

Aug. 29, 1944.

W. J. ZENNER

2,356,905

INTEGER STORAGE MECHANISM

Original Filed Oct. 1, 1941

5 Sheets-Sheet 1

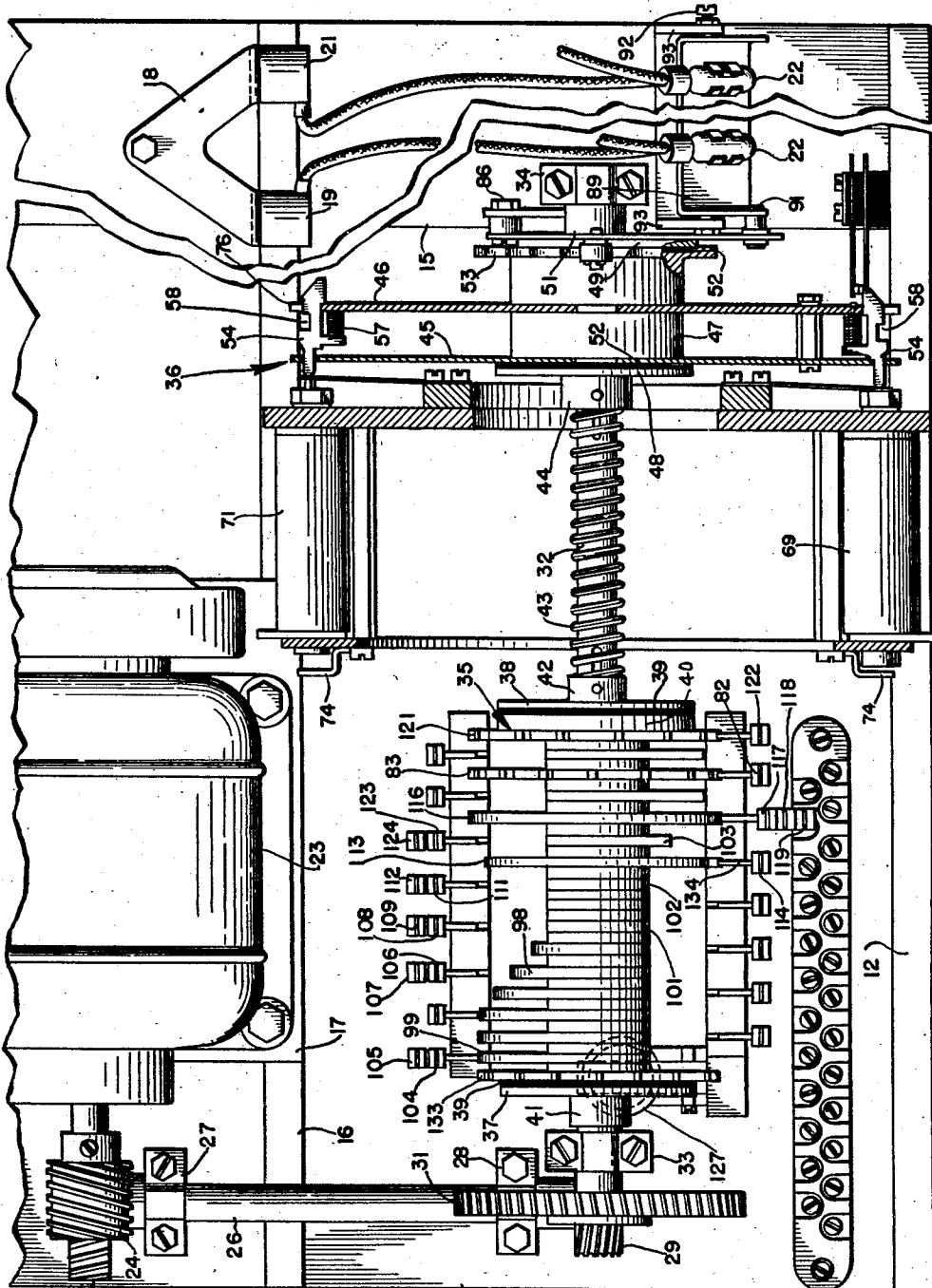


FIG. 1

11

14

BY

W. J. Zenner
ATTORNEY.

INVENTOR.
WALTER J. ZENNER

Aug. 29, 1944.

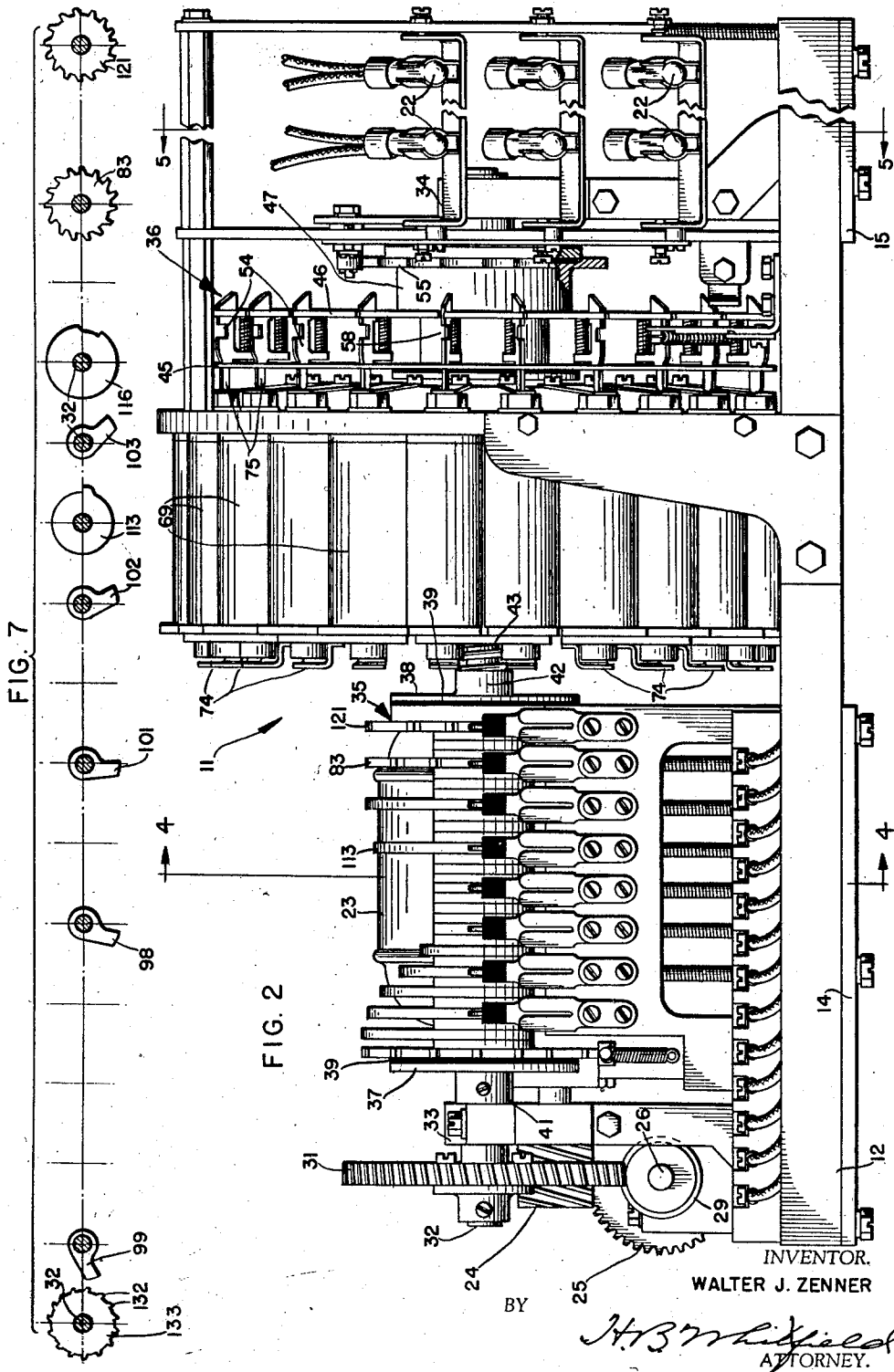
W. J. ZENNER

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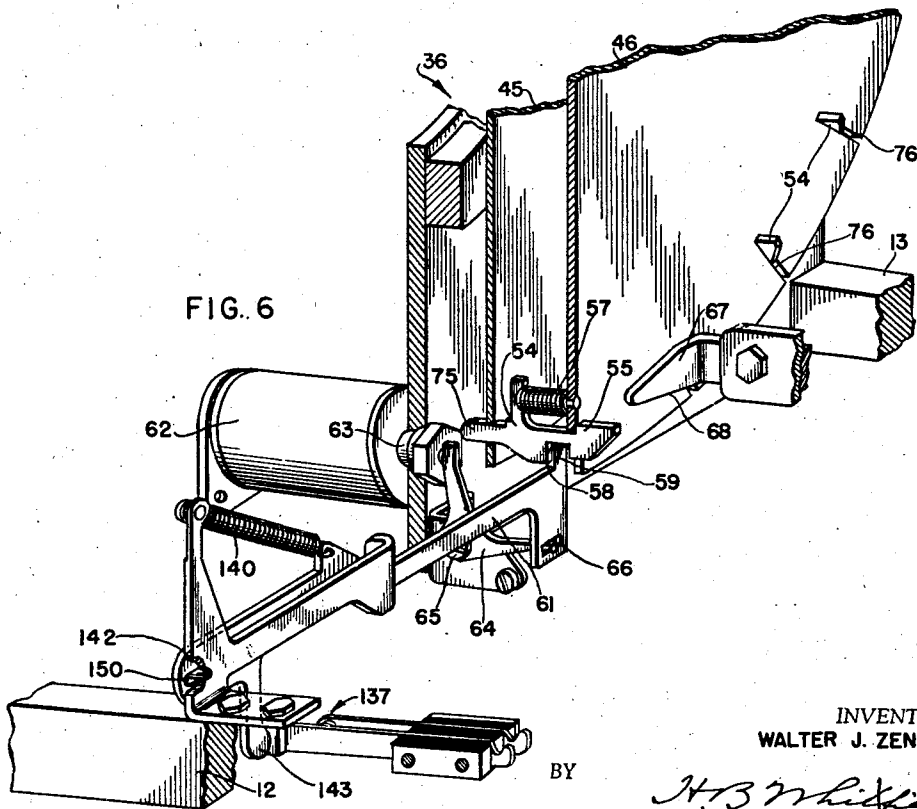
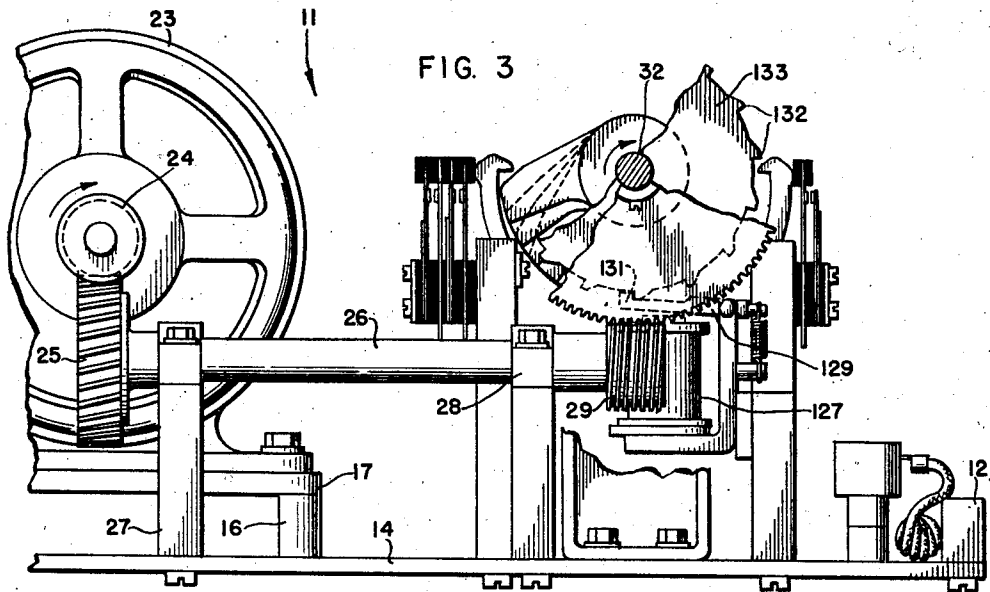
W. J. ZENNER

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5 Sheets-Sheet 3



INVENTOR.
WALTER J. ZENNER

BY *H. B. Whitfield*
ATTORNEY.

Aug. 29, 1944.

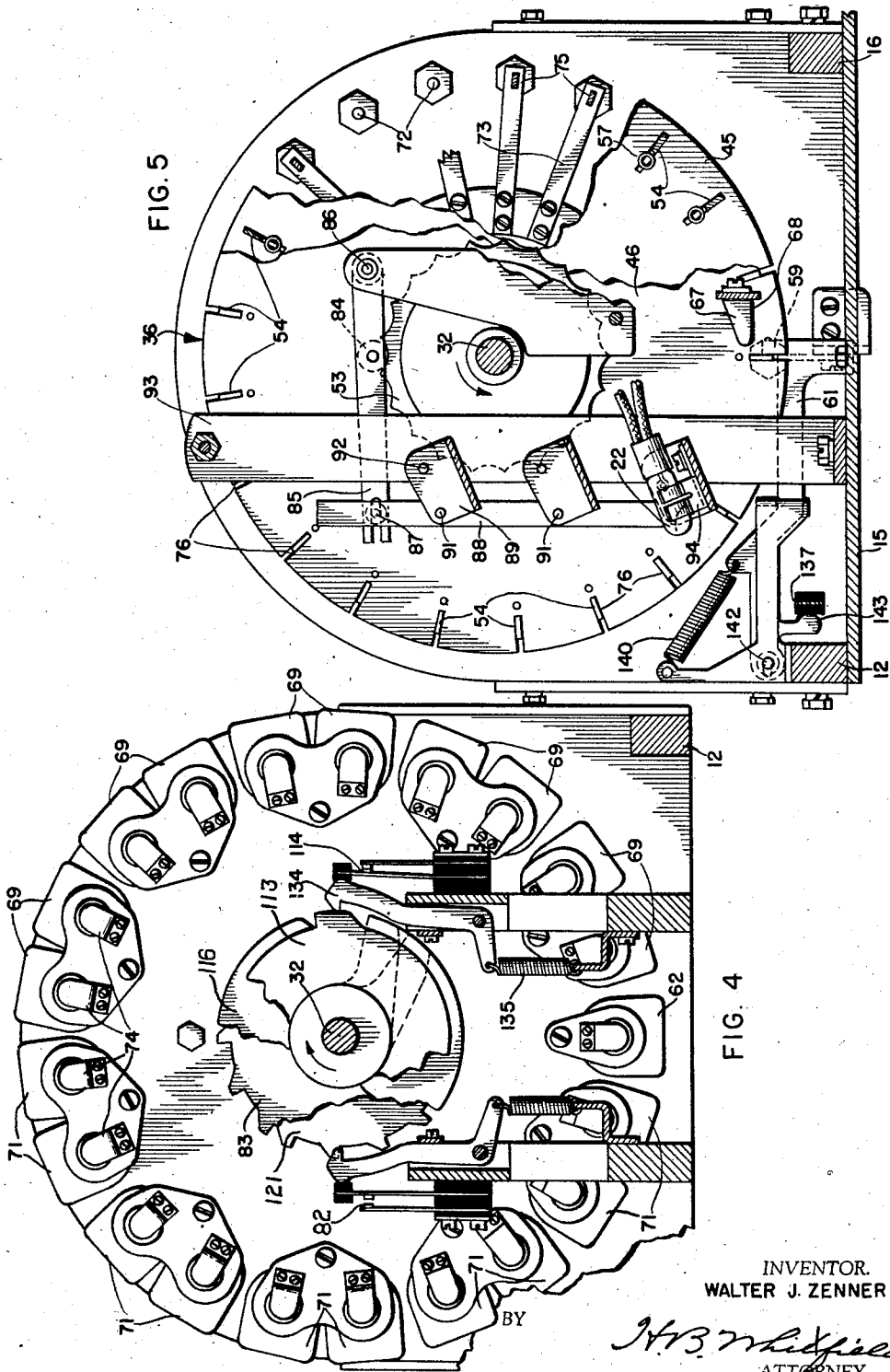
W. J. ZENNER

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5 Sheets-Sheet 4



INVENTOR.
WALTER J. ZENNER

BY *W. B. Whitfield*
ATTORNEY.

Aug. 29, 1944.

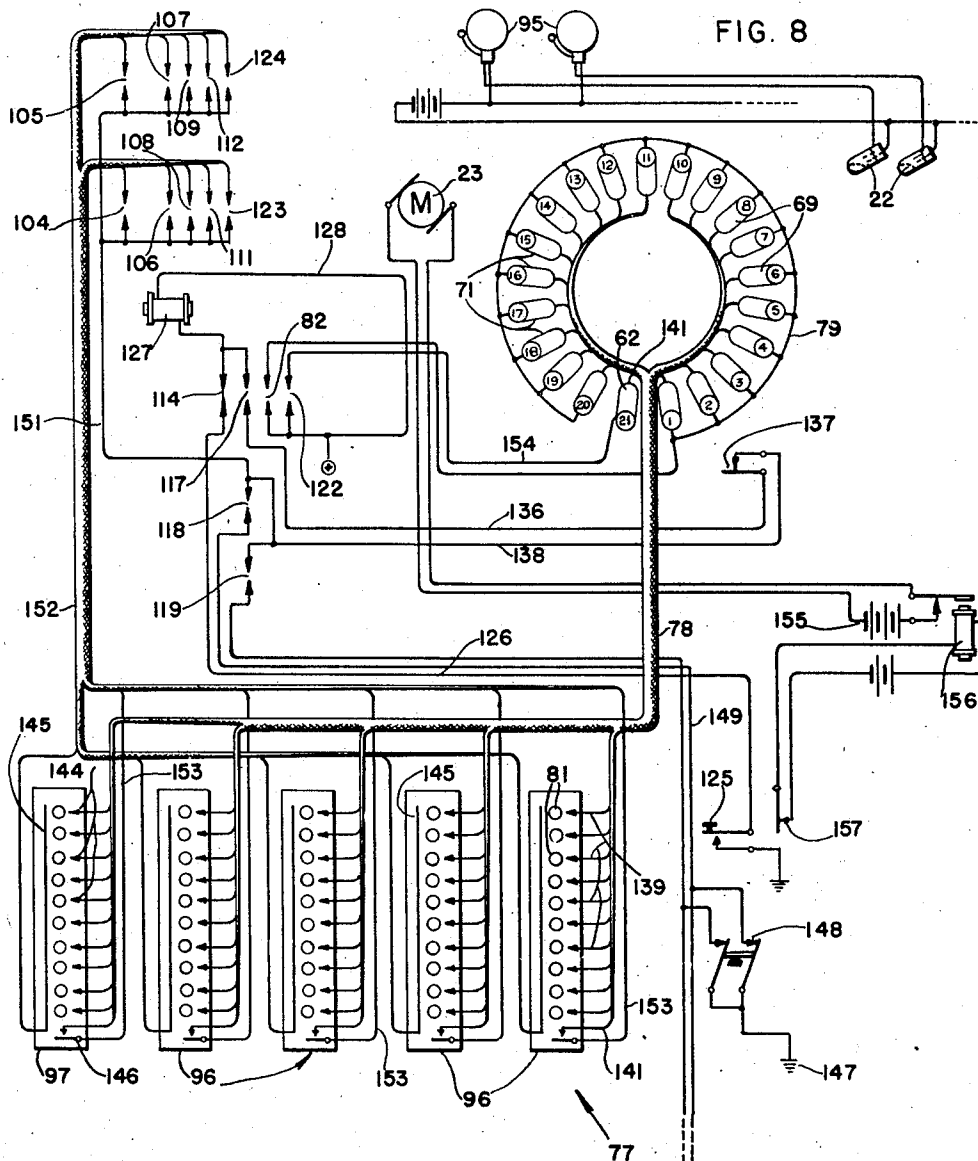
W. J. ZENNER

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5 Sheets-Sheet 5



INVENTOR.
WALTER J. ZENNER

BY

W. B. Whitfield
ATTORNEY.

UNITED STATES PATENT OFFICE

2,356,905

INTEGER STORAGE MECHANISM

Walter J. Zenner, Des Plaines, Ill., assignor to
Teletype Corporation, Chicago, Ill., a corpora-
tion of Delaware

Original application October 1, 1941, Serial No.
413,079. Divided and this application April 12,
1943, Serial No. 482,731

7 Claims. (Cl. 192—142)

The present invention relates to signal tolling apparatus and more particularly to a storage mechanism for receiving a signal setting from which an audible signal character may be generated.

This application is a division of application Serial No. 413,079, filed October 1, 1941, now Patent No. 2,334,467, issued Nov. 16, 1943.

The usual type storage mechanism comprises a device which has settable pins corresponding to the desired integer. After the tolling signal has been generated it is necessary to release the pin and then position the device back to a single zero position, which takes up a certain amount of time, often almost equal to an entire cycle of the device. This is not desirable as it causes a delay during which no tolling signal may be generated and which, in the case of fire alarm systems, may result in the loss of valuable time.

Accordingly, the principal object of the invention is to provide a variable integer storage mechanism which following each tolling operation is immediately ready to be set for a succeeding integer signal, and which resets itself to a zero condition during movement pursuant to a current signaling operation.

In its specific contemplation, the mechanism may be briefly described as a frictionally driven wheel having a plurality of settable elements angularly disposed on its periphery, each settable element having a spring urging it in one direction and a shoulder for latching the element when it is moved in the opposite direction. A bar is in proximity to the lower portion of the wheel and arrests rotation of the wheel by engaging the latched element, but releases the wheel to rotation when acted upon by a bell crank lever which is under the control of an armature of an electromagnet. After release of the wheel a cam projection unlatches the settable element preparatory to its being reset. Thus, no restoration to a zero position is required.

For a more comprehensive understanding of the present invention, reference is made to the accompanying drawings and to the following detailed specification wherein like reference characters designate corresponding parts throughout and wherein:

Fig. 1 is a plan view partially in section of an apparatus that is capable of receiving and storing a number of signals and in accordance therewith of operating a number of individual

circuit interrupters for generating audible alarm signals thereby;

Fig. 2 is a side elevation of the apparatus illustrated in Fig. 1;

Fig. 3 is an end elevation of the apparatus illustrated in Figs. 1 and 2, certain portions being broken away;

Fig. 4 is a transverse sectional view taken approximately on line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view taken approximately on line 5—5 of Fig. 2;

Fig. 6 is a detailed perspective view of a storage disc assembly release mechanism;

Fig. 7 is a dismantled group view illustrating the component cams of the unit assembly featured in Figs. 1 to 5; and

Fig. 8 is a schematic circuit illustration of a portion of the wiring hook-up of a fire alarm system as particularly related to the present invention.

In its essential embodiments, the present invention has been designed to operate as part of an auxiliary system to the one disclosed in the J. E. Wack et al. copending application for a fire alarm transmission system, Serial No. 345,260 wherein the propagation of fire alarm messages of a formal type is proposed to operate telegraph printing apparatus. As explained in said copending application, there is contemplated the provision of apparatus for transmitting time signals to accompany each message so that a record is thereby had of the precise time of day that each message is transmitted or received at the destination station. Also as explained in said application, provision is made for predetermining the length and the number of repetitions of each message under the control of a permanent setting of the instrumentalities, the individual message information being supplied at each operation in accordance with the manipulation of a keyboard.

In the accompanying drawings, the reference character 11 designates generally a signal coding apparatus unit which consists of a supporting structure comprised of two parallel side rails 12 and 13 which are traversed by the transversely connecting mount platforms 14 and 15. An intermediate supporting rail 16, Fig. 1, paralleling rails 12 and 13, and also connected to the mount platforms 14 and 15 affords support for a motor platform 17 as well as to a bracket 18 which carries a pair of junction blocks 19 and 21 to which the flexible leads from a plurality of mercury tube switches 22 are electrically connected.

An electric motor 23 which is bolted to platform 17 drives, by means of a worm gear 24, the worm wheel 25 of a power distributing shaft 26 journaled in the bearing brackets 27 and 28 and driving with its worm gear 29 a large worm wheel 31, the latter member being secured to a principal drive shaft 32 which is journaled in a pair of supporting brackets 33 and 34.

The armature of motor 23 and shaft 32 rotate in a clockwise direction as viewed in Fig. 3, and this is the direction of motion that shaft 32 tends to impart to its two frictionally driven assemblies 35 and 36.

Assembly 35 consists of a plurality of rotatable cam members integrally associated and driven by means of a pair of driving discs 37 and 38 which impinge upon an endmost cam element 133 and a spacer 40 of the assembly through the intervening agency of fibrous or friction discs designated 39. Disc 37 is a flange integrally associated with a collar 41 that is secured to shaft 32 as by means of a set screw, but disc 38 is a flange integrally associated with the collar 42 splined to the shaft 32 but freely movable endwise or longitudinally thereof in which respect it is influenced by a helical compression spring 43 which is shouldered between another splined collar 44 and the described collar 42 of flange member 38.

The other driven assembly 36 is termed a storage disc assembly and it too is carried upon the described shaft 32. It consists of two spaced disc elements 45 and 46, see particularly Figs. 5 and 6, carried upon a sleeve or drum member 47. This assembly is driven, as in the case of the afore-described cam assembly 35, by means of a pair of cooperating flanges 48 and 49, the former being integrally associated with the spring urged longitudinally movable collar 44 and the latter member, 49, being an integral part of the collar 51 anchored to shaft 32. Accordingly, since flange and collar members 42 and 44 are both longitudinally shiftable upon shaft 32, the common compression spring 43 acts jointly between the two of them to maintain frictional driving engagement between shaft 32 and their respective assemblies 35 and 36. In the assembly 36 fibrous frictional driving discs 52 are provided which function in the same manner as do the friction discs 39 of assembly 35.

Integrally formed with the drum 47 is an endmost cam disc 53 having a scalloped periphery as indicated in Fig. 5. Assembly 36 is free to rotate in a counterclockwise direction as viewed in Figs. 5 and 6, under the influence of the drive shaft 32 when all of its transverse pawl members 54 are disposed in their respective release positions. Under the alternative of their conditions, namely, the set positions of said pawl members 54, which is the condition portrayed by the foremost pawl 54 of Fig. 6, its latching shoulder 55 engages that of disc 46 in a notch 76, since the pawl member has been shifted rightwardly as viewed in this illustration compressing the individual spring 57. When in this condition a notch 58 formed in each pawl 54, Figs. 1, 2, and 6, is disposed sidewardly with respect to its normal position, so that as the pawl 54 reaches its lowermost position of travel as that illustrated by the foremost pawl 54 in Fig. 6, the notch 58 is no longer in alignment with a stop lug 59 formed upon a trigger 61. On this account, the storage disc assembly is arrested when a so disposed pawl 54 encounters the stop lug 59 and remains dormant until by the actuation of a release sole-

noid 62 the latter member's armature plunger 63 is shifted rightwardly causing the rotation of a bell crank 64 in a clockwise direction about its pivot 65 and, since one arm 66 of said bell crank is articulated to the trigger 61, the latter member is rotated clockwise about pivot 142 as a center so that its stop projection 59 is drawn free from blocking engagement with the side of pawl 54. Trigger 61, in addition to being pivotally supported upon the pin 142 is also longitudinally shiftable with respect thereto since said pin 142 passes through a horizontal elongated pivot slot 150 and though trigger 61 is normally urged by a spring 140 backwardly and leftwardly as viewed in Fig. 6 so that integrally formed switch operating projection 143 is retracted permitting the contact pair 137 to stand ajar, this condition is reversed when storage disc assembly 36 through any one of its pawls 54, when in a set condition, bears against stop projection 59, for in so doing it also shifts trigger 61 forwardly and rightwardly. Accordingly, the arrestment of storage wheel 36 results in the closure of contact pair 137 for a purpose which will become clearer during the course of subsequent description.

Upon the de-energization of release solenoid 62 which remains energized for but a brief period as will appear later, its associated elements 64 and 61 are permitted to resume their original condition but meanwhile the assembly 36 is freed to resume its rotation, the particular blocking pawl 54 having been retracted from its set position in which it engages lug 59. As the particular stopping pawl 54 proceeds in its rotary path together with assembly 36, its protruding portion, Fig. 6, engages a cam projection 67 by riding up onto its lowermost edge 68. This moves the latching end of the pawl 54 so that shoulder 55 is cammed away from locking engagement with disc 46, spring 57 restoring said pawl to its normal position whereat notch 58 is again in the peripheral alignment to clear blocking projection 59 of trigger 61. In Fig. 4, the solenoid 62 may be noted to be disposed lowermost of a circular arrangement of solenoids, the general class of which have been designated 69 and 71, each half of the circle being constituted of ten solenoids disposed on one side and the other of the central shaft 32 with the release solenoid 62 being the twenty-first one and centrally disposed at the bottom.

Each of the classes of solenoids 69 and 71 comprise ten individual solenoid members having armatures 72, Fig. 5, and flat spring elements 73 against which the foremost ends of the armatures or plungers 72 engage, and which serve to restore the plungers 72 after any solenoid has been de-energized. At their opposite ends, the solenoid plungers are prevented from being removed from the assembly by the interposition of stop brackets 74. In the illustration, Fig. 8, the solenoids have been designated serially by numbers 1 to 21 as well as by the reference character designations employed in Figs. 1, 2, and 4. When any one of the solenoid armatures 72 responds to the energization of its solenoid 69 or 71, it is moved rightwardly, as viewed in Fig. 2, causing its reduced projection to flex restoration springs 73 and to engage the rounded extremity 75 of its associated latchable pawl 54 moving the latter member sidewardly, as best indicated in Fig. 6 and against the influence of compression spring 57 until its shoulder 55 becomes

hooked over the end of its individual slot 76 in disc 46.

Thus it is to be understood that as assembly 36 is brought to rest when a particular one of its stop pawls 54 engages the shoulder 59 of trigger 61, the last operated one of said pawls 54 thus constitutes a new zero position. Following the arrestment of assembly 36, there may be obtained a number of angular positions between it and any one of the remaining pawls 54 that might become set by the energization of any of the solenoids 69 and 71 numerically designated from 1 to 20 in Fig. 8. The energization of any one of said solenoids is effected by the manipulation of a key bar in a keyboard unit designated by the general reference character 77 which prepares a circuit traceable over an individual line in cable 78 through the winding of one of the solenoids 69 or 71 to the common return circuit 79. While the closure of one of the key bars 81 of unit 77 prepares a circuit for energizing one of the solenoids 69 or 71 by placing ground on one of the lines in cable 78, the energization of said solenoid awaits the completion of the circuit when current is placed upon the common return wire 79 by the closure of contact pair 82 at a precise one of a plurality of regularly spaced intervals under the control of a multiple apex cam 83, Figs. 2, 4, and 7.

The number of solenoids 62, 69, and 71 which are assembled around the central shaft 32 corresponds to the number of scalloped apexes in cam 53. As a result, when assembly 36 is permitted to rotate from a previously established zero position, where it has been arrested due to the blocking of one of its pawls 54 with shoulder 59, to a subsequent position which may be any number of angular steps from 1 to 20 in terms of the angular distances between adjacent pawls 54, cam 53 will pass a corresponding number of its scalloped apexes under the follower roller 84 reciprocating the lever arm 85 upon which said roller 84 is carried about its anchored pivot 86 so that its free end through the articulation pin 87 will induce a corresponding motion to the vertically disposed tandem bar 88.

As a result of the movement of tandem bar 88 vertically in a reciprocating motion, there is transmitted a corresponding rocking movement to each one of a plurality of cradles 89 which are pivoted as at 91 to said bar 88. Since each one of the cradles is also pivoted as at 92 to a pair of stationary upright members 93, the movement transmitted to the several cradles 89 will cause them to rock in clockwise and counterclockwise motion correspondingly rocking the mercury tube switches 22 which are held in lamp members 94 especially provided for this purpose in each one of said cradles 89. Accordingly, the number of reciprocations imparted to the several tubes 22 will in turn effect the opening and closure of individual circuits, Fig. 8, to the alarm tolling bells 95 generating audible signals comprised of a plurality of successive gong soundings to denote to fire station attendants certain information such as already explained above.

Each unit in the keyboard 77 consists of an alignment of key bars 81 representing a decimal position and individually supported in a removable unit section 96. Of the several keyboard sections, a particular one designated 97 resembling in mechanical details those of the four sections 96, is especially provided with circuit connections to the solenoids 71 while the keyboard units 96 wired in parallel over lines

within cable 78 are connected to the solenoids 69. Accordingly, in the first decimal or numerical position, there being five such positions in accordance with the disclosure of Fig. 8, the number of tolling bell signals to be transmitted by means of the units 11 will comprise a number of gongs between 11 and 20, since the keyboard section 97, the first to be operated, is electrically connected to the solenoids 71 which correspond in the sequence to the eleventh to the twentieth solenoids of the series, inclusive. Subsequently, however, the operation of any of the remaining units 96 will cause to be energized the solenoids 69 so that accordingly the signals following the first position will be comprised of a number of gongs from 1 to 10, inclusive.

In the illustration of Fig. 8, the keyboard unit 77 represents a device generally similar to the keyboard illustrated in copending application Serial No. 345,260 discussed above, only such portions of the circuit being here indicated which concern the operation of the gong tolling apparatus. Other portions of the keyboard apparatus, as well as of the remainder of the circuit illustrated in said copending application, are to be understood as being substantially of the type therein disclosed. Also, the requirement of providing a keyboard unit 97 and the solenoids 11 through 20 for the purpose of tolling a larger number of integer signals than the primary number of from 1 to 10, is by way of illustrating an arbitrary enlargement of the fundamental disclosure. If a larger number of decimal positions than the five illustrated in Fig. 8 and represented by the five keyboard sections 96 and 97 are desired, it is but necessary to provide such additional sections in the keyboard 77, and in the cam distributor 35 to provide additional distribution cams and thereby there may be obtained a system in which the number of call digits will be correspondingly increased.

In the illustration of a cam assembly 35, in Figs. 1, 2, and 7, space has been provided for accommodating a larger number of cams than there are integer sections in the keyboard unit 77. Some indication of the additional number of digits which may be accommodated can be learned from observing the number of unused spacings in Fig. 7 which are not filled in by timing cams such as the ones designated 98, 99, 101, 102, and 103. The relationship between the cams 98 to 103 and the contact pairs in Fig. 8 may be understood by comparing the arrangement of the cams with the schematic showing of the contact pairs in Fig. 1. Thus cam 99, the first of its class as shown in Fig. 7, controls the closing simultaneously of two contact pairs designated 104 and 105. Cam 98 controls the closure of two contact pairs designated 106 and 107; cam 101 controls the closure of two contact pairs 108 and 109; cam 102 closes the contact pairs 111 and 112, and cam 103 controls in the same manner closure of contact pairs 123 and 124. The brief apex cam 113 controls a single contact pair 114, the cam 116 whose apex is continuous but for a brief angle controls the closure simultaneously of three contact pairs designated 117, 118, and 119, and the multiple apex cams 83 and 121, disposed in staggered relation one from the other, each controls an individual contact pair designated 82 and 122.

Subsequently, in the description, the control circuits and the manner in which the several cams of assembly 35 operate their contact pairs, will be explained in detail with specific reference

to their functional purpose. For the present it will suffice to note that during the normal or zero position of the assembly 35, which is an invariable position, all of the contact pairs remain open with the sole exception of contact pair 114 which is under the supervision of cam 113. The closure of this contact pair prepares a circuit which enables ground to be introduced upon the closure of a manual key lever 125 over line 126 through the cam held contact pair 114, winding of release magnet 127, line 128, to the positive current source. Release magnet 127, as may be observed from Figs. 1 and 3, is situated so that its pivoted armature 129 during the de-energized condition of magnet 127 will block by means of its shoulder tooth 131 any of a number of peripheral teeth 132 of a stop disc 133 depending upon the possible number of contact sets which are to be operated thereby.

As soon as the assembly 35 starts to rotate under impetus of the driving discs 37 and 38 of shaft 32, the release being effected upon the energization of magnet 127, the apex of cam 113 rides off its follower lever 134, Fig. 1, and as a result the contact pair 114 is permitted to come ajar since each one of the follower levers such as 134 is provided with an individual spring 135 suited to this performance, as best indicated in Fig. 4. As soon as the contact pair 114 opens, the control over magnet 127 by the manual start key 125 is withdrawn and thereafter magnet 127 in order to remain energized obtains ground from a source supervised by cam 116 whose apex, Fig. 7, continues over a peripheral angle that is substantially the complement of 360° from the apex angle of cam 113.

Referring now to Fig. 8 it will be noted that contact pair 117, which is one of three contact pairs under the supervision of cam 116, becomes effective alternatively with contact pair 114, insofar as introducing ground to the winding of magnet 127 is concerned. Whereas contact pair 114 is connected over line 126 to the ground supplied upon the closure of button 125, contact pair 117 supplies ground from a source 147 over a line 136 through the closed contact pair 137, line 138, contact pair 118 which is closed during the same time that contact pair 117 is closed, over line 149, contact pair 148, to a ground source 147.

It is to be understood, of course, that in setting up the keyboard 77 for the purpose of transmitting a message, the key bars 81 of one or more of the integer sections 96 or 97 are actuated before the start key 125 is actuated, and in accordance therewith a contact point 144 of one of the ten integer lead wires 139 is brought into electrical contact with a common bus 145, and also the conductor 141 of each unit is closed with a conductor 153. As a consequence, ground is placed on line 141, and the twenty-first solenoid 62 is conditioned for energization which energization is completed when contact pair 122 is closed by the multiple apex cam 121. As a result of the energization of solenoid 62, see Fig. 6, its armature is projected rightwardly as in the case of the general class of armatures 72, bell crank 64 is rocked clockwise about pivot 65 and member 61 is pivoted clockwise causing it to be pivoted about its mounting screw 142. This movement releases trigger 61 to its retractile spring 140 and the downwardly extending arm 143, which had been holding closed the contact pair 137, is permitted to recede therefrom breaking the ground circuit to the magnet 127 and thereat causing to be arrested the further rotation of cam assembly 35 be-

cause the armature 129 will at once engage an oncoming tooth 132 of the stop disc 133.

As a further result of the energization of magnet 62, and one which has already been mentioned above, blocking projection 59 will be withdrawn from a previously set one of the pawls 54 that had been holding the assembly 36 against rotation and in consequence, this assembly will be permitted to rotate in a counterclockwise direction, as viewed in Fig. 5, carrying with it the scalloped cam 53 and through it causing to be oscillated the entire cradle assembly including tandem bar 88 and the multiple switches 22. The number of oscillations which are permitted to be made by assembly 36 will depend upon the angular distance between the previously set pawl 54 which had been holding the assembly through its engagement with blocking tooth 59 and the newly set pawl 54 which is dislodged by the operation of one of the integer keyboard sections 96 and 97 and which will again cause the arrestment of said assembly.

When the key bars 81 are depressed, there is effected in each case a closure of one of a contact pair 144, Fig. 8, which is electrically connected over one of the lead wires 139 of cable 78 with a particular solenoid 69 or 71, and a common bus bar 145 which ultimately obtains ground. Also as a result of the energization of any key bar 81 of an integer set, there is effected a closure of the common contact pair designated 146 individual to each integer set 96 or 97. The contact pair 146 consists of one contact which is connected to the twenty-first solenoid 62 and another contact which is connected to one of the lower rows of cam contact pairs 104, 106, 108, 111, or 123, Fig. 8.

As a result of the closure of any contact pair 146, ground is introduced from source 147, manual switch contact pair 148, line 149 through the contact pair 118 which remains closed during the long apex period of cam 116, line 151, the particular one of the above-mentioned pairs of contacts 104, 106, etc., relating to the associated integer section 96 or 97, through the particular wire in cable 152 which relates to said integer sections, thence over its individual line 153, contact pair 146 and the twenty-first magnet line wire 141 through the winding of solenoid 62, line 154, contact pair 122, which is closed twenty-one times during the cycle of rotation of cam assembly 35, to positive current source.

The tolling unit 11 is driven by the motor 23 as already explained receiving power from an alternating current source 155 when a supervisory control relay 156 is energized in response to the closure of a switch 157 located in the keyboard unit. In addition to the afore-described responses resulting from the operation of any one of the key bars 81 in the keyboard unit 77, it is to be understood that permutation code signals may simultaneously be generated under the control of permutation code closing contact pairs as explained in the foregoing described copending application. At each outlying station, therefore, in addition to the provision of the afore-described means for creating an audible signal indicative of destination station identification or/and any other information desired to be thus communicated, there is also provided means for making a printed record of this and other information such as time signals, etc., within the contemplation of the disclosure in said copending application.

There having been explained above a structural description of the toll ball operating unit as

well as the circuit connections incident to the keyboard which supervise the performance of said unit, there will now be described in more particular detail, a typical cycle of operation under the supervision of the keyboard apparatus in order that the precise sequence of functional responses may be related in the order of their occurrence. Accordingly, let it be assumed that a station identifying signal together with such other information as is desired to be broadcast by means of the tolling gong, consists of the composite codal number 14—3—9—1—2.

It is incumbent upon the keyboard operator to make certain that the motor start contact pair 157 is closed at the start of transmission in order that the motor 23 of the tolling apparatus 11 is in operation. In accordance with this arbitrary conception, the keyboard operator at the central office will depress the key tops 81 of integer sections 97 in the number 4 position which, as explained above, corresponds to the fourteen integer solenoids 71, thereby preparing the keyboard for transmission of 14 gong signals; the number 3 key bar 81 of the left-hand unit 96 which will prepare for the transmission of the number 3 integer; the number 9 key top 81 in the second unit 96; the number 1 key top 81 in the third unit 96, and finally, the number 2 key top 81 in the last unit 96, the foregoing order being readable from left to right as viewed in Fig. 8.

Following the setting up of the code number upon the keyboard 77, the operator will close the manual start key 125 and introduce ground upon line 126 through contact pair 114, which is closed during the rest position of the unit 11, winding of start magnet 127, line 128, to positive. As a result, magnet 127 will become energized and will attract its armature 129 withdrawing stop shoulder 131 from the tooth in wheel 133 which corresponds to the zero arrestment position.

Cam assembly 35 will then be initiated into rotation under the driving impetus of shaft 32 and its associated driving discs 37 and 38 which act through the frictional driving discs 39 upon said assembly 35. As soon as contact pair 114 is permitted to open in consequence of the riding off by apex of cam 113 of the contact pair 114, see Fig. 4, the long apex cam 116 will close the three contact pairs 117, 118, and 119 simultaneously. As a result of the closure of contact pair 117, ground will be supplied to the winding of magnet 127 from a circuit including line 136, contact pair 137, line 138, contact pair 118, line 149, contact pair 148, to ground at 147. The rotation of cam assembly 35 will continue until the first one of the class of cams which close contact pairs 105—104, 106—107, etc., will become effective. In the order in which the arrangement of cams is laid out in accordance with Fig. 7, the first one of these to become effective is cam 99 acting upon contact pairs 104 and 105. As a result of the closure of these contact pairs, there will be energized the number 14 solenoid 71 and the twenty-first or storage disc release solenoid 62 over the following circuit.

Beginning at positive current source, the circuit continues through the contact pair 82, common wire 79, through the winding of the number 14 solenoid 71, its particular line 139 in cable 78 to the contact point 144, its particular common bus 145 in its associated bank 97, thence over an individual line in cable 152 through contact pair 105, line 151, contact pair 118, line 149, contact pair 148 to ground at 147. As a result, the number 14 solenoid 71 will become energized and will

cause to be displaced the pawl 54 which happens to be fourteen angular positions distance from the previously arrested pawl 54. As a result of the closure of contact pair 82 which occurs substantially simultaneously with the closure of the several contacts on cam 116, a circuit is completed for the energization of the twenty-first or assembly 36 release magnet 62. This is traceable from positive current, through the contact pair 122, line 154, winding of solenoid 62, line 141 of cable 78, and its associated contact pair 146, line 153 thereof, and its related continuation in cable 152 through the contact pair 104, line 151, contact pair 118, over line 149 through contact pair 148, to ground at 147.

As a result of the energization of the storage disc release magnet 62, the disc 36 is started into rotation and the cam assembly 35 is arrested. In consequence of the energization of solenoid 62, its armature causes bell crank 64 to be rocked in a clockwise direction, as viewed in Fig. 6. This releases the wheel 36 for rotation but also on account of its articulation with bar 61 which is pivoted at 42, contact pair 137 is opened when said member 61, acting against its spring 140, withdraws projection 143 from said contact pair. In consequence of this, armature 129 is permitted to present its stop shoulder 131 into the path of oncoming tooth 132 in stop disc 133. Meanwhile, wheel 136 is permitted to rotate through an angular distance equivalent to fourteen of the consecutive angles represented by the pallets 54.

This rotation carrying with it scalloped cam 55 causes to be initiated fourteen tolling gong signals to the several circuits connecting to the gongs 95. Because the projections on multiple apex cam 121 are of such short duration, contact pair 122 is opened before the assembly wheel 35 comes to rest and as a result solenoid 62 again becomes de-energized permitting its circuit at contact pair 137 to become closed. Meanwhile magnet 127 may not again become reenergized because its associated contact pair at one of the cams 99, 98, 101, etc., is no longer in position to hold closed its contact pair 104, 105, 106, 107, etc.

Assembly wheel 36 will then come to rest when the set pawl 54 encounters shoulder 59 of stop trigger 61. Upon the collision between pawl 54 and shoulder 59, member 61 is moved forwardly, as viewed in Fig. 6, in accordance with the provision made at pivot 142 where elongated hole 150 is provided in trigger 61. As a result of the forward motion of trigger 61, the bulbous extremity 143 again closes contact pair 137 and thereupon magnet 127 may become reenergized attracting its armature 129 and again freeing the cam assembly 35 to rotation.

Assembly 35 will continue to rotate until the next succeeding one of the contact pairs relating to the keyboard banks 96 is encountered. This contact pair is the one designated 106 and 107 which is closed by the cam 98, Fig. 7. As a result of the closure of contact pairs 106 and 107, circuits are established traceable from positive current source through contact pair 82 which is momentarily closed by one of the apices of multiple apex cam 83, line 79 through the winding of the number 3 solenoid 69, thence over individual line 139 relating to said solenoid in the cable 78 to contact point 144 and its associated common bus bar 145, thence through its individual line in cable 152, contact pair 107, line 151, contact pair 118, line 149, contact pair 148, to ground at 147. This energizes storage relay 3 while at the same time through the closure of

contact pair 106 a circuit is completed traceable from positive through contact pair 122 which is momentarily closed by reason of the brief apex of multiple apex cam 121 which closes its contact pair 122 shortly after the contact pair 82 is closed, thence over line 154, through the winding of the solenoid 62, its individual line wire 141 of cable 78, through the particular pair of contacts 146 relating to the integer unit in which the next operated key lever 81 is depressed, thence out over line 153 of cable 152 through the contact pair 106, line 151, contact pair 118, line 149, contact pair 148, to ground at 147. As a result of the energization of solenoid 62 contact pair 137 is opened after the manner already described, thus de-energizing start magnet 127 and permitting the cam assembly 35 again to be arrested upon armature shoulder 131 encountering an oncoming tooth 132 of stop disc 133. As a further result of the energization of solenoid 62, assembly 36 is released to rotation and in this case will continue to rotate through an angle equivalent to three intervening angles between the pallets 54 and will come to rest when the pallet which had been lined up with the number 3 solenoid and which had been displayed by the energization thereof encounters the stop lug 59 of trigger 61.

During the transit of the assembly 36, its scalloped cam 55 causes to be rocked the cradle assembly including lever 85, tandem bar 88, and the several cradles 89 whereupon all of the mercury switch tubes 22 open and close their respective circuits generating exciting impulses for the gongs 95 and sounding out a number of audible gong signals corresponding to the number of cam apexes which pass follower roller 84, in the instant case three.

Thus the operation proceeds on to the third release of cam assembly 35 in response to which nine impulses are generated and a total of nine signals caused to be broadcast by the gongs 95 during the succeeding interval and followed thereafter by a similar period during which a single gong signal is broadcast and, in correspondence with the last integer, two gong signals are broadcast as the final cam 103 effects its function of closing the contact pairs 123 and 124.

When following the transmission of the final signal, storage assembly 36 for the last time encounters trigger 61 and causes the closure of contact pairs 137, a circuit is established for energizing release magnet 127 which remains energized until its circuit is broken at contact pairs 117, 118, and 119. Of these the contact pair 117 is effective to interrupt the flow of ground from source 147 and because the contact pair at 125 is not then manually energized, magnet 127 will thereat become de-energized and the cam assembly 35 will be arrested in its zero position; namely, with cam 113 disposed so that its apex closes the contact pair 114 in readiness for a subsequent message signal transmission.

While the present invention has been explained and described with reference to a particular embodiment as indicated in the foregoing detailed specification and in the accompanying drawings, it is contemplated, nevertheless, that numerous modifications and variations may be incorporated without departure from its essential spirit or scope. Accordingly, it is not intended to be limited by the specific language employed in the foregoing specification nor by the particular de-

tails in the accompanying illustrations except as indicated in the hereunto appended claims.

What is claimed is:

1. A rotary signal controlling device, comprising a frictionally driven wheel, a plurality of settable bars peripherally disposed above said wheel each bar having a spring element urging it in one direction and including a shouldered portion for latching said bar when moved in the opposite direction, stop means for arresting said wheel in accordance with the setting of one of said plurality of bars, an electromagnet for withdrawing said stop means to release said wheel to rotation, and a cam device for resetting each of said bars after said wheel has been released to rotation.
2. An impulse generator, comprising a frictionally driven wheel, a plurality of elements carried by said wheel each having a spring for urging it in one direction and including means for latching when moved in an opposite direction, stop means for arresting said wheel when it encounters any of said plurality of elements in its set position, a release for withdrawing said stop element following arrestment, and a device for restoring each one of said elements following release of said wheel.
3. A signal storing mechanism, comprising a frictionally driven wheel, a plurality of settable bars carried by said wheel each bar having a spring for urging it in one direction and including a shouldered portion for latching said bar when moved in an opposite direction, stop means for arresting said wheel when it encounters any of said plurality of settable bars in its latched position, a release for withdrawing said stop element following arrestment, and a cam projection in proximity with said wheel which following the release of said wheel engages the shouldered portion of the settable bars to restore each one to its normal position preparatory to being reset.
4. In a signal storing mechanism, comprising a frictionally driven wheel, a plurality of elements carried by said wheel each having a spring for urging it in one direction and including means for latching when moved in an opposite direction, a bar having a shoulder thereon for engaging with said latched element to arrest rotation of said wheel, an electromagnet for causing the shoulder portion of said bar to be withdrawn from said latched element to release said wheel to rotation, and means to restore said elements to unlatched position after said wheel has been released to rotation.
5. A signal storing mechanism, comprising a frictionally driven wheel, a plurality of elements carried by said wheel each having a spring for urging it in one direction and including means for latching when moved in an opposite direction, a pivoted bar having a shoulder thereon for engaging with said latched element to arrest rotation of said wheel, an electromagnet having an armature, a pivoted bell crank lever one arm of which is in proximity with said magnet armature and the other arm of which is disposed within a slot in said pivoted bar, means to energize said magnet to cause the armature to move against the one arm of the bell crank lever and cause said lever to be pivoted resulting in its opposite arm moving downwardly and withdrawing the shoulder of said pivoted bar for engagement with said latched element thus releasing the wheel for rotation, and means for restoring each one of said elements to an unlatched position following the release of said wheel.

6. A signal storing mechanism, comprising a frictionally driven wheel composed of two spaced plates, a plurality of settable bars carried by said wheel and slidable between said spaced plates each bar having a spring for urging it in one direction and including a shouldered portion for latching said bar when moved in an opposite direction, a plurality of slots in one of said plates to engage the shouldered portion of said settable bar to latch said bar, stop means for arresting said wheel when it encounters any of said plurality of settable bars in its latched position, a release for withdrawing said stop element following arrestment, and cam means to engage said shouldered portion of said settable bar following the release of said wheel to urge said bar downwardly and free said shouldered portion

from said slot in said plate to restore each one to its normal position preparatory to being reset.

7. A signal storing mechanism, comprising a frictionally driven wheel, a plurality of elements 5 carried by said wheel each having a spring for urging it in one direction and including means for latching when moved in an opposite direction, a bar having a shoulder thereon for engaging with said latched element to arrest rotation of said wheel, a spring urging said shouldered 10 bar into motion arresting position, an electromagnet for causing the shoulder of said bar to be withdrawn from said latched element to allow said wheel to rotate, and means to restore 15 said elements from latched to unlatched positions.

WALTER J. ZENNER.