

Nov. 16, 1937.

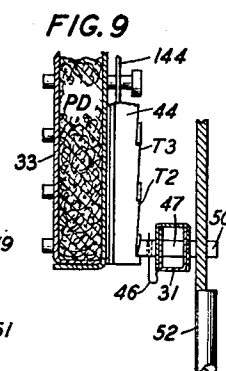
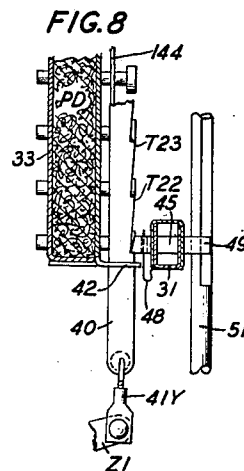
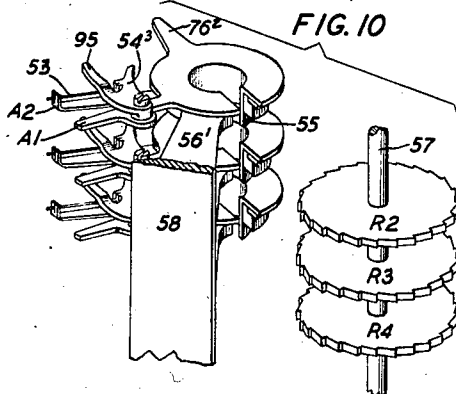
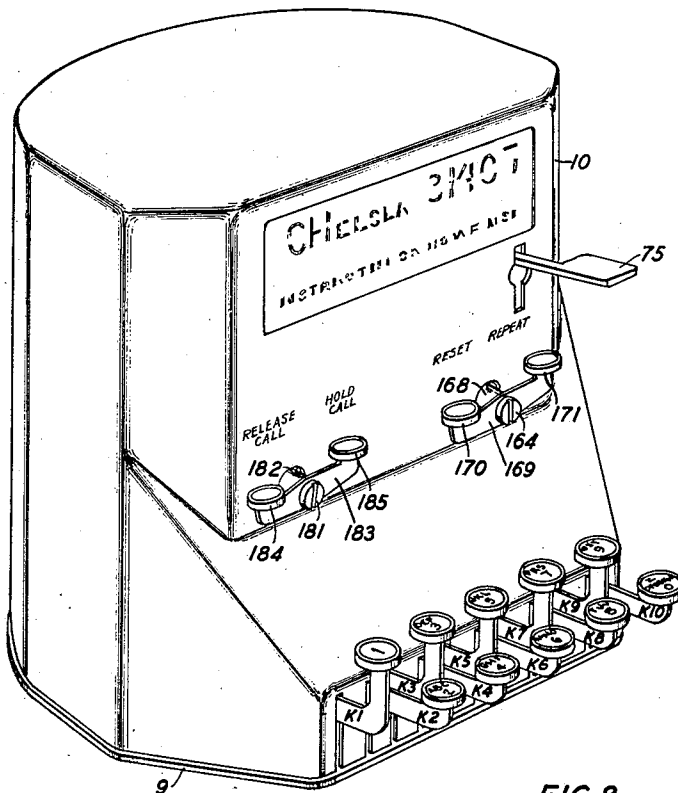
J. G. ROBERTS ET AL
CALL TRANSMITTER DEVICE

2,099,143

Filed June 20, 1936

7 Sheets-Sheet 1

FIG. 1



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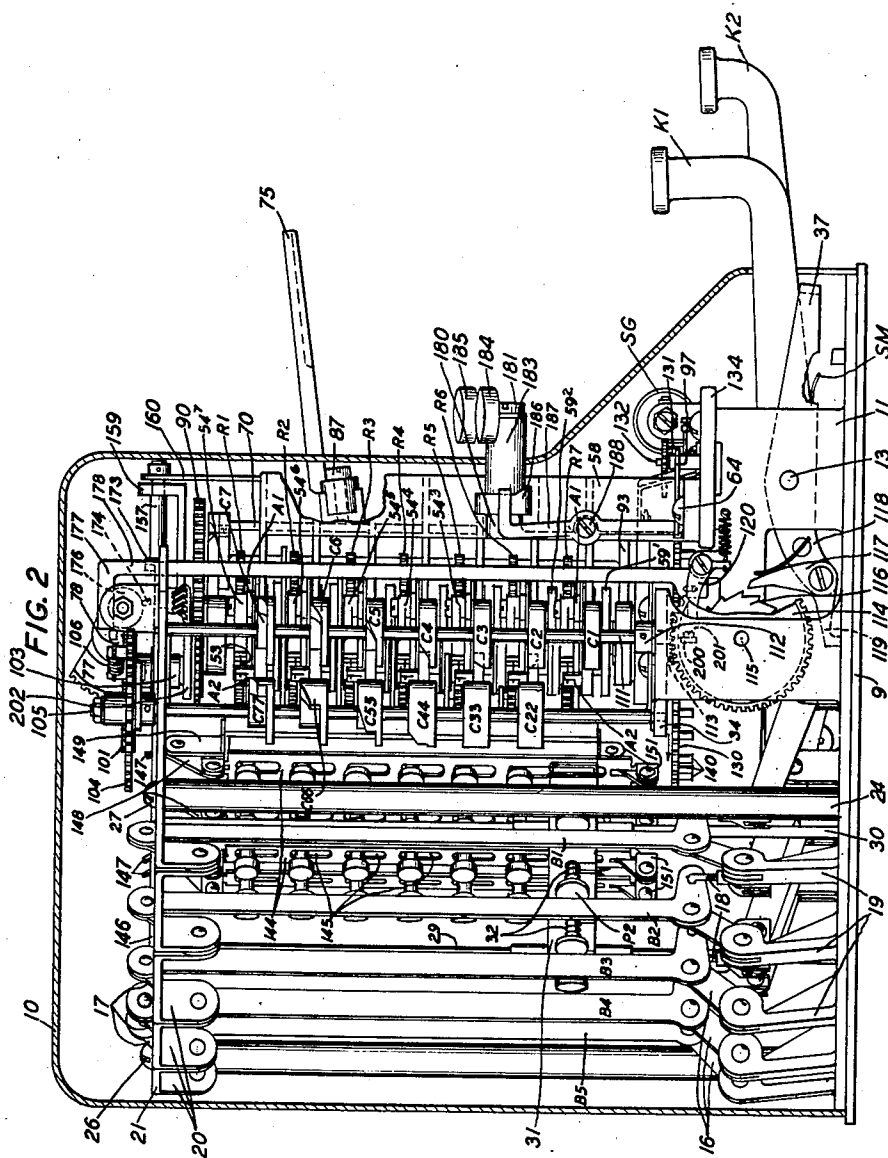
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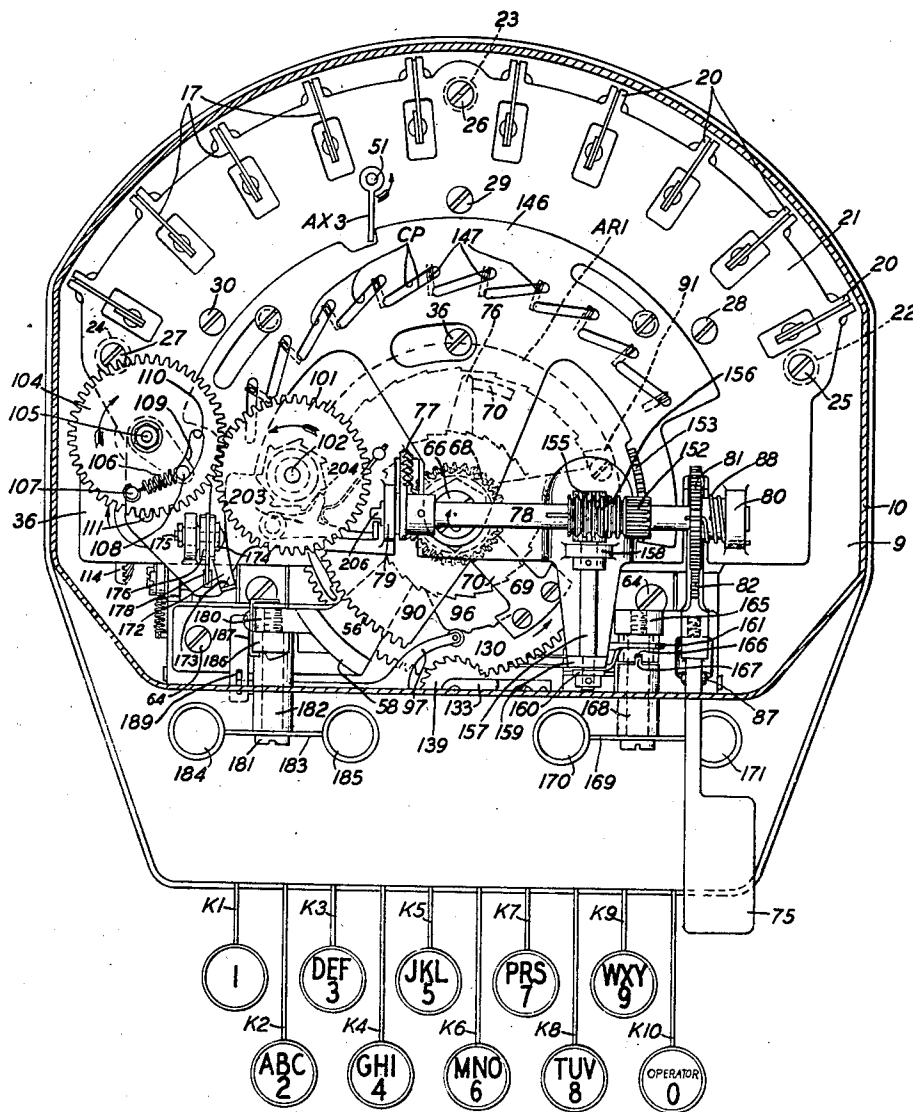
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FIG. 3



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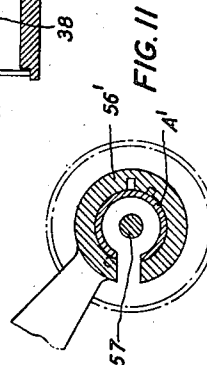
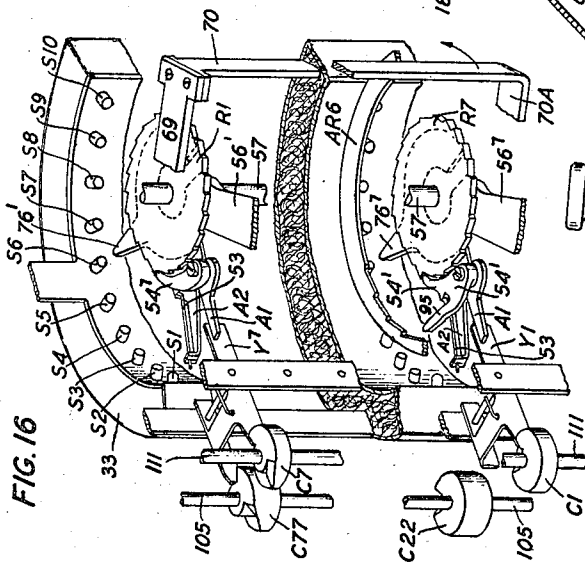
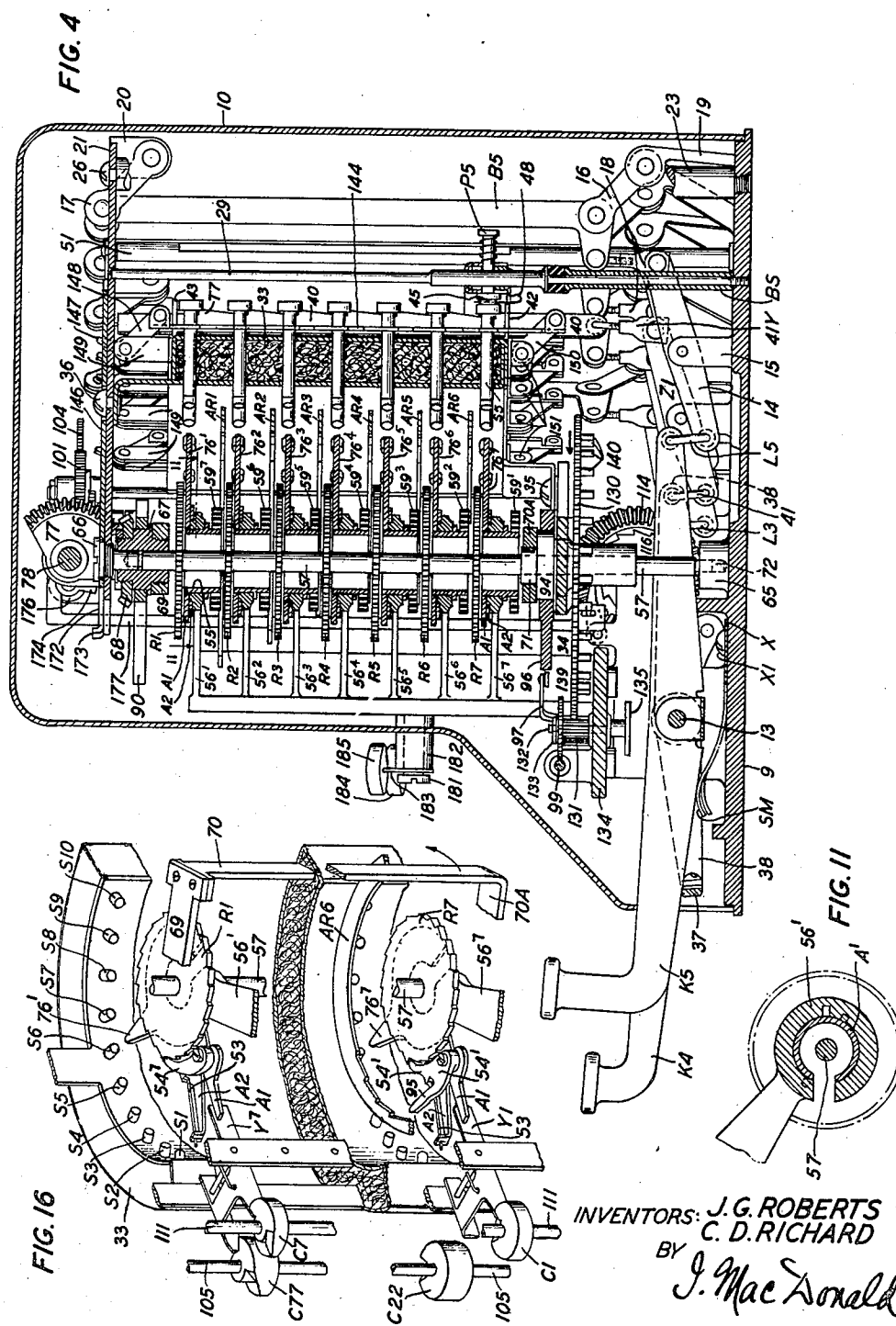
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FIG. 5

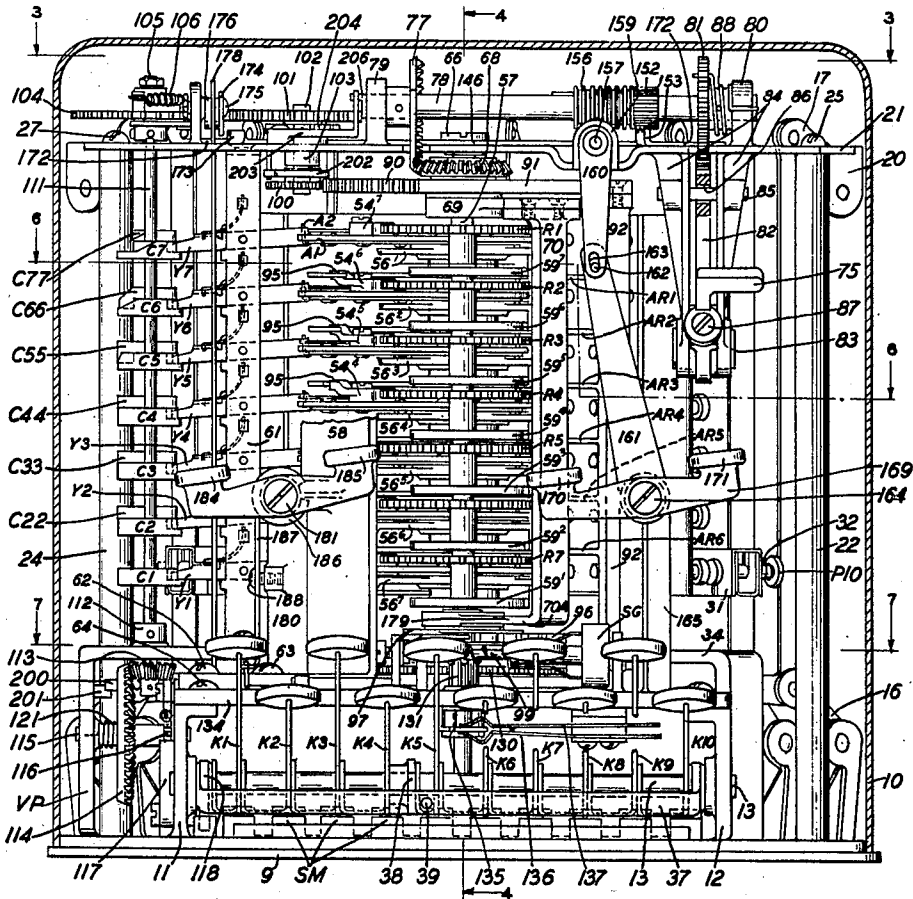


FIG. 12

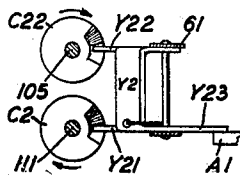


FIG. 13

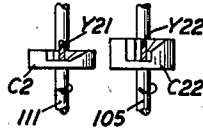


FIG. 14

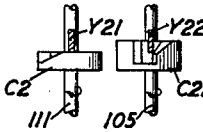
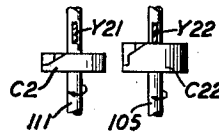


FIG. 15



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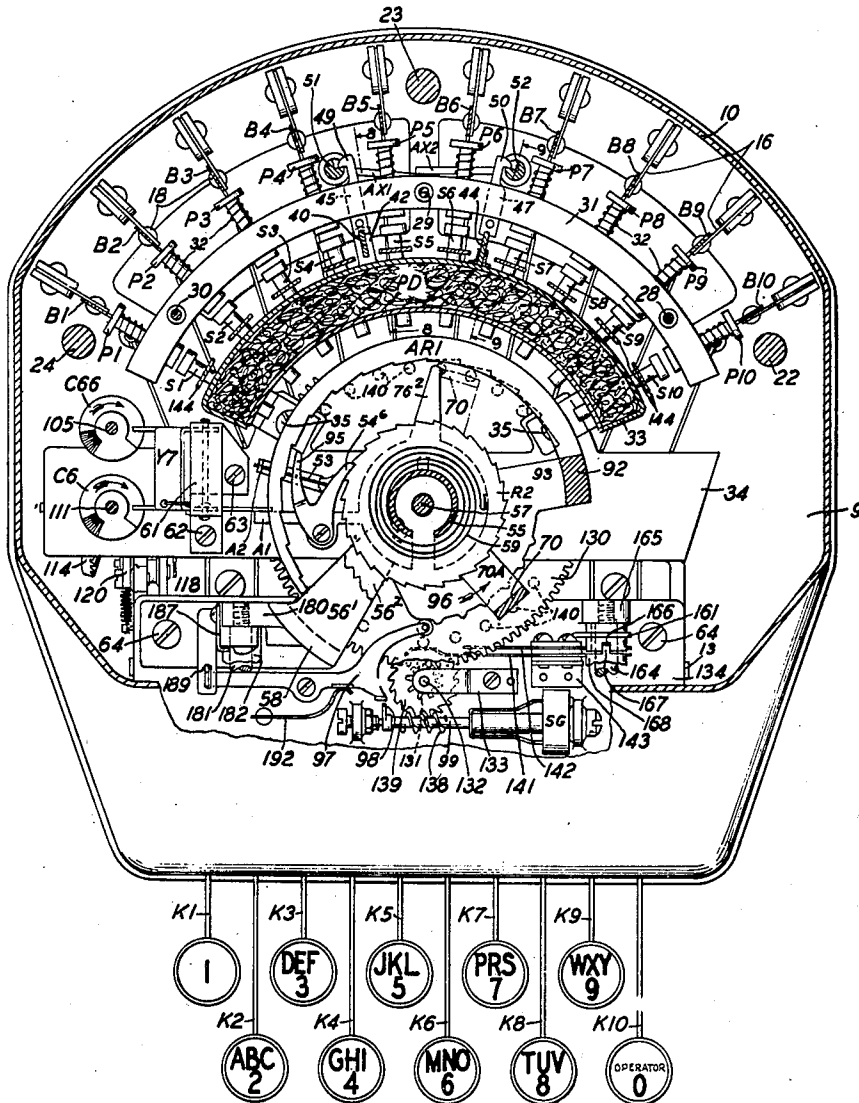
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FIG. 6



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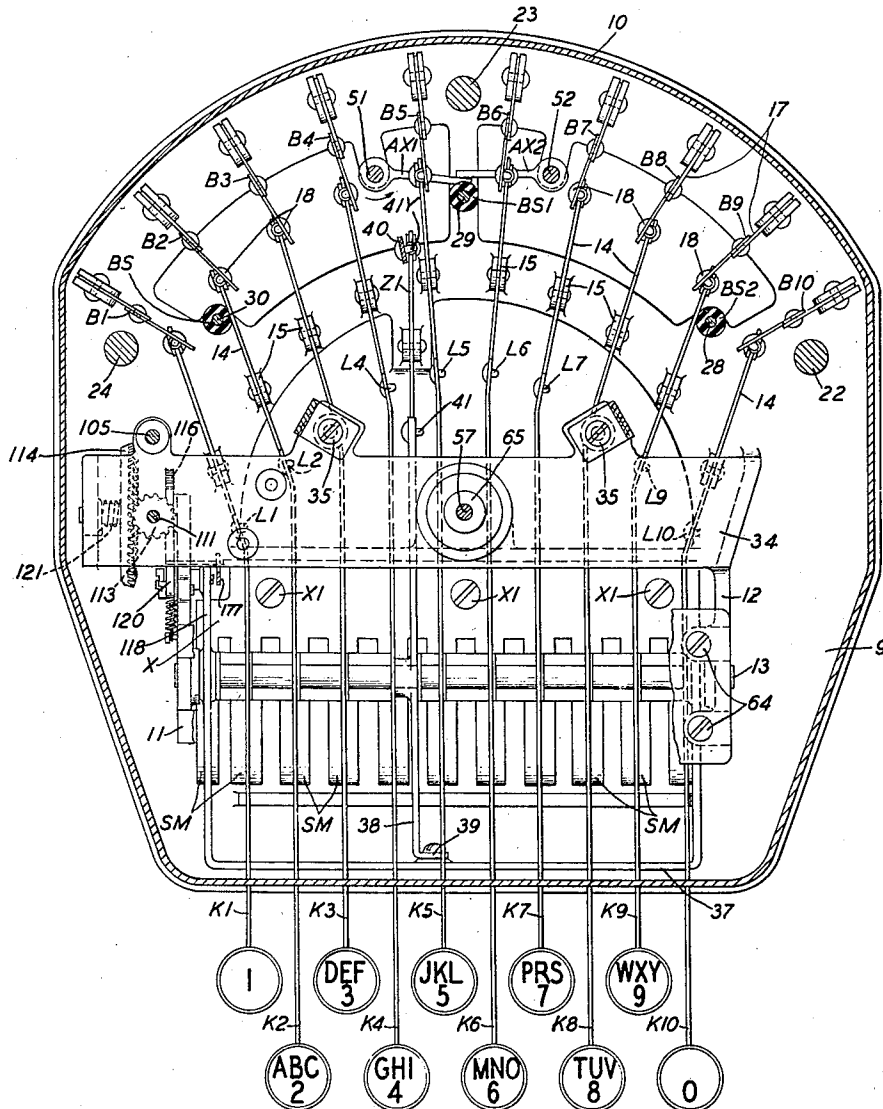
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FIG. 7



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UNITED STATES PATENT OFFICE

2,099,143

CALL TRANSMITTER DEVICE

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Application June 20, 1936, Serial No. 86,284

32 Claims. (Cl. 179—90)

This invention relates to call transmitter devices of the type used in automatic telephone systems and the like.

Heretofore when an operator had set up a call by the operation of an ordinary call transmitter for transmitting a certain call designation and had failed to get a response or found the called line busy, it was necessary to operate the call transmitter a second time by operating the impulse defining member a number of times corresponding to the number of digits comprised in the call designation desired, which in large areas necessitates as many as seven operations of the element with the consequent loss of time since it was necessary to wait until the operating element had returned to normal after each digit transmitting operation.

In certain types of call transmitter devices slidable camming bars are used which when moved for positioning numerals carried thereby in registry with respective indices, set a call designation to be transmitted by the operation of a pulsing mechanism operating according to the adjusted positions of such bars. In the setting of a call designation by the use of such devices, however, some time is lost, first, in the selection of the bars and, second, in the selection of the particular digits on such bars. Moreover, in such devices it is not possible to start the pulsing mechanism immediately after the positioning of the first camming bar which necessitates the positioning of all the bars prior to the starting operation of the pulsing mechanism, which also entails considerable loss of time in the transmitting of telephone call designations. Moreover, such devices have been found too costly to manufacture especially in the forming of the camming bars due to the accuracy required in the operation of the pulsing mechanism.

The object of the invention is to provide an improved call transmitter which will simplify call transmitting operations, which will be simple and which will operate in a positive manner.

In accordance with the present invention a call transmitter is provided in which the simple operation of digit key members corresponding to a desired call designation is effective to control the operations of impulse driving mechanisms for transmitting such designations and thereby causing the operation of automatic switches for selecting the desired line.

More specifically, the operation of the digit key members is effective to set stopping members in position for determining the operation of a plurality of motor elements operatively con-

nected to a pulsing mechanism. Auxiliary key members are provided which, when moved in an indicated position, actuate a locking device by which all the digit keys, which may comprise a certain call designation, may be set or operated prior to the starting operation of the pulsing mechanism as effected by the operation of the motor elements or when moved in another indicated position operate the locking device for releasing the motor elements immediately after the operation of the first digit key in such a call designation.

A manually operable handle member is provided for actuating a resetting mechanism whereby the motor elements in the form of spring-actuated ratchet mechanisms and the stopping elements are returned to their normal unoperated position collectively after each call transmitting operation, while the operation of other auxiliary key members actuates a gear shift mechanism whereby the operation of the handle member is rendered ineffective with respect to the stopping elements set by the operation of the key members, thus permitting the repeating of the sending of any call designation any desired number of times by a simple operation of the handle member without resetting the digit keys for the repeating of such a call designation.

The stopping members, which are in the form of pins, are slidably mounted in an arcuate support or bank. These stopping members are disposed in coordinate rows, there being in the present device seven stopping members in each vertical row and ten stopping members in each horizontal or coordinate row. The stopping members in each horizontal row are spaced at an equal distance apart and their angular relation with respect to the movement of the motor elements determines the operation of these elements and that of the pulsing mechanism actuated thereby. Means actuated by the operation of the key members, and cooperating with automatically operating means, is provided for controlling the successive operation of the motor elements upon the starting of the first motor element by the operation of one of the auxiliary key members.

An arcuate bar is provided for mounting ten plunger members each of which is associated with a vertical row of stopping members. This bar is, in turn, mounted on guiding rods and is moved by a ratchet mechanism under control of the key members for successively positioning these plungers in operative relation with the stopping members in each horizontal row, there being a bar

operatively connected to each key for selectively actuating these plungers in any position along the vertical rows of stopping members, with means provided for holding the mounting bar and the plunger members carried thereby in each advanced position, means being provided for resetting the mounting bar and the plunger members to normal unoperated position upon the operation of the handle member preparatory to any subsequent operation of the transmitter.

Other novel features and advantages of the invention will appear from the following description and by the claims appended thereto, reference being had in the accompanying drawings in which:

Fig. 1 is a perspective view of the call transmitter of the invention;

Fig. 2 is a left side assembly view showing the housing in section;

Fig. 3 is a top assembly view showing the housing in section taken approximately on line 3—3 of Fig. 5;

Fig. 4 is a cross-sectional view taken on lines 4—4 of Fig. 5;

Fig. 5 is a front assembly view shown with a number of operating parts in section;

Fig. 6 is a cross-sectional view taken approximately on line 6—6 of Fig. 5;

Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 5;

Figs. 8 and 9 are partial views of the plungers operating mechanism, the supporting bar being shown in section;

Fig. 10 is a partial view of the impulse shaft driving mechanisms shown in perspective;

Fig. 11 is a partial view of a supporting arm shown with its bearing portion in section taken on line 11—11 of Fig. 4;

Fig. 12 is a partial top view of the cam shafts and the yoke actuated thereby in normal position;

Figs. 13, 14 and 15 are views of the cam shafts in successive operated positions; and

Fig. 16 is a partial view of the impulse cam driving mechanism shown in perspective.

In the drawings 9 indicates a base which is provided with a peripheral shoulder portion shown in Figs. 2, 4 and 5 for receiving a housing 10. The base 9 is formed with upright portions 11 and 12, Figs. 5 and 7, for mounting a shaft 13 and on this shaft is pivotally mounted a set of ten key members, K1, K2, K3, K4, K5, K6, K7, K8, K9, and K10, having buttons provided with code numbers representing call designations as shown in Figs. 1, 3, 6 and 7. The other ends of these key members are operatively connected as by links L1, L2, L3, L4, L5, L6, L7, L8, L9, and L10, to a corresponding number of similar yoke members 14 shown in Figs. 4 and 7, which are pivoted on upright lug portions 15 disposed in an arcuated row and formed integrally with the base 9. The other ends of yoke members 14 are operatively connected to a corresponding number of vertically disposed bars B1, B2, B3, B4, B5, B6, B7, B8, B9, and B10, through similar links 18. The bars B1, B2, etc. are in turn pivoted at both ends to similar link members 16 and 17, the links 16 being pivoted on supports 19 formed with the base 9, and link members 17 pivoted on downward extending lugs 20 formed with a supporting plate 21 shown in Figs. 2, 3, 4, and 5.

The supporting plate 21 is held in spaced relation with respect to the base 9 by post members 22, 23, and 24, shown in Figs. 2, 3, 4, 5, 6

and 7, and secured thereto by screws 25, 26 and 27. The key members K1, K2, K3, etc., and the bars B1, B2, B3, etc. connected thereto are held in normal unoperated position as shown in Figs. 2, 4, 5 and 7 by similar spring members SM formed from a spring metal strip X secured to base 9 by a number of screws X1. The base 9 and the plate 21 are provided with registering holes for receiving the ends of guiding members in the form of long screws 28, 29 and 30, shown in Figs. 2, 3, 4 and 6, and on these guiding members is slidably mounted an arcuated bar 31 shown in Figs. 2, 4, 5, 6, 8 and 9 normally resting on the top ends of bushings bs, bs2 and bs3 shown in Fig. 7, the arcuated bar 31 being provided with ten equally spaced and slidable plunger members P1, P2, P3, P4, P5, P6, P7, P8, P9 and P10, best seen in Fig. 6 which are held in unoperated position by coiled springs such as 32 shown. These plunger members are radially disposed in the bar 31 for registering at one of their ends with the vertically disposed bars B1, B2, B3, B4, B5, B6, B7, B8, B9 and B10 with which they are operatively associated and their other ends with the ordinate rows S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 of coordinately disposed stopping members slidably mounted in an arcuated bank 33 and held frictionally in position therein by a pad PD of fibrous material such as felt, this bank being secured at its lower end on a bar or plate 34 carried by the base 9 and securely held thereon by a number of screws 35, shown in Figs. 4, 6 and 7, and at its upper end to the supporting plate 21 by a screw 36, shown in Fig. 4, there being ten stopping members in each ordinate row and seven stopping members in each ordinate row.

According to the mechanism above described, a downward movement imparted to any one of the key members as key K5, for example against the tension of its retracting spring SM is transmitted to its connecting bar B5 through the link L5 (Figs. 4, 7) connecting with its yoke 14 and the adjustable link 18 connected to the bar B5. The arcuated downward movement of this bar due to its connections with the links 16 and 17 causes this bar to engage its associated plunger P5 for moving it in the bar 31 against the resistance of its retractile spring 32, the axial movement of plunger P5 being effective to move the stopping member S5 of the lower disposed coordinate row in a radial direction in the path of pivoted arms A1 and A2 shown in Figs. 2, 4, 5, 6, 10 and 16 for a purpose that will be hereinafter described in detail. It is to be noted, however, that the plunger P5 is retracted to normal position by spring 32 upon the release of key K5, which in turn is returned to normal by its respective associated spring SM.

The movement of any one of the keys K1, K2, etc., as the key K5 above mentioned, imparts, a downward movement to a cross-bar 37 shown in Figs. 2, 4, 5, and 7 pivoted on shaft 13 and thereby a pivotal movement to a lever 38 also pivoted on shaft 13 and secured at one end to the bar 37 by a screw 39. The other end of lever 38 is operatively connected as by yoke member Z1 and links 41 and 41Y to a ratchet toothed rack member 40, shown in Figs. 4, 6, 7 and 8, slidably mounted in guiding members 42 and 43 laterally extending from the bank 33. Another ratchet toothed rack 44, shown in Figs. 6 and 9 is securely mounted on the bank 33 adjacent the movable rack 40. The rack 40 is engaged by a pawl 45 under the tension of a spring 48, while the rack 44 is en-

gaged by a pawl 47 under the tension of a spring 46, so that the upward movement of rack 40 through the return movement of one of the keys K1, K2, etc., K5 by this example and the return movement of bar 37 under the tension of its associated spring SM is effective to move the arcuated bar 31 one step up for positioning the plungers P1, P2, P3, etc. carried thereby with the second coordinate row of stopping members S1, S2, S3, etc., where the pawl 47 engages the second tooth T2 of the stationary rack 44 for holding the bar 31 and the plunger members P1, P2, P3, etc. carried thereby in coaxial and operative relation with the second coordinate row of stopping members S1, S2, etc., there being provided as above mentioned seven horizontal or coordinate rows of ten stopping members S1, S2, etc., the first vertical or ordinate row of stopping members S1 representing digit 1, the row S2, digit 2, the row S3, digit 3, the row S4, digit 4, etc. the vertical row S10 representing digit 0 which as well known in the automatic telephone art is equivalent to ten pulses.

The operation of the bar 31 as above described is repeated for each key K1, K2, etc. operated up to the tooth T7 at the upper end of the racks 40 and 44, thus successively positioning in seven steps each plunger member P1, P2, P3, etc. in axial alignment with a stopping member S1, S2, S3, etc. included in each ordinate or vertical row.

The slidable pawls 45 and 47 shown in Figs. 6, 8 and 9 are provided at their other ends with toothed portions 49 and 50 engaging the toothed portions formed in pivoted rods 51 and 52. These rods are provided at their lower ends with abutting arms AX1 and AX2 shown in Figs. 6 and 7 so that a pivotal movement of bar 51 in a counter-clockwise direction will impart a pivotal movement to the rod 52 in a clockwise direction for disengaging the pawls 45 and 47 from their respectively associated rack members 40 and 44, thereby permitting the arcuated bar 31 and the plunger members P1, P2, P3, etc. carried thereby to return as by gravity to normal starting position, shown in Figs. 2, 4, 5, 8 and 9, the pivotal movement of rod 51 being effected through the engagement of arm AX3 at the upper disposed end of rod 51 with a pivoted camming plate 146 shown in Figs. 2, 3, 4 and 5 in a manner that will be hereinafter described in detail.

With each coordinate row of stopping members S1, S2, S3, etc. in the bank 33 is associated a pair of radial arms A1 and A2 shown in Figs. 2, 4, 5, 6, 10 and 16. The arm A1 of each pair is formed with a hub portion 55 best seen in Figs. 4, 6 and 10 loosely fitted in the bearing portions of supporting arms 56', 56², etc. and the lever arms A2 are loosely fitted over bearing portions formed with the supporting arms 56' etc. adjacent the underside of arms A1. The arms A1 and A2 and the bearing portions of supporting arms 56' etc. are slotted radially for permitting, when placed in registry as shown in Fig. 10, the passing of a shaft 57 therein for positioning it concentric to the hubs 55 of arms A1 as shown in Figs. 4, 5, 6 and 10. An arm such as 56' etc. above mentioned is provided for independently supporting each pair of lever arms A1 and A2 and these supporting arms are formed integrally with an upright bar 58, in turn formed with a plate 134, this plate being held securely on lugs 11 and 12 of the base 10 by a number of screws 64. The arms A1 and A2 of each pair are movable relative to each other and are normally held in angular spaced relation by springs 53 having one of their ends se-

cured to respective pawl 54', 54², 54³, 54⁴ etc. pivoted on the arms A1 and the other ends of these springs engage slots in the upward bent portions of arms A2, the springs 53 normally holding the pawls 54', 54², 54³, etc. in engaged relation with associated ratchet wheels R1, R2, R3, R4, R5, R6, and R7 carried by the shaft 57.

The pairs of arms A1 and A2 and the shaft 57 are rotated through the tension of spiral springs 59', 59², 59³, 59⁴, 59⁵, 59⁶ and 59⁷, each having one of its ends hooked to the hub 55 of its other end to its respectively associated arm A1.

Arms A1 and A2 of each pair are held in normal unoperated position against the tension of their respective spiral spring 59', 59², 59³, 59⁴, 59⁵, 59⁶ and 59⁷ by yoke members Y1, Y2, Y3, Y4, Y5, Y6 and Y7 having one of their end portions normally engaging with the ends of arms A1 as shown in Figs. 5 and 6. Arm members Y1, Y2, Y3, etc. are pivotally mounted on an inverted U-shaped frame 61 secured at its lower end to the plate or bar 34 by screws 62 and 63, the successive release of the arms A1 and A2 of each pair of arms Y1, Y2, Y3, etc. being effected by camming mechanisms which will be hereinafter described in detail.

The shaft 57 at its lower end passes through the plate 34 and rests in a vertical position on a steel ball 72 in a bearing portion 65, shown in Figs. 4 and 7 formed with the base 10. The upper end of shaft 57 is journaled in a bearing portion formed at the end of a shoulder screw 66 shown in Figs. 34 and 5 engaging the supporting plate 21 and on the periphery of the bearing portion of this screw is rotatably mounted a bushing 67 shown in sectional view in Fig. 4, serving for securely mounting an angle gear 68 and an arm 69 formed with an enlarged portion at its free end as shown in Figs. 3, 5 and 16, provided for securing the upper end of a bar 70, formed with an arm 70A pivoted on the bearing portion 71 of a bushing formed with the plate 34 shown in sectional view in Fig. 4, the bar 70 in its movement in the direction indicated by the arrows in Figs. 3, 5, 6 and 16 being effective to engage the lugs 76', 76², 76³, 76⁴, 76⁵, 76⁶, and 76⁷, of the arms A1 for returning these arms and thereby the arms A2 to normally unoperated position upon the operation of a manually operable member 75 shown in Figs. 1, 2, 3 and 5, in a manner that will be hereinafter described in detail.

The gear 68 operatively engages an angle gear sector 77 keyed on a shaft 78 journaled in bearing portions 79 and 80 formed with the supporting plate 21. One end of shaft 78 is formed with a cam portion 206 disposed in operative relation with a ratchet pawl 203, as shown in Figs. 3 and 5, provided for a purpose that will be hereinafter described in detail. On the opposite end of shaft 78 is keyed a spur gear 81, operatively engaging a gear sector 82, this sector being mounted on a pivot 83 journaled at both ends in a forked-shaped support 84 downwardly extending from the plate 21, and a pin 85 in support 84 engages a slot 86 in gear sector 82 for limiting its movements as imparted by the handle lever 75 against the resistance of a retracting spring 88 having one end hooked to the gear 81 and its other end in the supporting lug 80 carried by plate 21, handle lever 75 being secured to gear sector 82 by a screw 87 shown in Figs. 2, 3 and 5.

On bushing 67 at the top portion of shaft 57 is loosely mounted a gear sector 90 shown in Figs. 2, 3, 4 and 5 having an arm portion 91, provided with an enlarged portion at its free end

to which is secured as by ordinary screws a vertically disposed bar 92 formed at its lower end portion with an arm 93 shown in Figs. 2, 5 and 6 pivoted on the bearing portion 94 of the bushing formed with the plate 34. The bar 92 is formed with six perpendicularly extending arcuated arms AR1, AR2, AR3, AR4, AR5 and AR6, each having ten ratchet teeth disposed in engageable relation with respectively associated pawl 95 formed integrally with the pawls 54', 54², 54³, 54⁴, 54⁵ and 54⁶. The engagement of pawl portions 95 of pawls 54', 54², etc. with the teeth of their respective arms or sectors AR1, AR2, etc. is effected upon a movement of the arms A1 relative to arms A2 when the movement of arms A2 under tension of their motor springs 59', 59², 59³, 59⁴, 59⁵ and 59⁶ is arrested by the stopping members S1, S2, S3, etc., according to the key K1, K2, K3, etc. depressed and the consequent flexing of spring 53 connecting the arms A1 and A2 of each pair, the engagement of pawl portions 95 with ratchet arms AR1, AR2, etc. being effective to impart an angular movement to the arm 93 and the cam toothed sectors 96 formed therewith corresponding to one tooth of sector AR1, AR2, etc., or an angular distance equal to the spacing of stopping members S1, S2, etc. The movement of cam toothed sectors 96 is effective to move the lever member 97 shown in Figs. 2, 3, 4, 5 and 6 in the path of an arm 98 best seen in Fig. 6 carried by the speed governor shaft 99 for momentarily arresting the movement of shaft 57 for a purpose that will be hereinafter described in detail.

The angular movement of gear sector 90 formed with arm 91 to which the bar 92 is secured as imparted through the engagement of any one of the pawl portions 95 with their respectively associated ratchet toothed arms AR1, AR2, etc., is effective to rotate the pinions 100 and 101, Fig. 5, keyed on a spindle 102, in turn pivoted in a bushing 103 carried by the plate 21. The movement of pinion 100 and gear 101 on spindle 102 is effective to tension a spiral retractile spring 202 and the spring pressed pawl 203 shown in Figs. 3 and 5 engages a ratchet wheel 204 secured to the underside of gear 101 for holding the ratchet toothed arms AR1, AR2, etc. in each advanced position. The gear 101 meshes with a gear 104 loosely mounted on the upper disposed end of a cam shaft 105 but imparts a rotary movement to this shaft through a spring 106 having one of its ends hooked to a post 107 carried by the gear 104 and its other end to a post 108 upwardly extending from the free end of a lever member 109 keyed on the cam shaft 105, the movement of gear 104 with respect to lever member 109 being limited by the length of an arcuated slot 110 in the gear 104 and the gear ratio from gear sector 90, gears 100 and 101 and gear 104 is such as to impart one-seventh of a turn to cam shaft 105 for each tooth of sectors AR1, AR2, etc.

Cam shaft 105 cooperates with a cam shaft 111 for operating the arms Y1, Y2, Y3, etc. in their proper sequence for releasing the arms A1 and A2 of each set as will be hereinafter described in detail.

The cam shaft 111 is journaled at its upper end in the plate 21 and at its lower end in a bearing portion formed with the plate 34 and is held against axial movement therein by a collar 112 shown in Figs. 2 and 5. On the lower end of shaft 111 is keyed a bevel gear 113 meshing with a larger gear 114 keyed on a shaft or spindle 115. This shaft is journaled at one end in

upright 11 and at its other end in the vertical portion VP of plate 34. On shaft 115 is keyed a ratchet wheel 116 shown in Figs. 2, 4 and 5 disposed in operative relation with an actuating pawl 117 shown in Figs. 2 and 5 pivotally mounted at the free end of an arm 118 formed integrally with the bar 37. The pawl 117 is formed with an extension 119 normally abutting against the base 9 for preventing its engagement with the ratchet wheel 116 when the bar 37 is in normal position as shown in Fig. 2, and a spring pressed retaining pawl 120 is provided for holding the cam shaft 111 in each advanced position against the tension of a retractile spring 121 shown in Fig. 5 coiled on shaft 115. According to this construction the operation of any one of the key members K1, K2, etc., and consequently the operation of bar 37 is effective to actuate the ratchet wheel 116 one tooth for successively preparing the release of arms A1 and A2 of each pair by imparting a small pivotal movement to yokes Y1, Y2, Y3, etc. for a purpose that will be hereinafter described in detail, the ratio of gears 114 and 113 being such as to impart a complete turn to cam shaft 111 in seven steps of ratchet wheel 116.

On the lower end of shaft 57 is keyed a gear 130, shown in Figs. 2, 3, 4, 5 and 6, operatively engaging a pinion 131 mounted on a spindle 132. This spindle is journaled at one end in the bracket 133 secured on plate 134 and its other end in a bearing portion formed with the plate 134. On the lower end of spindle 132 is securely mounted a wheel 135 of insulating material having two diametrically opposite cam portions provided for opening the normally closed impulse springs 136 and 137 shown in Fig. 5 mounted in a pile-up arrangement on the underside of plate 134.

The movement of shaft 57 and the pulsing cam 135 actuated thereby is controlled by a speed governor SG shown in Figs. 2 and 6 having its shaft 99 formed with a worm portion 138 engaging the worm gear 139 keyed on the spindle 132. The gear 130 keyed on the lower end of shaft 57 is provided with a plurality of studs 140 of insulating material provided for closing normally open contact springs 141 and 142 simultaneously with the closure of the pulsing contacts 136 and 137 for a purpose well known in the automatic telephone art, the contact springs 141 and 142 being mounted in a pile-up arrangement on the bracket 143 secured on the plate 134 as shown in Figs. 3 and 6.

Each ordinate row of pins or stopping members S1, S2, etc. is provided with a resetting bar or strip such as 144 shown in Figs. 2, 4 and 6, having slots 145 for permitting the axial movement of these bars as imparted by the movement of the pivoted plate 146, through the engagement of camming portions CP with the arms 147 of angle levers 148 shown in Figs. 2 and 4. Angle levers 148 are pivoted on lugs 149 extending from the top portion of bank 33 and the other ends of resetting strips 144 are loosely connected to links 150, in turn pivoted on similar lugs 151 secured to the lower edge of bank 33. The operation of the camming plate 146 is effected through the rotation of a pinion 152 shown in Figs. 3 and 5 keyed on the shaft 78 and engaging the gear toothed portion 153 formed with the camming plate 146. Pinion 152 is slidably mounted on shaft 78 and may be moved in disengaged relation from the gear portion 153 of plate 146 through the operation of a pinion 155 disposed in

operative relation with the rack portion 156 formed on the hub of pinion 152.

The pinion 155 is keyed at the end of a shaft 157 journaled on bearing portions 158 and 159 of plate 21 and on the opposite end of shaft 157 is keyed a lever member 160 shown in Figs. 2, 3 and 5 extending downwardly for connecting with a lever member 161 through the engagement of pin 162 carried by lever 161 in the slot 163 of lever 160.

The lever 161 is pivotally mounted on a shoulder screw 164 engaging the top end of a bracket 165 shown in Figs. 3, 5 and 6, formed with the plate 134. The bearing portion of lever 161 is provided with a radially disposed slot 166 engaging the lug 167 at the end of a sleeve 168 and to the front end of this sleeve is securely mounted a double armed lever member 169 shown in Figs. 1, 3 and 5, provided at its ends with key buttons 170 and 171 so that a movement of lever 161 as by a pressure applied on the key button 171 is effective to rotate the pinion 155 for slidably moving the pinion 152 out of engagement from the gear sector 163 of camming plate 146.

According to this mechanism and considering the pinion 152 in disengaged relation from the gear sector 153, the operation of gear sector 82 is rendered ineffective to operate the camming plate 146 and therefore ineffective to reset the stopping members S1, S2, etc. which may have been operated through the setting of the key members K1, K2, etc., thus permitting the successive operation of the pulsing mechanism as for signaling a given telephone number any number of times by a single setting operation of the key members K1, K2, etc., as will be hereinafter described in detail.

The camming plate 146 is provided with an arm 172 shown in Figs. 3, 4 and 5, formed with an upward extending lug portion 173 disposed in engageable relation with the free end of an arm 174 pivoted on a spindle 175, and on the arm 174 is securely mounted a cam 176. The turning movement of this cam imparts an upward movement to a rod 178 best seen in Fig. 2 for disengaging the retaining pawl 120 from ratchet wheel 116, thus controlling the resetting operation of cam shaft 111 so that the manual operation of lever arm 75 and thereby that of gear sector 82 and the shaft 78 is effective when the pinion 152 engages the gear sector 153 of camming plate 146 to disengage the pawl 120 from ratchet wheel 116 to permit the return movement of cam shaft 111 to normal under the tension of its resetting spring 121, the cam shaft 105 being returned to normal unoperated position through the engagement of a cam portion 206 carried by shaft 78 and engaging the upward extending lug of retaining pawl 203 as shown in Figs. 3 and 5, each time the handle lever 75 is operated as to return the sets of arms A1 and A2 to normal position after each operation of the transmitter.

The upright disposed bar 58 with which the laterally extending supporting arms 561, 562, 563, 554, etc. are formed is provided with a bracket portion 180 shown in Figs. 2, 3, 5 and 6, for receiving a shoulder screw 181 serving as pivot for a sleeve 182. On the front end portion of this sleeve is securely mounted a double armed lever 183 provided at its ends with key buttons 184 and 185 and the other end of sleeve 182 is formed with a camming portion 186 best seen in Figs. 2 and 3 provided for actuating a lever member 187. This lever is pivoted on screw 188 engaging the bracket portion 180 of upright disposed bar 58.

Lever 187 is bent at right angles at its lower end and is provided with a slot 189 for engaging the end of lever 97 as shown in Figs. 2, 3, 5 and 6 for moving it against the tension of spring 192 in the path of arm 98 carried by the governor shaft 99 upon the depression of key button 185 for preventing the movement of the governor shaft and therefore that of the shaft 57 of the pulsing mechanism, the locking and unlocking of governor shaft 99 by key members 184 and 185 permitting the complete setting of the key members K1, K2, etc. prior to the sending operation of any call designation or starting the pulsing operation upon the setting of the first key K1, K2, etc. of a given telephone number to be signaled. In a typical example of the operation of the transmitter, supposing that it is desired to transmit the call designation CH3-1009 and that the pulsing operation shall start upon the first key depressed; that is, the key member K2 inscribed with the designation letter C. The key button 184 which is in registry with the inscription "release call" on the front of casing 10 is first moved in that position as shown in Figs. 1, 2, 4 and 5. In that position the cam 181 permits the pivotal movement of lever 97 under the tension of spring 192 out of engaged relation from arm 98 carried by governor shaft 99.

The key K2 bearing the designation letter C, as above mentioned, is then depressed for actuating the bar B2 connected thereto through its yoke 14 and connecting links L2 and 18 shown in Figs. 2 and 7. The movement of bar B2 is transmitted to plunger P2, Fig. 6 against the tension of its retracting spring 32. The axial movement of plunger member P2 is effective to move the stopping member S2 of the lowermost disposed coordinate row in the path of arms A1 and A2 associated with that coordinate row of stopping members. The downward movement of key K2 actuates the bar 37 and thereby the cam shaft 111 through the engagement of pawl 117 with ratchet wheel 116 operating the angle gears 113 and 114. The first step of shaft 111 is effective to operate the lever arm Y1 shown in Figs. 5 and 16 for releasing the arm A1 associated with the lowermost disposed coordinate row of stopping members S1, S2, etc. The movement of these arms A1 and therefore that of A2 under the tension of their motor spring 59' and the engagement of pawl 54' carried by arm A1 with the ratchet wheel R7 carried by shaft 57 is effective to rotate this shaft and the gear 130 carried thereby for actuating the pulsing spring 137 through pinion 131, the movement of the pulsing cam 135 shown in Figs. 4 and 5 being controlled by the governor SG driven by the worm gear 139 engaging the worm portion 138 of governor shaft 99.

The angular movement of arms A1 and A2 from the position shown in Fig. 6 to the position where arm A2 engages the stopping member S2, the arm A2 has moved a corresponding angular distance; that is, equal to twice the distance between two stopping members S1, and S2, thus rotating the shaft 57 a corresponding angular distance and the pulsing cam 135 one turn for opening the contact springs 136 and 137 twice and thereby transmitting two pulses. The angular movement of shaft 57 is limited through the disengagement of pawl 54' from ratchet wheel R7 when the arm A2 engages the stopping member S2 and the consequent flexing of spring 53 due to the movement of this arm relative to its associated arm A1, thus causing the pawl portion 95 to engage its associated ratchet sector 75

AR6 for rotating it an angular distance corresponding to the angle formed by the normal position of arms A1 and A2; that is, an angular distance equal to the axial distance of any two stopping members such as S1 and S2. The movement of ratchet sector AR6 and therefore that of its camming sector portion 96, Figs. 3, 4, 5 and 6 is effective to operate the lever 97 for momentarily stopping the governor shaft 99 and therefore the impulse cam 135 geared thereto to provide a lapse of time between each set of pulses for obtaining the so-called "interdigit space". The movement of ratchet sector AR6 and therefore that of its gear sector 90 is effective to rotate the gear 104, Figs. 2, 3, 4 and 5 through pinion 100 and gear 101 for rotating the cam shaft 105 and tensioning the retractile spring 202. However, if key K4 bearing the designation letter H of the call designation CH3-1009 has not been depressed prior to the operation of gear 104, cam shaft 105 is prevented from turning through the cam C22, abutting against the arm Y22 of yoke member Y2 as shown in Figs. 12 and 13 so that the movement of gear 104 results in tensioning the spring 106 and the arm A1 of the second coordinate row of stopping members S1, S2, etc., is not released. The arms A1 and A2 associated with the lowermost disposed coordinate row of stopping members S1, S2, etc. are now abutting against the stopping member S2.

As above described, the downward movement of key K2 and the bar 38 actuated thereby actuates yoke Z1 shown in Figs. 4, 7 and 8 having one end connected to the lever 38 and its other end to the ratchet rack 40. In the downward movement of rack 40, the tooth T22 is brought in engaged relation with the pawl 45 of arcuated bar 31 so that the return movement of key K2 and therefore the ratchet toothed rack 40 is effective to position the arcuated mounting bar 31 and the plunger members P1, P2, P3, etc. carried thereby in axial alignment with the second coordinate row of stopping members S1, S2, S3, etc. where the pawl 47 carried by this bar engages the tooth T2 of stationary rack 44, for holding the bar 31 in that position.

Similarly, the operation of key member K4 for transmitting a number of pulses corresponding to the designation letter H is effective to operate the bar B4 and the spring retracted plunger member P4 for moving the stopping member S4 of the second coordinate row of stopping members S1, S2, etc., in the path of levers A1 and A2 of that row. The downward movement of this key and that of the cross bar 37 with the consequent operation of pawl 117 and ratchet wheel 116 is effective to impart a turning movement or one step to camming shaft 111. Prior to the second step of cam shaft 111, as imparted by the operation of key member K4, however, it is to be remembered that the cam shaft 105 as above mentioned is held from turning under the tension of spring 106 by the arm Y22 abutting against the stop afforded by the vertical portion of cam C22, the spring 106 having been tensioned by the movement of ratchet toothed sector AR6 through the gear sector 90 carried thereby and pinion 100.

The second step of cam shaft 111 is effective to pivot the yoke Y2 for moving its arms Y21 and Y22 from the position indicated in Figs. 12 and 13 to the position shown in Fig. 14 for permitting under the tension of spring 106 the movement of cam shaft 105 an angular distance determined by the length of slot 110 in gear 104 and thereby operating the yoke member Y2 from the position

shown in Fig. 14 to the position shown in Fig. 15 where the arm Y23 of yoke Y2 is moved clear of arm A1 for permitting its movement and that of its cooperating arm A2 under the tension of their associated motor spring 59². The operation of arms A1 and A2 and their associated pawl 54² engaging the ratchet wheel R6 is effective to actuate the shaft 57 and the impulse cam 135 two turns, thus opening the contacts 136 and 137 four times for transmitting the number of pulses corresponding to key K4. The downward movement of key K4, like in the operation of key K2, through the operation of arm 38 and yoke Z1, is effective to move the ratchet toothed rack 40 downwardly so that the tooth T23 of this rack engages the slidable pawl 45 for moving the arcuated bar 31 and the spring pressed plungers P1, P2, etc. carried thereby in axial relation with the third coordinate row of stopping members S1, S2, etc. where the axially movable pawl 47 carried by the bar 31 engages the tooth T3 of stationary rack 44 for holding the bar 31 in that position and the plunger members P1, P2, P3, etc. carried thereby in axial relation with the stopping members S1, S2, S3, etc. of the third coordinate row.

The engagement of arm A2 and subsequently that of the arm A1 with the stopping member S4 of the second coordinate row of stopping members S1, S2, etc., like in the signaling of the designation C by the depression of key K2, the movement of arms A1 and A2 relative to each other is effective to tension their associated spring 53 for disengaging the pawl 54² from ratchet wheel R6 and engaging its pawl portion 95 with ratchet toothed sector AR5 for rotating it and thereby its camming portion 96 for stopping the pulsing mechanism simultaneously with the movement of gear 104 for actuating the cam shaft 105 through the normal tension of spring 106. However, if the key K3 bearing the designation number 3 has not been depressed, the spring 106 is tensioned through the movement of gear 104 but the cam shaft 105 is not operated due to the cam C23 being prevented from turning by the yoke Y3 in the manner described in connection with the operation of key K2. The arms A1 and A2 remain in abutment against the stopping member S4 of the second coordinate row of stopping members S1, S2, S3, etc., stopping member S4 having been positioned by the operation of key K4, bearing the designation letter H, the second digit of the call designation to be transmitted. The operation of the transmitter is identical to that effected by the depression of the keys K2 and K4 for each successive key depressed which may comprise a call designation to be transmitted.

The operation of cam shafts 111 and 105 for the operation of yoke members Y1, Y2, Y3, Y4, Y5, Y6 and Y7 and thereby the release of their respectively associated pair of arms A1 and A2 has been described in connection with a condition in which each set of pulses is completely transmitted before the next key is depressed. However, in case key members representing a seven digit call designation are depressed in a shorter lapse of time than that required for the transmitting of one digit at the rate of ten pulses per second, as controlled by the governor device S. G. the operation of cam shaft 111 imparted by the movement of the key members is effective to move the yokes Y1, Y2, Y3, etc. successively from the position shown in Figs. 12 and 13 to the position shown in Fig. 14, where-in the movement of cam shaft 105 as above described will successively move these yoke members to the position shown in Fig. 15 for successively

releasing their respectively associated arms A1 and A2 at the end of each preceding pulsing operation.

At the completion of the complete call transmitting operation as CH3-1009, the arms A1 and A2 associated with the ratchet wheel R7 abut against the stopping member S2 of the lowermost disposed coordinate row.

The arms A1 and A2 associated with ratchet wheel R6 abut against the stopping member S4 of the second coordinate row in an ascending direction.

The arms A1 and A2 associated with ratchet wheel R5 abut against the stopping member S3 of the third coordinate row.

The arms A1 and A2 associated with ratchet wheel R4 abut against the stopping member S1 of the fourth coordinate row.

The arms A1 and A2 associated with ratchet wheel R3 abut against the stopping member S10 of the fifth coordinate row.

The arms A1 and A2 associated with ratchet wheel R2 abut against the stopping member S10 of the sixth coordinate row.

The arm A1 associated with ratchet wheel R1 abut against the stopping member S9 of the seventh coordinate row.

The example of operation of the call transmitter of the invention has been described with the key 184 moved in "release call" position as shown in Figs. 1, 2, 3, 4, 5 and 6; that is, with lever 187 in position ineffective with respect to arm 97, thus permitting the operation of the impulse mechanism immediately upon the operation of the first digit key depressed. However, whenever it is desired to prevent the starting operation of the transmitter immediately after the operation of the first key which may represent the first digit of a call designation to be transmitted, the pivotal movement of cam 186 by a pressure applied on the key button 185 is effective to move the lever member 97 in the path of arm 98 carried by governor shaft 99, thus preventing the operation of the transmitter until the governor shaft is released by a pressure applied on the key button 184 in the manner above described.

Arms A1 and A2 of the camming shafts 111 and 105 are returned to normal unoperated position shown in Figs. 5 and 6 by the operation of handle lever 75. The downward movement of this handle lever and therefore the rotary movement of gear sector 82 actuated thereby is effective to rotate the shaft 78 through the movement of gear 81, the movement of shaft 78 being effective to tension the retractile spring 88 and to impart an angular movement to the bar 70 shown in Figs. 5, 6 and 16 in a counter-clockwise direction concentric to shaft 57 through the operation of gears 77 and 68.

The movement of bar 70 from its normal unoperated position to its operated position shown in dotted lines in Figs. 3 and 6 is effective to engage the lugs 76', 76², 76³, 76⁴, 76⁵, 76⁶ and 76⁷ formed with the arms A1 of each pair for moving the arms A1 to normal unoperated position shown in Figs. 2, 5 and 6, where the arms of yokes Y1, Y2, Y3, Y4, etc. reengage the arms A1 for holding them against the action of their motor springs 59', 59², 59³, etc., which have been tensioned upon the return of the arms A1 and A2 to normal.

The movement of shaft 78 imparted by the movement of gear sector 82 is effective to rotate the camming plate 146 through its gear rack por-

tion 153 with the gear 152 for collectively operating the stopping members resetting bars 144 in a path determined by the pivotal movement of their associated links 148 and 150 to which they are connected, links 148 of each bar being formed with a lug 147 engaging respective camming slot CP in plate 148 shown in Figs. 2, 3 and 4.

The movement of bars 144 is effective to return the stopping members S2, S4, S3, S1, S10, S8 and S9, which have been operated by the movement of the key members bearing the ordinals or digits of the call designation transmitted, that is, CH3-1009 to normal unoperated position as shown in Figs. 4, 5 and 6.

Upon the pivotal movement of camming plate 146, the upward extending lug 173 carried thereby and shown in Figs. 2, 3, 4 and 5 engages the arm formed with the disc member 174 for rotating the cam 176, thus imparting an upward movement to the rod 177 for disengaging the pawl 120 from ratchet wheel 116 and thereby permitting the cam shaft 111 to return to normal unoperated position through the tension of its retractile spring 121, such return movement being limited by a pin 200 carried by gear 114 engaging a stop 201 carried by the upright VP of plate 34.

The movement of camming plate 146 simultaneously disengages pawl 203 from ratchet wheel 204 for permitting the ratchet toothed sectors AR1, AR2, etc. carried by bar 92 and the cam shaft 105 actuated thereby to return to normal unoperated position under the tension of retractile spiral spring 202. The return movement of lever arm 75 and the camming plate 146 to normal unoperated position is effected by the tension of retractile spring 88 and the transmitter is now ready for a subsequent call transmitting operation by depressing the key members K1, K2, K3, etc. according to the telephone number to be transmitted.

Supposing now that the telephone line having the call designation CH3-1009 above described was busy and that it is desired to repeat such a call. The key 171 shown in Figs. 1, 3 and 5 is depressed. The operation of this key moves the lever arms 161 and 160 to the right of the position shown in Figs. 3, 5 and 6, thus turning the shaft 157 and the pinion 155 carried thereby for moving the pinion 152 out of engagement from gear toothed sector 153 of plate 146. The downward movement of handle lever 75 and that of gear sector 82 actuated thereby actuate a gear 81 and the shaft 78 and wind the retractile spring 88. The movement of shaft 78 actuates the gear sector 77 and thereby the gear 68 for rotating the bar 70 for returning the arms A1 and A2 to their starting position shown in Figs. 5 and 6. The movement of shaft 78 a small angular distance from its maximum operated position is effective to operate the pawl 203 for permitting the return movement of ratchet toothed sectors AR1, AR2, AR3, etc. and the cam shaft 105 to normal position under the tension of retractile spring 206, the cams C22, C33, C44, etc. and the arms of yoke members Y1, Y2, Y3, Y4, etc. are now in the position shown in Fig. 14, while the cam shaft 111 remains in its advanced or operated position due to the engagement of retaining pawl 120 with ratchet wheel 116. Upon the resetting movement of arms A1 and A2 of each set through the engagement of bar 70 with the lug 76 formed with the arms A1, the arms A1 are moved relatively to their associated arms A2, causing the spring 53 to straighten for dis-

engaging the pawl portions 95 from the ratchet toothed sectors AR1, AR2, etc. and reengaging pawls 54', 54", 54³, etc. with their respectively associated ratchet wheels on shaft 57 for actuating this shaft according to the successive automatic release of arms A1 and A2 as effected by the operation of cam shaft 105 operated at the end of each digit pulsing operation determined by the location of stopping members corresponding to key members K2, K4, K3, K1, K10, K10 and K9 representing the telephone call designation CH3-1009 above mentioned.

According to this example of operation any call designation may be repeated any desired number of times by the simple operation of handle member 75 subsequent to the operation of key button 171 to the repeat position indicated on the housing of the transmitter.

It is obvious that minor changes may be made in the device of this invention without departing from the scope of the appended claims.

What is claimed is:

1. In a call transmitter, a unidirectional movable shaft, a pulsing mechanism operatively connected to said shaft for movement in said direction, a movable member, a motor spring for actuating said member, operable means for normally holding said member against the tension of said spring, a row of operable stopping members, a set of keys for positioning said stopping members for limiting the movement of said movable member, and means actuated by each of said key members for actuating the first-mentioned means for releasing said operable member to cause the operation of said pulsing mechanism.

2. In a call transmitter, a pulsing cam, a set of key members, a unidirectional movable shaft, a gearing mechanism operatively connecting said shaft to said cam, a plurality of motor means for actuating said shaft controlled by the operation of said key members and a governor mechanism for controlling the operation of each of said motor means.

3. In a call transmitter, a pulsing cam, a set of numbered key members representing digits, a plurality of spring driving mechanisms, a shaft operatively associated with each of said mechanisms, means operatively connecting said shaft to said pulsing cam and means operated by the movement of said key members for limiting the operation of said driving mechanisms for sending series of pulses according to the operation of said key members.

4. In a call transmitter, a pulsing cam, a set of key members representing digits, a plurality of spring driving mechanisms, a shaft operatively associated with each of said mechanisms, a gearing mechanism operatively connecting said shaft to said pulsing cam, means operated by the movement of said key members for causing the successive operation of said spring mechanisms, means operated by the movement of said key members for limiting the operation of said driving mechanism and manually operable means for resetting said driving mechanisms collectively.

5. In a call transmitter, a pulsing mechanism, a plurality of rotatable arms, a spring for actuating each of said arms, a row of normally ineffective stopping members for each of said arms, a plurality of means for normally holding said arms in normal position against the tension of said springs and a set of keys for selectively operating said members and simultaneously operating said means to cause the operation of said arms successively to points determined by the position of

said members in said rows for actuating said mechanism.

6. In a call transmitter, a pulsing cam, a set of numbered key members representing digits, a rotatable shaft, a gearing mechanism operatively connecting said shaft to said pulsing cam, a plurality of rotatable arms, a plurality of springs for actuating said arms, a lever member for normally holding each of said arms in starting position against the tension of said springs, a plurality of means operatively and independently connecting said arms to said shaft, means set by the operation of said key members for determining the extent of movement of said arms, and means actuated by the movement of said key members for successively operating said lever members for releasing said arms according to the order of operation of said key members for imparting a succession of movements to said shaft according to the position of the operated key members.

7. In a call transmitter, a pulsing cam, a set of key members representing digits, a rotatable shaft operatively connected to said pulsing cam, a plurality of pivoted arms, a motor spring for actuating each of said arms and means positioned by the operation of said key members for limiting the pivotal movement of each of said arms according to the digit represented by said key members, and a plurality of unidirectional means operatively connecting said arms to said shaft.

8. In a call transmitter, a plurality of rotatable arms, a plurality of stopping members arranged in coordinate rows, a set of manually operable key members for moving said stopping members in the path of said arms and a pulsing mechanism operable successively in one direction according to the combined movement of said arms.

9. In a call transmitter, a plurality of movable arms, a plurality of stopping members arranged in coordinate rows, one coordinate row for each of said arms, a set of manually operable key members representing digits for moving said stopping members in the path of said arms, a pulsing mechanism actuated by the movement of said arms, and means manually operable for returning said stopping members and said arms to normal after each call transmitting operation of said mechanism.

10. In a call transmitter, a pulsing mechanism, a plurality of rotatable arms, a motor spring for actuating each of said arms, a set of normally ineffective stopping members for each of said arms arranged in rows, a set of keys representing digits operable to render said member effective with respect to said arms, a plurality of operable means normally holding said arms in a starting position under the tension of said springs and a common mechanism operable upon the operation of said keys for successively releasing said arms for actuating said impulse mechanism, and manually operable means for returning said arms to normal position and simultaneously resetting said stopping members.

11. In a call transmitter, a pulsing mechanism, a plurality of pivoted arms, an arcuated row of stopping members associated with each of said arms but normally ineffective therewith, a set of keys, a plurality of plunger members actuated by the movement of said keys in one direction, a support for said plunger members, a step-by-step operating mechanism operable upon the movement of each of said keys in the other direction for successively moving said support for positioning said plunger members with respect to said

stopping members and a mechanism operable upon the successive operation of said keys for releasing said arms for successively actuating said impulse mechanism according to the order of operation of said keys.

12. In a call transmitter, a plurality of motor means, a shaft actuated by the operation of said motor means, a set of key members, a plurality of rows of equally spaced stopping members actuated by the operation of said key members for controlling the operation of said motor means, a resetting bar for each row of said stopping members, a camming plate common to all of said bars, a handle, a gearing mechanism operatively connecting said plate to said handle, and other means actuated by the operation of said handle for returning said motor means to normal unoperated position upon the operation of said camming plate.

13. In a call transmitter, a plurality of movable arms, a motor spring for actuating each of said arms, operable means for holding said arms in starting position against the tension of said springs, an arcuated row of stopping members for each of said arms, a set of manually operable key members representing digits for positioning a stopping member in each row in the path of said arms at points determined by the digits inscribed on said key members, means actuated by the operation of said key members for controlling the release of said arms, and a pulsing mechanism actuated by said arms according to the sequence of operation of said key members.

14. In a call transmitter, a plurality of movable arms, a pawl carried by each of said arms, a plurality of stopping members arranged in rows, one row for each of said arms, a shaft, a plurality of ratchet wheels carried by said shaft and normally engaged by said pawls, a motor spring for each of said arms, means for normally holding said arms in starting position, a set of key members for moving said stopping members in the path of said arms, and simultaneously releasing said arms for actuating said shaft, a pulsing mechanism actuated by the operation of said shaft following the successive operation of said key members, and a governor device for controlling the operation of said mechanism.

15. In a call transmitter, a plurality of pivoted arms, a plurality of stopping members arranged in coordinate rows, one arm for each of said coordinate rows, a supporting bar, a plurality of plunger members carried by said supporting bar disposed in engageable relation with one of the coordinate rows of said stopping members, a set of key members, a ratchet mechanism actuated by the movement of said key members for successively moving said supporting bar for positioning said plunger members in operative relation with the said stopping members in each ordinate row, and means actuated by each of said key members for operating one of said plunger members to move one of said stopping members in position effective with respect to one of said arms, a pulsing mechanism actuated by said arms, and a manually operable mechanism for returning said stopping members and said bar in normal unoperated position after each call transmitting operation of said pulsing mechanism.

16. In a call transmitter, a pulsing cam, a shaft operatively connected to said cam, a plurality of independently operating motor means for actuating said shaft, operable means normally preventing the operation of said motor means, and a set of manually operable key members repre-

senting digits, camming means operated by said key members for successively actuating said operable means for causing the operation of said motor means, and stopping members actuated by the operation of said key members for controlling the operation of each of said motor means for sending a plurality of series of pulses according to the digits of the operated key members.

17. In a call transmitter, a pulsing cam, a rotatable shaft, a gearing mechanism operatively connecting said shaft to said cam, a set of pivoted key members numbered to represent ten digits, a plurality of actuating mechanisms for said shaft, each of said mechanisms comprising a pivoted arm, a motor spring connected to said arm, a ratchet wheel secured to said shaft, and a pawl carried by said arm engaging said ratchet wheel, a plurality of operable means for holding each of said arms in normal starting position against the tension of said motor springs, an arcuate support, a plurality of stopping members for said arms mounted for sliding movement in radial direction in said support and arranged in superposed rows concentric to the pivotal axis of said arms and said shaft but normally ineffective with respect to said arms, means operably connected to each of said key members for moving said stopping members in position effective with respect to said arms, a cam shaft operatively associated with said operable means, and a step-by-step operating mechanism responsive to the operation of any one of said key members for actuating said cam shaft for releasing said arms consecutively to cause the successive operation of said pulsing cam according to the digits and the sequence of the key members operated.

18. In a call transmitter, a pulsing cam, a shaft operatively connected to said cam, a plurality of motor means for actuating said shaft, means for normally preventing the operation of said motor means, a set of normally operated key members, means operated by the movement of said key members for effecting the release of one of said motor means and preparing the release of the other of said motor means, means actuated by the successive release of said motor means for successively releasing the other of said motor means, and a governor device geared to said shaft for controlling the operation of said impulse cam.

19. In a call transmitter, a pulsing cam, a shaft operatively connected to said cam, a plurality of independently operating motor means for successively actuating said shaft, a governor device for controlling the operation of said shaft, and means actuated by the operation of a number of said motor means to cause an interval of time between each set of pulses greater than the interval of time between each of said pulses as determined by the operation of said governor device.

20. In a call transmitter, a pulsing cam, a plurality of motor means for actuating said cam, manually operable key members, means actuated by the setting of said key members for causing the operation of said motor means successively, a governor device for controlling the operation of said impulse cam, another manually operable means for returning said motor means to normal starting position, and means operating automatically for causing the successive operation of said motor means for repeating the series of pulses as determined by the setting of said key members, the operation of said automatically operable means being effective to control the starting operation of said motor means.

21. In a call transmitter, a plurality of pivoted

arms arranged in pairs, the arms in each pair being movable relative to each other, a motor spring for each pair of said arms, a pawl carried by one of said arms in each pair, a spring carried by each of said pawls and engaging the other arm of the pairs for holding them in angular spaced relation with respect to the first-mentioned arms, an arcuated row of stopping members operatively associated with each pair of said arms, operable means for individually holding the arms of each pair in starting position against the tension of said motor spring, a set of key members for selectively moving said stopping members in the path of said arms to cause them to move relative to each other under the tension of said motor springs, means actuated by the operation of said key members for effecting the partial release of said operable means, and other means operable upon the relative movement of said arms in each pair for successively effecting the complete release of the other pairs of arms and a pulsing mechanism actuated by the operation of each pair of said arms according to the set position of said stopping members.

22. In a call transmitter, a base, a mounting plate carried by said base, an upright member secured to said plate and having a plurality of supporting arms extending substantially at right-angles therefrom, a bearing portion at the end of each of said supporting arms, a plurality of arms each having a hub portion rotatably mounted in the bearing portions of said supporting arms, and other arms pivoted on the bearing portions of the first-mentioned arms and capable of relative movement with respect to the second-mentioned arms, a shaft pivoted in said base and in said plate and disposed concentric to the hub portions of said supporting arms and the first and second-mentioned arms, means carried by each of the second-mentioned arms for operatively engaging said shaft for rotating it, a pulsing mechanism actuated by the movement of said shaft, and means controlled by the movement of one of the second-mentioned arms relative to the movement of one of the last-mentioned arms for successively and momentarily preventing the operation of said shaft.

23. In a call transmitter, a pulsing cam, a shaft operatively connected to said cam, a plurality of independently operable motor means for actuating said shaft, pivoted yoke members normally preventing the operation of said motor means, a set of operable key members, a plurality of means positioned by the operation of said key members for controlling the extent of movement of said motor means, a cam shaft, a ratchet mechanism actuated by the successive operation of said key members for effecting the complete release of one of said motor means for actuating said pulsing cam upon the operation of the first key member in a call designation to be transmitted and preparing the release of the other of said motor means upon the successive operation of the other of said key members, another cam shaft, a ratchet mechanism actuated by the movement of the first operating motor, means for causing the operation of the last-mentioned cam shaft for causing the successive operation of each of said motor means succeeding the continued operation of said key members.

24. In a call transmitter, a plurality of stopping members arranged in coordinate rows, an arm operatively associated with each coordinate row, motor means for independently actuating said arms, said stopping members being normally

ineffective with respect to said arms, a movable supporting bar, a set of plunger members carried by said supporting bar, a set of key members operatively associated with said plunger members, means actuated by the movement of said key members for operating said supporting bar for successively positioning said plunger members in operative relation with the stopping members in each ordinate row, means for independently holding said arms from movement against the tension of said motor springs, a camming mechanism controlled by the movement of said key members for successively releasing said arms, and a pulsing mechanism actuated by the operation of said arms as determined by the operation of said key members.

25. In a call transmitter, a pulsing cam, a rotatable shaft, a gearing mechanism operatively connecting said pulsing cam to said shaft, a set of key members representing digits, a plurality of actuating mechanisms for actuating said shaft, each of said mechanisms comprising a pivoted arm, a ratchet wheel carried by said shaft, and a spring pressed pawl carried by said arm and engaging said ratchet wheel, and a plurality of stopping members set by the operation of said key members for controlling the movement of each of said mechanisms, means for resetting said driving mechanism and means for resetting said stopping members.

26. In a call transmitter, a pulsing cam, a rotatable shaft, a gearing mechanism operatively connecting said shaft to said cam, a set of key members having numerals thereon representing digits, a plurality of actuating mechanisms for operating said shaft, each of said mechanisms comprising a pivoted arm, a spring for actuating said arm, a ratchet wheel secured to said shaft, and a pawl carried by said arm and engaging said ratchet wheel, a plurality of stopping members for said arms arranged in superposed arcuated rows concentric to the pivotal axis of said arms and said shaft, an arcuated bank for slidably supporting said stopping members, means actuated by the operation of said key members for moving said stopping members in the path of said arms for controlling the operation of said shaft for transmitting sets of pulses according to the digits of said key members, a handle and resetting means for said arms and said stopping members operating simultaneously upon the operation of said handle, the resetting of said arms being effective to tension said springs.

27. In a call transmitter, a plurality of motor means, a shaft, a pulsing cam operatively connected to said shaft, a set of key members, a plurality of camming mechanisms, a ratchet mechanism actuated by the operation of said key members for actuating one of said camming mechanisms for effecting a partial release of said motor means, a plurality of rows of equally spaced stopping members, a plunger member associated with each of said rows, a supporting bar for said plunger members, a stepping mechanism actuated by the operation of each of said key members for moving said supporting bar one step for positioning said plunger members successively in operative relation with said stopping members in each successive row, a pivoted bar operatively connected to each of said key members for actuating each of said plungers in each consecutive position for determining the extent of movement of each of said motor means, a ratchet mechanism automatically operating for successively causing the operation of the other of said cam-

ming mechanism for effecting the complete release of said motor means for actuating said shaft, a resetting mechanism for said last-mentioned cam shaft, a resetting mechanism for said supporting bar, a manually operable camming plate for resetting said stopping members, means actuated by said plate for resetting the first and second-mentioned camming mechanism and other means actuated by said plate for resetting said supporting bar.

28. In a call transmitter, a pulsing cam, a plurality of motor means, a set of key members, and means responsive to the successive movement of any number of said key members for causing the operation of a corresponding number of said motor means for actuating said cam.

29. In a call transmitter, a pulsing cam, a plurality of motor means, a set of operable key members, a shaft, a plurality of cams carried by said shaft corresponding to the number of said motor means, and a stepping mechanism responsive to the movement of any number of key members for actuating said cam shaft for causing the successive operation of a number of said motor means corresponding to the number of the operated key members.

30. In a call transmitter, a pulsing cam, a plurality of motor means, a set of key members and a plurality of camming mechanisms for causing the successive operation of a number of motor means corresponding to the number of the operated key members, one of said mechanisms being responsive to the movement of the key members and the other operating under control of each of said motor means.

31. A call transmitter in which a set of keys controls an impulse mechanism to transmit a code of impulses according to the keys depressed, characterized in this, that the impulse mechanism is started in operation by the depression of the first digit key, and an auxiliary key is provided which when actuated prior to the digit keys prevents the impulse mechanism from functioning until such key is released.

32. A call transmitter, according to claim 31, characterized in this, that the auxiliary key when operated moves a lever into the path of an arm carried by the governor shaft.

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