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SIGNAL TRANSMITTER

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Fig. 1.

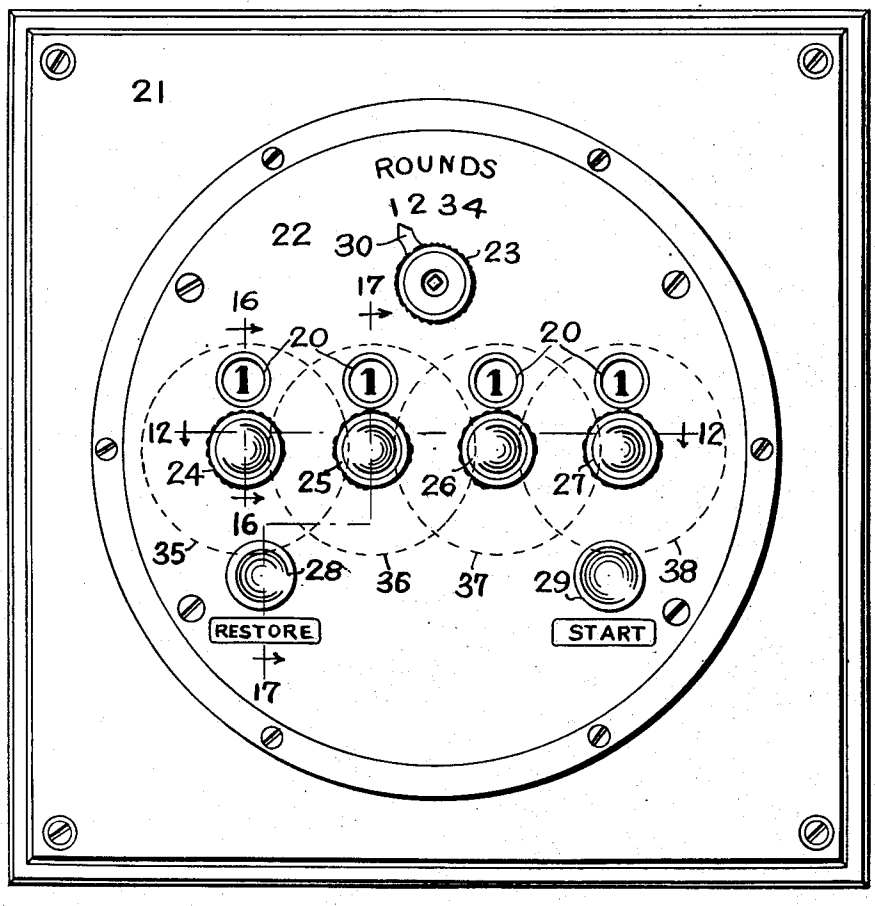
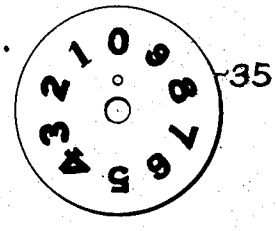


Fig. 2.



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SIGNAL TRANSMITTER

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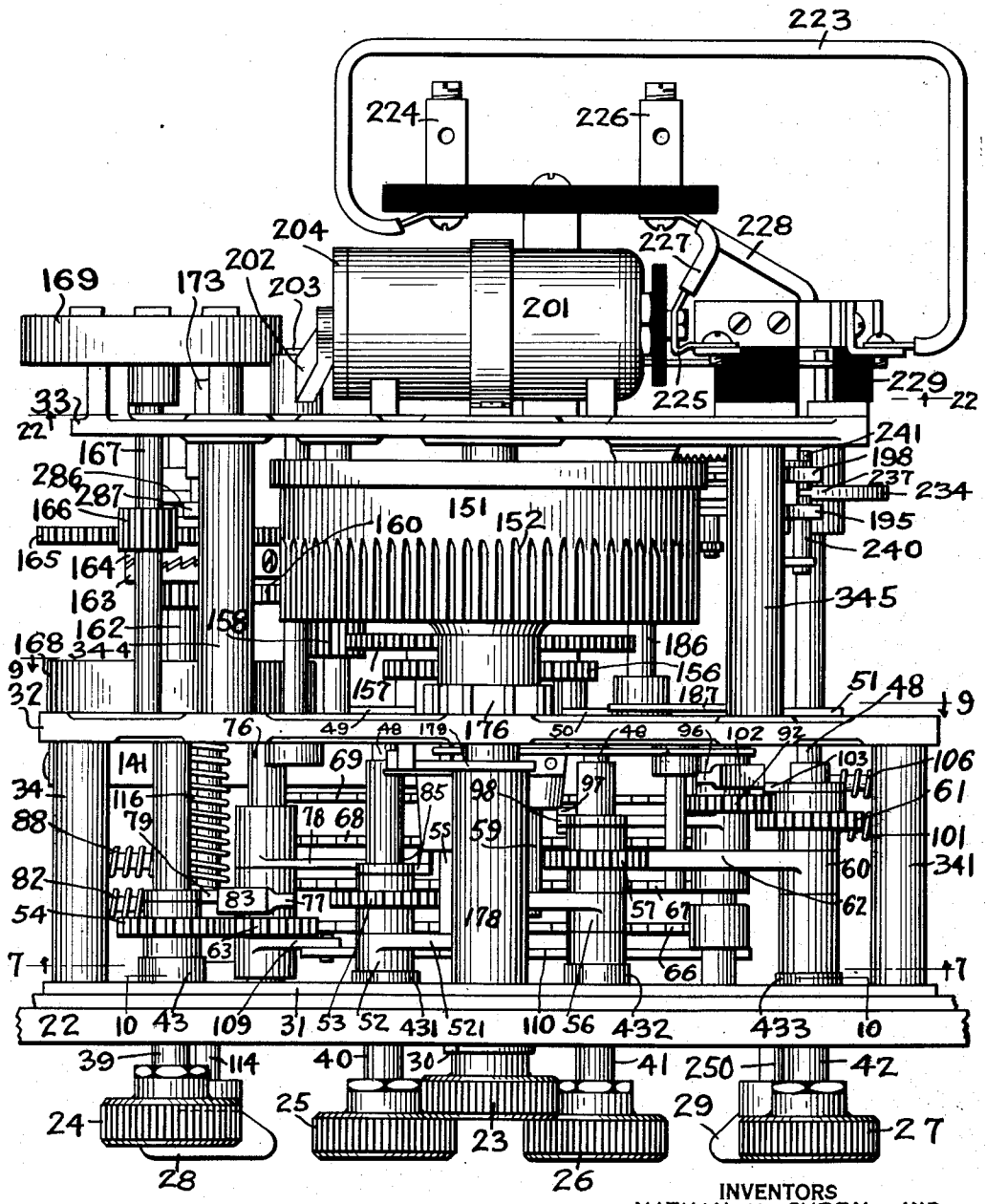
Fig. 3.



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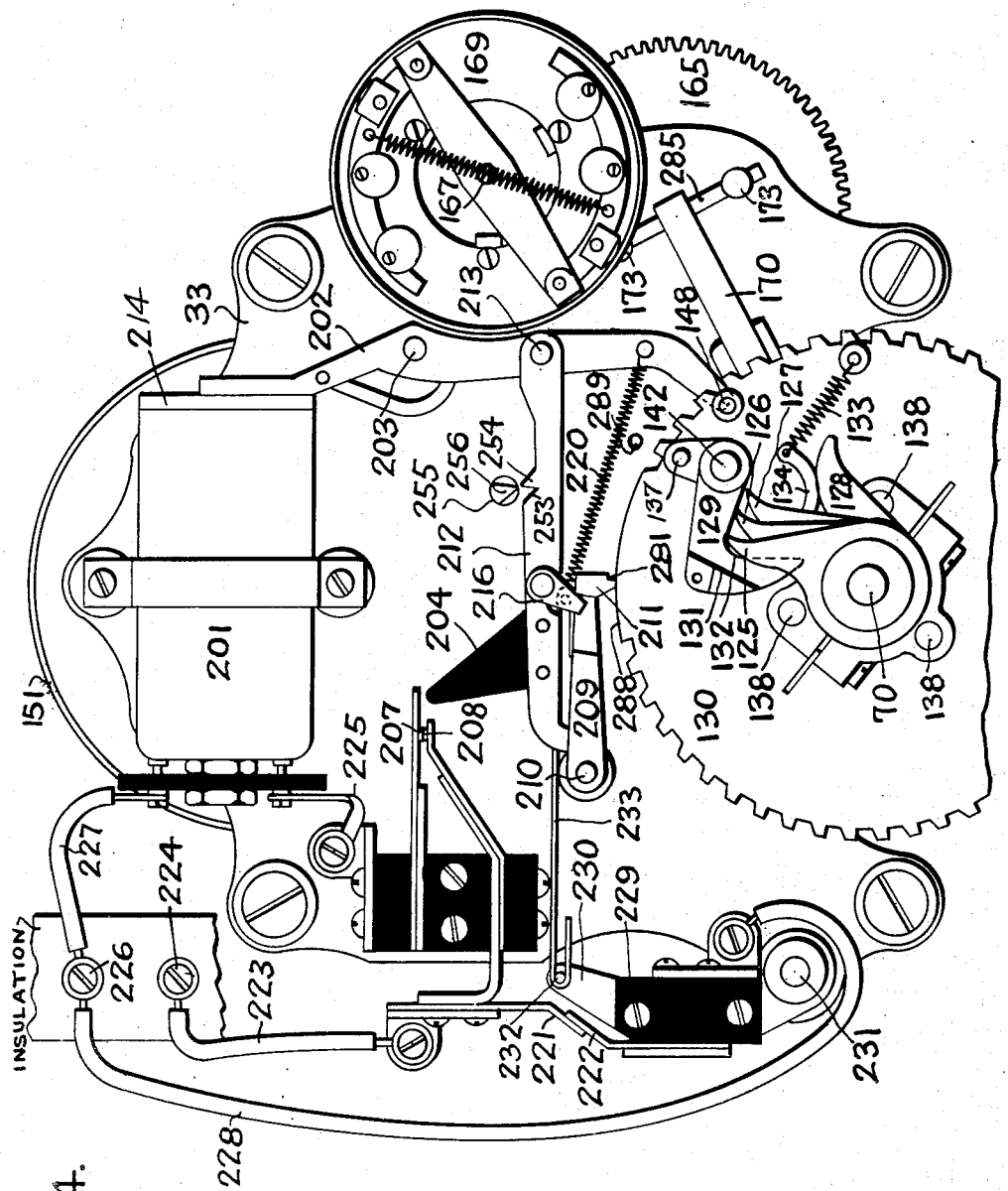

Fig. 4.

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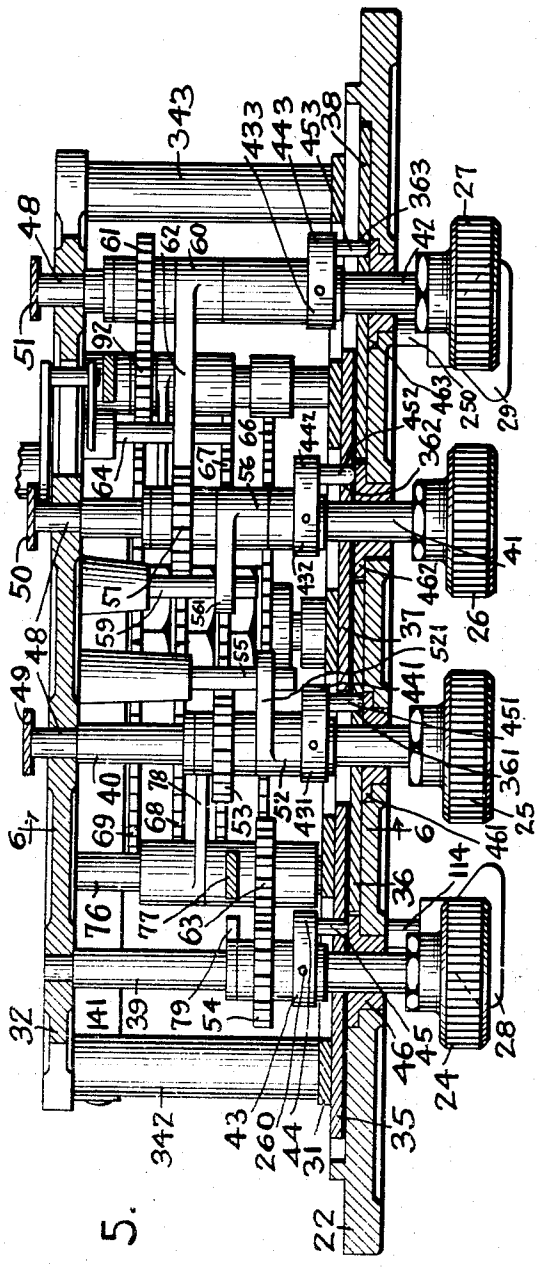

Fig. 5.

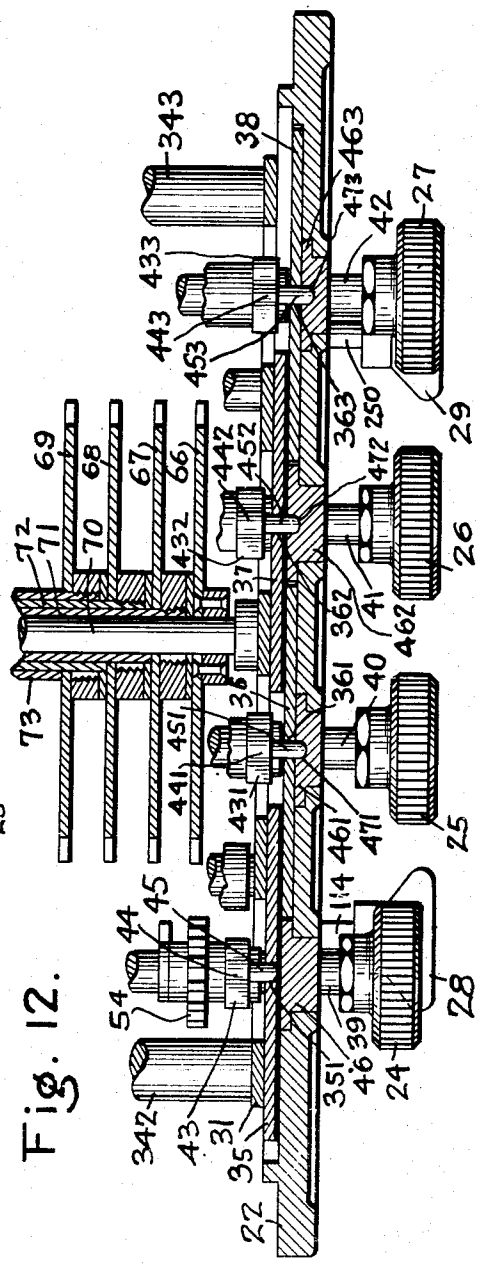

Fig. 12.

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Fig. 6.

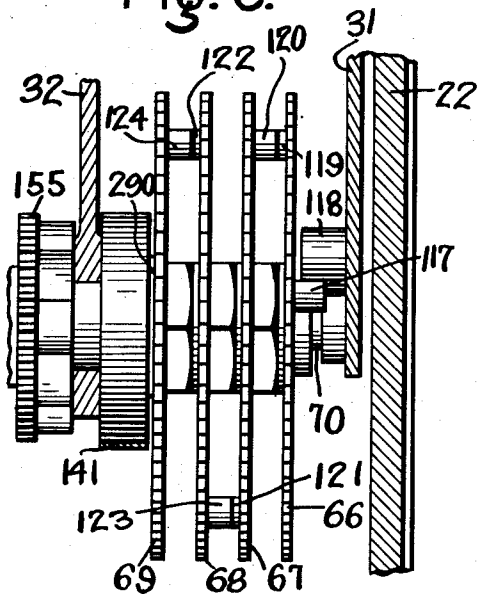

Fig. 16.

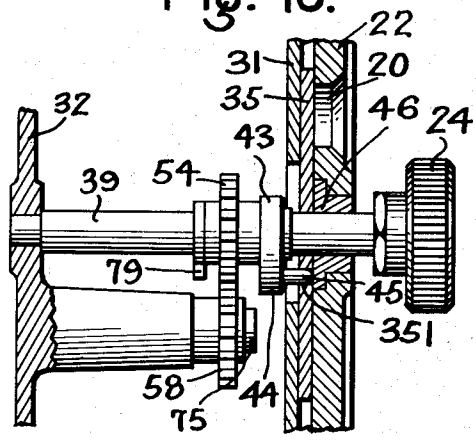

Fig. 13.

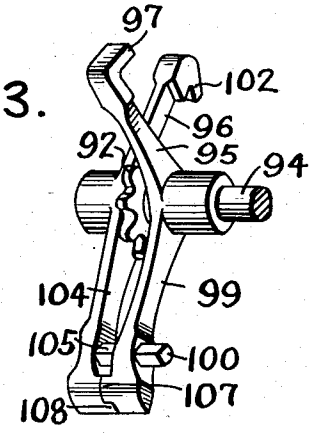

Fig. 17.

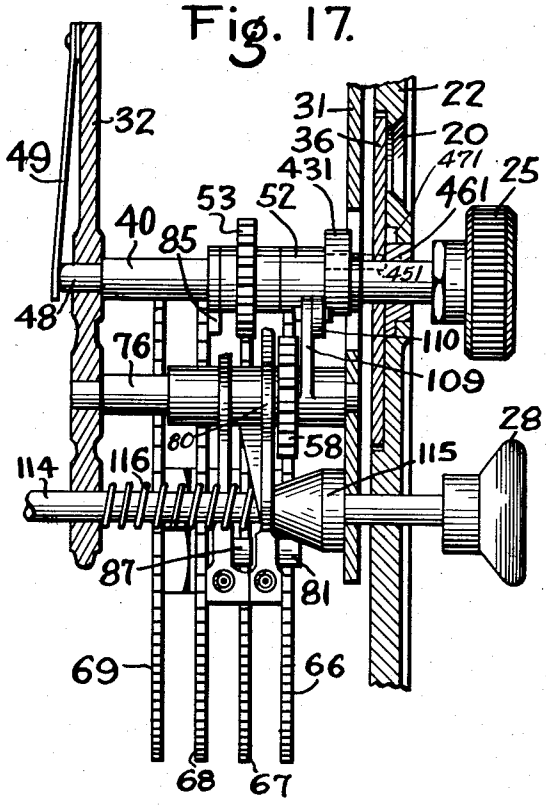

Fig. 14.

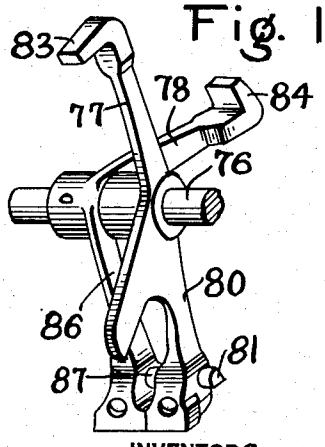

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Fig. 7.

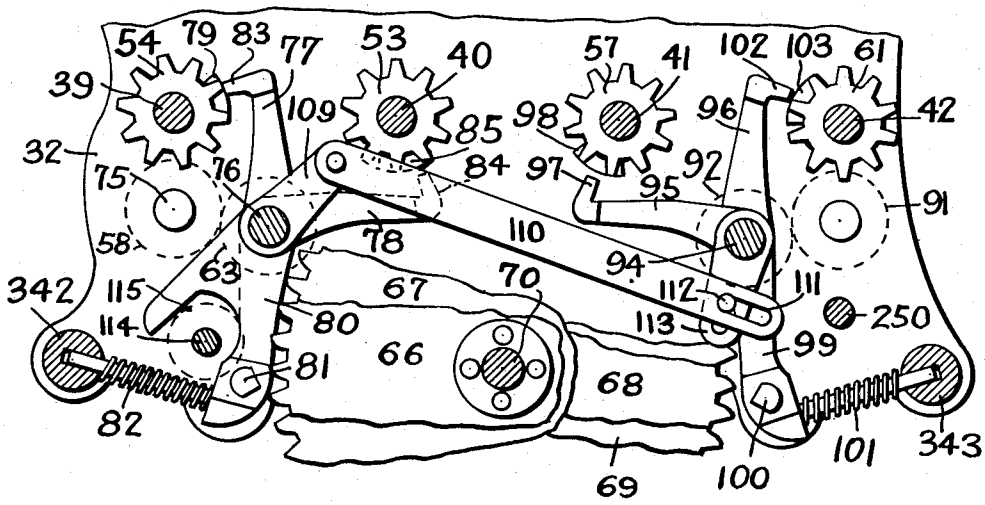

Fig. 8.

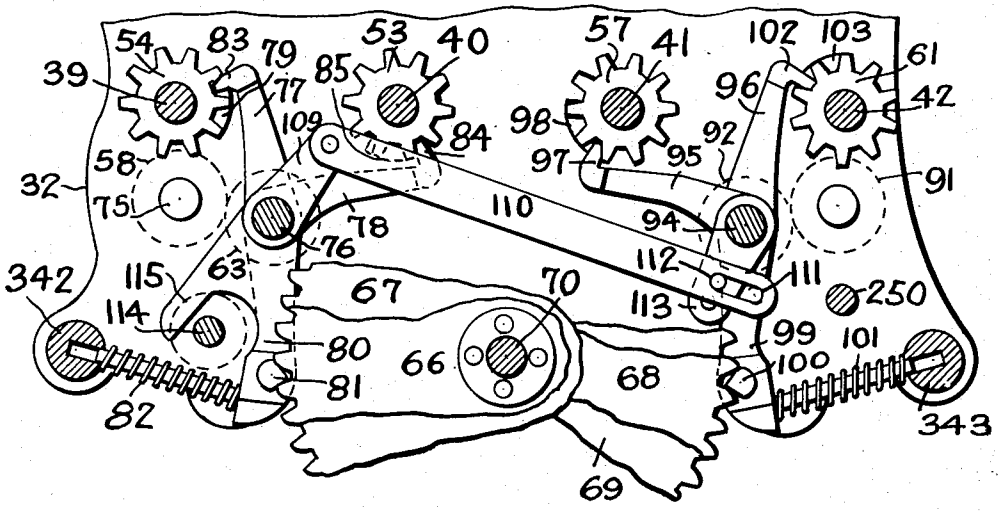

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Fig. 9.

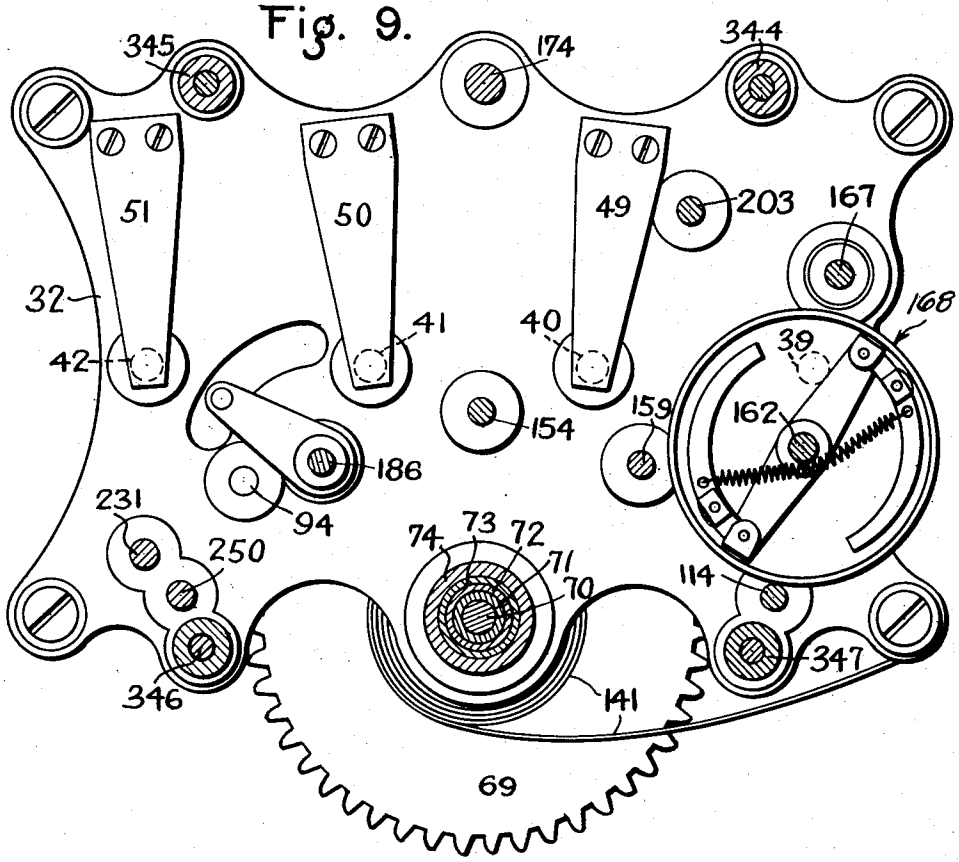

Fig. 10.

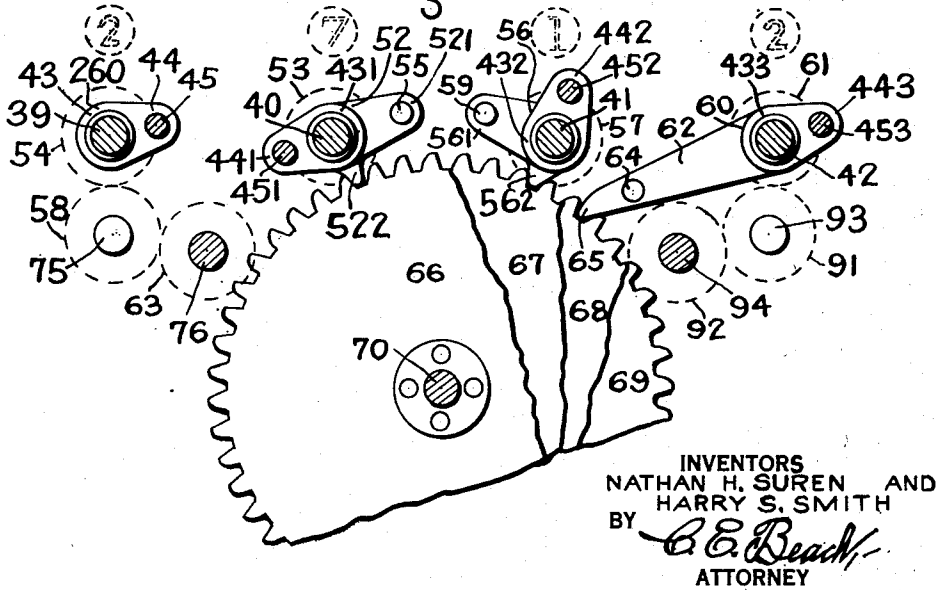

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Fig. 11.

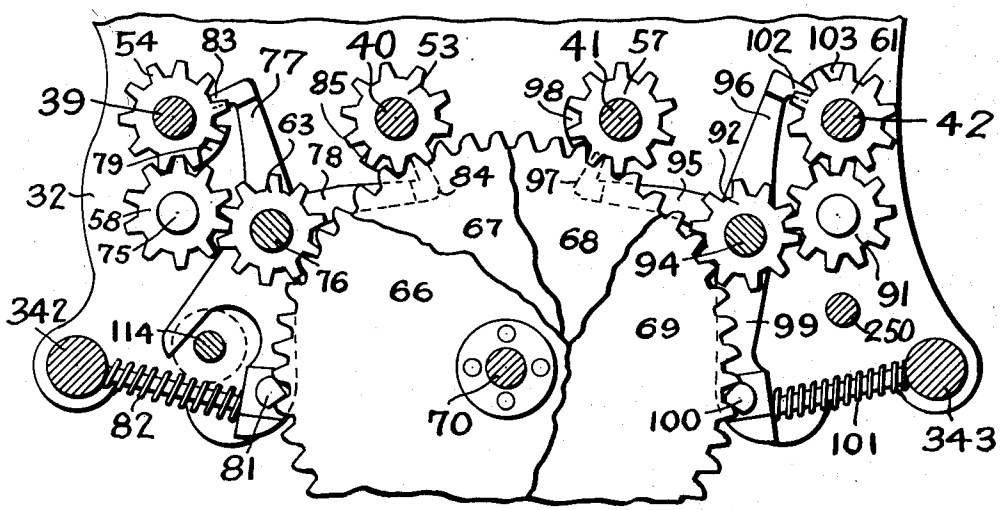

Fig. 15.

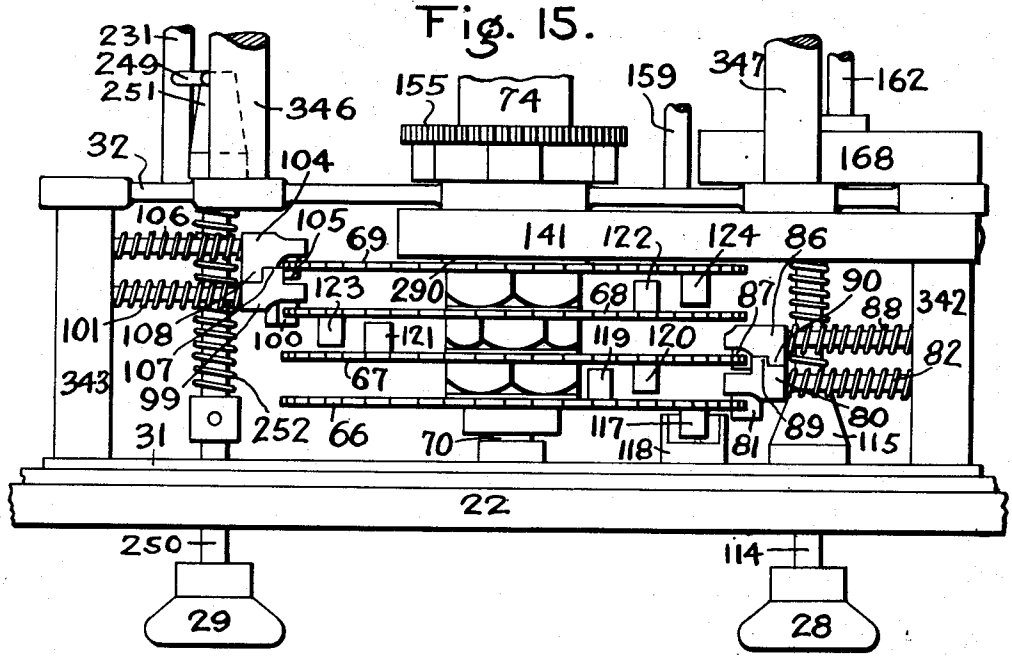

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Fig. 18.

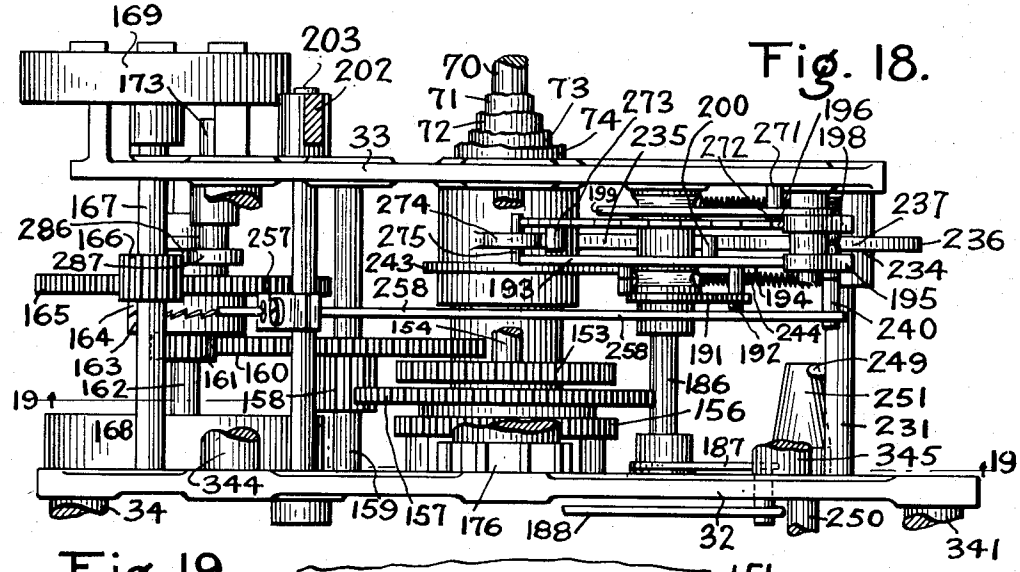

Fig. 19.

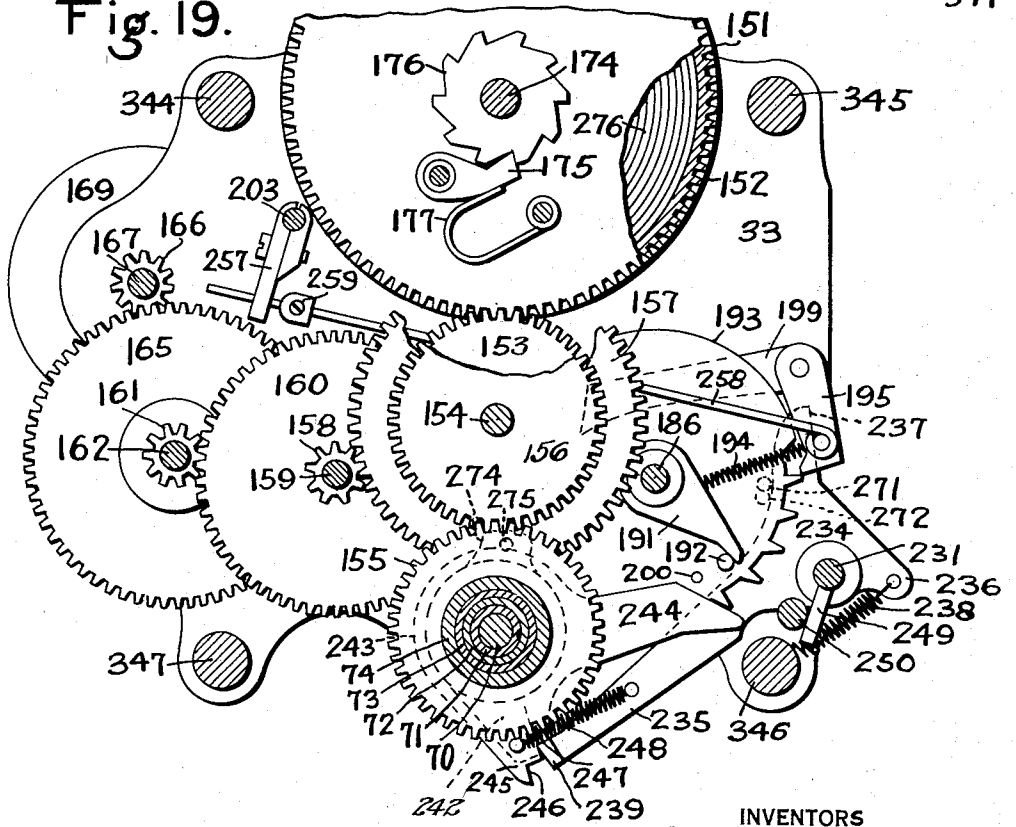

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Fig. 20.

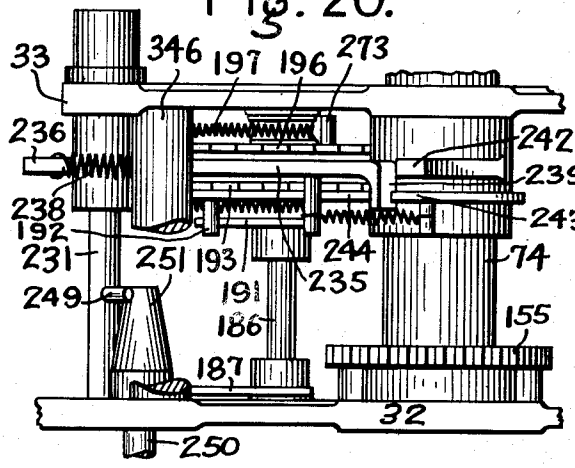

Fig. 21.

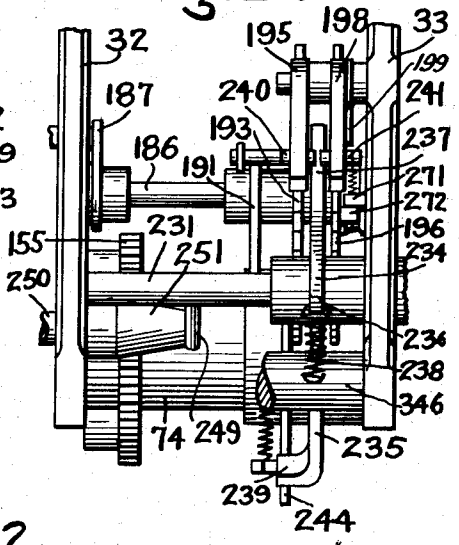

Fig. 22.

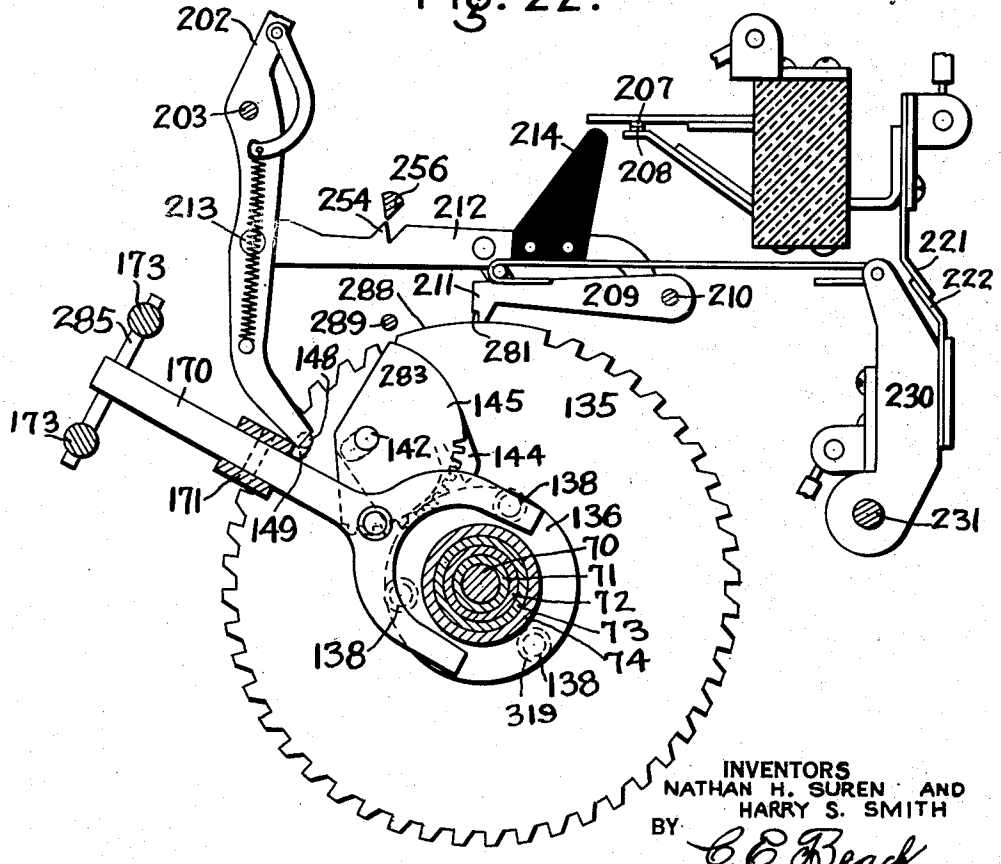

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Fig. 23.

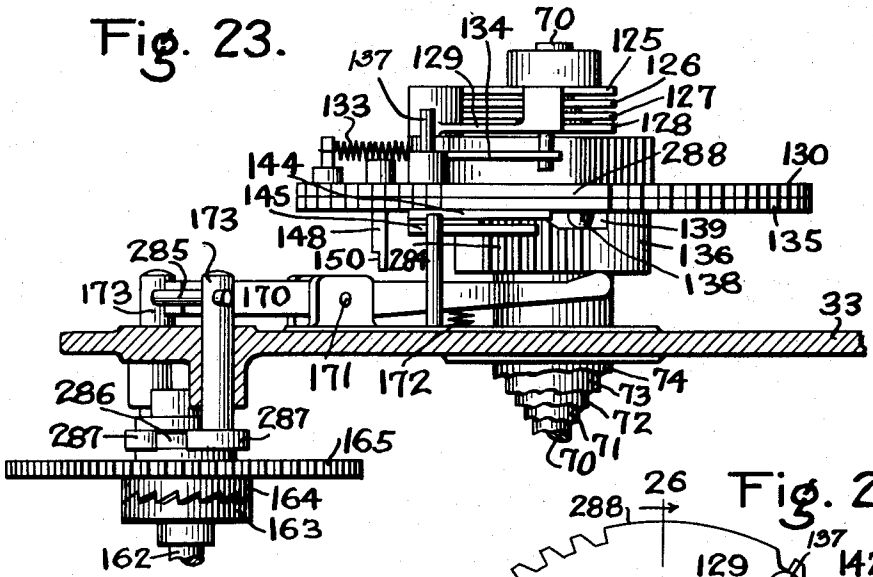

Fig. 24.

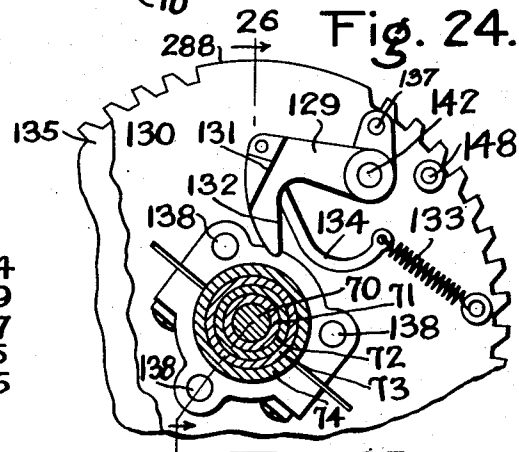

Fig. 26.

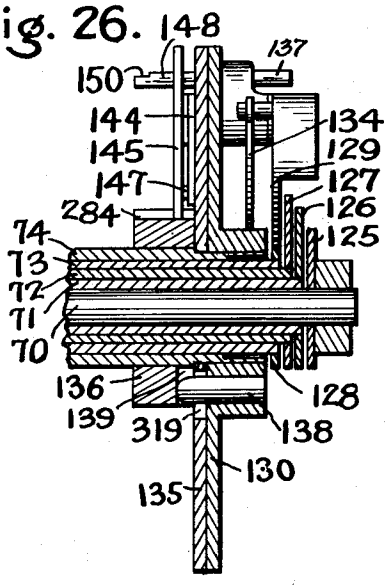

Fig. 25.

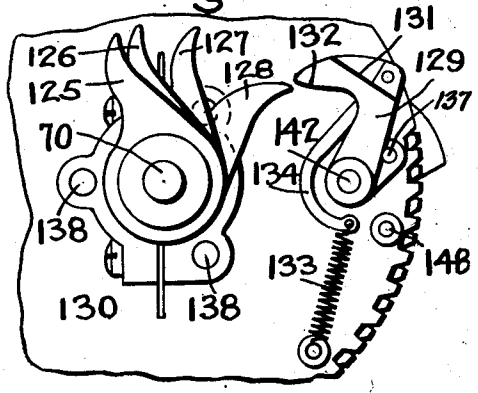

Fig. 32.

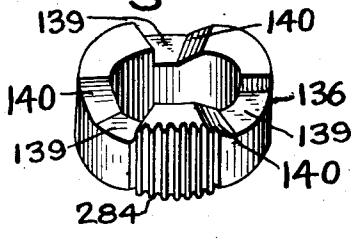

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Fig. 27.

0000 POSITION OF DIGITS

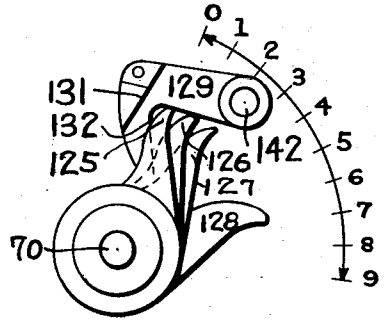


Fig. 28.

9000 POSITION OF DIGITS

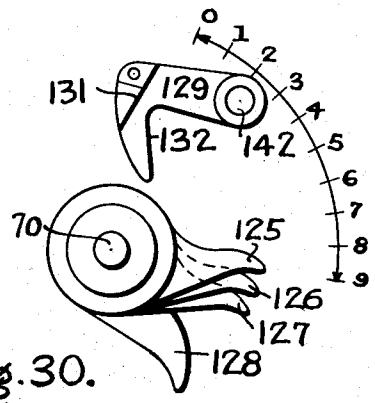


Fig. 29.

9900 POSITION OF DIGITS

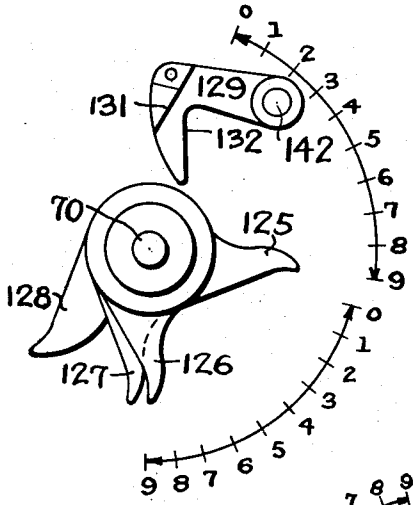


Fig. 30.

9990 POSITION OF DIGITS

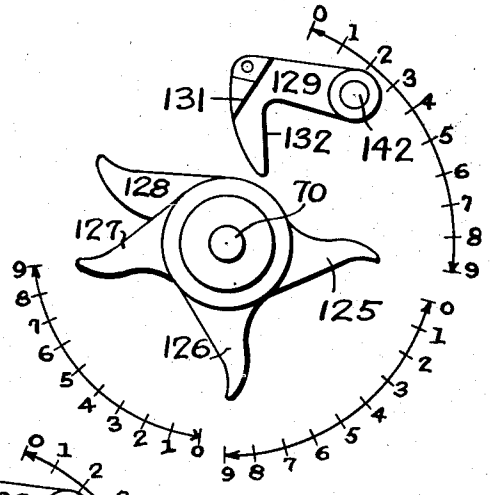
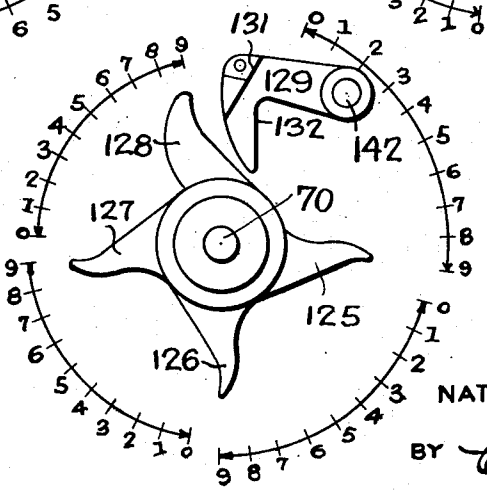


Fig. 31.



9999 POSITION OF DIGITS

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Fig. 35.

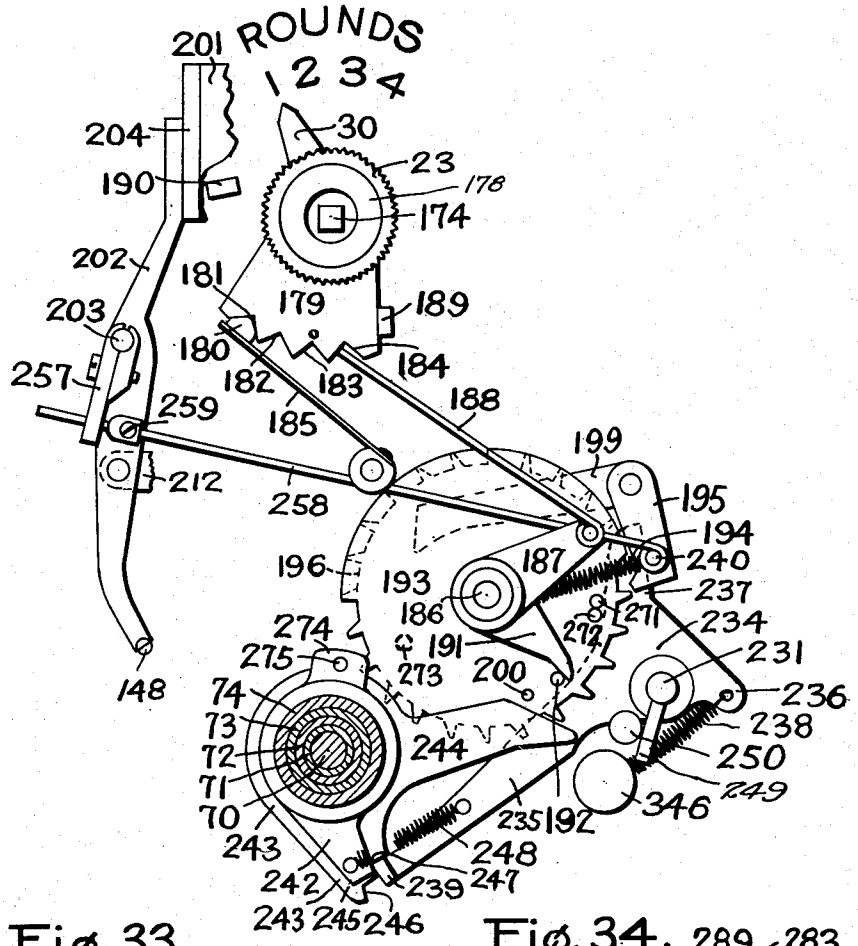

Fig. 33.

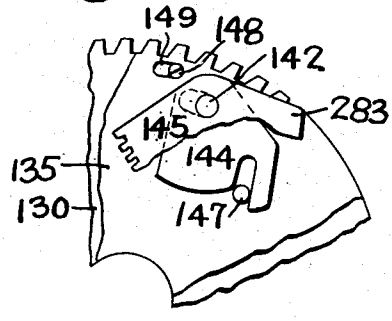

Fig. 34.

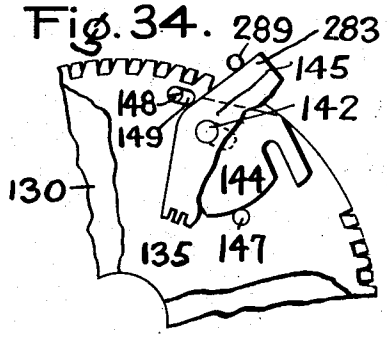

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Fig. 36.

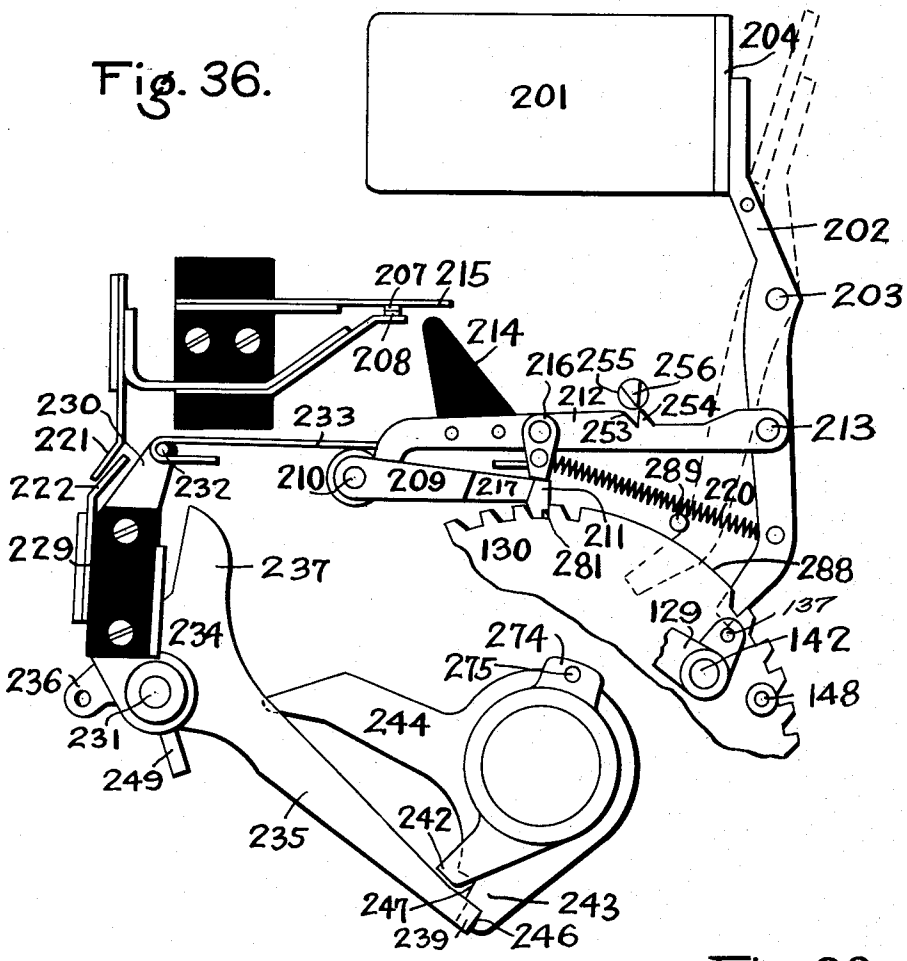


Fig. 37.

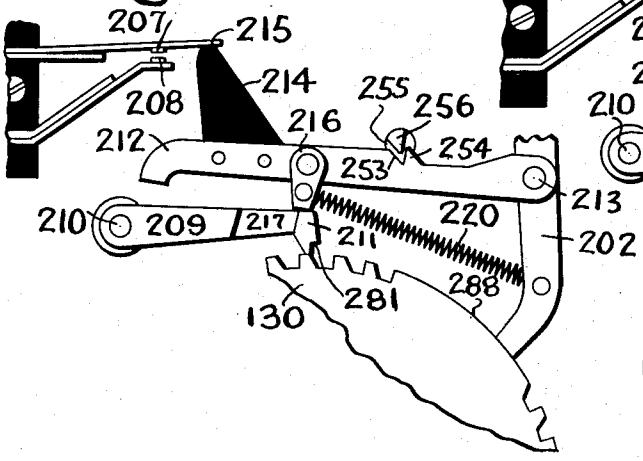
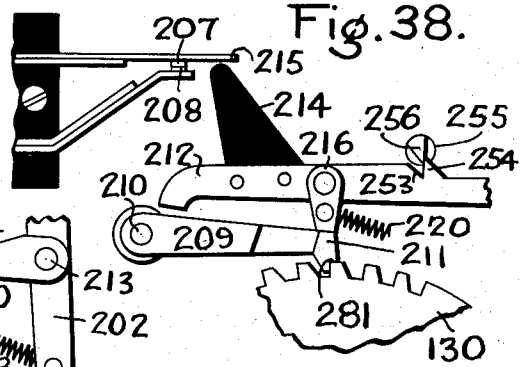


Fig. 38.



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Patented Jan. 1, 1935 1,986,026

UNITED STATES PATENT OFFICE

1,986,026

SIGNAL TRANSMITTER

Nathan H. Suren and Harry S. Smith, Needham, Mass., assignors to The Gamewell Company, Newton Upper Falls, Mass., a corporation of Massachusetts

Application January 24, 1931, Serial No. 511,339

16 Claims. (Cl. 177—380)

This invention relates to signal transmitters, and more particularly to variable signal initiating station transmitters involving manually operable members for varying the characteristics of signals, both as to their component parts, and as to cycles of operation or repetition of the signals formulated thereby.

An object of the invention is to provide an improved variable signal transmitter, in which is incorporated functions corresponding to the so-called "non-interference" functions of the most highly-developed types of fire alarm boxes.

Another object of the invention is to provide an improved signal transmitter of the above type, in which is incorporated functions corresponding to the so-called "succession" functions of such fire alarm boxes.

The term "non-interference" is intended to designate that characteristic of mechanisms associated with either initiating stations or repeaters whereby such a station or repeater will not act to break a circuit controlled thereby as a result of an attempt made at a time when some other signal is in course of transmission over such circuit, and whereby should several such stations (or a repeater and one or more stations) break a circuit simultaneously, all except one will relinquish control of such circuit before an improper break occurs; and whereby any station or repeater having found a circuit busy, or having relinquished it in favor of another which started simultaneously therewith, will refrain from breaking such circuit until it is fully relinquished by any or all previously controlling stations (or repeater).

The term "succession" is intended to designate that characteristic of mechanism of initiating stations whereby any station having relinquished its circuit in favor of another station (or repeater) will automatically act to renew its attempt to transmit its signal only after the conclusion of such previously controlling signal.

From the foregoing it will be apparent that signal transmitters of types falling within the scope of the present invention are adapted for use in circuits including other signal initiating mechanisms; however, certain features of this invention are also suited for independent use in signal transmitters employed under service conditions not requiring the succession function, as well as under conditions not requiring either the succession or the non-interference functions, as when connected in circuits which do not include other signal initiating stations.

According to the present invention a manually controlled apparatus is provided which is particularly adaptable to fire alarm systems where speedy conditioning for accurately formulating predetermined groups of signaling impulses, is required. The impulse actuations set up in the mechanism furnish a series of beats or impulses over an electric circuit, the characteristics of which are such that the impulses may readily be picked up and carried to a signaling finality in gongs or other suitable signal devices characteristically found in fire apparatus houses and other sub-stations. The character of signal transmission is such that the interval occurring between groups of impulses within a signal are greater than those between the impulses of a group, and those preceding each repetition of a signal are greater than those within any signal.

More specifically the invention contemplates an improved signal transmitter of a type wherein the signal impulses are sent out, through the agency of transmitting circuits, by a contact actuating mechanism in the form of two toothed signaling wheels, which are rotated by suitable mechanism, for the accurate timing of the required circuit changes.

The invention also contemplates suitable mechanism which provides for positive registered interpretation, mechanical actuation and electrical propagation of a series of signals, the mechanism having embodied therein a sub-mechanism capable of dial registration of the code signal to be transmitted, a releasing means for the same, and means for starting and automatically terminating the functioning of the apparatus when the predetermined number of rounds have been transmitted.

Another object of the invention is to provide an improved signal transmitter of the character mentioned which is simple in construction, and reliable and exact in function under all conditions of service.

The invention also comprises certain new and useful improvements in the construction, arrangement, and combination of the several parts of which it is composed, as will be hereinafter more fully described and claimed.

For the purpose of enabling this invention to be more readily understood, an embodiment thereof is hereinafter described, and is shown in the annexed drawings, in which:

Figure 1 is a front elevation of a signal transmitter embodying the invention;

Fig. 2 is a detail view of one of the digit plates;

Fig. 3 is a plan of the transmitter mechanism

with certain parts omitted, the remaining parts being shown in non-set positions;

Fig. 4 is a rear elevation of the structure shown in Fig. 3;

Fig. 5 is a view partially in section, of a portion of the structure of Fig. 3, showing the parts as positioned when set for a signal;

Fig. 6 is a vertical section taken on the line 6—6 of Fig. 5;

Fig. 7 is a vertical fragmentary section taken on the line 7—7 of Fig. 3 showing a portion of the digit setting mechanism, the parts being shown in non-set positions;

Fig. 8 is a view similar to Fig. 7, showing the parts positioned as when all of the digit plates are set at "1" position;

Fig. 9 is a vertical transverse section taken on the line 9—9 of Fig. 3, looking toward the rear of the intermediate frame plate;

Fig. 10 is a vertical transverse section taken on the line 10—10 of Fig. 3, with certain parts omitted;

Fig. 11 is a vertical section showing the manner of driving the index wheels associated with the digit plates;

Fig. 12 is an irregular horizontal section taken approximately on the line 12—12 of Fig. 1;

Fig. 13 is a detail perspective of the latch levers on one side of the index wheels;

Fig. 14 is a similar view of the latch levers on the opposite side of the index wheels;

Fig. 15 is an inverted plan of a portion of the indexing mechanism and the locking mechanism therefor;

Fig. 16 is a vertical section taken on the line 16—16 of Fig. 1 showing the parts as when positioned for the digit "5";

Fig. 17 is an irregular vertical section taken approximately along the line 17—17 of Fig. 1, showing the parts as when positioned for the digit "2";

Fig. 18 is a plan of a portion of the driving mechanism and the parts associated therewith;

Fig. 19 is a vertical section taken on the line 19—19 of Fig. 18;

Fig. 20 is a fragmentary inverted plan showing a portion of the starting mechanism;

Fig. 21 is a side elevation of a portion of the machine, showing particularly the starting and stopping mechanism;

Fig. 22 is a fragmentary vertical section taken along the line 22—22 of Fig. 3;

Fig. 23 is a detail plan of the structure shown in Fig. 22;

Fig. 24 is a detail rear elevation of the round pause hastening mechanism and associated parts;

Fig. 25 is a fragmentary view of a portion of the structure shown in Fig. 24, the parts being shown in the position in which the teeth of the discs are staggered;

Fig. 26 is a section taken on the line 26—26 of Fig. 24;

Figs. 27 to 31, inclusive, are diagrammatic views illustrating the relative positions of the index fingers of the impulse formulating mechanism when the digit plates are set in several positions;

Fig. 32 is a detail perspective of the thrust collar;

Figs. 33 and 34 are detail views of other portions of the round pause hastening mechanism;

Fig. 35 is a diagrammatic view of the round pause controlling mechanism; and

Figs. 36, 37 and 38 are diagrammatic views of the circuit controlling means.

Referring to the embodiment of this invention illustratively indicated in the accompanying drawings, the signal transmitter shown may be enclosed in a suitable casing which is generally indicated in Fig. 1, in which the front panel 21 has detachably secured thereto an annular disc 22. This disc constitutes a face plate or dial having associated therewith a plurality of knobs 23, 24, 25, 26, 27, 28 and 29, by means of which the device may be operated and controlled.

The knob 23, (see Figs. 1 and 3) controls the round setting mechanism, the knobs 24, 25, 26 and 27 control the several digit plates and their associated mechanism, the knob 28 controls the restoring mechanism, and the knob 29 controls the starting mechanism. Above the knob 23, the face of the dial 22 is provided with the numerals 1, 2, 3 and 4, which designate the "rounds". Operable by the knob 23, is a pointer 30, which indicates the number of rounds for which the transmitter is set. The knobs 23, 24, 25, 26 and 27 are rotatable, while the knobs 28 and 29 are manually movable toward the dial 22.

The knobs 24, 25, 26 and 27 are arranged in a horizontal row. Above each of these knobs there are openings 20 in the dial, through which numerals on the digit plates may be viewed.

Fastened to the rear face of the dial 22 is a skeleton frame composed of a plurality of spaced frame plates 31, 32 and 33, which are secured together by means of spacer bars 34, 341, 342, 343, 344, 345, 346 and 347.

Interposed between the dial 22 and the front frame plate 31, are digit plates 35, 36, 37 and 38, (see Figs. 10, 12 and 17) in the form of annular discs of relatively thin sheet metal, provided circumferentially with numerals from "0" to "9", inclusive, as shown in Fig. 2.

The digit plates are respectively mounted on shafts 39, 40, 41 and 42. The shafts extend through the dial 22 and the knobs 24, 25, 26 and 27 are respectively mounted on the outer ends of said shafts.

The digit plate 35 turns with the shaft 39; a collar 43 being fixed upon said shaft, as by means of a pin 260. Projecting from the collar 43, is an arm or crank 44 which carries a pin 45, said pin being made rigid with the arm and being disposed substantially parallel to the shaft 39.

The shaft 39 passes through a bushing 46 which is mounted in the dial 22. The digit plate 35 is provided with an opening 351, for receiving the projecting end of the pin 45.

The shafts 40, 41 and 42 pass through the bushings 461, 462 and 463, respectively, which are mounted in the dial 22 in the manner shown in Figs. 5 and 12.

The shafts 40, 41 and 42 have correspondingly associated therewith the collars 431, 432 and 433, the arms or cranks 441, 442 and 443, and the pins 451, 452 and 453, respectively; which pins pass through openings 361, 362 and 363 formed in the digit plates 36, 37 and 38.

The bushings 461, 462 and 463 have formed therein the openings 471, 472 and 473 for the reception of the ends of the pins 451, 452 and 453, respectively. These openings are so located that when the ends of the pins 451, 452 and 453 are disposed in said openings the digit plates 36, 37 and 38 will be respectively positioned so that the numeral "0" therein will register with the dial openings 20 associated with the respective digit plates.

When the pins 451, 452 and 453 are in the openings 471, 472 and 473, respectively, the parts

moving with the knobs 25, 26 and 27 will be yieldingly locked against rotation so that, through the action of the rounded ends of these pins, the knobs may be rotated with slight force so as to carry the pins out of the openings, whereupon said pins will bear against the smooth surface of the bushings associated therewith.

The ends of the shafts 40, 41 and 42 are reduced slightly in diameter, as indicated at 48 in Figs. 5 and 17. These reduced ends are mounted in openings formed in the intermediate frame plate 32, and the length of such reduced portions is such that when the digit plate pins are in their respectively associated openings in the dial, the shoulders between the reduced end portions 48 and the main body portions of said shafts will be situated a suitable distance from the face of the frame plate 32; so that the knobs and their shafts are movable inwardly of the machine for a distance sufficient to withdraw the digit plate pins from their dial bushing openings, and for other purposes to be hereinafter more fully described.

Leaf springs 49, 50 and 51 bear against the projecting ends of the shafts 40, 41 and 42, respectively; urging such movement of said shafts as will tend to cause the rounded ends of the pins 451, 452 and 453 to bear against the surfaces of the bushings 461, 462 and 463, and to enter the openings 471, 472 and 473, respectively, when the restoring mechanism is operated, as hereinafter more fully explained.

A sleeve 52 is mounted on the shaft 40 between the collar 431 and a gear 53, (see Figs. 3 and 10). The sleeve 52 is provided with a laterally projecting arm 521 having an opening therein, through which projects a rod 55 carried by the frame plate 32.

A sleeve 56 is likewise mounted on the shaft 41 between the collar 432 and a gear 57. The sleeve 56 is provided with a laterally projecting arm 561 having an opening therein, through which projects a rod 59 carried by the frame plate 32.

Also, as shown in Figs. 3 and 10, the shaft 42 is provided with a sleeve 60, which is mounted on said shaft between the collar 433 and a gear 61. The sleeve 60 is provided with a laterally projecting arm 62 having an opening therein near the end thereof, through which opening there extends a rod 64 carried by the frame plate 32.

Depending from the lower sides of the sleeves 52 and 56 and from the arm 62, are downwardly extending lugs or tips 522, 562 and 65, respectively, the purposes of which will be hereinafter more fully described.

Associated with the knobs 24, 25, 26 and 27 are relatively large annular gears or toothed wheels 66, 67, 68 and 69. The toothed wheel 66 is fixed to a shaft 70 and surrounding said shaft, are tubular sleeves 71, 72 and 73, to which the toothed wheels 67, 68 and 69 are respectively fixed. Also surrounding the tubular sleeve 73 for a portion of its length, is another tubular sleeve 74 which is provided with a gear 155. The gear 155 is adapted to be driven from a spring motor as hereinafter more fully described.

The toothed wheel 66 is operable from the shaft 39, through gears 54, 58 and 63. Said gear 58 is mounted on a shaft 75 carried by the frame plate 32, and said gear 63 is mounted on a shaft 76 and meshes with the toothed wheel 66. Latch levers 77 and 78 are also mounted on the shaft 76.

As shown in Figs. 3, 5 and 11, the gear 54 is at all times in operative relationship with the toothed wheel 66, so that it will act to impart the rotary movement of the shaft 39 to said wheel through the gears 58 and 63. The gears 53, 57 and 61 are movable with their supporting shafts into and out of operative relationships with the toothed wheels 67, 68 and 69, respectively; the gears 53 and 57 being movable into and out of direct meshing relationship with the toothed wheels 67 and 68, respectively, and the gear 61 being correspondingly associated with the gear 91, to act through said gear and the gear 92 for imparting the rotary movement of the shaft 42 to said toothed wheel 69.

When the digit plates are in their "0" positions, the shafts 40, 41 and 42 are so positioned that the gears 53, 57 and 61 are not in meshing relationship with the toothed wheels 67 and 68 and the gear 91, respectively; thus permitting the toothed wheels 67, 68 and 69 to rotate independently of the shafts 40, 41 and 42.

The lug 522 is so positioned with relation to the toothed wheel 66 that when the shaft 40 is moved to a position which carries the gear 53 into meshing relationship with the toothed wheel 67, said lug will be carried into the path of the teeth of said wheel 66 and thereby lock said wheel.

The lug 562 and the tip 65 are correspondingly positioned with relation to the toothed wheels 67 and 68, respectively, so that when the position of the shaft 41 is such as to bring the gear 57 into mesh with the wheel 68, said lug 562 will hold the wheel 67 against rotation, and when the position of the shaft 42 is such as to bring the gear 61 into meshing relationship with the gear 91, said tip 65 will hold the wheel 68 against rotation.

Means are thus provided for successively locking the number setting knobs, so that, as they are operated in sequence from left to right, actuation of each knob effects locking of all previously set knobs, for the purpose of preventing accidental displacement thereof.

Referring to Figs. 7, 8, 11, 13, 14, 15 and 17, the latch lever 77 is loosely mounted on the shaft 76, and one arm of said lever is provided with a laterally projecting nose 83. The other arm 80 of said latch lever is forked, and one of the limbs thereof is provided with a transversely disposed wedge-shaped pin 81 for cooperation with the teeth of the wheel 66. The lever arm 80 is urged toward the periphery of the toothed wheel 66 by an expansible coil spring 82, which acts against the lower end of said arm 80.

A lug 79 is associated with the gear 54 for cooperation with the nose 83 of the lever 77. Said lug is so positioned with relation to the digit plate 35 that when said plate is in its normal or "0" setting, said lug will act through said nose 83 to cause said lever to be so positioned that the pin 81 will be withdrawn from the path of the teeth of the wheel 66; and so that when said lug has been moved incidental to setting of the digit plate 35 to other than its "0" position, said lever will be permitted to move, responsive to its spring 82, and thereby carry said pin into the path of said teeth.

The projections 85, 98 and 103 are correspondingly associated with the gears 53, 57 and 61, respectively, for similar cooperation with the noses 84, 97 and 102 for acting through the levers 78, 95 and 96 to cause the pins 87, 100 and 105 to be correspondingly moved with relation to the teeth of the wheels 67, 68 and 69, respectively.

From the foregoing it will be apparent that the toothed wheels 66, 67, 68 and 69, constitute index wheels by means of which settings are effected for predetermining the numbers of sig-

naling impulses to be formulated in the respective groups. It will also be noted that through utilization of the wedge formation of the surfaces of the pins 81, 87, 100 and 105 in connection with specially formed teeth provided in the wheels 66, 67, 68 and 69, respectively, as shown, accurate positioning of these wheels, for their various settings, is more readily obtained.

As shown in Fig. 15, the lower ends of the lever arms 86 and 104 are provided with lateral projections 90 and 108 which extend into the paths of projections 89 and 107 which are formed at the lower ends of the lever arms 80 and 99 for at times adding the forces of the springs 88 and 106 to those of the springs 82 and 101, for causing the pins 81 and 100 to be maintained in the paths of the teeth of the wheels 66 and 68, respectively.

An arm 109 is fastened to the shaft 76, as best shown in Figs. 7 and 8, and projects upwardly therefrom. A link 110 has one end thereof pivotally connected to said arm and the other end of said link is slotted, as at 111, and engages a pin 112 which is carried by the end of an arm 113 fixed to the shaft 94 and extending downwardly therefrom.

The relation of the arms 109 and 113 and the link 110, to the latch levers 78 and 95, is such that when the noses of said latch levers are supported by the raised portions of the lugs 85 and 98, respectively, the pin 112 will be disposed at the inner end of the slot 111 (see Fig. 7); and so that, as shown in Fig. 8, when the noses of the latch levers are not so supported, the link 110 is retracted and permits the pin 112 to move toward the left so as to position pins 100 and 105 in cooperative relation with the teeth of the wheels 68 and 69, respectively, so that the knobs 25, 26 and 27 may be successively operated to set up a number, without thereby at any stage altering the setting of any previously set tooth wheels and their associated parts.

A stop 118 (see Figs. 6 and 15) projects rearwardly from the front frame plate 31 into the path of a pin 117 carried by the wheel 66.

A coiled spring 141 (see Figs. 5 and 9) is applied between the frame spacer bar 342 and a hub 290 carried by the toothed wheel 69, in such manner as to urge rotation of said wheel in a counter-clockwise direction as viewed in Figs. 7 and 8.

As viewed in Fig. 15, the wheel 69 also carries a pin 124 which is disposed in the path of a pin 122 carried by the wheel 68, and said wheel 68 carries a pin 123 which is disposed in the path of a pin 121 carried by wheel 67, and said wheel 67 also carries a pin 120 which is disposed in the path of a pin 119 carried by wheel 66, so that, unless otherwise held, said spring 141 will act through the wheels 69, 68 and 67, upon the wheel 66, through the pins carried by said wheels, to rotate said wheels in counter-clockwise direction to the position in which the pin 117 carried by wheel 66 is brought against the stop 118, thereby bringing said wheels to their respective normal positions, where the digit plates and other parts moving therewith are in their "0" positions, as indicated in Figs. 3, 6, 7 and 11.

Fixed to the inner or rear end of the shaft 70 is a curved finger 125 (see Figs. 4, 23, 25, 26 and 27 through 31). Curved fingers 126, 127 and 128, substantially similar to the finger 125, are fixed respectively to the inner or rear ends of the sleeves 71, 72 and 73. As shown in Figs. 23 and 26, the fingers are disposed in the path of an arm 129 carried by a toothed wheel 130 fixed to the sleeve 74.

Since the finger 125 is carried by the shaft 70, to which shaft the indexing or toothed wheel 66 is fixed, any movement imparted to said wheel will also be imparted to said finger. Therefore, when the toothed wheel 66 is rotated, the finger 125 will likewise be moved an angular distance corresponding to the movement of the wheel 66. Likewise, the fingers 126, 127 and 128 are responsive to any movements imparted to the indexing or toothed wheels 67, 68 and 69, respectively.

The arm 129 is fixed upon the rock-shaft 142, which shaft is journaled in the wheel 130, so that the arm 129 is carried around the fingers 125, 126, 127 and 128, incident to the rotation of said wheel.

The spring 133 is applied to the arm 129, through a link 134, in such manner as to urge movement of said arm from certain positions thereof toward the fingers 125, 126, 127 and 128; said link being so formed that, when said arm is moved more than a predetermined distance away from said fingers, the pull of said spring will tend to oppose movement of said arm in the direction of said fingers.

A surface 132 is so formed near the free end of the arm 129, with relation to the finger 128 that when, during the rotation of the wheel 130, such surface is brought into engagement with said finger, the movement thereby imparted to the arm 129 will be sufficient to carry it to a position such that the action of the spring 133 will tend to swing said arm toward a stop pin 137 carried by wheel 130 (see Fig. 25) and surface 131 is formed on said arm adjacent to said surface 132, in such relation to the fingers 125, 126 and 127 that, when said surface is brought into engagement with any one of said fingers incident to the rotation of the wheel 130, said arm will be swung a lesser distance, for a reason hereinafter more fully explained.

The teeth provided in the periphery of the wheel 130 are formed throughout a major portion thereof, but a portion 288 of such periphery is left blank (see Fig. 24).

A disc 135 has teeth formed in the periphery thereof corresponding to those of the wheel 130, so that when placed by the side of said wheel, said disc may be caused to assume such a position that its teeth, and the notches therebetween, will be matched in perfect alignment with those of said wheel; and may assume another position in which they will be so unmatched that the teeth of said disc will be in alignment with the spaces between the teeth of said wheel.

Said disc 135 is journaled upon the sleeve 74, adjacent the wheel 130, for rotation independently thereof.

A pin 148, fixed in the wheel 130, extends through a slotted opening 149 in the disc 135 and projects beyond said disc in the direction of the frame plate 33, terminating in a flattened portion 150 (Fig. 26), for a purpose which will be hereinafter more fully explained. Said opening 149 is so formed as to limit relative movement between said wheel 130 and said disc 135 to such that the teeth thereof may be matched in alignment as shown in Figs. 24 and 33, or unmatched in staggered relationship as shown in Figs. 25 and 34.

Shaft 142 extends through a slotted opening in disc 135 and has fixed thereon a cam plate

144 so formed with relation to a pin 147 carried by the disc 135 that when said shaft 142 is in the position which it occupies when the arm 129 has been moved by the spring 133 until the free end of the surface 132 thereof rests against the hub of the finger 128, said plate will act through said pin to so position said disc that the teeth thereof will be in matched alignment with those of the wheel 130, and so that when said arm 129 has been moved by engagement thereof with any of the fingers cooperating therewith, said disc will be moved to a position where the teeth thereof will be in unmatched or staggered relationship to the teeth of said wheel 130.

Driving mechanism is shown in Figs. 3, 18 and 19, comprising a spring motor having a drum 151 which is provided around its periphery with gear teeth 152. These teeth mesh with the teeth of a gear 153. The gear 153 is carried by a shaft 154 journaled in bearings in the frame plates 32 and 33. In addition to the gears 152 and 153; mechanism hereinafter referred to as "a slow speed train" includes the gear 155 fixed to the sleeve 74 and in mesh with a gear 156 on the shaft 154.

The mechanism hereinafter referred to as "a high speed train" is shown as comprising a gear 157 on the shaft 154 which is in mesh with a pinion 158 on a shaft 159. The shaft 159 also carries a gear 160 which is in mesh with a pinion 161 on a shaft 162, which shaft also has fixed thereon a governor device 168 for controlling the rotation thereof under what will be hereinafter referred to as "fast speed conditions".

Mounted on the shaft 162 is a clutch device comprising a toothed clutch member 163 fixed to said shaft and a cooperatively toothed clutch member 164 loose on said shaft.

Fixed to the loose clutch member 164 is a gear 165 which meshes with a pinion 166 on the shaft 167, which shaft also carries a governor device 169 for controlling the rotation of said shaft under what will be hereinafter referred to as "slow speed conditions".

For the purpose of effecting movement of the loose clutch member 164 into and out of engagement with the fixed clutch member 163, responsive to movement imparted to the arm 129 by engagement of the surface 132 therein with the finger 128, (see Figs. 22, 23, 25 and 26) intervening mechanism is provided as follows:

An arm 170 is pivotally secured to the rear side of the frame plate 33, as at 171, and the outer end of this arm is connected to the clutch member 164 by means of a pin 285, passing through an end of said arm and through openings provided in the ends of a pair of spaced rods 173 (see Fig. 23) which rods are slidably mounted in the frame plate 33. The heads 287, formed at the free ends of the rods 173, are disposed in a groove 286 formed in the boss of the loose clutch member 164.

A spring 172 is so applied to the arm 170 as to urge movement thereof to cause the loose clutch member 164 to be moved into engagement with the clutch member 163.

A thrust cam collar 136 (see also Fig. 32) is mounted upon the sleeve 74 for rotation and for axial movement independently thereof; this collar being situated between the disc 135 and the forked inner end of the arm 170 (see Figs. 22 and 23) so that movement of said collar away from the disc 135 will operate the arm 170 to compress the spring 172 and to cause withdrawal of the loose clutch member from engagement with the fixed clutch member 163.

For the purpose of moving the collar 136 away from the disc 135, as just described, three pins 138 are carried by the wheel 130, and extend through suitable openings 319 in the disc 135 and into the notches 139 provided in the collar 136. The openings 319 provided in the disc 135 for the pins 138 are of sufficient size as to permit required relative movement between said disc and the wheel 130, as heretofore more fully explained. The ends of these pins are rounded, as best shown in Fig. 23, so that rotation of the collar 136 relatively to the wheel 130 will bring the inclined surfaces 140 of the notches 139 in said collar against the rounded ends of said pins and thereby force said collar away from the disc 135.

For the purpose of rotating the collar 136, as just referred to, a portion of the periphery of said collar is toothed, as indicated at 284 (see Figs. 23 and 32) and a segmental gear 145, is fixed upon the shaft 142 in such position with relation to the arm 129 that, when said arm is in the position to which it is moved by engagement of the surface 132 thereof with the finger 128, said gear 145 will move the collar 136 to a position where the engagement of the inclined slot surfaces 140 with the ends of the pins 138 will force said collar away from the disc 135 to a position where it will act through the arm 170 and parts moving therewith to disengage the clutch member 164 from its co-engaging member 163.

A portion 283 of the segmental gear 145 is so formed that when said gear is positioned to cause disengagement of the clutch, as just described, said portion 283 will so extend beyond the periphery of the wheel 130 that the rotation of said gear will carry said portion 283 into engagement with a pin 289 (best shown in Fig. 34) carried by the frame plate 33 and projecting in the path of said portion 283; whereupon, the further rotation of the wheel 130 will cause the segmental gear 145 to move to a position which will cause the inclined surfaces 140 of the collar 136 to be moved out of the path of the pins 138, and will rotate the shaft 142 so that the spring 133 will be applied to the arm 129 below "dead center" and thereby enable said spring to urge movement of said arm in the direction of the fingers cooperating therewith.

A key break lever 209 is pivotally mounted at 210, on the frame plate 33, and is provided at its free end with a downwardly projecting tooth 211 for cooperation with the teeth of the wheel 130 and disc 135 (see Figs. 4 and 38). The tooth 211 has a step 281 formed therein so that as the wheel 130 and disc 135 are rotated, with their teeth in alignment, the downward movement of the lever 209 incident to the withdrawal of any wheel tooth from the path of its projecting tooth 211, (see Fig. 38) will first permit said arm to drop to a position where the step 281 rests upon the top of the tooth being withdrawn; and, when such wheel tooth is then withdrawn from the path of said step, a further downward movement of the arm 209 will be permitted. The reason for arresting the downward movement of the arm 209, through the action of the step 281, as just described, will be hereinafter more fully explained in connection with the non-interference mechanism. If, because of service conditions, non-interference mechanism will not be required, the step 281 may be omitted.

A pair of key break contacts 207 and 208 are associated with the key break lever 209, and the contact operating lever 212 is interposed between said key break lever 209 and the contacts 207 and

208, for at times effecting suitable actuation of said contacts responsive to operation of the key break lever 209.

As shown, the lever 212 is pivoted at 213, and carries an insulating projection 214 for actuation of the contacts 207 and 208. A dog 216 is so pivotally mounted on the lever 212 that, when said dog is in one position, the oscillations of the lever 209 incident to the cooperation thereof with the teeth of the wheel 130 and the disc 135 will be transmitted through said dog to the lever 212 and thus effect functional actuation of the contacts 207 and 208, and so that, when said dog is in another position, such oscillations of the lever 209 will not cause the lever 212 to be so elevated as to effect functional actuation of the contacts 207 and 208. A spring 220 is applied to the dog 216, urging movement thereof to the position where it will cause functional actuation of the contacts 207 and 208 responsive to the operation of the key break lever 209.

A controlling lever 202, pivoted at 203, carries an armature 204 at an end thereof, for cooperation with the electromagnet 201 (see Fig. 36). The pivotal support 213 for the lever 212 is also carried by the lever 202, and an end of said lever projects in the path of pin 148 carried by the wheel 130, so that said lever will be so swung as to carry the armature 204 into close proximity with the poles of the electromagnet 201 when the wheel 130 is in its normal position. The spring 220 which is applied to the dog 216, as hereinbefore described, is also connected to the lever 202 in such manner as to urge movement of said lever to withdraw the armature 204 from proximity to the magnet 201.

A pointed projection 254 is formed on the upper surface of the lever 212 for cooperation with the V-shaped end 256 of the pin 255 carried by the frame plate 33. The relationship of the cooperating pointed portions of the projection 254 and V-shaped end 256 are such that movement of the lever 202 to carry the armature 204 away from the magnet 201 will be permitted only when the lever 212 is below the position where it effects closure of the contacts 207 and 208, to a degree greater than permitted while the lever 209 is supported by engagement of the step 281 with the top of a tooth of wheel 130, as shown in Fig. 38.

For the purpose of controlling the starting and stopping of the transmitter thus far described, mechanism is provided as follows:

Referring to Fig. 1, the starting button 29 is mounted on the rod 250 (see Fig. 15) which carries a cone shaped tip 251, cooperating with a pin 249 fixed in the rock shaft 231, so that when said knob 29 is moved toward the dial plate 22, said cone shaped tip 251 will act through the pin 249 to rotate the shaft 231, and thereby effect withdrawal of main detent mechanism, which will be presently described. A spring 252 (Fig. 15) urges movement of the rod 250 in such direction as to carry the knob 29 away from the dial plate 22.

Fixed to said rock shaft 231 is a member 234 having a plurality of arms 235, 236 and 237 (see Fig. 35). Said arm 236 has applied thereto one end of a spring 238, the opposite end of which is secured to the spacer bar 346, for urging rotation of the member 234 in clockwise direction, as viewed in Fig. 35. The arm 235 extends inwardly and terminates in an offset portion 239, which is disposed beneath the sleeve 74 in the path of a finger 242 carried by said sleeve and a projection 243 moving with the arm 244 (see also Fig. 20) for a purpose which will be more fully explained.

For the purpose of conditioning the transmitter for causing the formulation of one or more repetitions of signals for which it is set, after the initial formulation thereof,—mechanism is provided as follows:

The rotary knob 23 is provided with a pointer 30 associated with numerals "1 2 3 4" formed in the dial 22, as shown in Figs. 1 and 35. Said knob is fixed upon a hollow shaft 178 (see also Fig. 3) upon which shaft the sector 179 is also fixed. The pawl 180, carried by the spring 185 cooperates with the notches 181, 182, 183 and 184 formed in the sector 179, for locating and retaining same in its various positions. The abutments 189 and 190 are situated in the path of the sector 179 for suitably limiting the movement thereof.

A link 188 connects the sector 179 with an arm 187 which is fixed on the shaft 186. The toothed wheels 193 and 196 are journaled upon said shaft 186 for rotation independently thereof, and the arm 191 is fixed upon said shaft 186, the free end of said arm being disposed in the path of a pin 192 carried by the wheel 193. A spring 194 is so applied to the wheel 193 as to urge movement thereof in counter-clockwise direction, as viewed in Fig. 35, and thereby maintain the pin 192 in engagement with the free end of the arm 191 so that, unless otherwise held, said wheel 193 will be moved, tooth for tooth, in accordance with movements imparted to the sector 179 through the actuation of the knob 23.

A pin 271 is secured in the frame 33, in the path of a pin 272 carried by wheel 196 (see Figs. 21 and 35), and a spring 197 is applied to said wheel 196 (see Fig. 20) in a manner corresponding to the application of spring 194 to the wheel 193 already described, so that said spring 197 tends to rotate said wheel 196 in counter-clockwise direction, as viewed in Figs. 21 and 35, and thereby tends to maintain said pin 272 in engagement with said pin 271.

A pin 273 is carried by the wheel 196, and a pin 200 carried by the wheel 193 is disposed in the path of said pin 273 so that, upon predetermined rotation of said wheel 196 against the tension of a spring 197, said pin 273 will be brought into engagement with said pin 200; whereupon, further rotation of the wheel 196 will cause corresponding rotation of the wheel 193, for a purpose to be hereinafter more fully explained.

An arm 274 rotates with the sleeve 74 and said arm carries, near the free end thereof, a pin 275 (see Figs. 20, 21 and 35) in such relation to the teeth of the wheels 193 and 196 that, during each revolution of said sleeve 74, said pin will engage the teeth of said wheels and cause rotation thereof in clockwise direction against the tension of the springs 194 and 197 applied thereto.

A retaining pawl 195 is provided for cooperation with the teeth of the wheel 193, the free end of said pawl being urged toward the path of said teeth by the spring 194, (see Figs. 21 and 35) and a retaining pawl 198 is arranged for corresponding cooperation with the teeth of the wheel 196, and is drawn toward said teeth by the spring 197.

The pins 240 and 241, carried by the retaining pawls 195 and 198, respectively, project into the path of the arm 237 of the member 234, in such relation thereto that when said member is in the position where the offset portion 239 thereof is in its normal position (as shown in Fig. 35)

said pawls will be withdrawn from the paths of the teeth of the wheels 193 and 196, respectively; and so that when said offset portion 239 is withdrawn from the path of the finger 242, said arm 237 will be so positioned as to permit said pawls to engage with the teeth of the wheels respectively associated therewith.

From the foregoing it will be apparent that when the shaft 231 is so rotated as to bring the portion 239 thereof in alignment with the notch 246 at the free end of the arm 245, the arm 237 will be so positioned as to permit the pawls 195 and 198 to act, as just described, for retaining the wheels 193 and 196 in the positions imparted thereto through engagement with the teeth thereof of the pin 275 carried by the arm 274 which rotates with the sleeve 74; so that, after predetermined rotation of said wheels, the pin 192 will be brought into engagement with the free end of the arm 244 and thereby withdraw the notch 246 from the path of the portion 239 and permit the spring 238 to swing the member 234 to a position where its portion 239 will lie in the path of the finger 242, and thus arrest the rotation of the sleeve 74 and members moving therewith; and, at the same time, the arm 237 will withdraw the pawls 195 and 198 from the paths of the teeth cooperating therewith and thus permit the wheels 193 and 196 to be restored to their respective normal positions.

In order that the mechanism will not become disarranged in the event that the starting knob 29 is held in starting position at a time when the mechanism should be brought to rest as just described, the arm 199, moving with the pawl 198 projects into the path of the pin 272, and is so formed with relation to the orbit of said pin as to prevent retention of any excessive movement which might be imparted to the wheel 196 by engagement of the pin 275 with the teeth thereof.

A link 258 connects the pawl 195 with the controlling lever 202 (see Fig. 35) in such manner that when said lever has moved to withdraw the armature 204 from proximity with the magnet 201, as hereinbefore described, the arm 257 moving with the lever 202 will act through said link to prevent the pawl 195 from assuming a position where it may engage the teeth of the wheel 193; so that, while said armature is in retracted position, actuations imparted to said wheel through engagement of the pin 275 with the teeth thereof will not be retained by said pawl.

A winding shaft 174 extends through the hollow shaft 178 and projects into the drum 151, which drum contains a driving spring 276, one end of which is connected to the drum and the other end of which is connected to said shaft. The outer end of said shaft, within the knob 23, is formed for proper cooperation with a suitable winding key (not shown) and said shaft has fixed thereon a ratchet wheel 176, the teeth of which cooperate with a locking dog 175 which is urged toward said teeth by a spring 177 (see Fig. 19).

In order to provide for rapid restoration of the setting knobs to their normal or "0" positions,—a knob 28 is mounted in front of the dial 22 (see Fig. 1), said knob being carried by a rod 114 (see Fig. 17), which rod has applied thereto a conical cam 115 and a spring 116 urging axial movement of said rod in the direction which will carry the knob 28 away from the dial 22. As best shown in Figs. 7 and 8, one side of the forked end of the arm 80 of the latch lever 77 cooperates with said cam 115, so that when said knob 28 is moved a suitable distance toward the dial 22, said cam 115 will act through said arm 80 to withdraw the pins 81, 87, 100 and 105 from the teeth of the wheels with which they respectively engage, thereby permitting the setting knobs and dials to return to their normal or "0" positions, one after another in the order of 27, 26, 25, 24.

In order to normally provide an electrical shunt or by-pass around the magnet 201 and the contacts 207 and 208, a pair of shunt contact springs 221 and 222 are provided, said spring 221 being permanently connected with the contact 208, and said spring 222 being carried by an insulating block 229 which is fixed upon the arm 230 moving with the shaft 231. Said spring 222 is connected through a flexible wire 228 with a terminal 226, to which terminal there is also connected a lead wire 227 from the magnet 201. The other lead wire 225 of said magnet 201 is connected to the contact 207 and a wire 223 connects the contact 208 with a terminal 224 so that, in order to connect the transmitter shown into a circuit to be controlled thereby, the wires from such circuit should be connected to the terminals 224 and 226.

The operation of the transmitter during the cycle of setting, starting and transmitting one digit one round is as follows:

Assuming that the digit plates are all occupying their normal or "zero" positions, and that the rounds setting knob 23 is positioned with its pointer 30 under the numeral one,—to set the mechanism for transmitting digit "nine", the left-hand knob 24 should be rotated clockwise (see Fig. 1) until the number nine on digit plate 35 is exposed through the left-hand opening 20 in the face plate or dial 22. When knob 24 is rotated, as just described, digit plate 35 is rotated by pin 45 in arm 43 carried by shaft 39, as best shown by Fig. 16.

Rotation of knob 24 and shaft 39 also causes rotation of the toothed wheels 66, 67, 68 and 69 in counter-clockwise direction, against tension of restoring spring 141, through gears 54, 58 and 63. (See Figs. 11 and 15.)

It should be noted that wheel 66 is driven direct by gear 63 while wheels 67, 68 and 69 are driven by wheel 66 through engagement of pins 119 to 124, inclusive, and that the inner end of the coil spring 141 is secured to the hub of wheel 69 while its outer end is anchored to the frame spacer bar 34.

It should also be noted that when only knob 24 is rotated, all four wheels 66, 67, 68 and 69 are rotated together, each disc being rotated an equal amount.

Rotation of shaft 39 out of its normal position carries lug 79 out of the path of nose 83 of latch lever 77 thereby permitting spring 82 to move lever 77 so as to bring pin 81 into engagement with the teeth of wheel 66 to prevent clockwise rotation of said wheel by spring 141. (See Figs. 7 and 8.)

Rotation of wheels 66, 67, 68 and 69 rotates shaft 70 and sleeves 71, 72 and 73, respectively, which in turn carry fingers 125, 126, 127 and 128. (See Figs. 12 and 26.)

From the foregoing it will be seen that rotation of knob 24 in clockwise direction to the position where the digit nine is exposed, will positively rotate fingers 125 to 128, inclusive, through shaft 39, gears 54, 58 and 63, wheels 66, 67, 68 and 69, shaft 70 and sleeves 71, 72 and 73 against tension of restoring spring 141 to the

position shown by Fig. 28 and held in such position by latch lever 77.

The operation so far described conditions the mechanism for transmission of nine single impulses consisting of nine breaks in a normally closed circuit each of equal duration and equally spaced.

The operation incident to starting and transmitting the signal when the terminals 224 and 226 (see Fig. 4) are serially included in a normally closed circuit including suitable current supply, will now be described.

Starting the transmitter

To start the transmitting mechanism, the "Start" knob 29 should be pressed toward the dial 22, thereby causing tip 251 to engage pin 249 and thereby rock the shaft 231, carrying end 239 of detent arm 235 out of the path of the finger 242, against tension of spring 238, where it is held by the projection 243 on arm 244. (See Fig. 35.)

This completes all operations incident to manually setting and starting the transmitter and the mechanism is now conditioned for automatic actuation by the main spring 276 under control of the non-interference magnet 201 as follows:

Automatic operation by train

The movement of detent arm 235 out of the path of finger 242, as just described, permits spring 276 to drive the toothed wheel 130 and disc 135 through the following gear train: spring drum 151, gears 153, 156 and 155, and sleeve 74 to wheel 130. (See Figs. 3, 18, 19 and 26.)

The speed of rotation of wheel 130 is controlled by the slow speed governor 169 during part of its revolution, and by fast speed governor 168 during the remaining part of such revolution, in the following manner:

Gear 157, which turns with gears 153 and 156, drives slow speed governor device 169 through the following train: gear 157 (see Fig. 18), pinion 158 and gear 160 on shaft 159, pinion 161 and clutch members 163 and 164 and gear 165 on shaft 162, and pinion 166 on shaft 167 which shaft also carries the slow speed governor device 169.

Shaft 162 also carries the fast speed governor device 168 which is effective only when the clutch members 163 and 164 are disengaged to render the slow speed governor 169 ineffective. The clutch members 163 and 164 are normally engaged so that during the first part of the rotation of wheel 130 by spring 276, the slow speed governor device 169 is effective for controlling its speed.

Rocking of shaft 231 by the pressing of starting knob 29 to disengage the detent arm 235 from the finger 242 also moves the shunt contact spring 222 out of engagement with the stationary shunt contact spring 221, thereby breaking the normally effective shunt around key break contacts 207 and 208 and the winding of magnet 201 (see Fig. 4) and permitting energization of the magnet 201, through the normally closed contacts 207 and 208, by the current supply included in the normally closed circuit in which the transmitter is connected.

During such slow speed rotation of wheel 130, the key break contacts 207 and 208 are actuated by the key break lever in the following manner:

Rotation of wheel 130 in a clockwise direction (see Fig. 4) first carries pin 148 out of the path of the lower end of lever 202 thereby permitting the armature 204 to move away from the magnet 201 in the event that current flow therethrough is interrupted. Continued rotation of wheel 130 will then bring the first notch in said wheel under the tooth 211 of the key break lever 209, and tooth 211 will drop into such notch in which position the free end of dog 216 will be positioned, by spring 220, in the path of the upward movement of tooth 211, so that, during further rotation of wheel 130, assuming that the armature has remained in attracted position, as would be the case when the circuit is in normal condition, each tooth therein will, in raising tooth 211, also raise contact operating lever 212, through dog 216, and thereby move contact 207 away from contact 208 by means of the insulating projection 214 on lever 212.

It is thus seen that, as wheel 130 is rotated, each tooth therein, in passing under tooth 211 causes actuation of contacts 207 and 208 to transmit a signal impulse over the circuit.

During each upward movement of lever 212, the point of projection 254 is so raised that the end 256 of stationary pin 255 will be in its path before contacts 207 and 208 are separated, to prevent armature 204 moving to retracted position during the time that current flow through magnet 201 is interrupted by contacts 207 and 208.

During each movement of a tooth on wheel 130 from under tooth 211 on key break lever 209, the step 281 in tooth 211 will momentarily arrest its downward movement in such position that the contacts 207 and 208 are closed but retraction of armature 204 is still prevented by pin 255 and projection 254. This delay in releasing the armature is to permit effective reenergization of the magnet 201 following closing of circuit by contacts 207 and 208.

Actuation of contacts 207 and 208 by the teeth in wheel 130 during rotation thereof will continue as just described until the contacts have been actuated (separated) a number of times corresponding to the number for which the digit plate 35 was set, in this case "9", after which the tooth 211 will be prevented from entering the notches between the teeth on wheel 130, throughout the remaining portion of the revolution of said wheel, in a manner hereinafter more fully explained.

Key break arm ineffective

When, during the rotation of wheel 130, the tooth corresponding to the last stroke of the digit for which the transmitter was set (in this case the ninth tooth) is positioned under tooth 211, the arm 129 will thereupon be rotated around its pivot 142 by engagement of surface 131 with the finger 125, which movement will cause disc 135 to be so rotated relatively to wheel 130 as to bring the teeth in disc 135 in line with the notches in wheel 130 thereby preventing tooth 211 on key break arm 209 from entering said notches.

This relative positioning of disc 135 and wheel 130 is effected upon rotation of arm 129 and its shaft 142, by the cam plate 144 (see Figs. 33 and 34) which rotates with said arm 129 and engages pin 147 in disc 135, thereby moving disc 135 relative to wheel 130.

Engagement of surface 131 on arm 129 by fingers 126 and 127 will correspondingly effect similar relative positioning of disc 135 and wheel 130 thereby preventing actuation of contacts 207

and 208 during passage of the next two teeth of wheel 130 under tooth 211.

Engagement of surface 132 on arm 129 by finger 128 will act in a corresponding manner to prevent actuation of contacts 207 and 208 by the next tooth on wheel 130, and will also then cause still further rotation of arm 129 which causes disengagement of clutch members 163 and 164 thereby rendering the slow speed governor device 169 ineffective and permitting wheel 130 to be rotated through the remainder of its revolution at a considerably faster speed, controlled by the fast speed governor 168.

Throughout such fast speed rotation of wheel 130, arm 129 is maintained in the abnormal position to which it was moved by finger 128, by spring 133, and cam 144 therefore maintains abnormal relative positioning of disc 135 and wheel 130 to prevent actuation of contacts 207 and 208 throughout such remaining rotation of wheel 130.

Fast speed operation

Actuation of arm 129 by finger 128 causes disengagement of clutch members 163 and 164 in the following manner:

Rotation of shaft 142 by engagement of arm 129 with finger 128 causes segmental gear 145 to so rotate thrust cam collar 136, relative to the pins 138 carried by wheel 130, that inclined surfaces 140 on said collar will engage said pins 138 and move said collar toward frame plate 33 thereby actuating arm 170, against tension of spring 172, to disengage clutch members 163 and 164. (See Figs. 22 and 23.)

Just before completion of the revolution of wheel 130, the portion 283 of segmental gear 145 engages the pin 289 in frame plate 33 and is so actuated thereby as to rotate shaft 142 to such position that spring 133 will return arm 129, cam 144 and clutch disengaging mechanism to normal condition. This action causes the slow speed governor to again become effective just before the train is stopped by detent arm 235, so as to avoid the strain on the mechanism which might result if the detent became effective while train was running at fast speed.

Stopping of train

The detent is rendered effective to stop the train in the following manner:

Arm 274 rotates with sleeve 74 in counterclockwise direction as shown in Fig. 35, and carries pin 275 which engages a tooth on round counter wheel 193, so rotating said wheel that pin 192 carried thereby engages the free end of arm 244, and so moves said arm as to carry notch 246 out of the path of the end 239 of the detent arm 235, thereby permitting the spring 248 to position said end 239 into the path of finger 242 which rotates with sleeve 74 and wheel 130.

The shunt contact spring 222, being carried by shaft 231, moves with detent arm 235 and is therefore, at this time, returned to its normal position in engagement with contact spring 221. Just before the train is stopped by engagement of finger 242 with end 239 of detent lever, pin 275 is carried out of engagement with the teeth of wheel 193 thereby permitting spring 194 to return wheel 193 to its normal position where pin 192 stops against arm 191.

The foregoing description covers all operations, both manual and automatic, incident to the setting and formulating of one round of the signal "9".

Restoration of setting mechanism

To restore the digit plate 35 to its normal or "0" position, the "Restore" knob 28 should be pressed in toward the dial plate 22. This causes conical cam 115 to rotate latch lever 77 on shaft 76 in a clockwise direction as shown by Fig. 7, withdrawing pin 81 from engagement with teeth on wheel 66 and withdrawing nose 83 from path of lug 79, thereby permitting spring 141 to restore wheels 66, 67, 68 and 69, digit plate 35 and setting knob 24 to their normal or "0" position.

Setting transmitter for two digits

To set the transmitter mechanism for the transmission of one round of a two digit signal, such, for example, as the number "99",—rotate the left-hand knob 24 in a clockwise direction until the number "9" on digit plate 35 is exposed through opening 20 in the plate 22, which operation causes rotation of wheels 66, 67, 68 and 69 and positioning of fingers 125, 126, 127 and 128 as hereinbefore described in operation of the mechanism for the transmission of the single digit number "9".

When pin 81 on latch lever 77 is moved into the path of the teeth on wheel 66 by spring 82 following rotation of knob 24 from its "0" position, projection 89 on lever 77 (see Fig. 15) moves away from projection 90 on latch lever 78 thereby permitting movement of pin 87 on latch lever 78 into the path of the teeth on wheel 67 when knob 25 is rotated and lug 85 is carried out of the path of nose 84 on said lever 78. (See also Fig. 11.)

To set the mechanism for the second digit "9", knob 25 should be first pressed in toward the plate 22 against tension of spring 49 to withdraw pin 451 from hole 471 in bushing 461 (see Fig. 12) and should then be rotated in a clockwise direction until the number "9" on digit plate 36 is exposed through opening 20 (second from the left) in plate 22.

Rotation of knob 25 acts through shaft 40 and gear 53 to rotate wheel 67 (see Figs. 5 and 11) which in turn causes rotation of wheels 68 and 69, therewith, through pins 121 to 124, inclusive, and fingers 126, 127 and 128, connected to said respective wheels by sleeves 71, 72 and 73, are thereby positioned as shown by Fig. 29.

It should be noted here that rotation of knob 25 does not cause actuation of wheel 66, but, instead, positively locks same from being thereafter moved by knob 24, by means of the lug 522 on arm 521 which is moved into the path of the teeth on wheel 66 by the lateral movement of shaft 40 when knob 25 is pressed in toward plate 22. Said arm 521 is held from rotating around shaft 40 by guide rod 55 carried by frame plate 32.

Operation when transmitting two digits

When starting knob 29 is now pressed, the wheel 130 will be rotated by spring 276 in drum 151 under control by slow speed governor 169 and key break contacts 207 and 208 will be actuated in same manner as described in connection with operation when transmitting one digit, except that, with fingers 125, 126, 127 and 128 as now positioned (as shown by Fig. 29),—the contacts 207 and 208 will be actuated once for each of the first nine teeth in wheel 130 and then finger 125 will engage surface 131 of arm 129, rotating said arm, shaft 142 and cam plate 144 (see Figs. 33 and 34) and thereby acting against pin 147 to so relatively position disc 135

and wheel 130 as to prevent tooth 211 of key break arm 209 from dropping in notch immediately following the ninth tooth in wheel 130.

This action will prevent actuation of the contacts 207 and 208 during passage of the tenth tooth on wheel 130 under key break arm tooth 211, but surface 131 will be carried out of engagement with finger 125 by rotation of wheel 130 so that arm 129 and disc 135 will be restored to normal position by spring 133 before the notch following the tenth tooth in wheel 130 is positioned under tooth 211.

Contacts 207 and 208 will therefore be actuated by the eleventh tooth and the eight succeeding teeth on wheel 130 following which the arm 129 will be rotated by fingers 126, 127 and 128 and thereby position disc 135 to prevent further actuations of key break lever 209 during the remaining rotation of wheel 130.

Actuation of arm 129 by the finger 128 also renders the slow speed governor 169 ineffective by causing disengagement of clutch members 163 and 164, and at completion of the revolution of wheel 130 the detent is rendered effective and all parts returned to normal condition in the manner hereinbefore more fully explained.

Setting for three digits

To set the transmitter mechanism for the transmission of one round of a three digit signal, such, for example, as the number "999",—rotate knobs 24 and 25 as when setting the mechanism for the number "99".

When latch arm 77 is released by withdrawal of lug 85 from the path of nose 84, it rotates shaft 76 and arm 109 in a counter-clockwise direction as viewed in Figs. 7 and 8, thereby so positioning link 110 as to permit movement of pin 112 toward the left and rocking of latch lever 95, when lug 98 is withdrawn from the path of nose 97 by rotation of knob 26, to bring pin 100 into the path of the teeth on wheel 68.

The knob 26 should then be pressed in toward plate 22 and rotated in a clockwise direction until the number "9" on digit plate 37 is exposed through opening 20 in plate 22. This will cause rotation of wheels 68 and 69 and locking of wheels 66 and 67 in the positions to which they were set by knobs 24 and 25, and will effect positioning of fingers 125, 126, 127 and 128 as shown by Fig. 30.

Transmitting three digits

When set for the number "999" as just described, and the starting knob 29 is pressed,—the wheel 130 will be rotated and key break arm 209 will actuate contacts 207 and 208 nine times, then arm 129 will be raised by finger 125 causing disc 135 to prevent actuation of arm 209 by the next tooth of wheel 130, following which arm 129 will be carried out of engagement with finger 125 and the arm 209 will actuate the contacts nine more times for the second digit of the number, then arm 129 will again be raised by finger 126 causing disc 135 to prevent actuation of arm 209 by the next tooth of wheel 130. The arm 129 will then be carried out of engagement with finger 126 and the arm 209 will then actuate the contacts nine times again for the last digit of the number.

The arm 129 will then be actuated by fingers 127 and 128 to prevent further actuation of key break arm 209 and to control the disengagement of clutch members 163 and 164, following which the mechanism will be brought to rest and parts restored to normal as hereinbefore more fully described.

Setting for four digits

To set the transmitter mechanism for the transmission of one round of a four digit number, such, for example, as the number "9999",—rotate knobs 24, 25 and 26 as when setting the mechanism for the number "999".

When latch arm 95 rotates in clockwise direction to bring pin 100 into engagement with teeth of wheel 68 following movement of link 110 and lug 98 incident to rotation of knob 26,— it carries projection 107 out of the path of projection 108 on latch lever 96 (see Figs. 13 and 15) thereby permitting movement of latch lever 96, when lug 103 is withdrawn from the path of nose 102 by rotation of knob 27, to bring pin 105 into the path of the teeth on wheel 69.

The knob 27 should then be pressed in toward the plate 22 and rotated in a clockwise direction until the number "9" on digit plate 38 is exposed through opening 20 in plate 22. This will cause rotation of wheel 69 and locking of wheels 66, 67 and 68 in the positions to which they were set by knobs 24, 25 and 26, and will effect positioning of fingers 125, 126, 127 and 128 as shown by Fig. 31.

Transmitting four digits

When set for the number "9999" as just described, and the starting knob 29 is pressed,—the wheel 130 will be rotated and key break arm 209 will actuate contacts 207 and 208 nine times, then arm 129 will be raised by finger 125 causing disc 135 to prevent actuation of arm 209 by the next tooth of wheel 130, following which arm 129 will be carried out of engagement with finger 125 and the arm 209 will actuate the contacts nine more times for the second digit of the number, then arm 129 will again be raised by finger 126 causing disc 135 to prevent actuation of arm 209 by the next tooth of wheel 130. The arm 129 will then be carried out of engagement with finger 126 and the arm 209 will then actuate the contacts nine times again for the third digit of the number, after which the arm 129 will again be raised by finger 127 causing disc 135 to again prevent actuation of arm 209 by the next tooth of wheel 130. The arm 129 will then be carried out of engagement with finger 127 and the arm 209 will then actuate the contacts nine more times for the fourth digit of the number.

The arm 129 will then be actuated by finger 128 to prevent further actuation of key break arm 209 and to control the disengagement of clutch members 163 and 164 and the mechanism will then be brought to rest and parts restored to normal as hereinbefore more fully described.

Setting for four rounds

If the rounds setting knob 23 is rotated until its pointer is under number 2, 3 or 4, for example, say 4, instead of 1, it will be resiliently held in such position by spring 185 (see Fig. 35) pressing pawl 180 into notch 184 in sector 179 which rotates with knob 23. Movement of sector 179 to this position causes rotation of arm 191 which forms the stop for pin 192 in wheel 193, by means of link 188 and arm 187, in a backward or counter-clockwise direction, as viewed in Fig. 35. This permits spring 194 to rotate the toothed wheel 193 an angular amount equal to three teeth on said wheel.

As hereinbefore more fully explained, pin 275

is carried by arm 274 which rotates with wheel 130 and engages the teeth on wheel 193 to rotate same in a forward or clockwise direction (as viewed in Fig. 35) an angular amount equal to one tooth on said wheel, just before the completion of each revolution of arm 274. Therefore when wheel 193 is rotated backward three teeth by rounds setting knob 23, it will require four revolutions instead of one of arm 274 to bring pin 192 into engagement with the free end of arm 244 and unlatch detent arm 235 to stop the mechanism and close the shunt contact springs 221 and 222.

This results in four revolutions of wheel 130 (following pressing of starting knob 29) during each of which the key break contacts 207 and 208 are actuated by arm 209 to transmit the complete signal for which the fingers 125, 126, 127 and 128 are set by the setting knobs 24, 25, 26 and 27.

When wheel 193 is advanced by pin 275 in arm 274, it is retained in such position by pawl 195. When detent arm 235 is unlatched and moves to stopping position, arm 237 engages pin 240 in said pawl and moves it out of the path of the teeth in wheel 193, permitting spring 194 to rotate said wheel backward until pin 192 again stops against arm 191.

Operation on open circuit

If the starting knob 29 should be pressed to start the transmission of a number at a time when the circuit was open, or if the circuit should open after the transmitter mechanism had started any time after pin 148 has moved out of the path of the free end of lever 202 (other than when contacts 207 and 208 are held open by arm 212) the armature 204 will be moved away from magnet 201 by spring 220 and contact operating arm 212 will be moved to the left as viewed in Fig. 4, carrying dog 216 out of the path of tooth 211 on key break arm 209 so that contact arm 212 is then rendered unresponsive to any further actuation of arm 209, and contacts 207 and 208 will therefore remain closed.

Inasmuch as the armature 204, when moved away from magnet 201 by spring 220, is positioned out of the normally effective field of the magnet 201, it will not return to its normal attracted position, even though the circuit is again closed, until wheel 130 has made nearly a complete revolution and pin 148 carried thereby engages the free end of lever 202 and restores it to its normal position again.

When armature 204 is moved away from magnet 201 by spring 220 as just described, shaft 203 is rocked and arm 257 on said shaft acts through link 258 to move retaining pawl 195 out of the path of the teeth on wheel 193 so that advancement of said wheel by pin 275, at a time when contact arm 212 is in ineffective or "non-signaling" position, will not be retained.

If the rounds setting knob 23 was set for the transmission of only one round, the detent will now become effective to stop the mechanism from further attempts to transmit its signal, but if the rounds setting knob was set for more than one round, say, for example, four rounds, it will require advancement of wheel 193 more than one tooth (in this case four) in order to bring pin 192 into engagement with arm 244 to unlatch the detent and stop the train.

Inasmuch as advancement of wheel 193 by pin 275 is not retained while lever 202 is holding pawl 195 out of the path of the teeth in wheel 193, the mechanism will not be stopped until wheel 196 has been advanced by pin 275 to bring pin 273 carried thereby into engagement with pin 200 carried by wheel 193 and thereafter causes advancement of wheel 193 to bring pin 192 into engagement with arm 244 to release the detent and stop the train.

The number of revolutions of arm 274 required to cause pin 275 to advance wheels 196 and 193 to a position where pin 192 will cause unlatching of detent, as just described, may be any predetermined number by locating pin 273 in various positions on wheel 196. When located as shown by Fig. 35, arm 274 will make nineteen revolutions before causing detent to stop train.

Forward advancement of wheel 196 is retained by pawl 198 until detent lever moves to stopping position when arm 237 engages pin 241 and moves pawl 198 out of the path of the teeth of wheel 196.

In the event that the starting knob 29 is held in starting position so that detent arm can not return to stopping position, further advancement of wheel 196 will cause pin 272 to engage arm 199 and move pawl 198 out of the path of the teeth on wheel 196 so that such further advancement will not be retained.

Operation of succession mechanism

If the circuit should close before the wheel 196 is advanced far enough to unlatch the detent, as just described, upon the next restoration of lever 202 to normal position by pin 148, the armature will be attracted by magnet 201 and hold said lever and contact arm 212 in normal or "effective" position, and if the circuit then remains closed (except when broken by contacts 207 and 208) further rotation of wheel 130 will cause actuation of contacts 207 and 208 to formulate the signal for which the fingers 125, 126, 127 and 128 have been set.

The mechanism will now continue to transmit the signal for the number of rounds for which the knob 23 is set. During this time the pawl 195 is again effective, so that, pin 192 will engage arm 244 and unlatch the detent after transmission of the intended number of rounds.

It should be noted in connection with the above that, if pin 273 is located to permit a given number of rounds, say nineteen (as shown by Fig. 35) and the transmitter runs, say seventeen rounds, before contact lever 212 is rendered effective by the attraction of armature 204, only two rounds (in this case) of the signal will be transmitted, following which the detent will be unlatched and the mechanism stopped, even though the rounds setting knob was set for three or four rounds.

Operation of "perfect non-interference mechanism"

If the starting knob 29 should be pressed to start the transmission of a number simultaneously with the starting of some other transmitter or fire alarm box connected in same circuit, in such timely relation that both break and close the circuit at the same time so that the circuit is broken only during the time that the end 256 of pin 255 is in the path of projection 254 on contact arm 212, the armature 204 will remain in attracted position and actuation of contacts 207 and 208 will continue as long as this condition exists.

If, however, contacts 207 and 208 are closed while the circuit is still held open by the other transmitter or box mechanism, magnet 201 will remain deenergized and movement of projection 254 out of engagement with the end 256 of pin 255

will permit spring 220 to swing lever 202 and armature 204 to retracted position and render arm 212 ineffective by positioning dog 216 out of the path of tooth 211 on key break arm 209.

The wheel 130 will now continue to rotate, without actuating contacts 207 and 208, and, if the rounds setting knob 23 is set for only one round, the mechanism will now be brought to rest by detent arm 235, even though it has not succeeded in effectively transmitting one complete round, as hereinbefore more fully described in explanation of operation when transmitting one digit one round.

Revolution of wheel 130 following movement of armature 204 to retracted position as shown by dotted lines in Fig. 36, causes pin 148 carried by said wheel to engage the free end of said lever 202 and restore it to its normal position with armature 204 within the effective field of magnet 201. Assuming now that the rounds setting knob 23 was set for more than one round, wheel 130 will continue to rotate, carrying pin 148 out of the path of the free end of lever 202 and, if the other transmitter or box is still active, the circuit will be broken either at the time pin 148 moves out of the path of lever 202 or at some time thereafter before tooth 211 is raised by the first tooth, following the blank portion 288, in wheel 130, and armature 204 will again move to retracted position and lever 212 will be rendered ineffective throughout the next revolution of wheel 130.

This cycle of operation will continue until the other transmitter or box ceases activity and the circuit again remains closed. The armature 204 will then be held in attracted position after being restored by pin 148 and contacts 207 and 208 will then be actuated by wheel 130 to formulate the signal for which fingers 125, 126, 127 and 128 are set.

The wheel 130 will continue rotating until the number of rounds indicated by pointer 30 of knob 23 have been formulated after which the detent will be unlatched by pin 192 and the mechanism brought to rest as hereinbefore more fully explained.

While there is shown in the accompanying drawings, and hereinbefore described in considerable detail, one specific embodiment of this invention,—it should be understood that this is illustrative only, and for the purpose of making clear the nature and objects of the invention, as it is believed that the invention is not limited to these details, nor to any of them, except insofar as such limitations are included within the terms of the appended claims.

It should also be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described, which are not claimed in divisional application Serial No. 738,847, filed August 7, 1934, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

The aforesaid divisional application is directed to the features of construction disclosed by Figs. 5, 12, 16 and 17 of the present application, wherein the digit setting shafts 40, 41 and 42 are mounted for rectilinear or axial movement as well as rotary movement, for the purpose of permitting the setting of one digit plate without thereby disturbing the setting of any other digit plate.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent of the United States of America is:

1. In a signal transmitter, a plurality of independently movable digit setting members each having a zero position and manually operable for variably conditioning the transmitter for effecting the formulation of groups of impulses, the position of each of which members determine the number of impulses to be formulated in the group represented thereby, a plurality of fingers movable into a plurality of positions by manipulation of said setting members, a signaling train, signal wheel structure operable by said train and comprising two relatively movable members, each member having peripheral teeth, the teeth of one of said members so formed that said member may be positioned where its teeth will match or where they will unmatch certain of the teeth of the other member, a circuit controller, a vibratory arm for effecting operation of said controller only while the teeth of said signal wheel members are matched during rotation thereof, means for at times effecting an unmatched relationship of the teeth of said signal wheel members comprising mechanism operated by said fingers incident to rotation of said signal wheel structure, an electromagnet serially connected with said circuit controller, an armature for said magnet, means associated with said armature and with said vibratory arm whereby said armature will be locked against retraction whenever said arm is conditioned for open circuit and will be unlocked during closed circuit positioning of said arm only after effectiveness thereof for a predetermined interval, whereby the signal wheel structure will be moved by the train to first operate the circuit in the course of the formulation of any signal only after the train has run for a time longer than the longest closure in any signal, and whereby said circuit controlling mechanism will be rendered inoperative upon retraction of said armature, means operable responsive to the positioning of said signal wheel structure for mechanically moving said armature into the field of said magnet whenever said transmitter is conditioned to commence a round of a signal thereof, rounds setting means for manually conditioning the signal train for effecting the formulation of various pluralities of rounds or signals, two governing mechanisms, means for effecting concurrent actuation of said governing mechanisms during the signal formulation portion of each round, means effective at the conclusion of such formulation portion for suspending actuation by said train of one of said governing mechanisms and for re-establishing such actuation prior to the resumption of the next such formulation portion, means operable responsive to conditioning of said rounds setting means for terminating the operation of the transmitter after it has effected formulation of its signal for the number of rounds for which it is set, said terminating means comprising two accumulation mechanisms each operable by said transmitter in running, means responsive to said armature for at times controlling the effectiveness of the operability of one of said accumulation mechanisms by the running of said train, means responsive to abnormal positioning of the other of said accumulation mechanisms for causing effective actuation of the first named one thereof irrespective of said armature, and means for preventing retention of excessive actuations of said mechanisms.

2. In a signal transmitter, a plurality of wheels, impulse number limiting members associated with said wheels for conditioning the transmitter for effecting formulation of groups of impulses having various numerical characteristics, a plu-

rality of independently movable manually operable digit setting means so associated with said wheels that movement of one of said setting means will impart corresponding movement to all of said wheels, and movement of another of said setting means will impart corresponding movement to all but one of said wheels, and movement of others of said setting means will correspondingly impart movement to other progressively decreasing groups of said wheels, resilient means urging said wheels toward their unset positions, and a lock associated with each but the first digit setting means for locking the last previously set wheel against further advance while the next wheel is further advanced, each lock being automatically moved into and out of locking position at the beginning and end of the manual actuation of its associated digit setting means.

3. In a signal transmitter, a plurality of wheels, impulse number limiting members associated with said wheels for conditioning the transmitter for effecting formulation of groups of impulses having various numerical characteristics, a plurality of independently movable manually operable digit setting means, interlocking mechanism for permitting effective setting of said setting means only in a predetermined order, means for actuating all of said wheels responsive to movement of the initially operable one of said setting means and for correspondingly operating groups of said wheels progressively decreasing in number, from respective ones of the other setting means, in the order of their operability, resilient means urging said wheels toward their unset positions, means individually locking said wheels in their various positions, and a single means for effecting simultaneous release of said locking means.

4. In a signal transmitter, a plurality of wheels, impulse number limiting members associated with said wheels for conditioning the transmitter for effecting formulation of groups of impulses having various numerical characteristics, a plurality of independently movable manually operable digit setting means, interlocking mechanism for permitting effective setting of said setting means only in a predetermined order, means for actuating all of said wheels responsive to movement of the initially operable one of said setting means and for correspondingly operating groups of said wheels progressively decreasing in number, from respective ones of the other setting means, in the order of their operability, resilient means urging said wheels toward their unset positions, and means individually locking said wheels in their various positions.

5. In a signal transmitter, a plurality of wheels, impulse number limiting members associated with said wheels for conditioning the transmitter for effecting formulation of groups of impulses having various numerical characteristics, a plurality of independently movable manually operable digit setting means, interlocking mechanism whereby effective setting of said setting means may be effected only in a predetermined order, means for effecting actuation of all of said wheels responsive to movement of the initially operable one of said setting means and for correspondingly operating groups of said wheels progressively decreasing in number, from the other setting means, in the order of their operability, and resilient means urging said wheels toward their unset positions.

6. In a signal transmitter, a plurality of wheels, impulse number limiting members associated with said wheels for conditioning the transmitter for effecting formulation of groups of impulses having various numerical characteristics, a plurality of independently movable manually operable digit setting means, interlocking mechanism for permitting effective setting of said setting means only in a predetermined order, and means for actuating all of said wheels responsive to movement of the initially operable one of said setting means and for correspondingly operating groups of said wheels progressively decreasing in number, from the other setting means, in the order of their operability.

7. In a signal transmitter, the combination of a signaling train, signal wheel structure operable by said train and comprising two juxtaposed relatively movable members, each member having peripheral teeth of similar pitch, the teeth of one of said members so formed that said member may be positioned either where its teeth will match or where they will unmatch certain of the teeth of the other, a circuit controller, a vibratory arm for effecting operation of said controller responsive to operation of said signal wheel structure only during matching of the teeth of the members thereof, and means variable in accordance with the signals to be transmitted for positioning said signal wheel members so that the teeth thereof will be alternately matched and unmatched.

8. In a signal transmitter, the combination of a signaling train, signal wheel structure operable by said train and comprising two relatively movable members, each member having peripheral teeth, the teeth of one of said members so formed that said member may be positioned where its teeth will match or where they will unmatch certain of the teeth of the other, a circuit controller, a vibratory arm for effecting operation of said controller only while the teeth of said signal wheel members are matched during rotation thereof, a plurality of fingers, means for varying the relative positionings of said fingers in accordance with signals to be transmitted, and means for at times effecting an unmatched relationship of the teeth of said signal wheel members, comprising mechanism operable by said fingers incident to rotation of said signal wheel structure.

9. In a signal transmitter, the combination of a signaling train, signal wheel structure operable by said train and comprising two relatively movable members, each member having peripheral teeth corresponding to those of the other, a circuit controller, a vibratory arm for effecting operation of said controller only during matching of the teeth of said signal wheel members, a plurality of fingers, means for varying the relative positioning of said fingers in accordance with signals to be transmitted, and means for at times effecting an unmatched relationship of the teeth of said signal wheel members, comprising mechanism operable by said fingers incident to actuation of said signal wheel structure.

10. In a signal transmitter, the combination with a signaling train, of signal actuating means comprising a wheel operable by said train, a circuit controller, a vibratory arm for effecting operation of the controller, a plurality of fingers, manual means for positioning the fingers relatively to each other in accordance to the signal to be transmitted, and means controlled by said fingers for controlling the vibrations of said arm,

said last means including means carried by said wheel and successively movable into engagement with said fingers.

11. In a signal transmitter, the combination with a signaling train, of signal actuating means comprising a wheel operable by said train, a circuit controller, a vibratory arm for operating the controller, a plurality of fingers, manual setting mechanism associated with each finger for positioning said fingers in accordance with the signal to be transmitted, and means controlled by said fingers for controlling the vibrations of said arm, said last means including means carried by said wheel and successively movable into engagement with said fingers.

12. In a variable signal transmitter, manually operable means for adjusting the number of cycles of the operation of said transmitter, comprising two accumulation mechanisms each operable by said transmitter in running, an electromagnet, means responsive to said magnet for at times suspending the effectiveness of the operability of one of said accumulation mechanisms by the running of said transmitter, means responsive to abnormal positioning of the other of said accumulation mechanisms for rendering the first named one thereof responsive to operation by said transmitter irrespective of the control thereof by said suspending means, and means for preventing retention of excessive actuations of said accumulation mechanisms.

13. In a variable signal transmitter, manually operable means for adjusting the number of cycles of the operation of said transmitter, comprising two accumulation mechanisms each operable by said transmitter in running, an electromagnet for at times controlling the operability of one of said accumulation mechanisms directly by the running of said transmitter, and means responsive to abnormal positioning of the other of said accumulation mechanisms for rendering the first named one thereof responsive to operation by said transmitter irrespective of the control thereof by said magnet.

14. In a variable signal transmitter, manually operable means for adjusting the number of cycles of the operation of said transmitter to be produced when said transmitter is released, comprising two accumulation mechanisms each operable by and during running of said transmitter for controlling termination thereof, an electromagnet, non-interference mechanism responsive to the influence of said magnet for at times controlling the operability of one of said accumulation mechanisms, and means controlled by the other of said accumulation mechanisms for controlling said one of the accumulation mechanisms when the latter is under the control of said non-interference mechanism.

15. In a variable signal transmitter, a manually adjustable member for adjusting the number of cycles of the operation of said transmitter to be effected when said transmitter is released, accumulation mechanism governed by said member and operable by and during running of said transmitter for controlling termination thereof, an electromagnet, its armature, and non-interference mechanism responsive to said armature for controlling the effectiveness of said accumulation mechanism.

16. In a signal transmitter, a plurality of independently movable digit setting members so relatively associated that movement of a predetermined one of said setting members will impart corresponding movement to all of the other of said members, and movement of a certain other of said setting members will impart corresponding movement to all but said predetermined one of said members, and movement of others of said setting members will correspondingly impart movement to other progressively decreasing groups of said members, means for locking said members in unset position, individual means for locking respective setting members in digit setting positions, a single means for simultaneously releasing said members, and means including a single coil spring acting on one member to return it to unset position and coacting abutments associated with the respective members to cause the return of all the other members to unset position by the return of said one member.

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