March 27, 1945. H. W. GOFF 2,372,268

CALL TRANSMITTER

Filed Dec. 30, 1942 5 Sheets-Sheet 1

FIG. 1

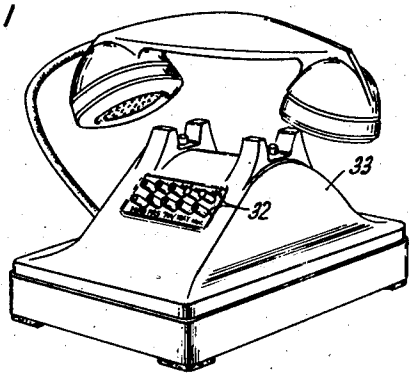
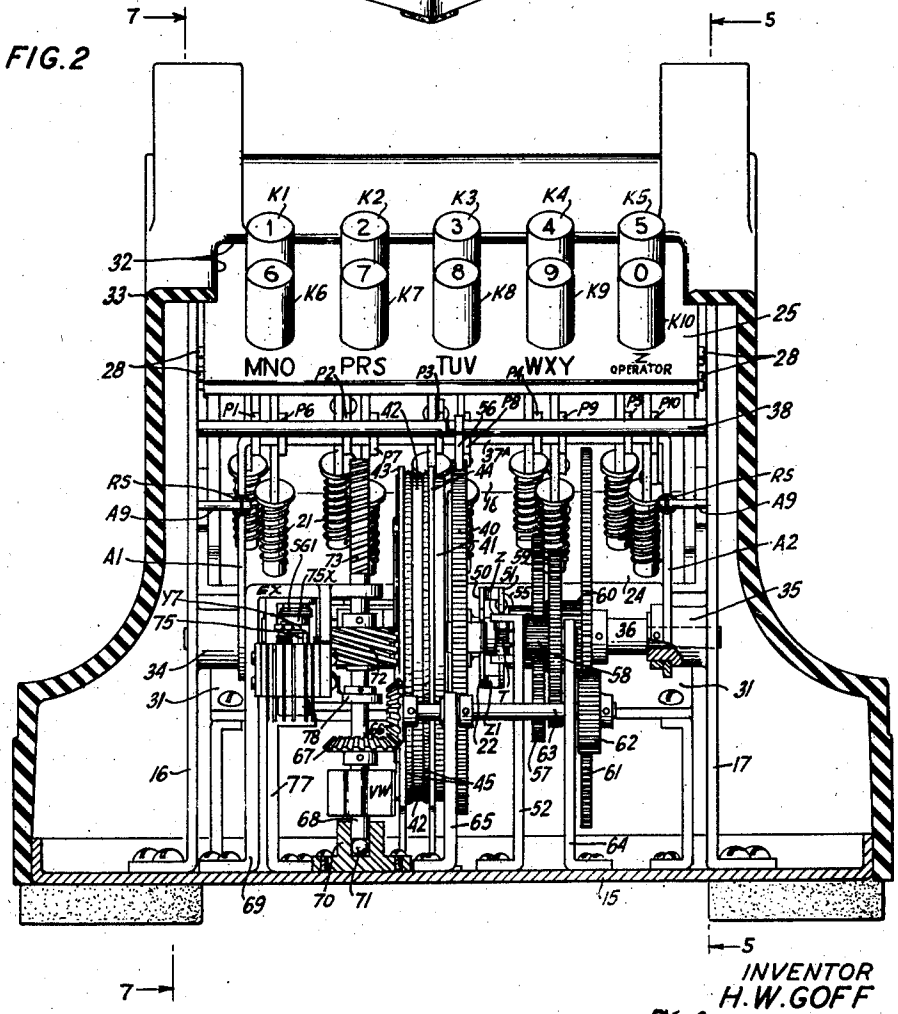


FIG. 2



INVENTOR
H. W. GOFF

BY J. MacDonald

ATTORNEY

March 27, 1945. H. W. GOFF 2,372,268

CALL TRANSMITTER

Filed Dec. 30, 1942 5 Sheets-Sheet 2

FIG. 4

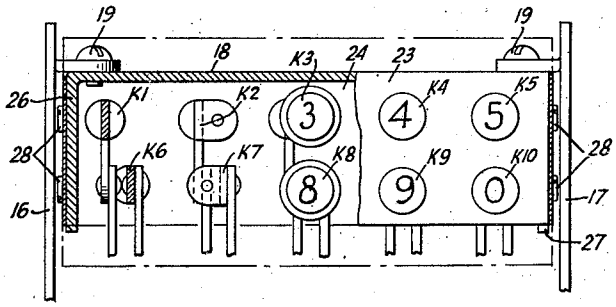
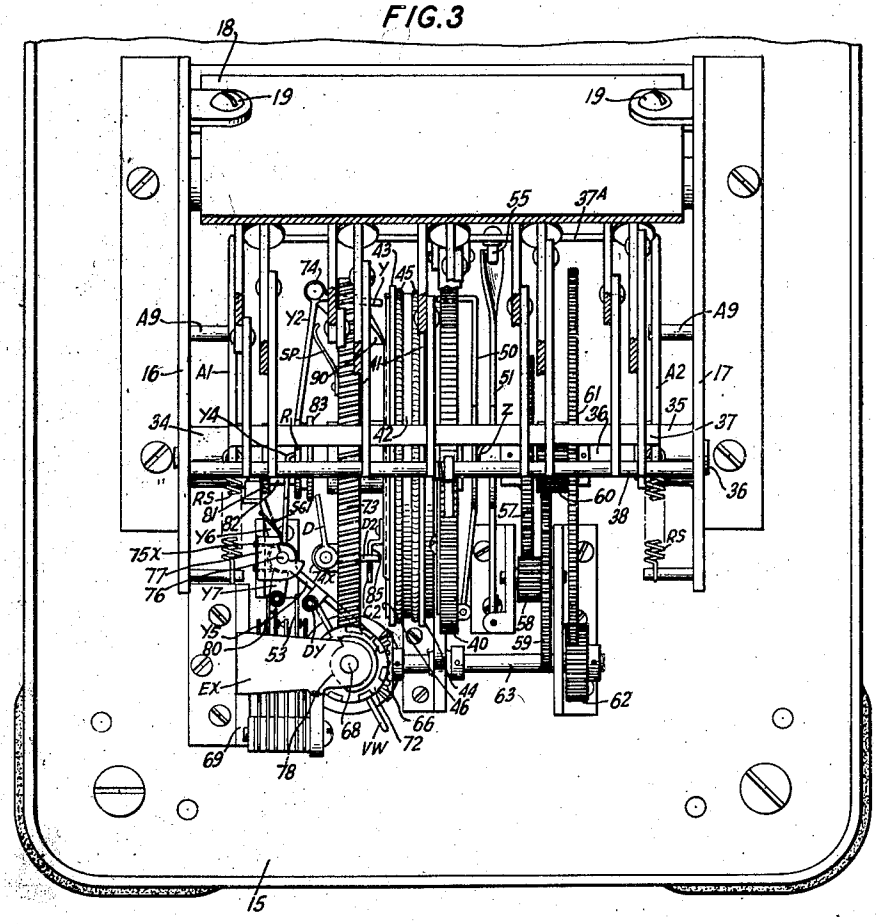


FIG. 3



INVENTOR
H.W.GOFF
BY J. Mac Donald
ATTORNEY

March 27, 1945. H. W. GOFF 2,372,268

CALL TRANSMITTER

Filed Dec. 30, 1942 5 Sheets-Sheet 3

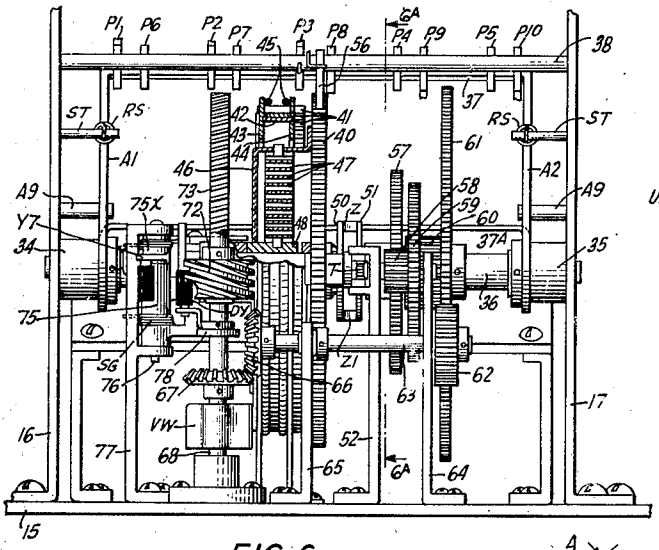


FIG. 6

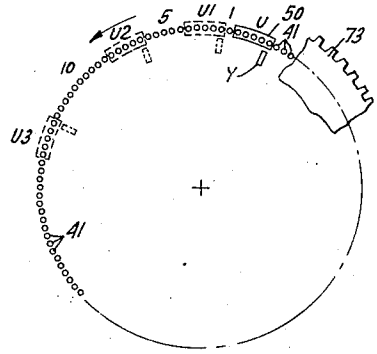


FIG. 11

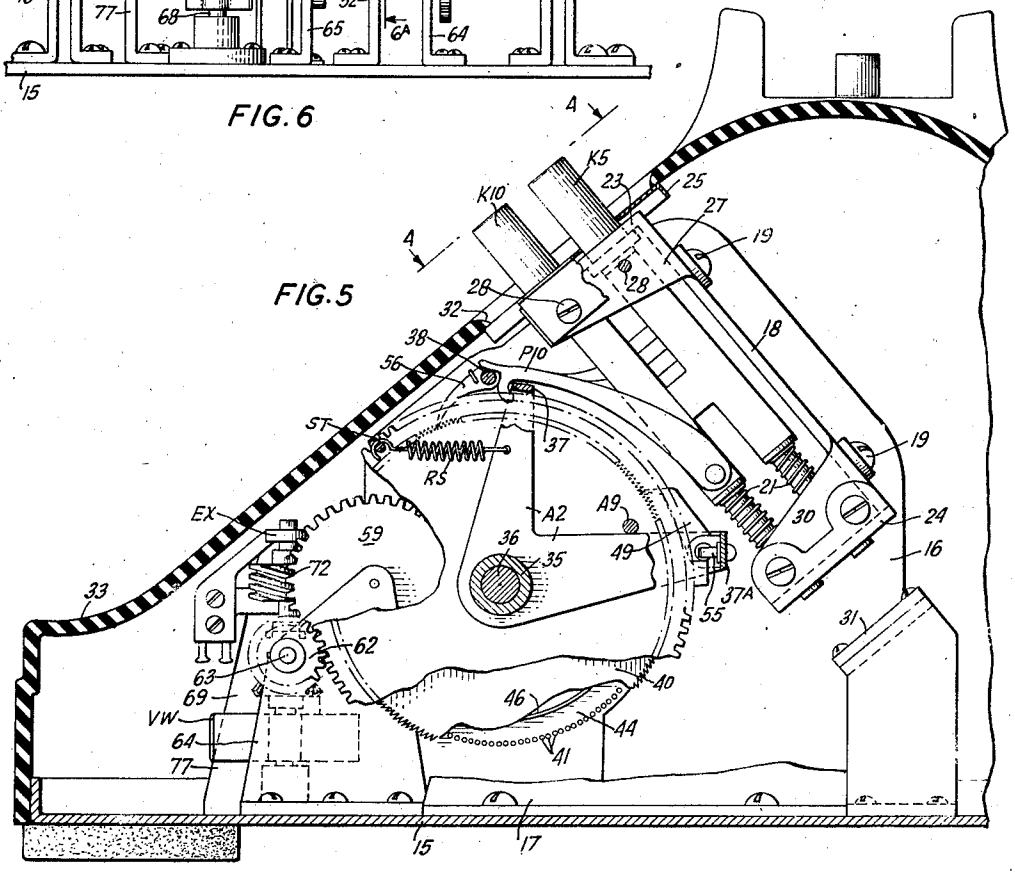


FIG. 5

INVENTOR
H. W. GOFF
BY J. MacDonald
ATTORNEY

March 27, 1945. H. W. GOFF 2,372,268

CALL TRANSMITTER

Filed Dec. 30, 1942 5 Sheets-Sheet 4

FIG. 6A

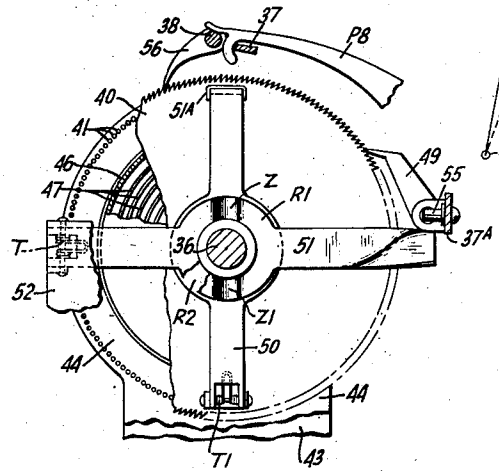


FIG. 7A

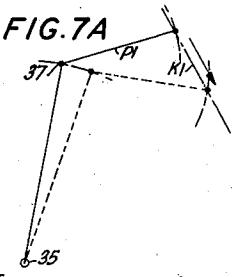


FIG. 9A

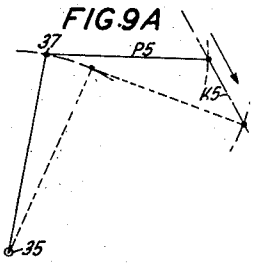


FIG. 10A

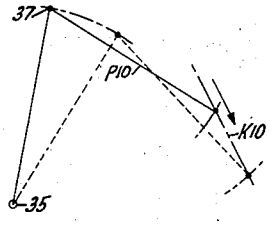


FIG. 10

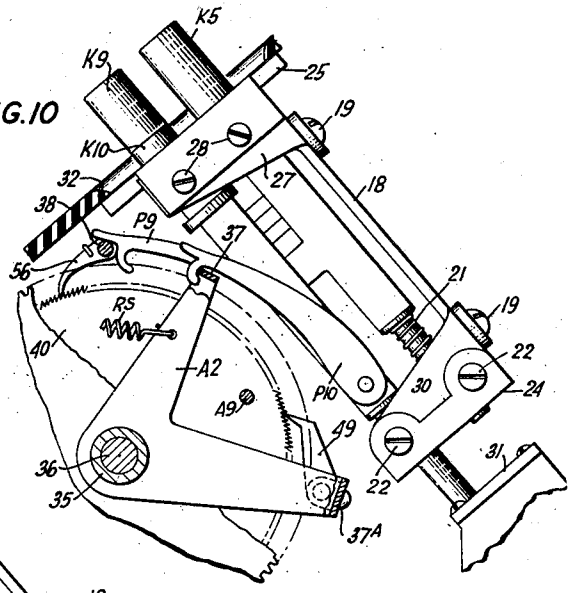
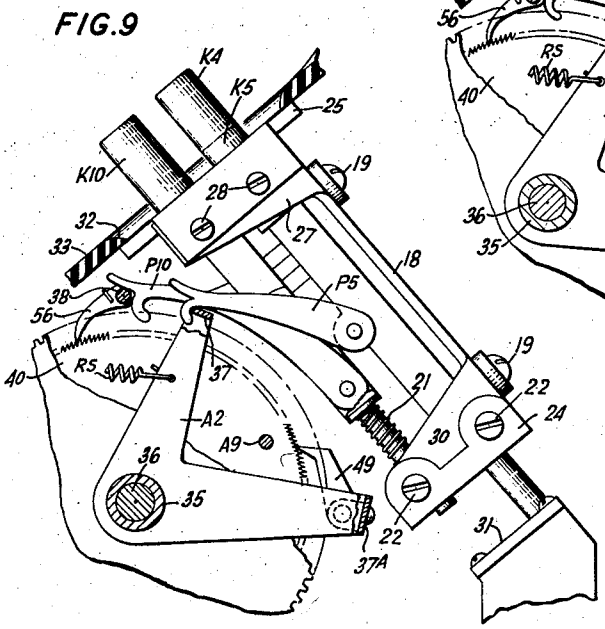


FIG. 9



INVENTOR
H. W. GOFF
BY J. MacDonald
ATTORNEY

March 27, 1945. H. W. GOFF 2,372,268

CALL TRANSMITTER

Filed Dec. 30, 1942 5 Sheets-Sheet 5

FIG. 12

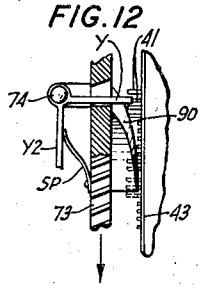


FIG. 8

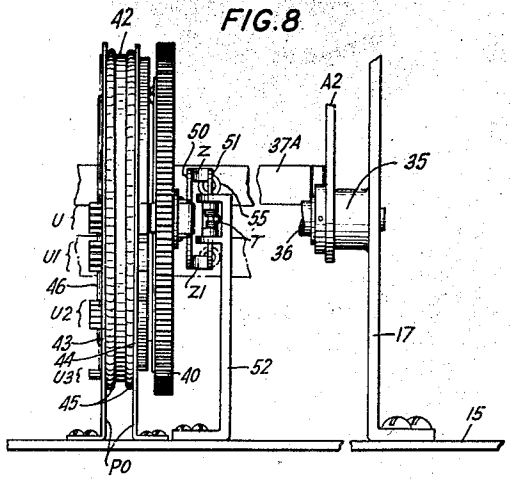
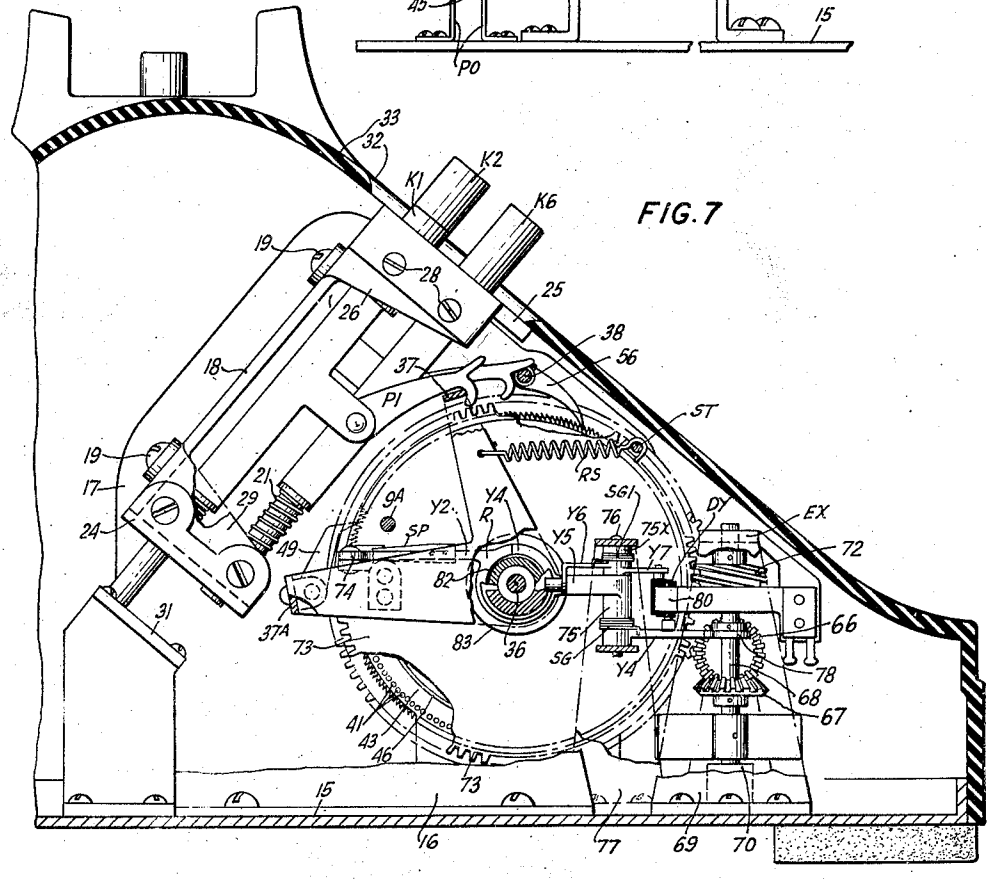


FIG. 7



INVENTOR
H. W. GOFF
BY J. MacDonald
ATTORNEY

Patented Mar. 27, 1945

2,372,268

UNITED STATES PATENT OFFICE

2,372,268

CALL TRANSMITTER

Harold W. Goff, Manhasset, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application December 30, 1942, Serial No. 470,531

7 Claims. (Cl. 179—90)

This invention relates to electrical signaling devices and more specifically to call transmitters of the type used, for example, in automatic telephone and like systems for establishing talking connections.

The object of this invention is the provision of a call transmitter of the type above referred to which is convenient in use, capable of rapid manipulation in the transmitting of a call and positive in operation.

According to the call transmitter of this invention means carried by each of a plurality of digit numbered key members movable equidistant from normal non-operated position to operated position as determined by a common stop element, impart varying angular movements to a pivoted bar and a pawl carried thereby while tensioning a spring the function of which is to return the pivoted bar to normal unoperated position for actuating a ratchet wheel in a unidirectional movement and of amplitudes corresponding to the numerical values of the successive operated keys through the engagement of the ratchet wheel by the pawl carried by the pivoted bar.

Means carried by the ratchet wheel and movable in position adjacent and concentric to a circular row of longitudinally movable pins mounted in a stationary support is actuated at an angle relative to its plane of rotation by a lever member operated by means carried by the bar upon the pivotal movement of the latter as effected by the different keys for moving a predetermined number of the longitudinally movable pins in position for controlling the operation of a lever mechanism actuated by a cam and thereby controlling the operation of a pulsing contact in relation to the digit of each of the operated keys.

Motor means in the form of a spring tensioned upon the return movement of the pivoted bar to normal position, actuates a gearing mechanism connecting with the pulsing cam for rotating the latter a number of turns corresponding to the number of movable pins in the circular row, with means positioned by the movement of the ratchet wheel cooperating with means carried by an element of the gearing mechanism for actuating means to control the operation of a shunting contact under certain condition at the completion of each digit transmitting operation and under another condition depending upon the speed at which the keys are operated at the end of a number of successive digit transmitting operations.

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

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

Fig. 2 is a front elevation view shown with the base and casing housing the transmitter mechanism partly in section, the set of keys being shown in normal non-operated position;

Fig. 3 is a top view shown with the casing housing the transmitter mechanism removed and with a number of operating parts with portions cut away, the mechanism being shown in normal non-operated position;

Fig. 4 is a detail view showing a number of digit keys and their mounting with portions cut away and viewed in the direction indicated by the arrows 4—4 in Fig. 5;

Fig. 5 is a right side view showing the casing in vertical longitudinal section taken on line 5—5 of Fig. 2 and a number of operating parts with portions cut away, the keys being shown in normal non-operated positions;

Fig. 6 is a partial font view showing a number of operating parts partly in section and the pawls actuated by the keys shown in engageable relation with the bar actuating the ratchet mechanism;

Fig. 6A is a detail view showing the pin-setting mechanism and the ratchet wheel in operated position 90 degrees from the position shown in Fig. 3, the shaft supporting the ratchet wheel and other operating parts being shown in section taken on line 6A—6A of Fig. 6;

Fig. 7 is a vertical longitudinal section taken on line 7—7 of Fig. 2 showing the digit key K1 and the pivoted bar actuated thereby in the operated position, a number of operating parts being shown with portions cut away;

Fig. 8 is a partial view of the pin-setting mechanism showing a number of groups of the longitudinally movable pins in operated position;

Fig. 9 is a partial view showing digit key K5 and the pivoted bar in the operated position;

Fig. 10 is a partial view showing the digit key K10 and the pivoted bar in operated position;

Figs. 7A, 9A and 10A are views showing diagrammatically the operation of the digit keys K1, K5 and K10, respectively, in relation to the varying angular movements of the pivoted bar actuated thereby;

Fig. 11 is a view showing diagrammatically the arm carried by the ratchet wheel in different digit operated positions relative to the movable pins

in the circular row and in relation to one element of the lever mechanism controlling the operation of the pulsing contact; and

Fig. 12 is a detail view showing an element of the gearing mechanism and the cam carried thereby used for returning the operated pins to normal non-operated position following the control operation of a lever mechanism by the pulsing cam.

In the call transmitter of this invention, a base 15 is provided for mounting two upright supports 16 and 17 held in spaced relation at their upper ends by a plate 18 shown in Figs. 3, 4, 5, 7, 9 and 10 secured at both ends to the supports by screws 19 in oblique relation to the base 15, the spacer plate 18 having a portion 23 bent at right angles thereto cooperating with a spacer plate or bar 24 best seen in Figs. 4 and 5 for slidably mounting longitudinally movable key members K1, K2, K3, K4, K5, K6, K7, K8, K9 and K10, arranged in two parallelly disposed rows and resiliently held in normal position by similar retractile springs 21. The bar 24 is secured at both ends to the arms 29 and 30 of plate 18 as by screws 22, best seen in Figs. 5, 9 and 10, so as to permit the ready assembly and removal of the keys K1, K2, K3, etc. whenever required for adjustment and repairs, a stop plate 31 being provided for limiting the movement of the keys to equal distance from normal unoperated position, while a cover plate 25 is secured at both ends to arms 26 and 27 formed with plate 18 by screws 28, shown in Figs. 2, 4 and 5, this plate serving for closing a rectangularly shaped opening 32 in a casing 33 housing the transmitter mechanism.

The upright supports 16 and 17 are formed with bearing portions 34 and 35 for rotatably supporting a shaft 36 while serving as spindles for pivotally receiving the bearing portions of V-shaped arms A1 and A2 formed integrally with parallelly disposed bars 37 and 37A, shown in Figs. 2, 3, 5, 6, 7, 9 and 10, bar 37 being disposed in engageable relation with pawl-like members P1, P2, P3, P4, P5, P6, P7, P8, P9 and P10 pivotally mounted on key members K1, K2, K3, K4, K5, K6, K7, K8, K9 and K10, respectively, with the free ends of the pawls normally resting on a rod 38 in turn journaled at both ends in upright supports 16 and 17.

Figs. 7A, 9A and 10A show graphically the lengths of the arcs generated by the bar 37 of duplex bar 37—37A thus formed as effected, for example, by the equidistant operation of key members K1, K5 and K10 obtained by the pivoting of pawls P1, P5 and P10 at different points on these keys relative to bar 37 when the latter is in normal position. Fig. 7A shows the bar 37 pivoted at 35 moved from normal to operated position by key K1, an angular distance corresponding to the spacing of six pins 41 disposed in a circular row in supporting rings 43 and 44, best seen in Figs. 2, 6, 6A and 8, five of these pins to be operated by the movement of two cooperating arms 50 and 51 to form the so-called interdigit space and transmitting one impulse in a manner which will be hereinafter described in detail. Fig. 9A shows the angular movement of the bar 37 following its operation by pawl P5 pivoted on key K5 equal to ten pins 41, five of which are to be operated by the movement of arms 50—51 in addition to the five impulses to be transmitted, and Fig. 10A shows the angular movement of bar 37 following its operation by pawl P10 pivoted on key K10 equal to fifteen pins 41, five of which are to be operated by the movement of arms 50—51 in addition to the ten pulses to be transmitted. In practice, for any chosen longitudinal movement of the keys K1, K2, K3, the pivotal points of pawls P1, P2, P3, etc. mounted on these keys are determined by locating such pivotal centers along the stem of the keys to correspond to the arcs at which a ratchet wheel 40, best seen in Figs. 2, 3, 5, 6, and 6A, must be moved so as to position the arm 50 carried thereby with reference to the number of pins 41 corresponding to the digit values of the keys.

The wheel 40 which forms part of a ratchet mechanism is mounted for free rotation on the shaft 36 and is provided with one hundred and twenty teeth corresponding to the number of longitudinally movable pins 41 arranged, as above described, in a circular row in the supporting rings 43 and 44, these rings having portions secured to the base 15 and are held in spaced parallel relation to each other by a cylindrical ring element 42, best seen in Fig. 6, while the pins 41 are held frictionally collectively in normal and operated position by two coiled springs 45 encircling the row of pins 41, as shown in Figs. 2, 3, 6 and 8.

The ratchet wheel 40 carries a cup-shaped member 46 concentric to and projecting beyond the outer surface of ring 43 and to this cup-shaped member is secured the end of the outer convolution of a spiral spring 47, best seen in Fig. 6, the inner convolution of which is secured to a sleeve 48 in turn keyed to the shaft 36 for rotating the latter following the operation of ratchet wheel 40 as imparted by a pawl 49 carried by the bar 37A upon the return movement of this bar to normal under the tension of retractile springs RS having one of their ends hooked to the V-shaped arms A1 and A2 and their other ends to studs ST laterally extending from upright supports 16 and 17, the ratchet wheel 40 being held in each advanced position by a spring-pressed pawl 56 mounted on the rod 38.

An arm 50 shown in Figs. 2, 3, 6, 6A, 8 and diagrammatically in Fig. 11 is pivotally mounted diametrically on one side of ratchet wheel 40 and has its free end portion bent at right angles projecting through an opening 51A (see Fig. 6A) in the wall of this wheel in operative relation with the row of pins 41, the width of this arm being made sufficiently large to collectively move a number of pins 41 from normal to operated position as shown at U, U1, U2 and U3 in Fig. 8 in any angular position of the ratchet wheel 40 to perform a function which will be hereinafter described in detail.

The arms 50 and 51 are each formed with a ring portion concentric to shaft 36, the ring R1 of arm 51 having two diametrically opposite cam portions Z and Z1, best seen in Figs. 2, 6, 6A and 8, abutting against the ring portion R2 of arm 50 with the free end of arm 51 twisted to form an inclined surface, best seen in Figs. 3 and 6A, disposed in engageable relation with a pin 55 carried by the bar 37A for imparting a pivotal movement to arm 51 against the tension of its retractile spring T and thereby to arm 50 against the tension of its retractile spring T1 upon each pivotal downward movement of the duplex bar 37—37A as effected by the operation of any one of the keys K1, K2, K3, etc., thus moving a number of pins 41 in operated position followed by the movement of the ratchet wheel 40 during the return operation of duplex bar 37—37A under

the tension of retractile springs RS acting on the bar 37—37A and the engagement of pawl 49 with the ratchet wheel which is held in each advanced position against the tension of spiral motor spring 47 by the retaining pawl 56 pivoted on rod 38.

The rotation of ratchet wheel 40 and the consequent tensioning of motor spring 47 cause the rotation of shaft 36 and thereby the rotation of a gear 57 keyed thereon for rotating a pinion and gear unit 58—59, rotatably mounted on the support 52 and a support 64, the gear 59 engaging a pinion 60 secured to the hub of a gear 61 mounted for free rotation on shaft 36 with the gear 61 engaging with a pinion 62 keyed on one end of a shaft 63 journaled on the upright support 64 and a support 65 secured to the base 15. On the end of shaft 63 opposite to pinion 62 is mounted a miter gear 66 meshing with a similar gear 67 keyed on a vertically disposed shaft 68, this shaft being journaled at its upper disposed end in a horizontally extending portion *ex* of an upright support 69, shown in Figs. 2, 3, 5 and 7, secured to the base 15 while the lower disposed end of this shaft is journaled in a bushing 70 resting on an end thrust bearing in the form of a ball 71, best seen in Fig. 2.

On the shaft 68, as shown in Figs. 2, 3, 5, 6 and 7, is keyed a one-step cam 78 and a worm 72 engaging a worm gear 73 mounted for free rotation on shaft 36 and on this worm gear is pivotally mounted an angle lever 74, best seen in Figs. 3 and 7, having its arm Y extending through an opening in the wall of worm gear 73 in engageable relation with the pins 41 which may be operated, while the arm Y2 of this angle lever is formed with a ring portion R concentric to a sleeve 82 on shaft 36 for engaging in any angular position of worm wheel 73 the forked-shaped arm Y4 of a yoke 75, the arm Y5 of which engages the one-step cam 78 under the tension of a coiled spring SG (see Figs. 6 and 7) acting against the tension of a comparatively light retractile spring SP for the angle lever 74, the yoke 75 being pivotally mounted on a pin 76 journaled in lugs formed with an upright support 77 secured to the base 15 while a lug formed with the arm Y5 of this yoke serves for mounting an insulating stud *dy* provided for engaging the pulsing contact 53, best seen in Fig. 3.

On pin 76 in superposed relation to yoke 75, as shown in Figs. 2, 6 and 7, is mounted a second yoke 75X consisting of arms Y6 and Y7, the latter having an insulating sleeve for engaging a shunting contact spring 80 under the tension of a retractile spring SG1, shown in Figs. 3 and 7, while the arm Y6 of yoke 75X is disposed in engageable relation with a rim 81 formed at the outer disposed end of the sleeve 82 mounted for sliding movement on the shaft 36. Sleeve 82 is provided with a second rim element 83 normally engaged by the arm D of an angle lever 74X pivotally mounted on worm gear 73 diametrically opposite the angle lever 74, while the arm D2 of angle lever 74X extends through an opening in the worm gear 73 in engageable relation with a stop arm 85 secured to the cup-shaped member 46 housing the motor spring 47. The stop arm 85 is formed with a cam portion C2, the function of which is to actuate the angle lever 74X for moving the sleeve 82 in the position shown in Fig. 3 and thereby pivoting the yoke 75X for operating the shunting contact 80 prior to the engagement of arm 85 with the arm D2 of angle lever 74X, such stop determining the adjusted normal position of angle lever 74 relative to arm 50 carried by the ratchet wheel 40 and the registry position of arm Y of angle lever 74 with any one of the pins 41, as the case may be, such registry positions being shown in Fig. 11.

The speed ratio between gear 57 on shaft 36 and miter gear 67 on shaft 68 is such as to rotate the latter shaft and thereby the cam 78 keyed thereon once for each pin 41 under control of a speed governor in the form of a vane wheel VW, while the number of teeth in worm gear 73 corresponds to the number of pins 41 or is equal to one hundred and twenty turns of cam 78. The worm gear 73 as shown in Figs. 3 and 12 is provided with a cam 90 serving to return the operated pins 41 to normal non-operated positions following their engagement by arm Y of angle lever 74 operated, as above described, by the movement of yoke 75 and the retractile spring SP. The number of pins 41 was chosen for use of the transmitter in a seven digit telephone exchange system, plus a number of pins corresponding to the necessary length of resetting cam 90 but the number of pins used may be changed for the setting of any number of digit desired, ahead of the controlled operation of the pulsing mechanism.

In a typical operation of the call transmitter device of this invention the gearing mechanism is prevented from operating under the normal tension of motor spring 47 due to the engagement of arm D2 of angle lever 74X with the stop arm 85 carried by the cup-shaped member 46 mounted on the ratchet wheel 40 while the angle lever 74X, the sleeve 82 and the yoke 75X are held in normal operated position by the cam C2 engaging the arm D2 of the angle lever 74X. In that position the pulsing cam 72 is set as to hold the yoke 75 in position so as to permit the closure of pulsing spring 53 while the angle lever 74 is held by its retractile spring SP in position wherein the ring portion R at the end of arm Y2 of this angle lever abuts against the forked arm Y4 of yoke 75 as shown in Figs. 2 and 3.

The normal or starting position of ratchet wheel 40 from any angular position as determined by the retaining pawl 56 is such as to locate the arm 50 pivoted thereon in position as shown in Figure 11 wherein the successive operation of this arm by arm 51 will collectively move sets of five pins 41 into operated position as shown for example by the groups of pins U, U1, U2 and U3 in Figs. 8 and 11 in response to the successive operation of keys K1, K5 and K10 as will be hereinafter described in detail, while the normal position of worm gear 73 and the angle lever 74 carried thereby relative to arm 50 pivoted on ratchet wheel 40 as determined by the engagement of the arm D2 of angle lever 74X with arm 85 is such as to locate the arm Y of angle lever 74 in registry with the first pin of each group of pins 41 to be moved by the arm 50 in engageable relation with the arm Y of this angle lever.

Considering the direction of movement of arm 50 indicated by the arrow in Fig. 11 as imparted by the rotation of ratchet wheel 40 and the consequent rotation of the worm gear 73 relative to the successive group U, U1, U2 and U3 of pins 41, the operation of any one of the key members as, for example, digit key member K1 from normal position to the position shown in Fig. 7 a distance limited by the stop plate 31 is effective to impart an angular movement to the bars 37—37A through the engagement of pawl P1

with the bar 37 corresponding to six teeth of ratchet wheel 40 to cause the operation of this ratchet wheel upon the return movement of bar 37 to normal unoperated position under the tension of retractile springs RS connecting with the arms A2 of this bar following the release of key K1 by the operator. The pivotal movement of bars 37—37A as effected by the operation of key K1, the pin 55 carried by bar 37A, Figs. 2, 3, 5, 6A and 8, is effective to engage the inclined surface of arm 51 for imparting a pivotal movement to this arm and thereby to arm 50 against the tension of their retractile springs T and T1 for moving a set of pins 41 as U, Fig. 11, from normal to operated position when the movement of key K1, as above described, is arrested by the common stop plate 31. The release of key K1 by the operator and the consequent return movement of this key to normal position under the tension of its retractile spring 21 permit the return movement of bars 37—37A to normal non-operated position under the tension of retractile springs RS, thus causing the rotation of ratchet wheel 40 through its engagement by the pawl 49 an angular distance corresponding to six of its ratchet teeth and therefore corresponding to six pins 41 while moving the arm 50 from the position U shown in full line in Fig. 11 to the position U1 shown in dotted line in that figure and tensioning the motor spring 47 through the tension of retractile springs RS, the return movement of bars 37—37A being limited by the stop pins A9 engaging the arms A2 of these bars. The rotation of ratchet wheel 40 as effected by the pawl 49 carried by bar 37A is effective to cause the disengagement of angle lever 74X from the cam C2 thus permitting the movement of sleeve 82 and that of yoke 75X under the tension of the retractile spring SG1 for closing the shunting contact 80.

The engagement of pawl 56 with ratchet wheel 40 to this advanced position prevents any return movement of this wheel under the tension of spiral spring 47, thus causing the rotation of shaft 36 and gear 57 keyed thereon for rotating the pinion and gear unit 58—59, pinion and gear unit 60—61, pinion 62 meshing with gear 61, shaft 63, and miter gears 66 and 67, the latter being keyed to the shaft 68 for rotating the cam 78 and the worm gear 72. The rotation of cam 78, however, is rendered ineffective relative to the yoke 75 and therefore ineffective relative to pulsing contact 53 due to the engagement of arm Y4 of this yoke with arm Y2 of angle lever 74 and the engagement of arm Y with the successive five pins 41 of group U, while the passing of arm Y of angle lever 74 in registry with the sixth pin 45 unoperated will permit the movement of this angle lever as effected by yoke 75 having its arm Y4 in operative relation with the cam 78. The movement of yoke 75 under the tension of its retractile spring SG causes the operation of pulsing contact 53 once for the group of pins U which is followed by the reengagement of arm D2 of angle lever 74X with the cam C2 of stop arm 85, for operating the angle lever 74X so as to impart a movement to the sleeve 82 on shaft 36 to cause a pivotal movement of the yoke 75X and thereby opening the shunting contact 80 at the end of this digit transmitting operation, the arm 50 carried by ratchet wheel 40 and the arm Y of angle lever 74 being now in the position indicated in dotted lines at U1 in Fig. 11.

The operation of digit key K5, the second digit of the example above referred to, from normal to the position shown in Fig. 9 against the common stop plate 31 is effective to impart an angular movement to the bars 37—37A for actuating the arm 51 due to the engagement of pin 55 carried by bar 37A and thereby actuating the arm 50 for moving the pins in group U1 in the operated position during the downward movement of bars 37—37A an angular distance corresponding to ten teeth of ratchet wheel 40. The release of the operated key K5 by the operator permits the return of bars 37—37A to normal position under the tension of retractile springs RS for rotating the ratchet wheel 40 and thereby moving the arm 50 from position U1 to position U2 while tensioning the motor spring 47 by the tension of retractile springs RS, themselves tensioned by the downward movement of the operated key K5, the ratchet wheel 40 being held, as above described, against any return movement by the spring-pressed pawl 56 mounted on rod 38, thus causing the operation of shaft 36 and thereby that of pulsing cam 78 and worm gear 73.

The operation of ratchet wheel 40 as effected by retractile springs RS acting on the bars 37—37A moves the stop arm 85 in advance to the operation of worm gear 73 for releasing the angle lever 74X and thereby permitting the movement of sleeve 82 on shaft 36 as effected by the retractile spring SG1 of yoke 75X the movement of which closes shunting contact 80. The rotation of cam 78, however, during the follow-up movement of worm gear 73 relative to the ratchet wheel 40 is rendered ineffective relative to pulsing contact 53 due to the engagement of arm Y2 of angle lever 74 with the forked arm Y4 of yoke 75, angle lever 74 being itself prevented from operating in response to the movement of cam 78 and retractile spring SP due to the arm Y of angle lever 74 successively engaging the operated pins 41 of group U1. However, upon the passing of arm Y of angle lever 74 in registry with the non-operated pins of group U1 the arm Y of this angle lever permits the yoke 75 to follow the operation of cam 78 for operating the pulsing contact 53 a number of times corresponding to the number of unoperated pins 41 in the group U1, that is, five pins when the movement of worm gear 73 relative to ratchet wheel 40 is arrested by the stop arm 85 engaged by the arm D2 of angle lever 74X following the operation of this angle lever by the cam C2 of the stop arm to move the sleeve 82 on shaft 36 and thereby imparting a pivotal movement to yoke 75X to cause its arm Y7 to operate the shunting contact 80, as above described, in connection with the operation of the transmitter in response to the operation of key K1.

In the group of pins as U and U1, the pins moved in operated position by the operation of arm 50, provides the so-called interdigit spaces between the sets of pulses representing the digits of the operated keys so as to control the automatic switches at the telephone exchange in a manner to differentiate between digits transmitted whenever the key members K1, K2, K3, etc. are operated at a greater speed than that of the digit transmitting mechanism. For example, supposing that the key K10 is operated for transmitting ten pulses prior to the completion of the pulsing mechanism in the transmitting of the five pulses of group U2 above described. The operation of key K10 from normal to operated position against the stop plate 31 as shown in Fig. 10 is effective to impart an angular movement

to the bars 37—37A corresponding to fifteen teeth of ratchet wheel 40 while actuating the arm 50, as above described, for moving five pins in the group of pins U2 in the operated position. The return movement of bars 37—37A through pawl 49 carried thereby is effective to rotate the ratchet wheel for positioning the arm 50 in registry with the group U3 of pins 41 and positioning the stop arm 85 further angularly away from the arm D2 of angle lever 74X, while further tensioning the motor spring 45 without interfering with the pulsing cam 78 now operating for the transmitting of the five pulses in response to the operation of key K5 previously operated. Under this condition the arm D2 of angle lever 74X does not come into engagement with stop arm 85 at the conclusion of the five pulses transmitted so that the sleeve 82, the yoke 75X and the shunting contact 80 are not operated, the opening of such contact occurring only upon the engagement of arm D2 of angle lever 74X with stop arm 85 at the end of its pulsing operation in the transmitting of a digit or a plurality of digits according to the speed at which the digit keys K1, K2, K3, etc. are operated, the operated pins in the groups U, U1, U2, U3, etc. being returned to normal unoperated positions by the cam 90 disposed a small angular distance from the arm Y of angle lever 74, as shown in Fig. 12.

What is claimed is:

1. In a call transmitter, a rotatable shaft, a ratchet wheel mounted for free rotation on said shaft, a pair of integrally formed bars extending transverse of the movement of said ratchet wheel and movable concentric to said shaft, a set of longitudinally movable key members arranged in rows parallel to said bars, means carried by each of said key members at points thereon for moving said bar from normal to positions corresponding to the digit values of said key members, a pawl carried by the other of said bars for actuating said ratchet wheel upon the return movement of said bars to normal, spring means for effecting such return movement, a motor spring tensioned by the movement of said ratchet wheel for actuating said shaft, a pulsing mechanism, means operatively connecting said shaft to said pulsing mechanism, means actuated by the conjoint variable operation of said bars and said ratchet wheel for controlling the operation of said pulsing mechanism, a shunting contact, means carried by said ratchet wheel cooperating with means actuated by an element of said operatively connecting means for actuating said shunting contact at the conclusion of each operation of said pulsing mechanism.

2. In a call transmitter, a plurality of key members, a ratchet wheel, a pivoted bar, means carried by said key members for actuating said bar, means carried by said bar for actuating said ratchet wheel, a support, a plurality of movable pins arranged in a row in said support, an arm carried by said ratchet wheel for movement adjacent and coaxial to said pins in said row, means actuated by the pivotal movement of said bar to cause the operation of said arm for moving a predetermined number of said pins in operated position, a motor spring tensioned by the operation of said ratchet wheel following the operation of said bar by said key members, a pulsing cam, a gearing mechanism actuated by said motor spring for actuating said cam, means reciprocated by the movement of said cam and successively engaging said operated pins for controlling the operation of said contact, and means actuated by an element of said gear mechanism for returning said operated pins to normal following the operation of the means reciprocated by said pulsing cam.

3. In a call transmitter, upright supports, a shaft and a bar mounted on said supports for movement concentric relative to each other, longitudinally movable digit key members, means carried by each of said key members for operatively engaging said bar, a ratchet wheel mounted for free rotation on said shaft, a motor spring operatively connecting said wheel to said shaft for rotating the latter in a follow-up movement upon the operation of any one of said key members, a ring-shaped support, a plurality of operable elements arranged in a circular row in said support, a pivoted arm carried by said ratchet wheel having a ring portion concentric to said shaft, a pivoted arm having a cam ring concentric to said shaft for engaging the arm carried by said ratchet wheel in any angular position of the latter for setting a group of said movable pins in operated position in response to the operation of each of said key members, a pulsing contact, a gearing mechanism actuated by the rotation of said shaft under the tension of said motor spring, a cam actuated by said gearing mechanism, and a lever mechanism actuated by the operation of said cam and controlled by the pins set by the operation of said pivoted arm for negativing a corresponding number of operations of said cam to cause the operation of said contact according to the digit of said key members.

4. In a call transmitter, a plurality of movable pins disposed in a circular row, a pivoted bar, a set of key members having means for actuating said bar, a system of levers and a ratchet wheel operated by said bar for successively setting groups of pins in said row in operated position, a shaft for supporting said ratchet wheel, a motor spring tensioned by the operation of said wheel for rotating said shaft, a gearing mechanism actuated by the operation of said shaft, a cam actuated by said gear mechanism, a pulsing contact, a shunting contact, an angle lever pivoted on one of the elements of said gear mechanism having one arm disposed in engageable relation with said operated pins and the other arm having a ring portion concentric to said shaft, a support, a yoke member pivoted on said support having one arm engaging said cam and the other arm the ring portion of said angle lever, means carried by said arm for engaging said pulsing contact, another yoke pivoted on said support having one arm engaging said shunting contact, a longitudinally movable sleeve mounted on said shaft having a collar portion engaged by the other arm of the last-mentioned yoke member, and means carried by said gear element and said ratchet wheel to cause the movement of said sleeve for operating the last-mentioned yoke member to cause the operation of said shunting contact following the operation of said pulsing contact by the movement of said cam in response to the successive operation of said key members.

5. In a call transmitter, a base, a pair of upright supports secured to said base, a shaft journaled in said supports, a bar having arms pivoted on said supports for movement concentric to said shaft, a set of longitudinally movable key members having means for moving said bar in one direction upon the operation of any one of said key members, a retractile spring tensioned by the movement of said bar in said direction, a

ratchet wheel mounted for free movement on said shaft, a pawl for rotating said ratchet wheel upon the movement of said bar in another direction under the tension of said retractile spring, a motor spring for rotating said shaft following the operation of said ratchet wheel as effected by the movement of said bar in the last-mentioned direction, a gear train actuated by the movement of said shaft, a cam, and a worm gear actuated by said gear train, a pulsing mechanism actuated by said cam, a plurality of movable elements mounted in a circular row concentric to said shaft, means carried by said ratchet wheel operated by the movement of said bar during its movement in the first-mentioned direction for setting a predetermined number of said pins in operated position, means carried by said worm gear actuated by the movement of said cam and engaging the pins set by the operation of the means carried by said ratchet wheel to render a number of operations of said cam ineffective relative to said pulsing mechanism.

6. In a call transmitter, a pulsing mechanism, a plurality of longitudinally movable digit key members, a common stop element for limiting the movement of said key members to a similar distance, a ratchet mechanism, means pivoted at different points on said key members for actuating the driving element of said ratchet mechanism to cause the operation of said driven element angular distances corresponding to the digit values of said key members, a motor spring tensioned by the operation of said driven element, a circular row of pins, a member carried by the driven element of said ratchet mechanism movable concentric to and in position adjacent the pins in said row, means carried by said driving element for operating the member carried by said driven element for moving a number of said pins in position effective for controlling the operation of said pulsing mechanism according to the operation of each of said key members.

7. In a call transmitter, a base, a pair of upright supports secured to said base, a set of longitudinally movable digit numbered key members, a mounting secured to said supports having elements for guiding said key members in their movement from normal to equidistant operated position, retractile springs for said keys, a bar pivoted to said supports, means pivoted at different points on said key members for variably actuating said bar upon the successive operation of said key members, spring means tensioned by the operation of said bar, and a pulsing mechanism actuated by the tension of said spring means and controlled by means operated by the variable movement of said bar.

HAROLD W. GOFF.