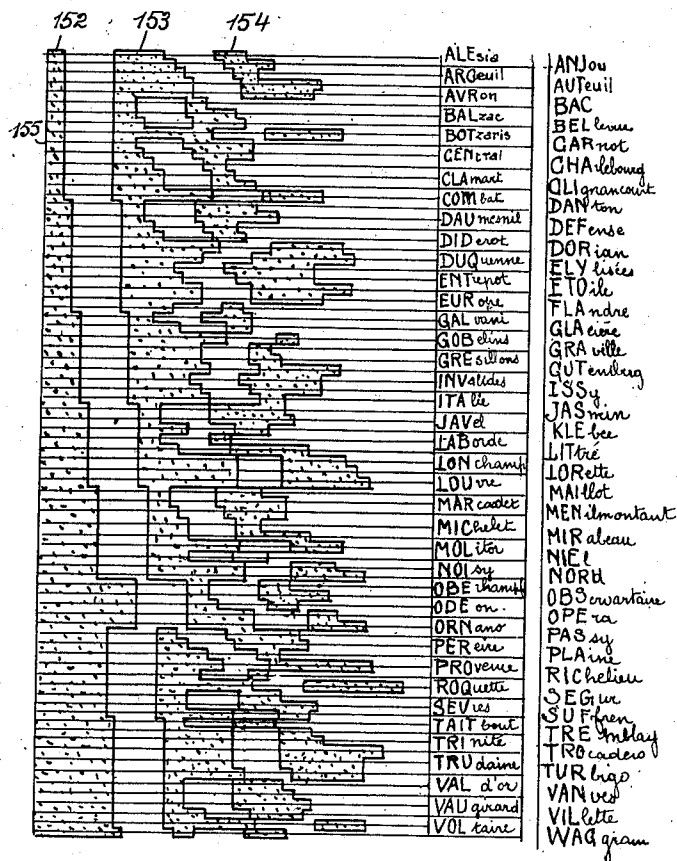
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AUTOMATIC TELEPHONE APPARATUS

Filed June 8, 1933

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Fig. 1



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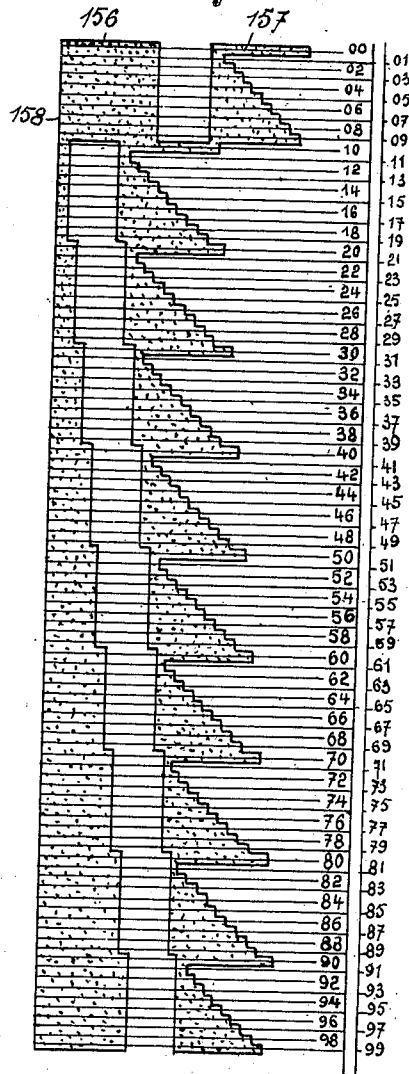
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Fig. 2



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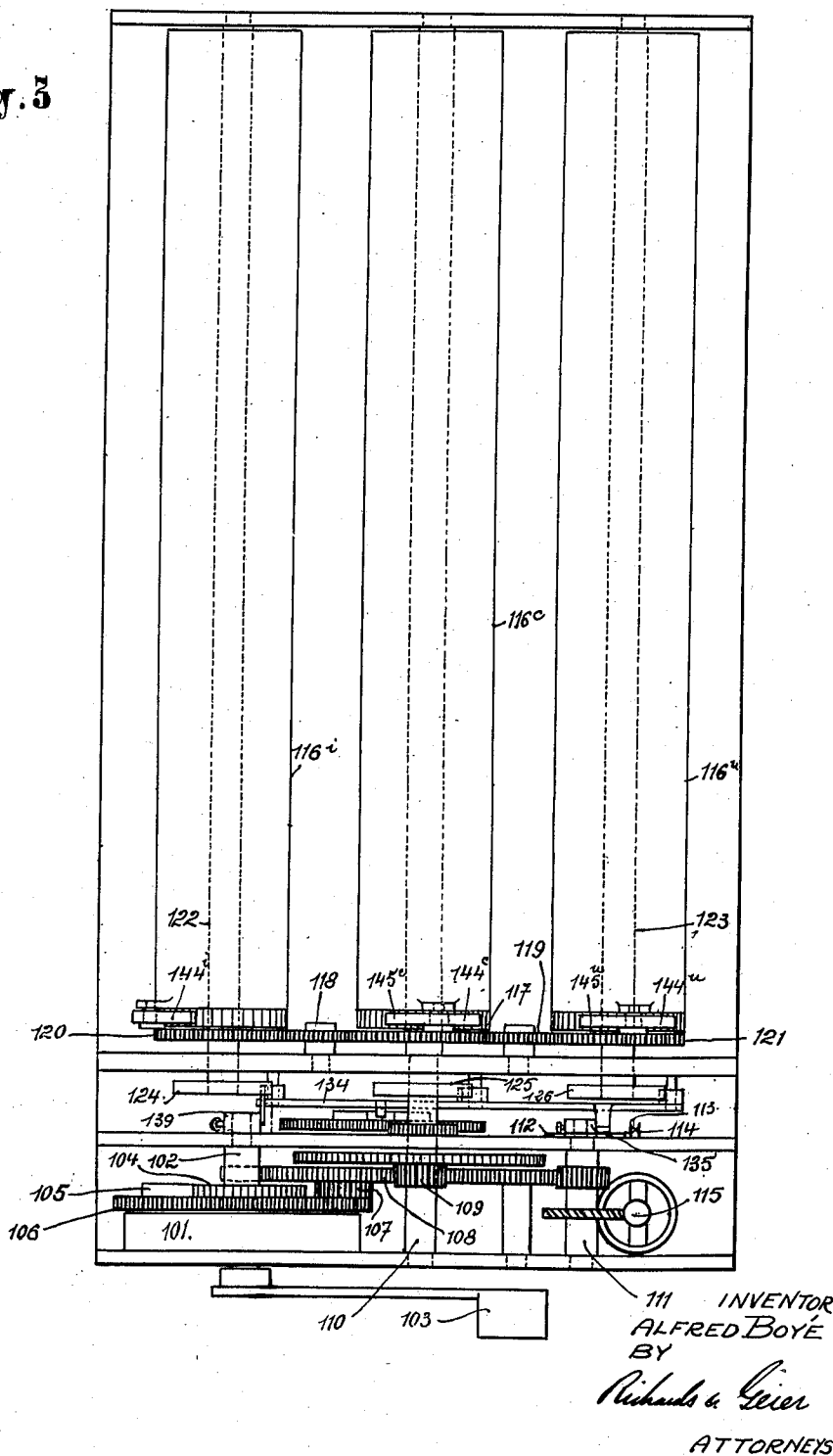
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Fig. 3



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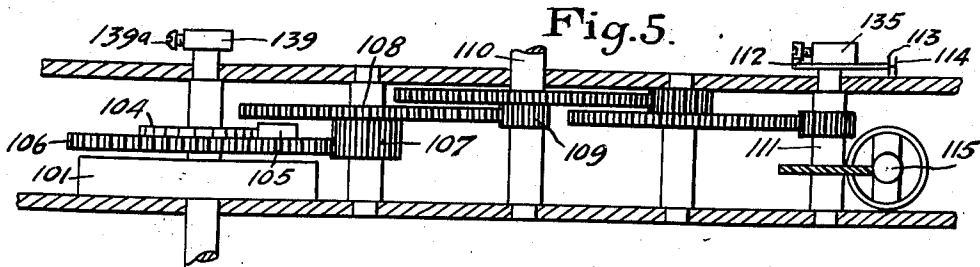


Fig. 7.

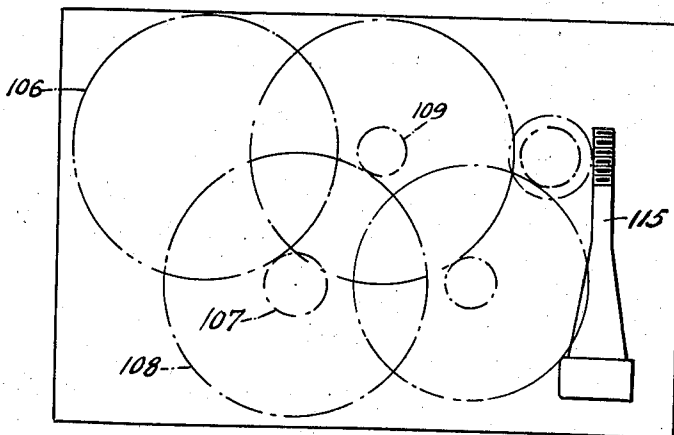
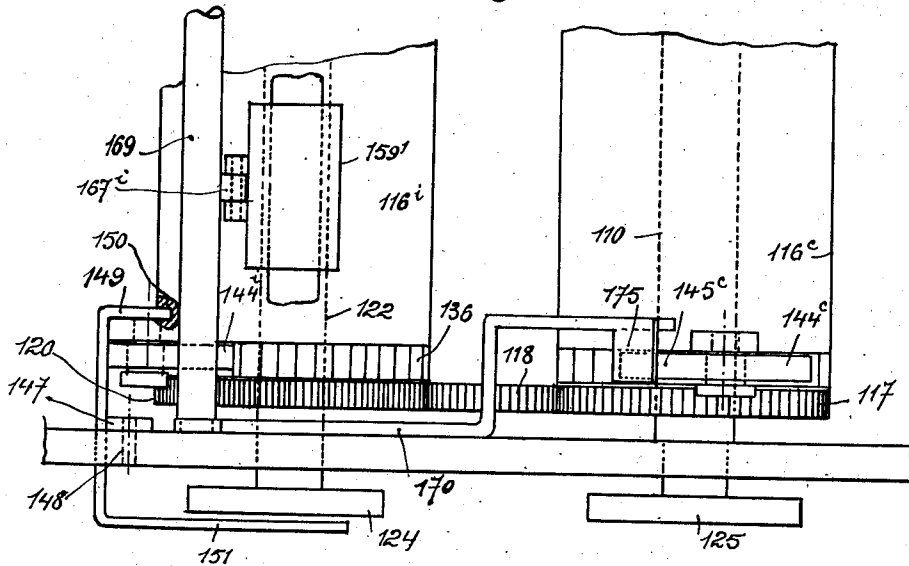


Fig. 4.

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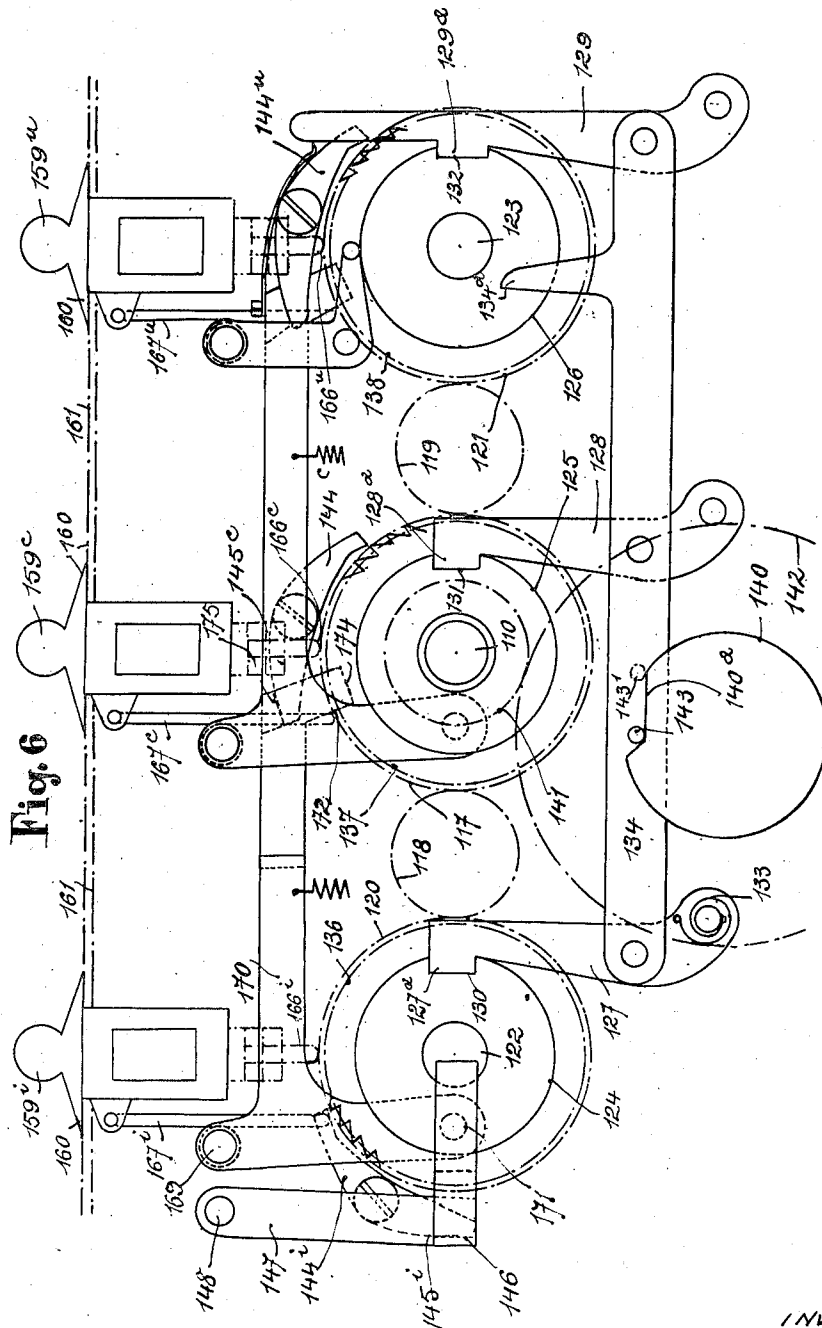
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Filed June 8, 1933

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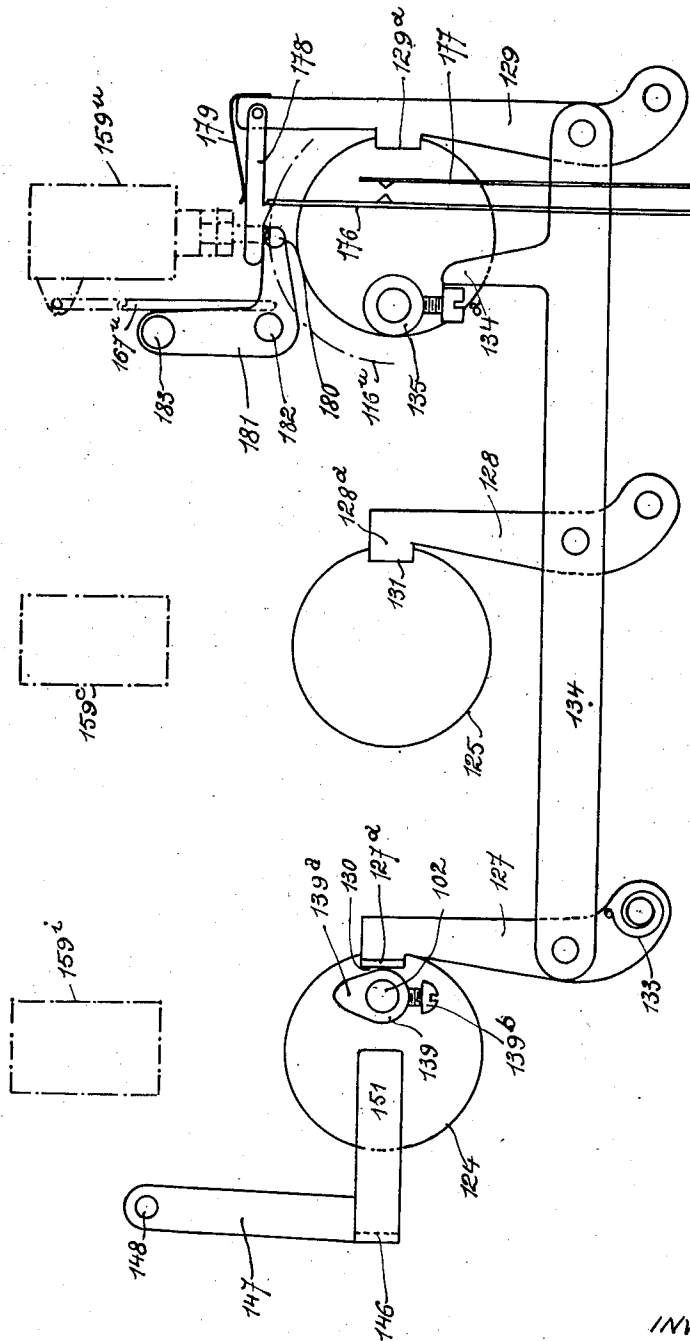
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Fig. 8



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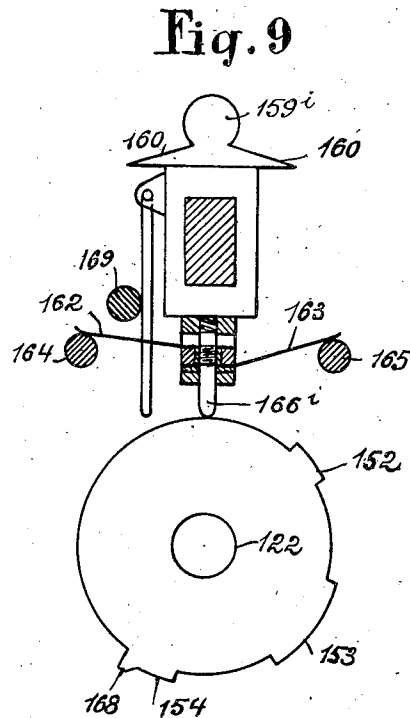
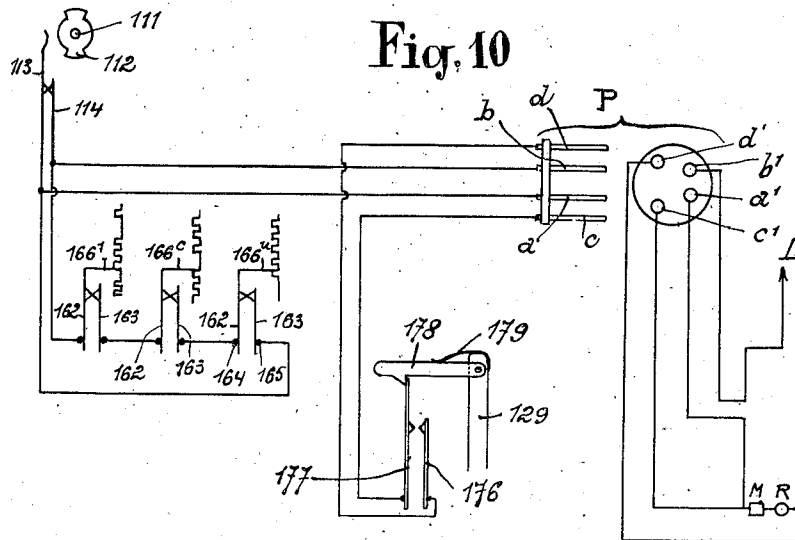
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Filed June 8, 1933

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UNITED STATES PATENT OFFICE

2,075,634

AUTOMATIC TELEPHONE APPARATUS

Alfred Boyé, Paris, France

Application June 8, 1933, Serial No. 674,792
In France June 14, 1932

1 Claim. (Cl. 179—90)

This invention relates to apparatus for making calls with rapidity in automatic telephony.

There already exists an apparatus designed to be utilized in automatic telephony in the place of the ordinary rotary dial for calling a station with which it is desired to be connected, said apparatus comprising several rows of rotary discs, equal in number to that of the number of current interruptions to be produced in the line in order to establish automatically the connection, for Paris for example, three rows of discs; one for the station call signal (Cent. for example) one for the first group of digits (23 for example) and one for the second group (34 for example) the discs being provided with teeth and the like for opening a so-called short circuit switch, appropriate to each row of teeth and brought over the disc in said row that corresponds to the desired call in such a manner that during the whole time in which every short circuit switch is open, a predetermined suitable number of current interruptions are sent in the line by another switch rotating permanently at a constant speed, and shunted relatively to the short circuit switches which are themselves mounted in series, and in such manner also that consequently the operation is ended when all the rows of discs have completed their rotation.

The present invention has for its object an apparatus of the kind above described which is characterized firstly in that to the rows of discs are substituted an equal number of solid cylinders provided around their circumference with lines of bosses arranged in steps according to length in a number equal to that of the call signals they are designed to compose or, in other words, to the number of groups of interruptions they are designed to produce, (say 60 lines of bosses for the first cylinder if there are 60 stations to supply and 100 lines of bosses for the number cylinders) these lines of bosses all beginning at the same generatrix and comprising each a suitable number of bosses divided from one another by intervals of the same value each of a length suited to the letter or the digit which it must form.

This arrangement has the great advantage that it allows of these cylinders being made by casting so that their construction is much less costly than that of the discs, there is no assembling of the latter to be considered, no danger of their coming out of adjustment and they have a greater resistance.

Another feature of this invention consists in the provision for connecting every cylinder with

the general movement of the apparatus of a gear mechanism combined with the bosses of the preceding cylinder in such a manner that the considered cylinder begins to move as soon as the last boss upon the preceding cylinder has completed its operation.

According to one mode of execution the last boss of each line of bosses in every cylinder is provided at its end with a projection in the path of which a lever pivoted upon the frame of the corresponding short circuit switch is mounted, said lever being designed to actuate, when it is moved by said projection, the locking element of a pawl integral with the cylinder following the considered cylinder and thus allow said pawl to engage in a rotary ratchet wheel designed for driving said cylinder, with the result that as soon as one cylinder has ended its operation—without having completed its rotation—the following cylinder begins to turn and consequently there is no delay in the sending of the current interruptions in the line from one cylinder to the other.

Another feature of this invention consists in the arrangement of a contact for short circuiting the microphone and the receiver during the sending of current interruptions, one blade of said contact being engaged with a hook integral with a locking device of the general movement so that the unlocking stroke of said device causes through a pull upon said hook the closing of the contact, a mechanism provided at its end with a lever arm being placed in the path of the end projections of the last bosses upon the last cylinder, said mechanism when inoperative being positioned under the aforesaid hook so that as soon as the last cylinder has ended its operation relatively to the corresponding short circuit switch, said arm lifts the hook and thus allows the blade to open the contact through the effect of its elasticity, consequently putting again the microphone and the receiver in circuit.

Other detail features of the invention will be apparent during the course of the following description.

The appended drawings show by way of example one mode of execution of an apparatus according to the present invention, in the case of three cylinders being utilized for composing call signals such as "Cent. 23-24" used in Paris.

Figs. 1 and 2 are respectively a developed plan view illustrating respectively the cylinder designed to form the call signal of the station to be connected and a cylinder designed to form a pair of digits, the indications upon said figure being

in fact inscribed upon an index plate placed above the cylinders.

Fig. 3 is a plan view illustrating the general arrangement of the mechanism and of the cylinders (the short circuit switches being excepted).

Fig. 4 is a front elevation showing the driving gears diagrammatically.

Fig. 5 is a corresponding developed plan view.

Fig. 6 is an elevation of the mechanism used for the successive driving of the cylinders.

Fig. 7 is a corresponding part plan view.

Fig. 8 illustrates the locking mechanism of the movement, and driving mechanism of the interrupter used for short circuiting the microphone and the receiver.

Fig. 9 is a front view of a short circuit switch.

Fig. 10 is the diagram of the connections.

Referring more particularly to the drawings, the apparatus shown (in Figs. 3, 4 and 5) comprises a clockwork motor 101 whose shaft 102 carries on the exterior a handle 103 and on its inner side a pinion 104. When the handle is depressed to a position limited by an abutment, the pinion 104 slides under a pawl 105 integral with a main wheel 106 so that as soon as the handle has been released, it rises and the shaft 102 with the pinion 104 rotate in the opposite direction, the wheel 106 being drawn along in the rotary movement.

The wheel 106 drives a pinion 107 integral with a wheel 108 which in its turn drives another pinion 109 secured upon a middle shaft 110. The latter drives, by means of appropriate gears, another shaft 111 supporting a cam or interrupter 112 arranged to open a contact 113—114 twice at every turn, the rotation of said cam being regulated by a speed regulator of any suitable kind 115.

The shaft 110 is extended in order to constitute an axis of rotation for the middle cylinder of the hundreds 116^c and it carries a wheel 117 which by the intermediary of pinions 118, 119 causes the rotation in the same direction of two other wheels 120, 121 with their shafts 122, 123 forming the axes of rotation for the cylinders 116^b, 116^a of the call signal and of the units respectively.

Upon the shafts 122, 110, 123 are carried discs 124, 125, 126 (Fig. 6) which when inoperative are locked by means of pawls 127^a, 128^a, 129^a integral with oscillating levers 127, 128, 129, said pawls being engaged in notches 130, 131, 132 in said discs by the action exerted by a spring 133 upon the first lever which is connected to the two others by means of a connecting rod 134. This connecting rod is provided with a projection 134^a which when in its inoperative position acts as a stop for a part 135 mounted upon the shaft 111 of the interrupter 112 and thus prevents its rotation.

It will therefore be seen that it will be necessary to first move the connecting rod 134 to the right in order to start the whole apparatus.

On the other hand the shafts 122, 110, 123 carry ratchet wheels 136, 137, 138 which will rotate permanently as soon as the discs 124, 125, 126 are unlocked. For this purpose there is provided upon the clockwork motor shaft 102 a cam 139 whose projecting part 139^a pushes back the pawl 127^a when the hand lever 103 is depressed and thus unlocks the whole system. When the hand lever is set free, the projection 139^a rotates in the opposite direction but does not immediately free the pawl 127^a so that a cam 140 actuated by the intermediary of the gears 141—142, from

the shaft 110 has sufficient time to come to lock a pin 143 on the connecting rod 134 which is then at 143ⁱ and thus allow the whole mechanism to rotate up to the moment when a notch 140^a upon said cam comes in the position shown in Fig. 6 and then allows said pin to return to its first position in which the discs 124, 125, 126 are locked by the pawls of the levers 127, 128, 129.

It will therefore be seen that between the starting of the mechanism and the instant when it stops the cam 140 accomplishes exactly one turn. By way of indication it will be noted that the gear ratio 141—142 is such that during that time the shaft 110, and consequently both the other shafts, can accomplish three revolutions this being sufficient to allow the three cylinders to complete their operation.

It has only been ascertained now that the axes of rotation of said cylinders—the latter not being secured upon the shafts 122, 110, 123—carry ratchet wheels which may rotate as soon as the winding lever is released, make 3 revolutions and stop.

As will be seen in Fig. 6 upon every one of the cylinders 116^b, 116^c, 116^a is provided a pivoted pawl 144ⁱ, 144^c, 144^a designed to transmit the movements of the ratchet wheels 136, 137, 138 to said cylinders.

When inoperative, the tail 145ⁱ of the first pawl 144ⁱ is locked by the wall 146 of a lever 147 pivoted upon a stationary part 148 of the apparatus frame, so that the hook on the pawl is out of engagement with the ratchet wheel 136. The lever 147 is provided on the other hand with an arm 149 which when in the aforesaid inoperative position engages a notch 150 in cylinder 116^b and locks the latter, and with a second arm 151 which may be moved to the left by a second projection 139^b of the cam 139 when the handle 103 which drives said cam through the shaft 102 is depressed. Springs are naturally provided to draw the lever 147 towards its inoperative position and the pawl 144ⁱ towards the engagement with the ratchet wheel 136; these springs have not been shown in the drawings for the sake of clearness. It will now be understood that the depression of the hand lever 103 will not only produce the unlocking of the three shafts 122, 110, 123, as before mentioned but also that the pawl 144ⁱ whose hook will engage the ratchet wheel 136, and that of the cylinder 116^b so that the latter will start rotating. The projection 139^b of the cam 139 which begins to rotate in the opposite direction as soon as the hand lever 103 is released is suitably shaped to free the arm 151 at about $\frac{1}{3}$ of its own return stroke, that is to say when the first cylinder has made a revolution in such a manner that the cylinder is again locked after a complete revolution.

It will now be necessary to explain the constitution of the cylinders. The first one 116^b (station call signal) comprises (Fig. 1) as many lines of bosses as there are telephone stations to supply. Considering that in the example which has been selected every station is designated by three letters, every line of bosses comprises three bosses 152, 153, 154, divided by equal intervals of a length which is proportionate to the number of current interruptions that corresponds to the making of each one of said letters. All the first bosses start from the same generatrix 155.

The cylinders 116^c and 116^a (hundreds and units) are identical. They comprise, as shown in Fig. 2, 100 lines of bosses each, and every line has two bosses 156, 157 divided by a constant

interval, the same as in the cylinder 116ⁱ. In this case also all the first bosses start from the same generatrix 158. Three runners 159ⁱ, 159^o, 159^u which may be brought above the selected line of bosses are slidably mounted over the three cylinders. For this purpose said runners are provided with indexes 160 and guiding marks, directions (letters and numbers) being traced upon a horizontal plate 161 arranged at the top of the apparatus.

The runners are each provided with a short circuit switch consisting of two blades 162, 163, which frictionally engage two blades 164, 165 and when inoperative are electrically connected together. One of said blades is integral with an insulated finger 166ⁱ, 166^o, 166^u, which when engaging the bosses of the corresponding rotary cylinder breaks the contact between these two blades. Referring now to Fig. 10 it will easily be seen that the three short circuit switches are mounted in series and that the whole is shunted relatively to the contact 113—114 controlled by the interrupter 112, so that when any one of the short circuit switches is open, the electric current interruptions produced at a regular cadency by the interrupter 112 are sent in the line L of the telephone station, the latter being connected to the present apparatus by a connecting plug P the male contacts of which are designated by *abcd* and the corresponding female contacts by *aⁱbⁱcⁱdⁱ*. The action of the contacts *c—cⁱd—dⁱ* will appear hereinafter.

Referring now again to the runners it will be seen (Fig. 6) that they each carry a hanging lever 167ⁱ, 167^o, 167^u, which when the corresponding cylinder rotates is pressed back by a projection 168 (Fig. 9) at the end of the last boss in every line of bosses of every cylinder, this projection being however included in said boss so as to keep the time of raising of the finger such as 166ⁱ unchanged.

During the above indicated movement, the lever 167ⁱ of the first runner presses back a bar 169 integral with another lever 170 pivoted at 171 in such a manner that a pawl 172 carried by said lever 170 which was engaged in a notch 174 of the second cylinder 116^o comes out of said notch and frees said cylinder, and that a boss 175 of the same lever 170 frees the tail 145^o of pawl 144^o and allows the latter to engage the ratchet wheel 137 and consequently to cause the displacement of the cylinder 116^o.

It will therefore be seen that as soon as the last boss in a line in the first cylinder has come under the short circuit switch which co-operates with said cylinder, the second cylinder starts and begins its operation.

The hanging lever 167^o of the second runner fills the same office, by similar means with regard to the third cylinder so that the latter begins to rotate as soon as the second cylinder has ended its effective function.

It has already been seen how the first cylinder is stopped at the end of a revolution. It will now be seen that when the second cylinder has accomplished one revolution it will also be stopped owing to the pawl 172 falling back in

its notch 174 simultaneously with the relocking of its pawl. The third cylinder will be stopped in the same manner at the end of a revolution.

Referring again to the general diagram in Fig. 10, it will be seen that a branch circuit passing through the contacts *c—cⁱ, d—dⁱ* of the junction P is provided for short circuiting the microphone M and the receiver R, said branch circuit may be closed by means of a contact consisting of two blades of which the one 176 is divided from the other through the effect of an initial voltage (Fig. 8). This blade 176 may be drawn in the required direction for producing the contact by means of a hook 178 pivoted at the end of the locking lever 129 of disc 126. Said hook is pressed in the required locking direction by a spring 179 but may be raised by a finger 180 integral with a lever 181 pivoted at 182, integral itself with a bar 183 which may be actuated by a lever 167^u of the third runner 159^u.

Consequently when the cam 139^a pushes back the pawl 127^a, the contact 176—177 is closed by the hook 178, and when the last boss of a line of bosses upon the third cylinder has come under the finger of the short circuit switch, the projection 168 pushes back the lever 167^u, and by the intermediary of the lever 181 causes the lifting of the hook 178, so that the contact 176—177 opens again. The microphone and the receiver are therefore put again in circuit when the sending of all the current interruptions is ended. Now when the third cylinder has accomplished its revolution, it is locked as well as the three discs 124, 125, 126 and the lever 129 which in particular serves to lock the disc 126 returns the hook 178 to its starting position behind the blade 176. The interrupter 112 is also locked by the projection 134^a and the apparatus is ready for a new operation.

What I claim and desire to secure by Letters Patent of the United States is:

In an automatic telephone apparatus, the combination of a plurality of rotary cylinders, each cylinder having an exterior surface provided with a plurality of elongated embossings, a plurality of projecting members, a separate one of said projecting members being situated at an end of each of said embossings, a plurality of levers, each of said levers being adapted to be moved by some of said projecting members, a plurality of other levers, each of the second-mentioned levers being adapted to be moved by a separate one of the first-mentioned levers, mechanical clutching and disengaging means adapted to be actuated by the second-mentioned levers to cause one of said cylinders to begin its rotation as soon as the rotation of another one of said cylinders has been terminated, a plurality of switches, the number of said switches being equal to that of said cylinders, a separate one of the first-mentioned levers being pivotally mounted on a separate one of said switches, and means connected with said switches and actuated by the first-mentioned levers to create impulses of electrical energy in electrical circuits.

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