Aug. 26, 1941. C. D. RICHARD 2,253,650

TELEPHONE CALL TRANSMITTER

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FIG. 1

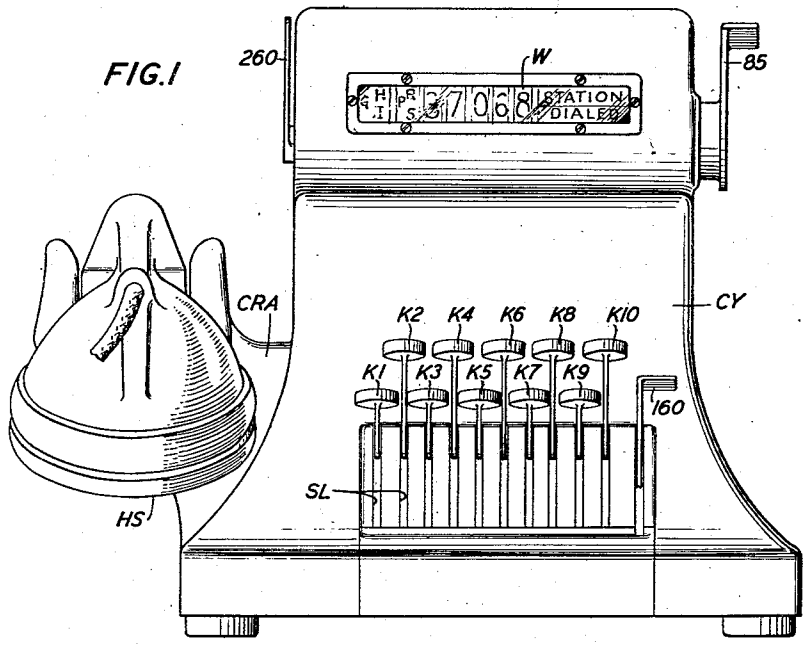
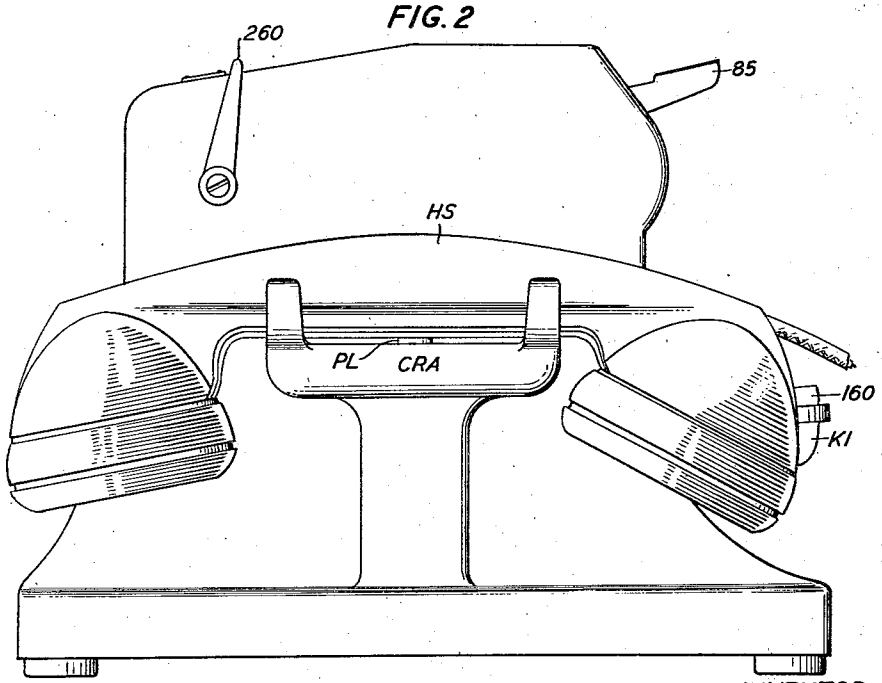


FIG. 2



INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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FIG. 3

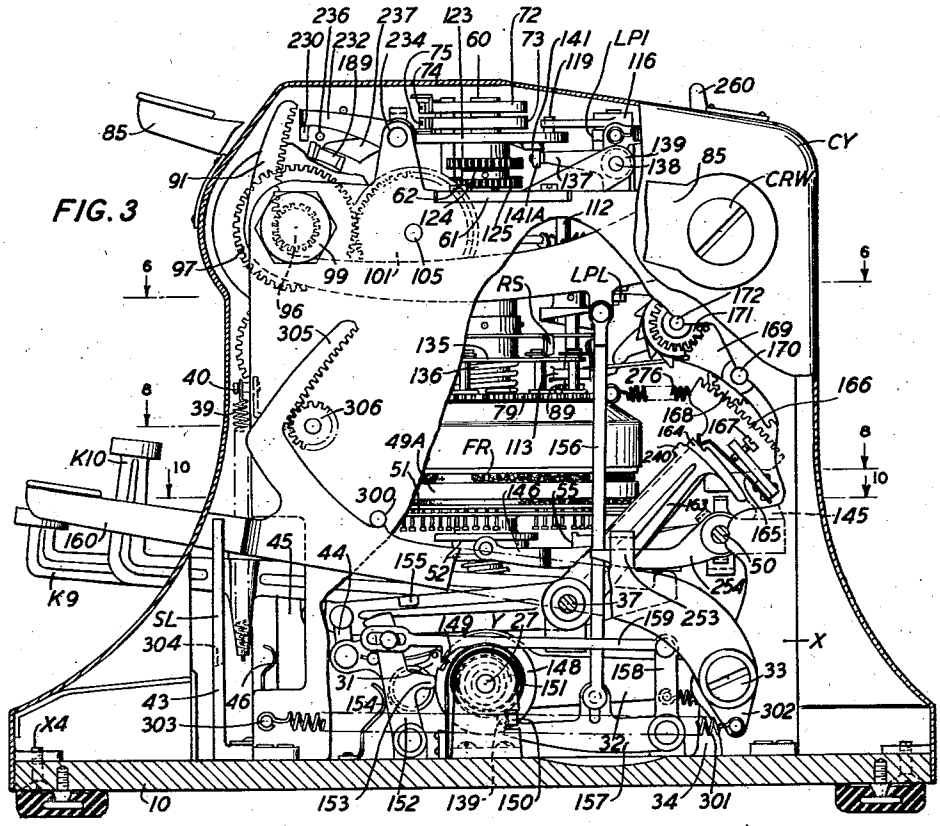
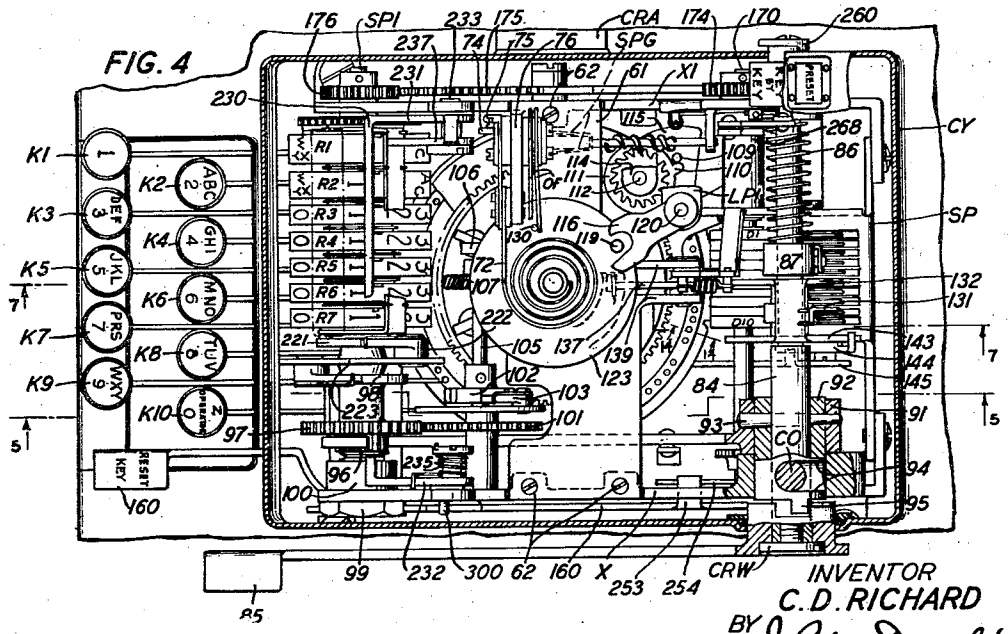


FIG. 4



INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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FIG. 5

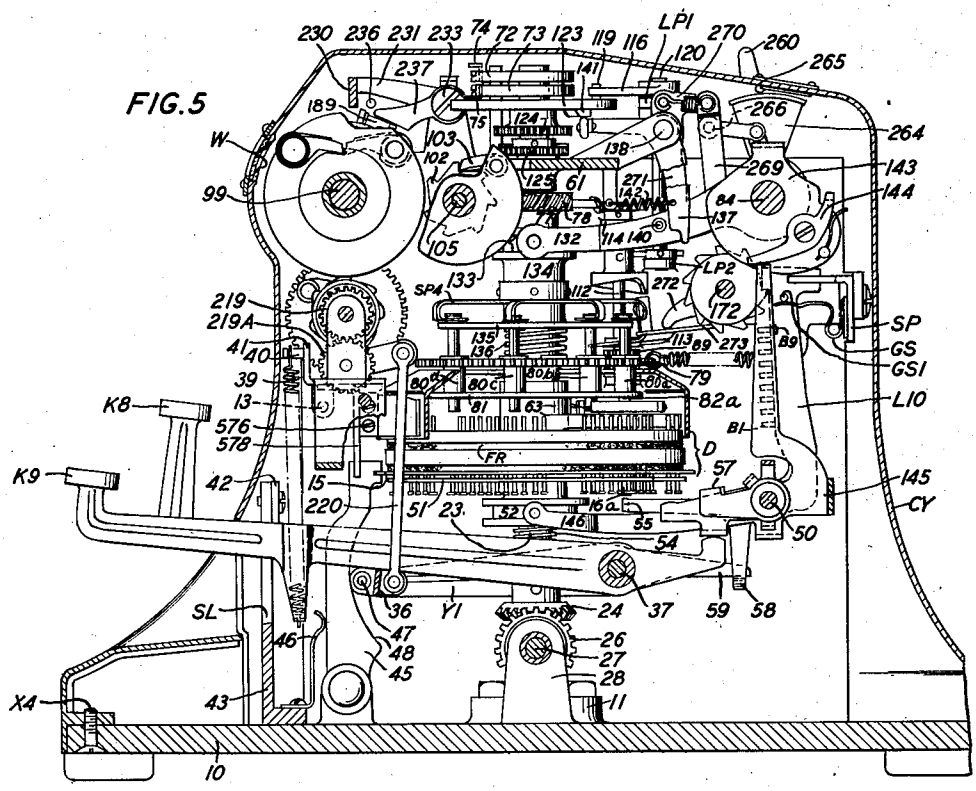
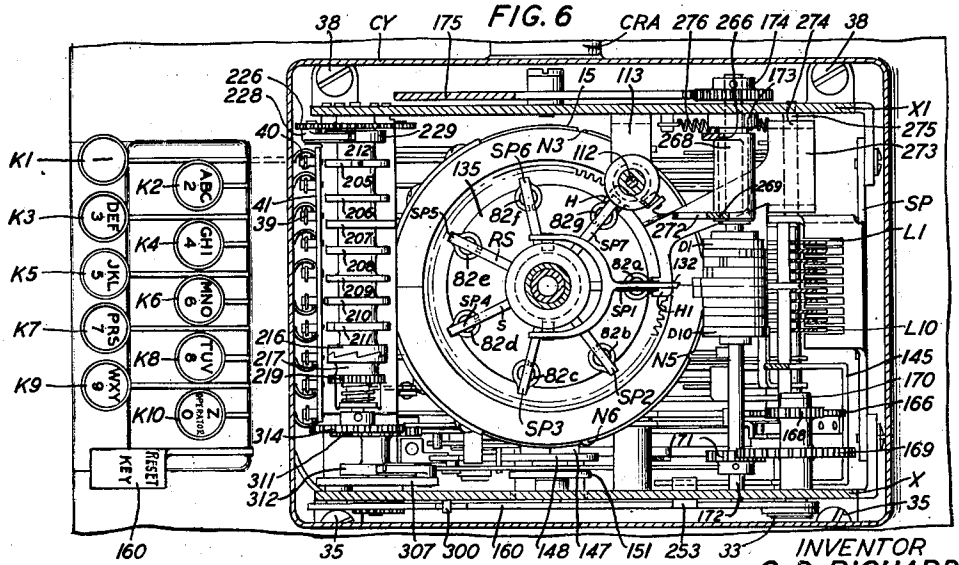


FIG. 6



INVENTOR
C. D. RICHARD
BY
J. MacDonald
ATTORNEY

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FIG. 7

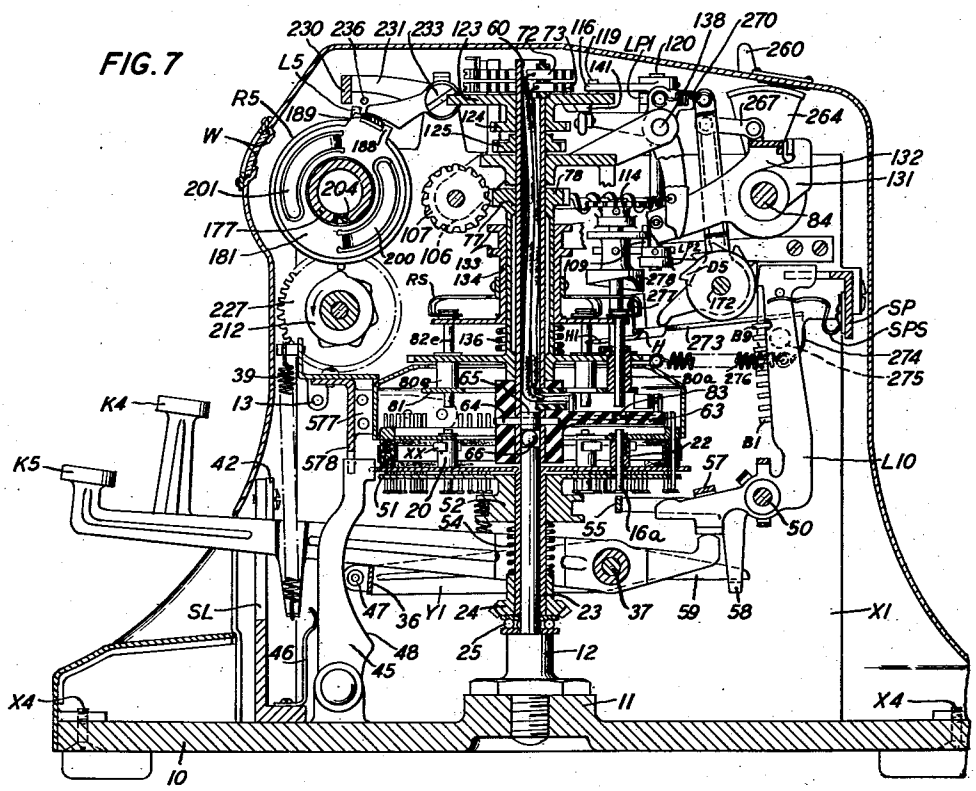
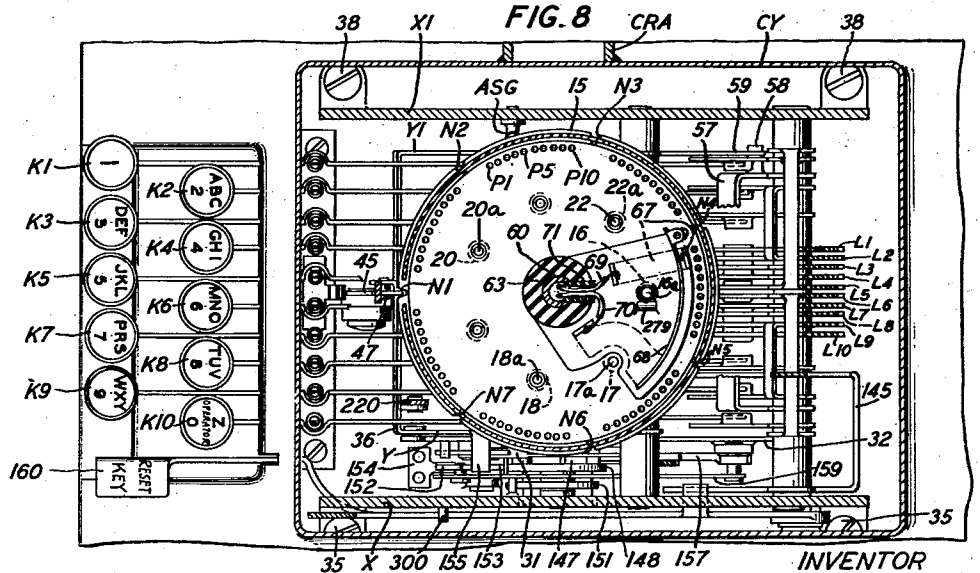


FIG. 8



INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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FIG. 9

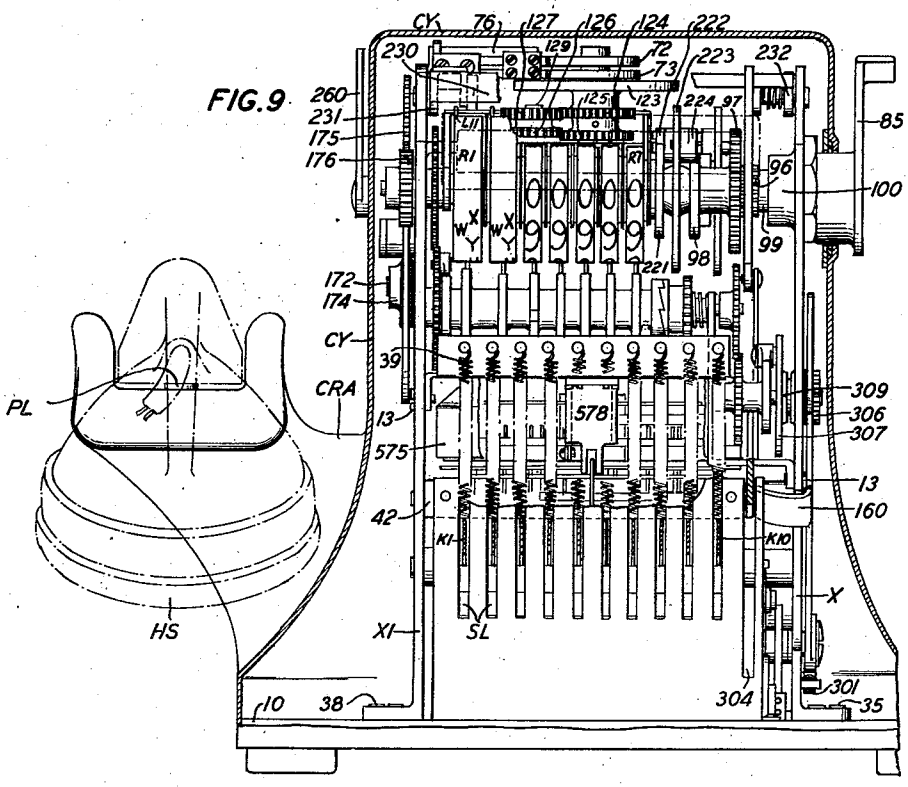
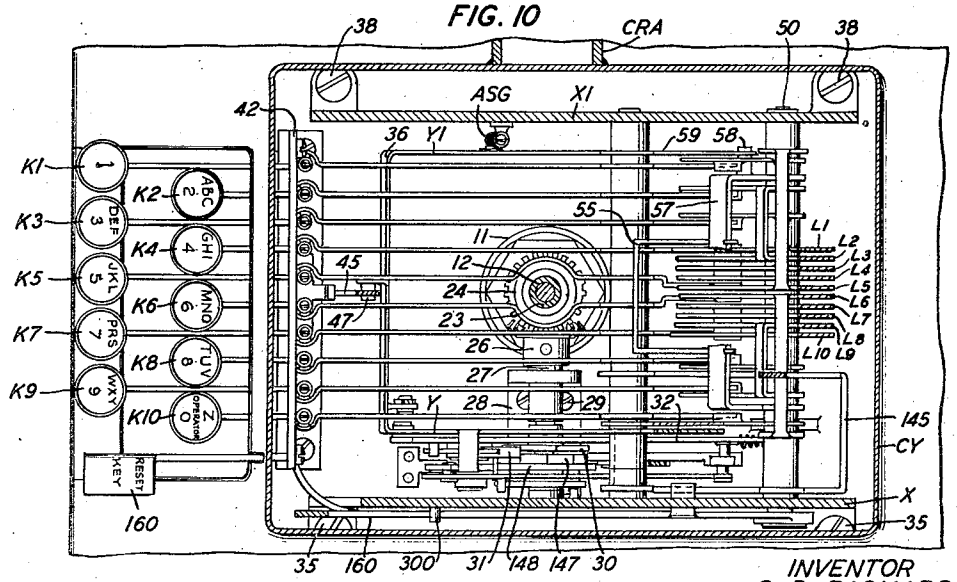


FIG. 10



INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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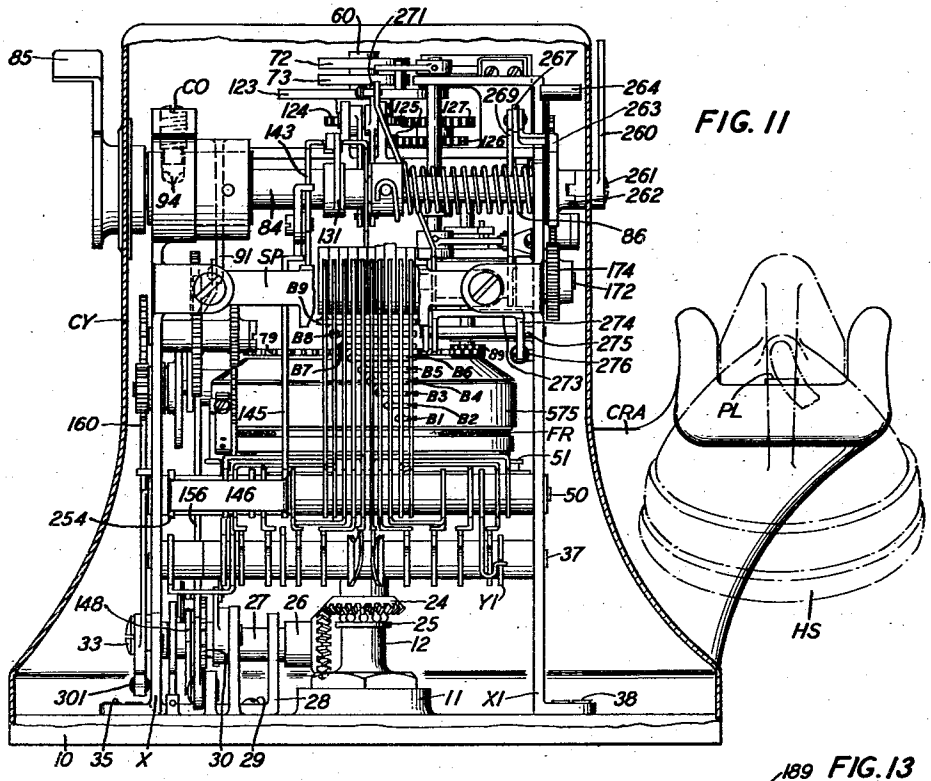
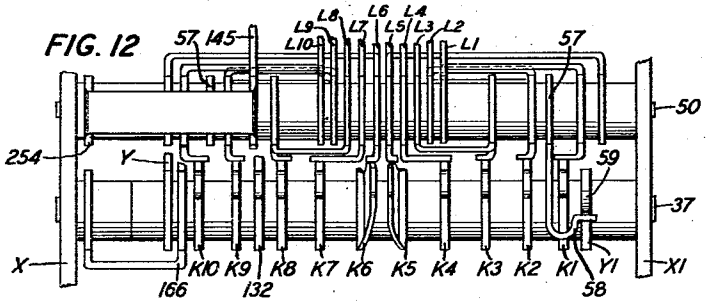


FIG. 11

FIG. 12



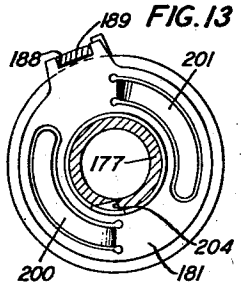


FIG. 13

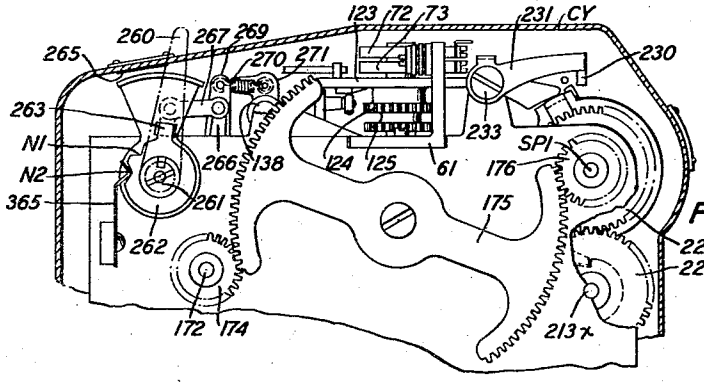


FIG. 15

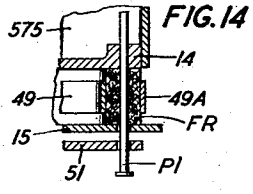


FIG. 14

INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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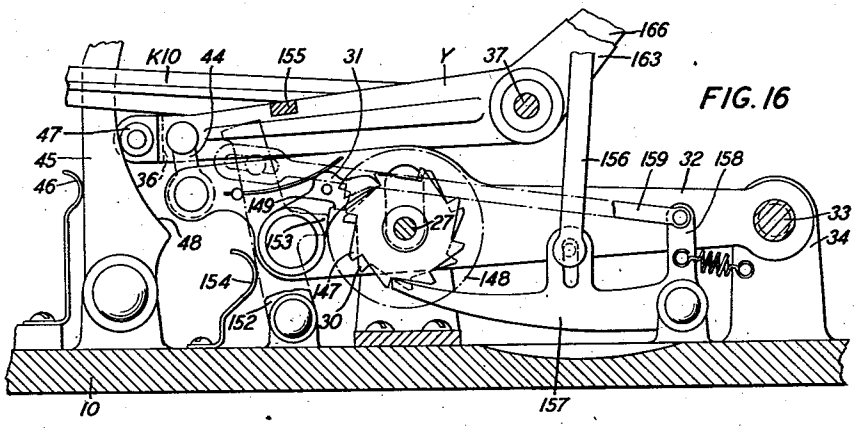

FIG. 16

FIG. 17A

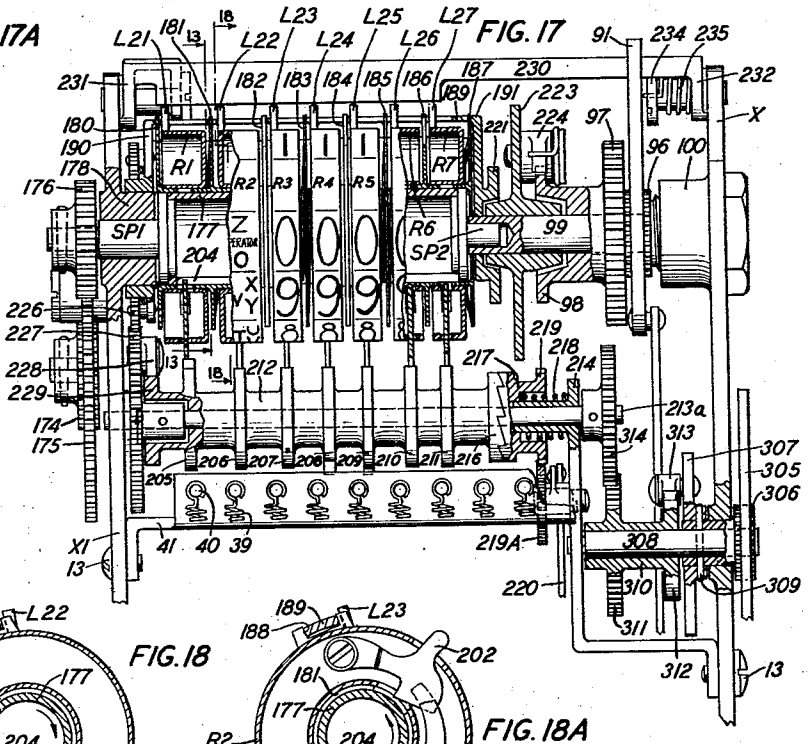

FIG. 17

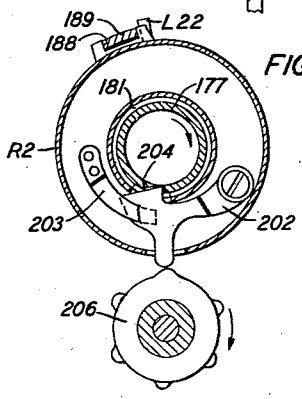

FIG. 18

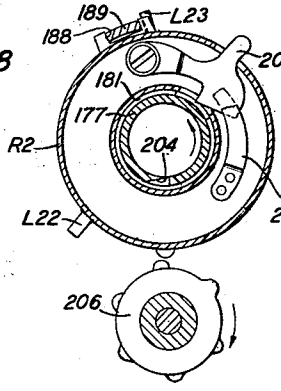

FIG. 18A

INVENTOR
C. D. RICHARD
BY J. MacDonald
ATTORNEY

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FIG 23

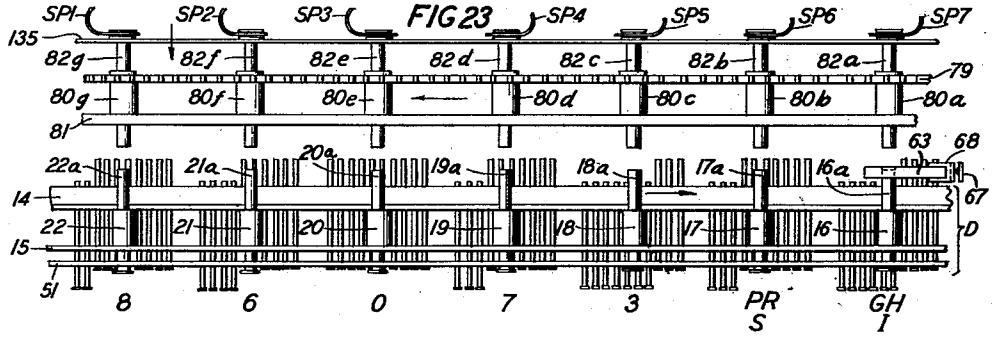


FIG. 25

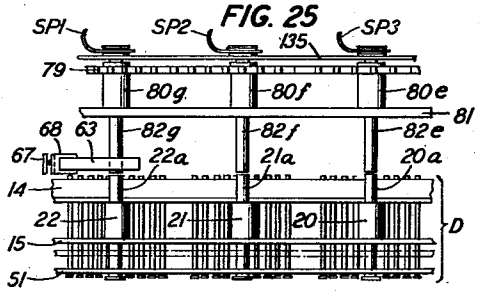


FIG. 24

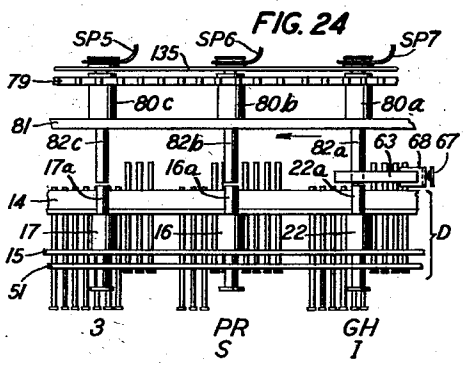


FIG. 26

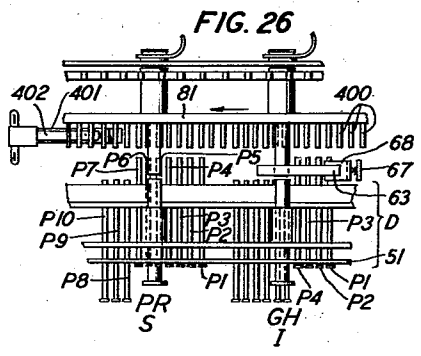


FIG. 27

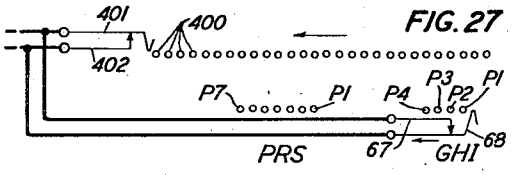
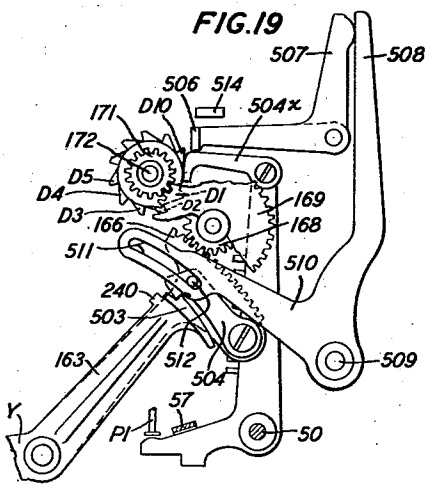


FIG. 19



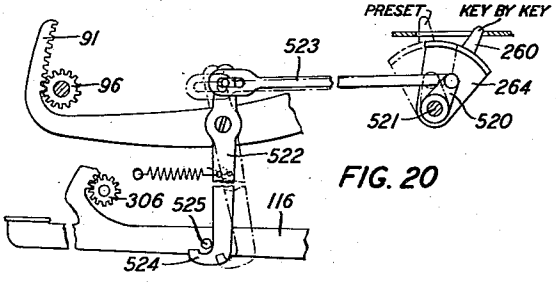


FIG. 20

INVENTOR
C. D. RICHARD
BY J. Mac Donald
ATTORNEY

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FIG. 21

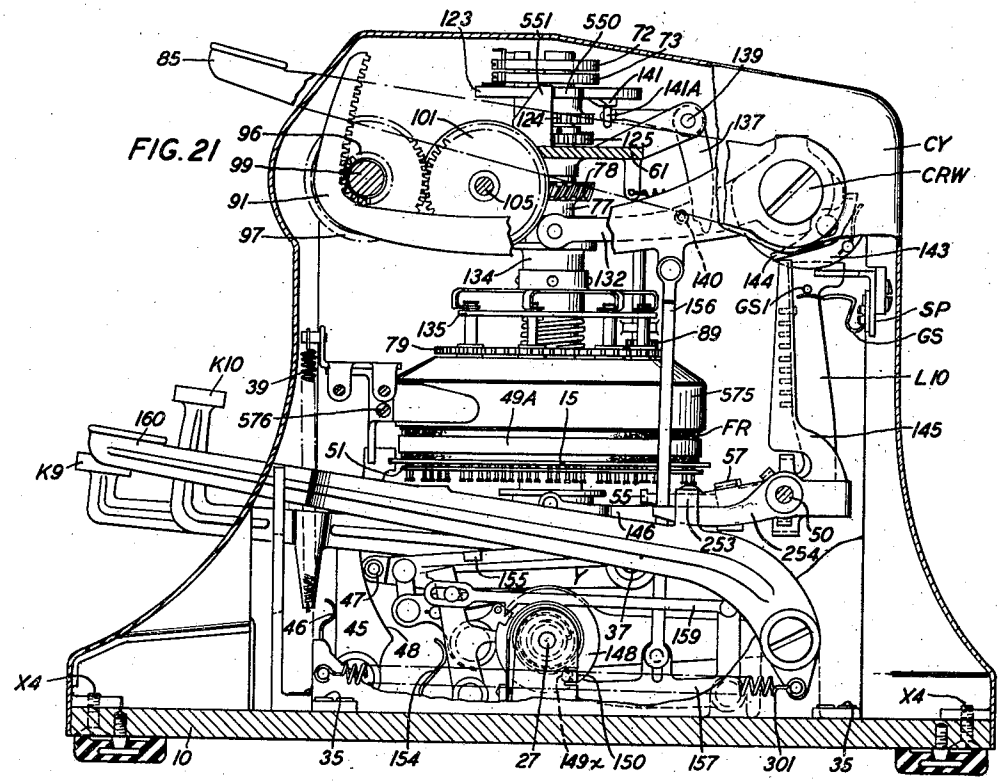
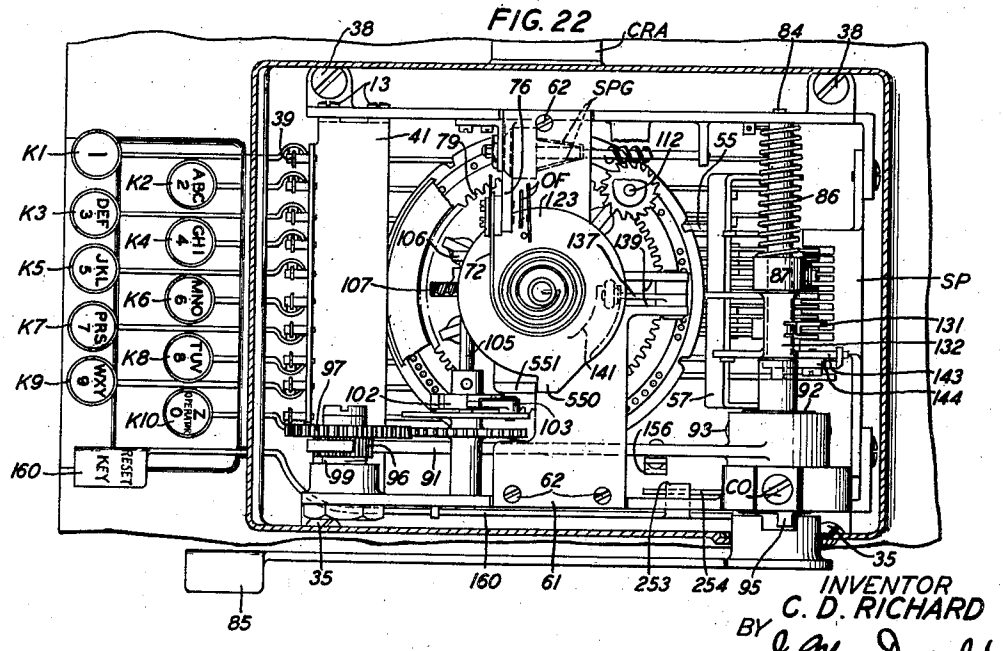


FIG. 22



INVENTOR
C. D. RICHARD
BY
J. MacDonald
ATTORNEY

Patented Aug. 26, 1941 2,253,650

UNITED STATES PATENT OFFICE

2,253,650

TELEPHONE CALL TRANSMITTER

Charles D. Richard, West New Brighton, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application March 24, 1938, Serial No. 197,762

28 Claims. (Cl. 179—90)

This invention relates to call transmitters, and more particularly to call transmitters used in automatic telephone exchange systems.

Its object is to provide an improved call transmitter of the key operated type which embodies a minimum number of simple operating parts and in which the call designations are indicated by registering dials appearing on the front of the casing housing the transmitter mechanism.

A feature of the invention resides in the provision of indices bearing key numbers operable for moving normally ineffective contact actuating elements in position effective relative to associated pulsing contacts for setting a call.

Another feature is the provision of a lever mechanism interposed between the key members and the contact actuating elements for operating such elements in groups corresponding to the indices respresented by their actuating key members.

Another feature is the provision of a step-by-step operable mechanism actuated by the key members for successively positioning the contact actuating elements in operable relation with their actuating lever mechanism.

Another feature is the provision of means operating automatically upon the return movement of each key member to normal for engaging the support of the contact actuating elements for centering such elements relative to their actuating lever mechanism.

Another feature is the provision of manually operable means whereby the transmitter mechanism may be conditioned for transmitting a call designation either after the complete setting operation of the key members or by the key-by-key setting operation of these key members.

Another feature is the provision of means operable automatically for controlling the extent of operation of the contact support under the action of the motor mechanism.

Another feature is the provision of means automatically operable for resetting the contact actuating elements to normal position at the conclusion of each call transmitting operation.

Another feature is the provision of registering means for indicating the call designations set by the operation of the key members, such designations appearing through an opening in the front of the casing housing the transmitter mechanism.

Another feature is the provision of a gearing mechanism for actuating the registering wheels or dials, such gearing mechanism being controlled by the operation of a clutch in cooperation with stopping arms formed with the elements of the lever mechanism.

Another feature is the provision of manually operable means whereby the contact actuating elements and the registering dials are returned to normal position for canceling a wrong telephone call designation prior to the pulsing operation of the transmitter mechanism.

Another feature is a pair of conductors extending through the movable pulsing contact support for electrically connecting the pulsing contacts to stationary terminals mounted on the frame of the transmitter mechanism.

Another feature is the provision of manually operating means whereby the registering dials are returned to normal position simultaneously with the tensioning of a motor spring.

Another feature is the provision of means operable for connecting the registering wheels to their driving shaft according to the ordinal operation of the key members in the setting of a call.

Another feature is the provision of means controlled by the movement of the caming elements actuating mechanism for locking the key members at the completion of a call setting operation, means being provided for releasing these key members upon the operation of the motor spring tensioning mechanism and preparatory to a subsequent call setting operation.

Another feature is the provision of means for protecting the contact actuating elements and associated contacts from dust.

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

Fig. 1 is a front elevation view showing the registering dials in the operated position and the telephone handset in position on a cradle formed with the casing housing the transmitter mechanism;

Fig. 2 is a left-side elevation showing the transmitter conditioning mechanism in position for operation by the preset operations of the key members;

Fig. 3 is a right-side elevation showing the casing with portions cut away and a number of operating parts in section;

Fig. 4 is a top view shown with the casing and a number of operating parts in section;

Fig. 5 is a vertical sectional view taken on line 5—5 of Fig. 4;

Fig. 6 is a horizontal sectional view taken on line 6—6 of Fig. 3;

Fig. 7 is a vertical sectional view taken on line 7—7 of Fig. 4;

Fig. 8 is a horizontal sectional view taken on line 8—8 of Fig. 3;

Fig. 9 is a front assembly view shown with the casing and a number of operating parts in section;

Fig. 10 is a horizontal sectional view taken on line 10—10 of Fig. 3;

Fig. 11 is a rear assembly view shown with the casing in section;

Fig. 12 is a partial view showing the operative relation of the system of levers and their actuating digit key members;

Fig. 13 is a partial view showing one of the spring discs serving as bearing for mounting the registering wheels, the driving shaft for these wheels being shown in section;

Fig. 14 is a partial view of the mounting for the contact operating elements taken on line 14—14 of Fig. 4;

Fig. 15 is a partial view showing the drive for the registering wheels and the mechanism for conditioning the transmitter for preset and key-by-key pulsing operation, the conditioning mechanism being shown in position for present operation;

Fig. 16 is a detail view showing the driving mechanism for the support of the contact actuating elements and the key locking mechanism;

Fig. 17 is a view of the register mechanism enlarged, a number of operating parts being in section;

Fig. 17A shows examples of indices carried by the registering wheels;

Fig. 18 is a sectional view taken on line 18—18 of Fig. 17, showing one of the wheels operatively connected to its driving shaft;

Fig. 18A is a view similar to that of Fig. 18 but showing the wheel disconnected from its driving shaft;

Fig. 19 is a modification of the clutch mechanism for controlling the operation of the registering wheels;

Fig. 20 is a modification of the registering wheels resetting mechanism for use in connection with the key-by-key conditioning mechanism when transmitting calls consisting of a number of digits less than the capacity of its transmitter;

Fig. 21 is a side assembly view of the transmitter of the invention modified, showing the casing with portions cut away and a number of operating parts in section;

Fig. 22 is a top view thereof shown with the casing in section;

Fig. 23 is a diagrammatical view showing the pulsing contact actuating elements set in position for transmitting the call designation HP3,7069, as indicated in Fig. 1;

Fig. 24 is a partial view of Fig. 23 shown with the motor actuated clutch elements in the operated position;

Fig. 25 is a partial view of Fig. 23 showing the contact actuating elements moved in their normal position after the call transmitting operation;

Fig. 26 is a diagrammatical view of a modification used for transmitting a call by shunting a predetermined number of operations of the pulsing contacts as determined by the contact actuating elements set by the operation of the key members; and

Fig. 27 is another diagrammatical view of the modification shown in Fig. 26.

In the drawings, 10 is a base provided with a projection or boss 11, shown in Figs. 5, 7, 10 and 11, which is machined for receiving a spindle 12, and on this spindle is loosely mounted a rotatable drum-shaped support D best seen in Figs. 5, 7 and 8 consisting of discs 14 and 15 held in spaced relation to each other by bushings 16, 17, 18, 19, 20, 21 and 22, these bushings serving as guides for a similar number of independently moving clutch elements in the form of pins 16*a*, 17*a*, 18*a*, 20*a*, 21*a* and 22*a*, provided for a purpose which will be hereinafter described in detail. The disc 15 of drum D, as shown in Figs. 5, 7, 10 and 11, is formed with a hub or sleeve 23, on the lower end of which is secured a miter gear 24, resting on an end thrust bearing 25. The gear 24 meshes with a similar gear 26 secured on one end of a shaft 27 journaled in the bearing portions of a U-shaped support 28 secured to the base 10 by a plurality of screws 29, and on the other end of shaft 27 is securely mounted a ratchet wheel 30, best seen in Figs. 8, 10, 11 and 16, having in the present construction seven equally disposed peripherally disposed teeth. This ratchet wheel is operatively engaged by a spring-pressed pawl 31 mounted on the free end of a lever 32, in turn pivoted on a shoulder screw 33, threadedly engaging an upright extending lug 34 formed with the base 10, while the other end of shoulder screw 33 is supported by a flange X, also secured to the base 10 by a number of screws 35. A link 44, best seen in Figs. 3 and 16, operatively connects the lever 32 to a cross-bar 36 having its arms Y and Y1 pivoted on a shaft 37 in turn journaled at one end in the flange X and its other end in a flange X1, also secured in the base 10 by a number of screws 38.

The bar 36 is yieldably held against the under side of a plurality of key members K1, K2, K3, K4, K5, K6, K7, K8, K9 and K10 by a retractile spring ASR. These key members are pivotally mounted on shaft 37 and held individually in their normal non-operated position against a stop-bar 42, shown in Figs. 5, 7, 9 and 10, by retractile springs, such as 39, having their upper disposed ends hooked onto respective stud, as 40, carried by a bar 41 secured at both ends to the flanges X and X1, as by screws 13, while the lower disposed ends of these springs are hooked to their respective key K1, K2, K3, etc., the angular movement of these key members being limited by the top bar 42 which is secured at the top end of a slotted upright extending plate 43 and in their operated position by stops afforded by the plate 43 at the bottom of slots SL, best seen in Fig. 9, which also serve for guiding the key members K1, K2, K3, etc., at their free ends.

The operation of any one of the key members K1, K2, K3, etc., is effective to impart a rocking movement to the cross-bar 36 and thereby a pivotal movement to lever 32 for engaging the pawl 31 successively with the teeth of ratchet wheel 30 for rotating its supporting shaft 27 and thereby imparting movement to the drum D one-seventh of a turn for each operation of the key members K1, K2, K3, etc., the drum D being locked in each step by an index member 45, shown in Figs. 3, 5, 7, 8, 10 and 16, upon its engagement with the notches N1, N2, N3, N4, N5, N6, and N7 of disc 15 as effected under the tension of a spring 46 while a roller 47 carried by the cross-bar 36 engages the camming surface 48 of index member 45 for disengaging it from

the notches N1, N2, N3, etc., as the case may be during the downward movement of each key K1, K2, K3, etc., and thereby the downward pivotal movement of cross-bar 36.

The drum D, as above mentioned, is provided with seven clutch elements 16a, 17a, 18a, etc., that is, one of such elements for each set of equally spaced contact acting or camming elements in the form of longitudinally movable pins P1, P2, P3, P4, P5, P6, P7, P8, P9 and P10, there being seven sets of such camming elements disposed in equally spaced relation in a circular row and the distance between each set forming the so-called interdigit spaces provided for a purpose well-known in automatic telephone systems. These camming elements, as shown in Figs. 3, 4, 5, 7, 8, 21 and 22, pass through a felt ring FR best seen in Fig. 7 clamped between the spring rings 49 and 49a provided for frictionally holding these camming elements either in their normal or operated position, the clutch elements being frictionally held in their operated and non-operated position by springs x, x shown in Fig. 7 disposed in slots in the bushings 16, 17, 18, etc., and in contact with the clutch pins 16a, 17a, 18a, etc.

The key members K1, K2, K3, etc., are disposed in engageable relation with lever members L1, L2, L3, L4, L5, L6, L7, L8, L9 and L10, respectively, these levers being in turn disposed in operative relation with the camming elements P1, P2, P3, P4, etc., respectively, for moving them longitudinally upon the successive operation of the keys K1, K2, K3, etc., in position for engaging a movable spring 68 which with stationary conductor 67 form the pulsing contact.

Levers L1, L2, L3, etc., are pivotally mounted on a shaft 50 supported by flanges X and X1 and are guided at their upper ends by a comb-shaped plate SP, shown in Figs. 4, 5, 6, 7, 11, and are yieldably held in the operated position by springs GS engaging the pins GS1 carried by these levers. Levers L1, L2, L3, etc., are formed with cross-bars B1, B2, B3, B4, B5, B6, B7, B8 and B9 of different length for actuating these levers and the camming elements P1, P2, P3, etc., in the following numeric order:

Key K1 operates lever L1 for moving camming element P1.

Key K2 operates levers L1 and L2 through bar B1 for moving the camming elements P1 and P2.

Key K3 operates levers L1, L2 and L3 through bar B2 for moving the camming elements P1, P2 and P3.

Key K4 operates levers L1, L2, L3 and L4 through bar B3 for moving the camming elements P1, P2, P3 and P4.

Key K5 operates levers L1, L2, L3, L4 and L5 through bar B4 for moving the camming elements P1, P2, P3, P4 and P5.

Key K6 operates levers L1, L2, L3, L4, L5 and L6 through bar B5 for moving the camming elements P1, P2, P3, P4, P5 and P6.

Key K7 operates levers L1, L2, L3, L4, L5, L6 and L7 through bar B6 for moving the camming elements P1, P2, P3, P4, P5, P6 and P7.

Key K8 operates levers L1, L2, L3, L4, L5, L6, L7 and L8 through bar B7 for moving the camming elements P1, P2, P3, P4, P5, P6, P7 and P8.

Key K9 operates levers L1, L2, L3, L4, L5, L6, L7, L8 and L9 through the bar B8 for moving the camming elements P1, P2, P3, P4, P5, P6, P7, P8 and P9.

Key K10 operates the levers L1, L2, L3, L4, L5, L6, L7, L8, L9 and L10 through bar B9 for moving the camming elements P1, P2, P3, P4, P5, P6, P7, P8, P9 and P10, or a complete set.

A disc 51, shown in Figs. 3, 5, 7, 11, 21 and diagrammatically in Fig. 23, is securely mounted on the hub portion of a collar 52 slidably mounted on the sleeve 23 of drum D. This disc is provided at its peripheral edge with holes for receiving the camming element P1, P2, P3, etc., of each set for returning them to normal non-operated position upon the downward movement of disc 51 against the tension of a retractile coiled spring 54, best seen in Fig. 7 in a manner which will be hereinafter described in detail.

On shaft 50, as shown in Figs. 3, 5, 7, 10, 11 and 12, is pivotally mounted a yoke 57, normally resting on the horizontally disposed arms of levers L1, L2, L3, etc., and to this yoke is secured, as by welding, a cross-bar or extension 55 provided for individually operating the clutch elements 16a, 17a, 18a, etc., upon the successive movement of drum D under control of any one of the key members K1, K2, K3, etc., for actuating a corresponding number of lever members L1, L2, L3, etc., while a projection 59, formed with the arm Y1 of bar 36, engages a lug 58, formed with the yoke 57 for resetting the levers L1, L2, L3, L4, etc., collectively upon the return movement of the key members K1, K2, K3, etc., to normal.

On the top disposed end of spindle 12 is loosely mounted a hollow shaft 60, best seen in Fig. 7, journaled at its upper disposed end in a bearing portion, formed with an oblong-shaped spacer plate 61, secured to flanges X and X1 by a number of screws 62, shown in Figs. 3, 4 and 21, and on the lower end of this shaft is mounted an arm 63, Figs. 7, 8, of insulating material secured to the shaft 60 by a pin 64 passing through a hardened steel plug 65, serving in cooperation with a steel ball 66 to form an end thrust bearing for the hollow shaft 60. In insulating arm 63 is embedded the stationary contact 67 which protrudes at right angles therefrom in engaged relation with the movable spring contact 68, also embedded in arm 63, these contacts having terminal ends protruding from the arm 63 for connection with the conducting wires 69 and 70, passing through an insulating bushing 71 and hence through the hollow shaft 60 for connection with spirally wound terminals 72 and 73, having their inner disposed convolutions secured to the hollow shaft 60 and their other ends to stationary terminals 74 and 75 mounted in a pile-up arrangement on an upright support 76 formed with the spacer plate 61, thus permitting the rotation of hollow shaft 60 while maintaining electrical connection between the contacts 67 and 68 of arms 63 and the terminals 74 and 75 on plate 61, these springs also serving under certain operation of the transmitter mechanism for returning the shaft 60 to normal unoperated position.

On shaft 60 is rotatably mounted a sleeve 77, best seen in Fig. 7, on the top end of which is secured a helical gear 78 and at its lower disposed end is securely mounted a spur gear 79 provided with seven equally spaced bushings 80a, 80b, 80c, 80d, 80e, 80f and 80g, shown diagrammatically in Fig. 23, held collectively at their lower disposed ends by a ring 81, these bushings serving as guides for a corresponding number of clutch elements in the form of pins 82a, 82b, 82c, 82d, 82e, 82f, and 82g normally disposed in coaxial relation with the clutching elements 16a, 17a and 18a, etc., carried by the drum-shaped

support D, the clutching elements 80*a*, 80*b*, 80*c*, etc., carried by gear 79 and the clutching elements 16*a*, 17*a*, 18*a*, etc., of drum D being provided for successively operatively engaging an opening 83 in the insulating arm 63 for actuating it either by the step-by step operation of the drum support D under control of key members K1, K2, K3, etc., or by the operation of a constant speed motor mechanism in a manner which will be hereinafter described in detail.

On flanges X and XI is journaled a shaft 84, shown in Figs. 4, 5, 7, 11 and 22, on one end of which is loosely mounted a handle lever 85 retained in position thereon by a screw CRW and on the other end of this shaft is mounted a coiled spring 86 having one of its ends hooked to a collar 87 keyed on the shaft 84 and its other end to the supporting flange X1. The movement of lever 85 is imparted to shaft 84 through a bushing or sleeve 92, best seen in Fig. 4, having two diametrically opposite lug portions 95 engaging segmental portions in the hub of handle lever 85 and on bushing 92 is mounted a gear sector 91, the bushing 92 and the gear sector 91 being keyed collectively on the shaft 84 by a taper pin 93 while the bushing 92 is provided with a groove 94 cooperating with a screw CO to serve as a stop for limiting the angular movement of handle lever 85 toward its normal and operated position.

The movement of shaft 84 and that of gear sector 91 carried thereby is effective to rotate a pinion 96, shown in Figs. 3, 4, 9 and 17, and a gear 97 both secured on the hub of one-tooth ratchet wheel 98, in turn loosely mounted on a spindle 99, best seen in Fig. 17, screwed in a boss portion 100 formed with the flange X. The movement of gear 97 is imparted to a gear 101 and to a seven-tooth ratchet wheel 102 through a spring-pressed pawl 103. Ratchet wheel 102 is keyed on one end of a shaft 105, having one of its ends journaled in flange X and its other end in a lug portion 106 formed with the spacer plate 61. On the end of shaft 105, adjacent the lug portion 106, is securely mounted a helical gear 107 meshing with its associated helical gear 78 at the end of hollow shaft 60 which is thus rotated upon the return movement of gear sector 91 toward normal under the tension of motor spring 86 but under control of a speed governor SPG actuated by a vertically disposed shaft 112 operatively connected to gear 79 by a pinion 89.

The turning movement of hollow shaft 60 under the tension of motor spring 86 is normally prevented by a stop pin 109, shown in Figs. 4 and 7, engaging the tooth portion 110 of a disc 111 carried by the vertically disposed shaft 112 which is journaled in bearings 113 and 114 extending from the flange X1.

The stop pin 109 is carried by sector-shaped plate 115 secured on the top disposed end of vertically disposed shaft 120, journaled in lug portions LP1 and LP2, extending from flange X1, and on the other end of this shaft is secured a fork-shaped arm 116. This arm is disposed in operative relation with a pin 119 carried by a disc 123, shown in Figs. 3, 4, 5, 7, 9 and 11 securely mounted on the hub of a gear 124. This gear is loosely mounted on the top disposed end of hollow shaft 60 and is rotated through the movement of this shaft by a gear reduction train including the gear 125 keyed on the shaft 60, the duplex gear unit 126—127 loosely mounted on a spindle 129 and the gear 124 engaging the gear 127, the ratio of this gear train being of the order of 1 to 7/8, while the pin 130 carried by the disc 123 is provided for controlling the operation of the so-called off-normal springs OF, provided for a purpose well-known in automatic telephone systems.

On shaft 84 is keyed an arm 131, shown in Figs. 4, 7, 11 and 22 disposed in engageable relation with a forked lever 132, engaging a collar 133 at the upper disposed end of a sleeve 134, best seen in Figs. 5 and 7, slidably mounted on sleeve 77, and at the lower end of sleeve 134 is secured a disc 135 having openings for engaging the clutching elements 82*a*, 82*b*, 82*c*, 82*d*, 82*e*, 82*f* and 82*g* for moving them downwardly collectively against the tension of a retractile spring 136 upon the movement of shaft 84, as effected by the manual operation of handle lever 85 as for tensioning the motor spring 86 thus operatively connecting the pulsing contact supporting arm 63 to the motor mechanism. The lever 132 is formed with a semi-disc bearing portion 143, shown in Figs. 4, 5, 11, 21 and 22, provided for mounting a spring-pressed pawl 144 disposed in engageable relation with the upright extending arm 145 of an angle lever having its horizontally disposed arm 146 engaging the collar 52 of disc 51 for resetting the camming elements P1, P2, P3, etc., in a manner which will be hereinafter described in detail.

An angle-shaped lever 137, shown in Figs. 3, 4, 5 and 7, is pivoted as at 138 on lugs 139, formed with the spacer plate 61. This angle lever has its downwardly extending arm disposed for engaging a roller 140 under the tension of a spring 142; this roller is carried by arm 132 and serves when engaged by arm 137 for holding the arm 132 and the clutch elements 82*a*, 82*b*, etc., actuated thereby in their lowered position when another roller 141*a*, carried by the horizontal arm of this angle lever rests against the underside of disc 123 for operation by a cam 141 upon the rotation of this disc as imparted by the movement of shaft 60 for disengaging the arm 137 from roller 140 so as to permit the return movement of this arm to normal, as effected by the tension of spring 136 for returning the disc 135 and the clutch elements 82*a*, 82*b*, etc., to normal. As above mentioned, the disc portion 143 of lever 132 carries a pawl 144 provided for engaging the upright extending arm 145 of the angle lever pivoted on shaft 50 and due to the other arm of this lever engaging the collar 52 of disc 51 a downward movement is imparted to this disc for moving the clutching elements 16*a*, 17*a*, 18*a*, etc., and the camming elements P1, P2, P3, etc., to normal position at the conclusion of each pulsing operation under the tension of retractile spring 136 acting on disc 135 when the downwardly extending arm of angle lever 137 is disengaged from roller 140 upon the engagement of cam 141*a* with roller 141 carried by the horizontally disposed arm of angle lever 137.

Upon the operation of each key member K1, K2, K3, etc., and that of cross-bar 36 for operating the lever 32 and thereby moving the drum D step by step through the engagement of pawl 31 with the seven-tooth ratchet wheel 30, the pawl 31 also engages an eight-tooth ratchet wheel 147, shown in Figs. 6, 8, 10 and 16, for rotating a disc 148, this disc and its driving ratchet wheel 147 being loosely mounted on the shaft 27 and a pin 139*x* carried by the disc cooperates with a stop 150 formed with the upright support 28 for holding the disc in the start position, as

shown in Fig. 3, against the tension of a spiral retractile spring 151. A lever 152 pivoted on the base 10 has a lug portion 153 for engaging under the tension of the spring 154 a notch 148 at the periphery of disc 148 when the latter has been rotated seven-eighths of a turn simultaneously with the operation of the drum driving ratchet wheel 30, thus permitting this lever to move under a lug 155 carried by the arm Y of cross-bar 36 for preventing further operation of the key members K1, K2, K3, etc., at the conclusion of a seven-digit call setting operation.

The return of disc 148 and arm 152 to normal and the consequent release of bar 36 for the freeing of the key members K1, K2, K3, etc., is effected upon the operation of handle 85 as for tensioning the motor spring 86 through a link 156 connecting the gear sector 91 to a retaining pawl 157, this retaining pawl being formed with an arm 158 connected to the lever 152 by a link 159 best seen in Figs. 3 and 16 for disengaging the lever 152 from disc 147 simultaneously with the release of ratchet wheel 147 by the retaining pawl 157, thus permitting the disc to return to normal against the stop 150 under the tension of spiral spring 151.

As shown in Figs. 3, 6, 11 and 16, the arm Y of cross-bar 36 is formed with another arm 163 having at its free end a clutch element in the form of a ratchet tooth 164 which is operatively engaged by a spring 165 carried by a gear sector 166 loosely mounted on shaft 37 in position adjacent to the arm 163 and a screw 167 is provided for adjusting the tension of this spring and thereby the torque transmitted by the gear sector 166. Gear sector 166 meshes with a pinion 168 securely mounted on the hub portion of a gear 169 in turn loosely mounted on a spindle 170 laterally extending from flange X. The gear 169 meshes with a pinion 171 keyed on the shaft 172, journaled at one end in the flange X and its other end in a bushing 173, shown in Fig. 6, secured to the flange X1. Shaft 170 carries a plurality of discs D1, D2, D3, D4, D5, D6, D7, D8, D9 and D10, each having a periphery disposed ratchet-shaped tooth angularly disposed one-eleventh of a circle apart for controlling the angular movement of shaft 172 through their engagement with their associated arms or levers L1, L2, L3, L4, etc., to cause the disengagement of clutch spring 165 from the ratchet tooth 164 of arm 163, as will be hereinafter described in detail. On the other end of shaft 172, as shown in Figs. 4, 6, 9, 11, 15 and 17, is securely mounted a gear 174, the movement of which imparted to a gear 176 through a duplex gear sector 175 pivoted on flange X1. Gear 176 is keyed on the end portion of a driving shaft provided for actuating the registering wheels R1, R2, R3, R4, R5, R6, R7, R8, R9 and R10, in a manner which will be hereinafter described in detail. This shaft is formed of two reduced portions SP1 and SP2, best seen in Fig. 17, each having a disc portion welded to the ends of a tubing portion 177, the reduced end SP2 is mounted for rotating movement in the bearing portion formed in the end of the spindle 99, while the end SP1 of this shaft is mounted for rotating movement in the bearing portion 178 formed with the flange X1, while the tubing portion 177 is provided with a longitudinally disposed ratchet tooth 204 for engagement with pawls as 202 carried by the registering wheels R1, R2, R3, etc., the wheels R1 and R2, as shown in Figs. 1, 4, 9, 17 and 17a being printed with groups of symbols 1, ABC, DEF, GHI, JKL, MNO, PRS, TUV, WXY and

Z
operator
0

plus a blank space, while the wheels R3, R4, R5, R6 and R7 are printed with the ten arabic numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0, plus a blank space, the 0 meaning 10, as is well known in automatic telephone systems.

The register wheels R1, R2, R3, etc., are mounted on the hub portions of thin metal discs 180, 181, 182, 183, 184, 185, 186 and 187 loosely mounted on the tubular portion 177. These discs are each provided with a peripherally disposed notch, as 188, snugly engaging a bar 189 which is formed with arms 190 and 191 pivoted on the hub 178 of flange X1 and on the free end of spindle 99. Discs 180, 181, 182, etc., are each provided with spring elements 200, 201, best seen in Fig. 13, for frictionally engaging the disc portions of the registering wheels R1, R2, R3, etc., for prevention of the so-called overrun of these wheels when moved in registering position by the operation of key members K1, K2, K3, etc. Each registering wheel R1, R2, R3, etc., as above mentioned, is provided with a pawl 202 frictionally held in operated and non-operated position by a spring 203, shown in Figs. 18 and 18A and are successively moved in engaged relation with the longitudinally disposed ratchet-shaped tooth 204 in the tubular portion 177 by a plurality of cams 205, 206, 207, 208, 209, 210 and 211 disposed one-tenth of a circumference apart on a rotatable sleeve 212. This sleeve is loosely mounted on a shaft 213x journaled at one end in flange X1 and its other end in an upwardly extending lug 214 formed with the angle-shaped bar 41 to which the retractile springs 39 of keys K1, K2, K3, etc., are hooked. The sleeve 212 is provided at one end with a clutch element 216 engaged by an operable clutch element 217 under the tension of a spring 218. Clutch element 217 is formed with a gear 219, shown in Figs. 5, 6, 9 and 17, meshing with a gear sector 219a connected to the bar 36 by a link 220 for rotating the sleeve 212 and the cams 205, 206, 207, etc., carried thereby one-tenth of a turn upon each operation of the key members K1, K2, K3, etc.

The arm 191 of bar 189 which is used for resetting the registering wheels R1, R2, R3, etc., to normal is provided with a one-tooth ratchet wheel 221, shown in Figs. 4, 9 and 17, engaged by a pawl 222 carried by a disc 223 loosely mounted on the spindle 99, the rotation of ratchet wheel 221 and thereby the movement of the bar 189 being effected by a pawl 224 carried by disc 223 and engaging a one-tooth ratchet wheel 96 formed with the hub of gear 97, the bar 189 being rotated one turn during each operation of handle lever 85 and, therefore, that of the movement of gear sector 91 and that of gear 97 for returning the wheels R1, R2, R3, etc., to normal unoperated position, as will be hereinafter described in detail.

The wheels R1, R2, R3, etc., are each provided at their periphery with a radial lug L1, L2, L3, L4, L5, L6 and L7 disposed in alignment against the front edge of bar 189 when the pawls 202 of these wheels register with the longitudinally disposed tooth 204 of shaft portion 177 and the blank spaces of wheels R1, R2, R3, etc., in turn appearing through the window W in the casing CY housing the transmitter mechanism. The turning movement of bar 189 is imparted to the

sleeve 212 and the cams 205, 206 and 207 carried thereby through the gear 226 securely mounted on the hub portion of arm 190 formed with the bar 189 and engaging a gear 227 securely mounted on shaft 213x, the gear 227 carrying a spring-pressed pawl 228 engaging a one-tooth ratchet wheel 229 formed at the end of sleeve 212 for rotating it in directions to that of its driving clutch element 217 and thereby returning the cams 205, 206, 207, etc., to normal simultaneously with the return movement to normal of wheels R1, R2, R3, etc., as effected by the movement of handle lever 85.

A rocking stop bar 230, shown in Figs. 3, 4, 5, 7, 9, 15 and 17, is provided at its end portions with arms 231 and 232 pivoted as on shoulder screws 233 and 234. The downward movement of this bar under the tension of a spring 235 is limited by a pin 236 and is normally held in non-engageable relation from the lugs L1, L2, L3, etc., through the bar 189 engaging a lug 237 formed with the arm 231 of bar 230, as shown in Figs. 3, 4 and 5.

The registering wheels R1, R2, R3, etc., and the cams 205, 206, 207, etc., carried by the sleeve 212 may be returned to normal unoperated position independently of the operation of handle lever 85 by the operation of an auxiliary key member 160, shown in Figs. 3, 4, 6, 8, 9, 10 and 11. This key member is pivoted on the shoulder screw 33 and is held in normal unoperated position against a pin 300, extending from flange X under the tension of a retractile spring 301, having one of its ends hooked to a lug 302 formed with the auxiliary key member 160 and its other end to a pin 303 carried by the flange X, while the downward movement of this key member is limited by a stop 304 afforded by its guiding plate 43. Key member 160 is provided with a gear sector 305 meshing with a pinion 306, having a hub portion loosely mounted in a bearing formed with the flange X and on the hub of pinion 306 is mounted a disc 307, the pinion 306 and the disc 307 being keyed to a spindle 308 by a pin 309, best seen in Figs. 9 and 17. The other end of spindle 308 is journaled in plate 41 and on it is loosely mounted a sleeve 310 formed with a gear 311 and a one-tooth ratchet wheel 312 which is operatively engaged by a spring-pressed pawl 313 carried by the disc 307. The gear 311 meshes with a similar gear 314 keyed on the end of shaft 213x for imparting movement to gear 227 secured on the other end of shaft 213x and thereby to sleeve 212 through the engagement of pawl 228 with the one-tooth ratchet wheel 229 formed with the sleeve 212, the rotation of gear 227 imparting movement to gear 226 for rotating the bar 189 and thereby resetting the registering wheels R1, R2, R3, etc., to normal unoperated position, as above described in connection with the operation of handle lever 85.

Supposing now that it is desired to set a number of key members for transmitting the telephone call designation HP3,7068 as indicated in Fig. 1, the key member K4 bearing the symbols

GHI
4

is depressed against the resistance of its retractile spring 39 for actuating the lever L4. This lever through its cross-bar B4, see Fig. 11, actuates levers L3, L2 and L1 for moving the camming elements P1, P2, P3 and P4 of one of the seven groups which may be in registry with the levers L1, L2, L3 and L4, etc., in engageable relation with the movable contact 68, this condition being shown in Fig. 21. The operation of these levers, that is, L1, L2, L3 and L4 is effective to pivot the yoke 57 and the extension 58 carried thereby for moving the clutch element 22a in engaged relation with the hole 83 of pulsing contact supporting arm 63 for operatively connecting this arm and its hollow supporting shaft 60 to the drum-shaped support D.

The downward movement of key K4 also causes the pivotal movement of bar 36 and that of the arm 163 carried thereby. The movement of this arm is imparted to gear sector 166 through the engagement of the spring pawl 165, see Fig. 3, with the ratchet tooth 164 of arm 163 and thereby to the pinion and gear unit 168—169, the shaft 172 through the engagement of gear 169 with pinion 171, but, due to the staggered relation of the discs D1, D2, D3, D4, D5, D6 and D7, the shaft 172 will be rotated to a point wherein the disc D5 engages the lever L5 when the spring pawl 165 is caused to flex out of engagement from its associated clutch element 164, thus formed as to permit the continued movement of arm 163. The movement of shaft 172 and the pinion 174 carried thereby is imparted to the duplex gear sector 175 and to pinion 176 for rotating the shaft 177. The movement of this shaft actuates the registering wheel R1 through the engagement of its pawl 202 with the ratchet tooth of shaft 177 to a position for indicating the symbol GHI, the digit represented by key member K4 and the first digit in the call designation HP3,7068 above mentioned. The downward movement of this key is effective to turn the sleeve 212 one-tenth of a turn through the engagement of clutch elements 216 and 217 to cause the cam 206 to move the pawl 202 of registering wheel R2 in engaged relation with ratchet tooth of shaft 177 preparatory to the operation of key member K7 bearing the symbol

PRS
7

The pivotal movement of bar 36, as imparted by the downward movement of key K4 is effective to disengage the arm 45 from the notch N1 of disc 15 and moves the lever 32 to cause the engagement of pawl 31 with the ratchet wheels 30 and 147 for rotating them collectively upon the return of this key to normal the space of one tooth each, the ratchet wheel 30 rotating the drum-shaped support one-seventh of a turn for moving another set of camming elements P1, P2, P3, etc., in operative relation with the set of levers L1, L2, L3, etc., while the operation of ratchet wheel 147 rotates the disc 148 one-eighth of a turn, the ratchet wheel 147 and the disc 148 carried thereby being held in each advance position against the tension of its retractile spring 151 by the retaining pawl 157.

Upon the return movement of key K4 and that of bar 36 to normal, a lug 240 formed with arm 163 of this bar engages the gear sector 166 for returning it to normal for rotating the shaft 177 in normal unoperated position through the pinion and gear 168—169, the pinion 171 secured on the shaft 172, the gear 174 and the duplex gear sector 175 engaging the gear 176 secured on the end portion SP1 of shaft 177. The turning movement of driving shaft 177 in the opposite direction is effective to disengage the pawl 202 of registering wheel R1 from the ratchet tooth 204 of the shaft while the tension of springs 200

and 201, formed with the discs 180 and 181 frictionally, hold the registering wheel R1 in its adjusted indicating position and the arm 45 which has been released by roller 42 carried by the bar 36 automatically engages the notch N2 of disc 15 for centering the succeeding set of camming elements P1, P2, P3, etc., in registry with the levers L1, L2, L3, etc., and the transmitter mechanism is now ready for the operation of key K7 bearing the symbols

PRS
7

the second digit in the call designation HP3,7068 above referred to.

The operation of key K7 is effective to set seven of the camming elements P1, P2, P3, etc., in position, effective, relative to pulsing contacts 67 and 68 and to move the register wheel R2 in position for indicating the symbols PRS in a cycle of operation as described in connection with the operation of key K4.

Upon the complete setting of a call designation as HP3,7068 by the operation of the key members K4, K7, K3, K7, K0, K6 and K8, diagrammatically shown in Fig. 21, and the consequent turning movement of the contact supporting arm 63, due to the engagement of clutching element 22a with this supporting arm as effected by the operation of the first key member in the telephone call designation HP3,7068, the operable pulsing contact 68 is angularly positioned for successively engaging the camming elements P1, P2, P3, etc., of each set which have been moved in operative relation by the operation of the key members K4, K5, K3, K7, K0, K6 and K8 upon the return movement of arm 63 and its supporting hollow shaft 60 to normal, as effected by the motor spring 86 following the operation of handle lever 85.

The operation of forked lever 116 upon the movement of the first key member in the designation above mentioned is effective to release shaft 112, actuating the speed governor SPG, shown in Figs. 4 and 7 but the transmitter mechanism under preset condition is not operated during the progression of the setting of the call due to the handle lever 85 being in its normal unoperated position, as determined by the screw CO engaging the groove 94 in sleeve 92.

Upon the downward movement of handle lever 85, the turning movement of its supporting shaft 84 is effective to tension the motor spring 86 and move the lever 132, best seen in Figs. 5 and 7, through its engagement with arm 131 keyed on shaft 84 in position wherein the free end of arm 137 engages the roller 140 under the tension of spring 142 for holding this lever and the disc 135 together with the clutching elements 82a, 82b, etc., in the operated position, as shown in Figs. 24 and 25, wherein the clutching elements 82a, 82b, 82c, etc., under the tension of their respective springs SP1, SP2, SP3, SP4, SP6, SP7, move the clutching elements 16a, 17a, 18a, etc., in the non-operated position, with the clutching element 82c, as in this example, now engaging the contact supporting arm 63. Under this condition, the release of handle lever 85 permits the motor spring to unwind for actuating the gear sector 91. This sector actuates the gears 96—97, the gear 101 and thereby the ratchet wheel 102 secured on shaft 105 and the helical gears 107 and 78, thus rotating the contact supporting arm 63 and its tubular support 60 for successively moving the contact 68 in engageable relation with the camming elements P1, P2, P3, etc., of each set. At the conclusion of the call transmitting operation, the contact spring 68 is in the position shown in Fig. 25 where the cam 141 carried by disc 123 causes the pivotal movement of angle lever 137 for disengaging it from roller 140 so that upon the release of lever 132 the coiled retractile spring 136 causes the movement of disc 135 for collectively returning the clutching pins 82a, 82b, 82c, etc., collectively to normal unoperated position and causes the pivotal movement of angle lever 145, and thereby the downward movement of disc 51 through the engagement of the upright extending arm of this lever with pawl 144, the movement of this disc being effective to reset the camming elements P1, P2, P3, etc., to normal position as indicated in Fig. 25 and the mechanism is now ready for a subsequent call setting and transmitting operation. It is to be noted that the register wheels R1, R2, R3, etc., have been returned to normal unoperated position upon the tension of the motor spring 86 by the movement of handle lever 85 and thereby that of gear sector 91 connected thereto.

Supposing now that an error is made in the setting of a call designation and that it is desired to cancel such a call either at the conclusion or at any point during the progression of such a call setting operation. The downward movement of auxiliary key member 160 and the gear sector 305 carried by this key is effective to impart a complete turn to pinion 306, best seen in Figs. 3 and 17, for rotating the gears 311 and 314 through pawl 313 engaging the one-tooth ratchet wheel 312, thus actuating the shaft 213x and thereby the gears 227 and 226, the latter actuating the resetting bar 189. The auxiliary key 160, as shown in Fig. 3, through its lug 253 also actuates the arms 254 formed with arms 145—146 for moving the disc 51 and thereby returning the clutching pins 16a, 17a, 18a, etc., and camming elements P1, P2, P3, etc., to normal unoperated position upon the release of the auxiliary key by the operator while the spiral springs 72 and 73 return the hollow shaft 60 and the contact supporting arm 63 in normal position and the mechanism is now ready for the setting of the telephone call designation desired.

The call transmitter device of the invention has been described for use for transmitting and registering telephone call designations by the preset operation of the key members K1, K2, K3, etc.; a mechanism, however, is provided whereby the device may be readily conditioned for transmitting such call designations by the so-called key-by-key operation. This conditioning mechanism, as shown in Figs. 3, 4, 5, 7, 11 and 15, consists of a handle lever member 260 loosely mounted on the end of shaft 84 and retained thereon by a screw 261. This lever, as best seen in Fig. 11, is keyed to the hub portion 262 of a lever 263 also loosely mounted on shaft 84 and passing through an opening in an indicator dial 264, the lever 263 and the indicating dial 264 being held in either of two positions by a spring 365, shown in Fig. 15, engaging as the case may be the notches N1 and N2 in disc 262, these positions corresponding to the inscription "preset" and "key-by-key" printed on the dial 264 appearing through a window 265 in the casing CY housing the transmitter mechanism.

Lever 263 is operatively connected at the free end of an arm 266 by a link 267, while arm 266 in turn is secured to one end of a sleeve 268, best

seen in Fig. 6, loosely mounted on the bearing or bushing 173 of shaft 172, extending from flange X1 and on the other end of sleeve 268 is securely mounted another arm 269 for connection by a spring 270 to the top end of an arm 271 loosely mounted on pivot 138 adjacent to the arm 137. The other end of arm 269, like the arm 271, extends downwardly for engagement with roller 140 of forked lever member 132 when this lever is operated as above described, that is, for moving the disc 135 and the clutch elements 82a, 82b, etc., in the operated position for engaging the contact supporting arm 63.

Lever 269, best seen in Fig. 6, is provided with a projection 272 disposed in engageable relation with a plate 273 formed with two lugs or bearing portions as 274, shown in Figs. 6, 7 and 11, for pivoting this plate on a stud 275, this stud having one end supported by flange X1 and its other end in a lug portion formed with the bar SP serving, as above described, for holding the levers L1, L2, L3, etc. in spaced relation to each other and a retractile spring 276 is provided for normally holding the plate 273 against the underside of projection 272 of lever 269 when this lever, and therefore the handle lever 260, is moved in the key-by-key position when the spring 265 engages the notch N1 of disc 262, such positions being indicated by the dial 264. In that position a roller 277 shown in Fig. 7 carried by the plate 273 engages a cam 278 keyed on the vertically disposed shaft 112 which is rotated seven turns for each turn of gear 79. The movement of cam 278 is effective in cooperation with retractile spring 276 to impart reciprocating movement to the plate 213 for simultaneously actuating two of the clutching elements 82a, 82b, 82c, 82d, etc. which may be in registry with the lugs H and H1 of this plate.

In transmitting a call by the key-by-key operation of the pulsing mechanism the handle lever 85 as distinguished from the preset condition of the transmitter is first moved in its operated position for tensioning the motor spring 86, the movement of gear sector 91 and therefore the turning movement of shaft 112 and cam 278 carried thereby being now prevented, due to the engagement of a pin 109, best seen in Fig. 4, with the tooth 110 of disc 111 keyed on the vertically disposed shaft 112. The downward movement of forked lever 132 as effected by the rotation of shaft 84 during the tensioning of the motor spring is effective to move the clutch disc 135 and thereby the clutch elements 82a, 82b, 82c, etc., in the operated position shown in Fig. 24, except two of these clutching elements, that is, 82a and 82g, best seen in Figs. 5 and 6, which are held from downward movement by their respective lugs H1 and H formed as above mentioned with the segmental portion of plate 273 and engaging the retractile springs SP1 and SP7 of these clutching elements. In that condition the contact supporting arm 63 may be moved angularly one-seventh of a turn when clutched with the drum-shaped support D without interference from the two clutching elements, the clutching element 82a being raised sufficiently high for permitting the projection 279 of arm 63 to pass under this clutching element while the clutching element 82g is raised only to clear the upper disposed surface of arm 63 and to engage the projection 279 for actuating this arm. The operation of any one of key members K1, K2, K3, etc. is effective during its downward movement to set, as above described, a corresponding number of camming elements P1, P2, P3, etc. and to move the clutching pins as 16a, 17a, 18a, etc. as the case may be for operatively connecting the contact supporting arm 63 with the drum D. The return movement of such operated key is effective to rotate the drum support D and the contact supporting arm 63 one-seventh of a turn. The movement of shaft 60 which carries the contact supporting arm 63 and thereby the movement of disc 123 through the gears 125, 126, 127 and 124 is effective to impart a small angular movement to arm 116 due to its engagement with pin 119 for disengaging the pin 109 from the teeth 110 of disc 111 in order to permit the movement of shaft 112 under the tension of motor spring 86 but controlled by the speed governor SPG.

The clutching pin 16a of drum D which was moved in engaged relation with contact arm 63 is upon the return movement of the operated key and the consequent angular movement of drum D in position formerly occupied by clutching pin 22a shown in Fig. 8 and in coaxial relation with clutching pin 82g of the motor actuated clutching pins now held in its elevated position by the lug H of plate 273 and against the tension of its own retractile spring SP7 with the tooth-shaped projection 279 of arm 63 in position to be engaged by the motor-driven clutching pins 82g above mentioned which occur upon a small angular movement of disc 135 of the motor-driven clutching elements, the engagement of projection 279 of contact supporting arm 63 with clutching pin 82g being timed to occur simultaneously with the release of clutching elements 82a and 82g from the projections H and H1 of the segmental portion of plate 273 when the pin 82g engages the hole 83 of contact supporting arm 63 and simultaneously disengaging the arm, these projections having such an angular distance that from the clutch pin carried by the drum D the engagement of pin 82g with arm 63 occurs prior to the engagement of contact 68 with the first contact actuating camming element in the group set by the operation of one of the key members K1, K2, K3, etc., and therefore within the angular distance determined by the interdigit spaces as to prevent the so-called shattering of the pulsing contacts. Upon a complete turn of cam 278 and thereby the return movement of the contact supporting arm 63 to normal, the pin 219 carried by disc 123 reengages the arm 160 for reengaging the pin 109 with the tooth of disc 111 for stopping the governor mechanism and the transmitter is now ready for the operation of the second key member included in the call designation it is desired to transmit which is accomplished in a manner similar to that described in connection with the first operated key member, the handle lever 85 reaching its normal position upon the operation of the last key member K1, K2, K3, etc., in a seven-digit call designation and the complete call designation is indicated by the registering wheels R1, R2, R3, etc., at the conclusion of the call transmitting operation, these wheels being returned to normal upon the operation of handle lever 85 simultaneously with tensioning of motor spring 86 preparatory to the transmitting at a succeeding call designation.

In the modification shown in Figs. 26 and 27, the disc 81 of the motor-driven clutch is provided with a continuous row of contact actuating elements 400 disposed in axial relation to the camming elements P1, P2, P3, etc., carried by

drum D and stationary pulsing contacts 401, 402 are operatively associated with the contact actuating elements 400 which in this modification are the pulsing contacts, while the contacts 67 and 68 are used for negativing the operation of the contacts 401 and 402 a number of times corresponding to the number of camming elements set by the operation of the key members K1, K2, K3, etc. As shown in Fig. 26, for example, the movement of camming elements 400 simultaneously with the movement of contact springs 67 and 68 over the contact elements P1, P2, P3, and P4, the contacts 401, 402 and 67—68 will be opened four times simultaneously for transmitting the digit 4 corresponding to symbol

GH
I

and while the pulsing contacts 401, 402 are actuated during the movement of contacts 67—68 a number of times corresponding to the angular distance included between the camming element P4 of symbol

GH
I

and camming element P1 of symbol

PR
S

the operation of contact 401, 402 will be negatived due to the contacts 67—68 remaining closed. Similarly upon the passing of contact 67—66 on the camming elements P1, P2, P3, P4, P5, P6 and P7 representing the symbol

PR
S

the contacts 67—68 will again be operated simultaneously with the opening of the contacts 401 and 402 by pins 400, thus transmitting seven pulses, this operation being repeated for each set of camming elements P1, P2, P3, etc. which may be set by the operation of the key members K1, K2, K3, etc.

In the modification of the register wheels actuating mechanism shown in Fig. 19 the operation of any one of the key members K1, K2, etc. is as above mentioned effective to impart a pivotal movement of cross-bar 36 and to the arm 163 carried thereby for actuating the gear sector 166 through the engagement of pawl 504 carried by this gear sector with the tooth 503 at the free end of lever 163. The operation of any one of these key members is also effective to move the levers L1, L2, L3, L4, etc., in number corresponding to the digits represented by these key members thus moving their pivoted arms 505 out of engagement from their associated toothed disc members D1, D2, D3, etc. as the case may be. The engagement of disc D4, for example, with its associated pivoted arm 504x is effective to impart a rotating movement to a bar 506 common to all levers L1, L2, L3, etc. having an upright extending arm 507 disposed in operable relation with lever 508. This lever is pivoted as at 509 and is formed with an arm 510 provided at its free end with an arcuated groove 511 engaged by a pin 512 carried by pawl 504 for moving this pawl out of engagement from the ratchet tooth 503 upon the movement of arm 504x as imparted by disc D4. Upon the disengagement of pawl 504 from ratchet tooth 503 further angular movement of shaft 172 and the register wheel which may have been operated to indicate digit 4 is prevented due to the bar 506 engaging a stop 514, the levers L1, L2, L3, etc., being returned to normal position by the cross-bar 57, best seen in Fig. 8, when the projection 59 of arm Y1 formed with bar 36 engages the lug 58 upon the return movement of this bar to normal unoperated position.

In the modification, shown in Fig. 20 on a shaft 521, is securely mounted the operating arm 260, the dial 264 and the arm 520. The arm 520 is connected to one end of lever 522 pivoted on the gear sector 91 and having its downward extending portion terminating in the form of a hook 524 engaging a pin 525 carried by an auxiliary key member 116 so that the operation of auxiliary key member 116 prior to the operation of the device as for transmitting a call designation of less than seven digits is effective to move the gear sector 91 in its starting position while tensioning the motor spring 86 simultaneously with the resetting of the register wheels R1, R2, R3, etc., to normal through the rotation of pinion 306 as above described.

Figs. 21 and 22 show a modification of the call transmitter of the invention in which call designations may be transmitted solely by the preset operation of the key members K1, K2, etc., and wherein the registering mechanism is omitted. In this modification, the camming elements are moved in engageable relation with the contact 68 in the manner above described and the operation of handle lever 85 is effected at the conclusion of each call setting operation for turning the shaft 84 and thereby tensioning the motor spring 86. The movement of shaft 84 is effective to impart a small angular movement to the arm 131 for actuating the lever 132 and moving the clutch elements 82a, 82b, 82c, etc., in the operated position for engaging one of them with the contact supporting arm 63 while disengaging it from one of the clutch elements carried by the drum D. Upon the pivotal movement of lever 132 the arm 137 engages the roller 140 for holding this arm and the clutching elements 82a, 82b, 82c, etc. carried thereby in the operated position during the return movement of shaft 84 and that of the arm 131 to normal, the contact support 63 and the contact 68 carried thereby being operated through the return movement of gear sector 91 through the pinion 96, the gear 97 secured to this pinion and the gear 101 meshing with gear 97 for rotating the shaft 105 through the pawl 103 engaging the seven-tooth ratchet wheel 102 keyed on shaft 105, thus rotating the angle gears 107 and 78, the latter being formed as above described at one end of sleeve 77 also carrying the gear 79.

At the conclusion of each pulsing operation the cam 141 engages the roller 141a for imparting a small angular movement to lever 137 for disengaging it from roller 140 and thereby freeing the arm 132 to permit its return movement and that of the clutching elements 82a, 82b, 82c, etc., to normal while the contact supporting arm is held in normal unoperated position against the tension of spiral springs 72 and 73 due to the tooth 550 of disc 123 abutting against a lug 551 formed with plate 61.

The operation of auxiliary key member 160 as for canceling a wrong call designation prior to the pulsing operation of the transmitter is effective to impart a pivotal movement to lever 146 through lug 253 carried by this auxiliary key member engaging the arm 254 formed with lever 146 for moving the disc 51 and thereby resetting the clutching pins 16a, 17a, 18a, etc., and the

camming elements P1, P2, P3, etc., to normal position simultaneously, the disc 51 being returned to normal unoperated position by its retractile spring 64, Fig. 7, while the auxiliary key 160 is returned to normal through the tension of its retractile spring 301 and the device is now ready for a subsequent call transmitting operation. In this modification, it is obvious that the supporting flanges X and X1 may be machined for readily receiving the registering mechanism and if desired without the use of the key-by-key conditioning mechanism as embodied in the transmitter shown in Figs. 3, 4, 5, 7 and 9.

A hood 575, shown in Figs. 3, 4, 5, 6, 7, 11 and 21 is provided for preventing dust reaching the contacts 67 and 68. It is formed of two parts which are secured by screws 516 to lug portions 577 formed with an angle piece 578 secured to the underside of bar 41, the angle piece 578 being provided with a slot for receiving the free end of arm 45 for assisting in the centering of drum D. The casing CY housing the transmitter mechanism is secured to the base 10 by a plurality of screws *x4*, shown in Figs. 3, 5, 7 and 21. This casing carries a cradle CRA for receiving the handset HS and a plunger PL provides for actuating switch springs, not shown, for effecting well-known switching operations.

It is also understood that minor changes may be made to the invention without departing from the scope of the appended claims, the provision of a greater or lesser number of sets of cam elements P1, P2, P3, etc., the use of other types of clutches for connecting the drum D to the contact supporting arm and this arm to the motor, the substitution of an electric motor and its controlling mechanism for a motor spring and the arrangement of the cam elements for transmitting call designations by code are examples of such changes.

What is claimed is:

1. In a call transmitter, a pair of pulsing contacts, a plurality of longitudinally movable pins normally ineffective to operate said contacts disposed in a group, a set of key members operatively associated with said longitudinally movable pins for moving said pins in groups corresponding to said key members in position effective with respect to said contacts, and means for imparting movement to said contacts and said actuating means relatively to cause the make and break operation of said contacts.

2. In a call transmitter, a pair of contacts, a plurality of normally ineffective independent actuating longitudinally movable element for said contacts disposed in a group, a set of indices bearing key members, a system of levers actuated by said key members for moving said elements in groups of varying numbers in position effective relative to said contacts for setting a call, and pins for moving said contacts in engaged relation with each of said effective elements for transmitting such a call.

3. In a call transmitter, a pair of contacts, a plurality of actuating means normally ineffective relative to said contacts, a set of indices bearing key members, interconnected levers actuated by said key members for moving said actuating means in numbers varying according to the operation of said key members in position effective relative to said contacts for setting a call, and means for moving said contacts in engaged relation with said actuating means for transmitting such a call.

4. In a call transmitter, a set of numbered key members, a plurality of levers actuated by the movement of said key members from normal, said levers being interconnected to each other for operation in number equal to the numeral of each of said key members, camming elements, a support for said elements actuated by the movement of said key members for successively positioning said elements in operative relation with said levers upon the return movement of said key members to normal for setting a call, a bar actuated by the operation of each of said key members, and means actuated by the successive operation of said bar for locking said key members against movement upon the completion of said call setting operation.

5. In a call transmitter, contacts, a set of digit key members, camming elements, means actuated by each of said key members in one direction for setting a group of said elements in number corresponding to the digit represented by the operated key member, a rotatable support for said camming elements actuated by the successive operation of each of said key members in the other direction for moving other groups of said elements in operative relation with said means, a rotatable support for said contacts, and means for actuating said supports relatively for engaging said contact with the groups of said operated elements for sending series of pulses corresponding to the operation of each of said key members.

6. In a call transmitter, a rotatable support, a set of indices bearing key members for actuating said support, a plurality of levers interconnected to each other for operation according to the indices represented by said key members, a plurality of contact actuating elements moved by the operation of said support in engageable relation with said levers for setting a call, a pair of contacts, a rotatable support for said contacts, and motor means for actuating the second-mentioned rotatable support relative to the first-mentioned support for causing the make and break operation of said contacts upon their engagement with the elements set by the operation of said levers.

7. In a call transmitter, a rotatable drum-shaped support, a set of key members, a mechanism for actuating said support step by step upon the successive operation of said key members, pulsing contacts, a rotatable support for said contacts, a plurality of groups of movable digit defining elements carried by said drum-shaped support, said elements being normally ineffective relative to said contacts, means actuated by the operation of said key members from normal for positioning the elements in each of said groups in number depending upon the digit value of said key members in position effective relative to said contacts upon each step of said drum, means actuated by said key members for operatively connecting said rotatable support to said drum-shaped support, a motor spring, a manually operable lever member for tensioning said spring, and means actuated by said lever member for operatively connecting said rotatable support to said motor spring and simultaneously disengaging it from said drum-shaped support for actuating said rotatable support for engaging said contacts with said effective elements.

8. In a call transmitter, a drum-shaped support, a set of key members, a pair of contacts, a two-way movable support for said contacts, means actuated by the operation of said key members

for actuating said drum and said movable support one way, camming elements carried by said drum and set by the operation of said key members in position effective relative to said contacts and a constant speed motor mechanism for actuating said movable support the other way relative to said drum for engaging said contacts with the elements set by the operation of said key members.

9. In a call transmitter, a set of pivoted key members, a rotatable drum-shaped support, groups of equal number of longitudinally slidable camming elements carried by said drum, a pair of contacts operatively associated with said elements, a rotatable support for said contacts said elements being normally in position ineffective relative to said contacts, a lever for each of said camming elements in one of said groups disposed in operable relation with each of said key members, a pivoted bar actuated by the movement of each of said key members, a pawl actuated by the movement of said bar, a ratchet wheel actuated by said pawl for rotating said drum for successively positioning said slidable elements in engageable relation with said levers for setting a call, and motor means for moving said contacts in engaged relation with the elements set by the operation of said key members.

10. In a call transmitter, contacts, a rotatable drum-shaped support, a plurality of sets of contact actuating elements carried by said drum, said elements being normally in position ineffective relative to said contacts, a movable support for said contacts, a set of numbered key members, a ratchet mechanism actuated by the operation of each of said key members for rotating said drum step by step, means actuated by the operation of the first of said key members in the setting of a call for operatively connecting said movable support to said drum, a lever mechanism operated by each of said key members for moving said elements set by set upon the step by step operation of said drum in number corresponding to the numerical value of said operated keys in each of said sets in position effective relative to said contacts, a constant speed motor mechanism, and means manually operable for disconnecting said support from said drum and simultaneously operatively connecting it to said motor for causing the successive make and break of said contacts according to the operation of said key members.

11. In a pulsing device, a set of key members, normally ineffective camming elements, a one-way movable supporting member for said elements, a pair of contacts, a two-way movable support for said contacts, means actuated by the movement of said key members from normal for setting said elements in position effective relative to said contacts, means actuated by said key members for operatively connecting said support to said supporting members for moving them collectively, said supporting member in said way and said movable support in one of said two ways upon the return movement of said key members to normal, and motor means for actuating said movable support the other of said two ways for engaging said contacts with said effective elements.

12. In a call transmitter, a set of key members, normally ineffective digit defining elements, a one-way movable supporting member for said elements, contacts, a two-way movable support for said contacts, a set of levers actuated in varying numbers by the operation of each of said key members from normal for moving said elements according to said varying numbers in position effective relative to said contacts and simultaneously operatively connecting said one-way movable support and said two-way movable support for moving them collectively upon the return movement of said key members to normal, a motor spring, a gearing mechanism actuated by said spring, and manually operable means for tensioning said spring and disconnecting said two-way movable support from said one-way movable support and simultaneously operatively connecting said two-way movable support to said gearing mechanism for moving said contacts in engaged relation with said effective digit defining elements, a speed governor for controlling the operation of said gearing mechanism, and means operable automatically upon the movement of said two-way movable support for controlling the extent of operation of said motor.

13. In a call transmitter, a pair of contacts, a two-way movable support for said contacts, a plurality of camming elements normally in position ineffective relative to said contacts, a set of key members operable for moving said elements in position effective relative to said contacts, and means manually operable in two positions for conditioning the transmitter, in one position for transmitting a call by the successive back and forth movement of said support and in the other position for transmitting a call by a single back and forth operation of said support.

14. In a call transmitter, a rotatable drum-shaped support, a plurality of digit defining elements carried by said drum-shaped support, a pair of contacts operatively associated with said elements, said elements being normally in position ineffective relative to said contacts, a movable support for said contacts, a set of digit key members, means for actuating said drum-shaped support upon the operation of said key members, means actuated by said key members for operatively connecting said movable support to said drum-shaped support, a lever mechanism actuated by each of said key members for successively and collectively operating said elements in groups upon the movement of said drum in number corresponding to the digits of said key members for setting a call, and a register mechanism operable upon the operation of each of said key members and controlled by the operation of said lever mechanism for indicating the call designation set by the operation of said key members, and motor means for moving said movable support relative to said drum-shaped support to cause the make and break operation of said contacts for transmitting the call set by the operation of said key members.

15. In a call transmitter, a pair of contacts, a movable support for said contacts, another movable support, camming elements carried by the last-mentioned support, a set of key members, means for operating the last-mentioned support upon the successive operation of said key members, a lever mechanism actuated by the operation of said key members for operatively moving said elements in successive groups in position for causing the operation of said contacts upon the movement of said supports relatively, a bar operated by the movement of each of said key members, an arm carried by said bar, a gear sector, a clutch operatively con-

necting said gear sector to said arm, a rotatable shaft, a gear on said shaft engaging said gear sector, a plurality of toothed discs secured to said shaft for engaging said lever mechanism for controlling the angular movement of said shaft and register wheels actuated by the movement of said shaft for indicating the operation of said key members.

16. In a call transmitter, sets of equal numbers of normally ineffective independent longitudinally movable pins, a rotatable support for said pins, a pair of contacts, a set of digit key members, means actuated by each of said key members for rotating said support and, moving variable numbers of said pins in each of said sets in position effective relative to said contacts following each movement of said support, a rotatable support for said contacts, a motor spring, a lever member for tensioning said spring for actuating said rotatable support relative to the first-mentioned support to cause the operation of said contacts, a register mechanism actuated by the operation of each of said key members for indicating the number of said pins actuated by each of said key members and resetting means for said register mechanism actuated by the movement of said lever member.

17. In a call transmitter, a set of digit key members, a plurality of levers actuated by each of said key members in number corresponding to the digits thereof, a plurality of toothed discs actuated by said key members to position determined by the number of operated levers and according to the digit represented by each of said key members, register wheels, and a gearing mechanism operatively connecting said discs to said register wheels for indicating the digits of each of said key members.

18. In a call transmitter, a set of numbered key members movable a similar distance, a plurality of levers actuated by said key members and interconnected to each other for operation in number corresponding to the numerical value of each of said key members, a gearing mechanism actuated by the successive operation of said key members to positions defined by the number of operated levers, register wheels and a mechanism operated by said key members for successively operatively connecting said register wheels to said gearing mechanism for indicating the numerical values and the sequence of operation of said key members.

19. In a call transmitter, stationary mounting means for said impulse contacts, a set of impulse contacts, a set of shunting contacts, a rotatable support for said shunting contacts, camming elements for operating said impulse contacts, a rotatable support for said camming elements, other camming elements carried by the first-mentioned support for actuating said shunting contacts but normally positioned ineffective relative thereto, a set of indices bearing key members operable for moving said shunting contacts support, means operated by the movement of said key members following each operation of said shunting contacts support for moving the last-mentioned camming elements in position effective relative to said shunting contacts, and motor means for rotating the first-mentioned support for moving said shunting contacts and the second-mentioned support for actuating said pulsing contacts for sending sets of pulses corresponding to the operation of said key members.

20. In a call transmitter, a set of pivoted numbered key members, a pair of contacts, independent longitudinally movable camming elements set by the operation of said key members in position for actuating said contacts, each of said key members setting a predetermined number of said elements, a common register mechanism, and means actuated by the movement of each of said key members for operatively associating said mechanism with said key members for indicating the number of longitudinally movable camming elements set in position effective to said contacts.

21. In a call transmitter, a set of numbered key members, a lever operatively associated with each of said key members, said levers being interconnected to each other for operation in number corresponding to the number of each of said key members, a shaft controlled by the operation of said levers, a gearing mechanism actuated by said shaft, dials, a common driving shaft for said dials actuated by said gearing mechanism for moving said dials in position for indicating the number of each of said key members, and manually operable means for returning said dials to normal position collectively.

22. In a call transmitter, a set of numbered key members, a lever mechanism actuated by each of said key members, a gearing mechanism actuated by said key members and controlled by the operation of said lever mechanism, a shaft operatively connected to said gearing mechanism, said shaft having a ratchet tooth along its length, a bar mounted for rotating movement concentric to said shaft, a plurality of arms carried by said bar, said arms being arranged by pairs, a register wheel journaled on the arms of each of said pairs, a pawl carried by each of said wheels for engaging the ratchet tooth in said shaft but normally disengaged therefrom, a cam shaft operated by said key members for successively moving said pawls in engaged relation with the ratchet tooth in said shaft for moving said wheels upon the operation of said gearing mechanism in position for indicating the sequence of operation and the numbers of said key members.

23. In a call transmitter, a set of impulse contacts, a set of shunting contacts, a rotatable support, a continuous row of pins carried by said support for operating said impulse contacts, normally ineffective longitudinally movable camming elements for actuating said shunting contacts, a normally stationary rotatable support for said elements, a set of indices bearing members operable for moving the last-mentioned support and said longitudinally movable camming elements following each operation of the latter support in position effective relative to said shunting contacts, a register mechanism common to and actuated by the operation of each of said indices bearing members for indicating the operation of the latter and a constant speed motor for rotating the first-mentioned support for moving said pins in engagement with said pulsing contacts and rotating said shunting contacts simultaneously for transmitting series of pulses as indicated by said register mechanism.

24. In a call transmitter, a pair of contacts, groups of individually longitudinally operable pins for actuating said contacts normally positioned ineffective relative thereto, a set of indices bearing manually operable members, a plurality of levers actuated in different numbers by the operation of each of said operable members for positioning said pins effective relative to said contacts for setting a call, register wheels moved from normal unoperated position by the

movement of said manually operable members to position for indicating said call, and a handle operable for collectively returning said wheels to normal and collectively resetting said pins in position ineffective relative to said contacts for canceling said call.

25. In a call transmitter, a stationary spindle, a rotatable drum mounted on said spindle, camming elements carried by said drum, a hollow shaft having one of its ends engaging said spindle for movement relative thereto, an insulating arm carried by said shaft for movement in a plane parallel to said drum, contacts carried by said arm and disposed in engageable relation with said elements, a frame structure having a cross-bar at its upper disposed end, said bar having a bearing portion for rotatably receiving the other end of said shaft, terminals insulatedly mounted on said cross-bar, and conductor members extending through said hollow shaft and electrically connecting said contacts to said terminals.

26. In a call transmitter, a set of numbered key members, a drum actuated by said key members, groups of equally spaced camming members carried by said drum, a pair of contacts, said elements being normally in position ineffective relative to said contacts, a set of levers actuated by said key members, one of said levers for each of said elements in one of said groups, means interconnecting said levers for operation in numbers corresponding to the numbers of said key members, a driving mechanism operated by said key members for moving said drum, step-by-step for successively positioning said elements in each of said groups in operative relation with said levers for moving them in position effective relative to said contacts, a notched wheel carried by said drum, a lever member, a spring for engaging said lever member in the notches of said wheel for centering said elements relative to said lever members upon each step of said drum, and means actuated by said mechanism for disengaging said lever from said notches for permitting the movement of said drum upon the operation of each of said key members.

27. In a call transmitter, a set of contacts, a rotatable support for said contacts, a rotatable drum-shaped support, a plurality of actuating means for said contacts carried by said drum but normally ineffective relative thereto, a set of key members, a lever mechanism operable upon the operation of said key members for setting said actuating means in number corresponding to the value of one of said key members in position effective relative to said contacts, a clutching device operable upon the movement of said lever mechanism for operatively connecting said rotatable support to said drum, a ratchet mechanism, operable upon the operation of each of said keys for rotating said drum and said rotatable support step-by-step for setting others of said actuating means in position effective relative to said contacts, a register mechanism operated by each of said key members for indicating the number of actuating means set by the successive operation of said key members, a motor spring, a lever mechanism for tensioning said motor spring, means actuated by the operation of said lever member for disengaging said drum from said rotatable support and operatively connecting said support to said motor for moving said contacts in engaged relation with said actuating means, means operable automatically at the conclusion of operation of said contacts for disconnecting said movable support from said motor, and a mechanism operable upon the operation of said automatically operable means for returning said actuating means in position ineffective relative to said contacts.

28. In a call transmitter, a set of digit key members, a rotatable support, a plurality of ineffective camming elements carried by said support disposed in sets, a pair of contacts, a movable support for said contacts, a system of levers operatively connecting said elements to said key members, a bar actuated by the downward operation of said key members, a lever member operatively connected to said bar, a pawl carried by said lever, a ratchet wheel actuated by the movement of said pawl upon the return movement of said key to normal for actuating said rotatable support for successively positioning said camming elements step-by-step in operative relation with said levers for setting a call, a pivoted arm, a notched disc for controlling the operation of said arm, another ratchet wheel operated by the movement of said pawl for moving said disc upon a predetermined number of operations of said key members in position for engaging said lever with said bar for locking said key members, means manually operable for disengaging said lever from said bar and said pawl from the second-mentioned ratchet wheel, a spring for returning said disc to normal, and a motor mechanism for actuating said movable support relative to said rotatable support for engaging said contacts with said elements for transmitting the call.

CHARLES D. RICHARD.