

April 29, 1947.

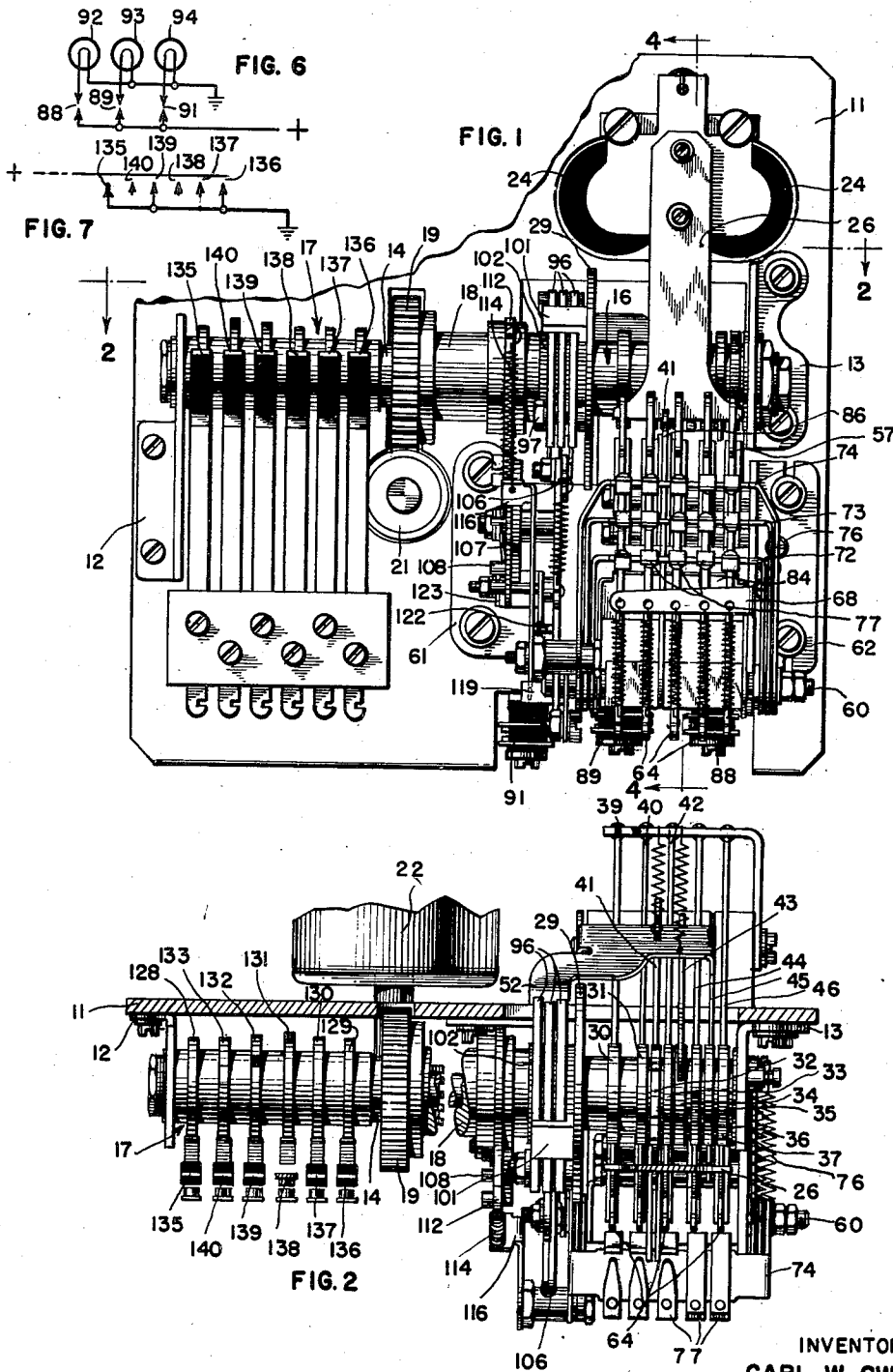
C. W. SWAN

2,419,799

RECEIVER TRANSMITTER

Filed Aug. 6, 1943

2 Sheets-Sheet 1



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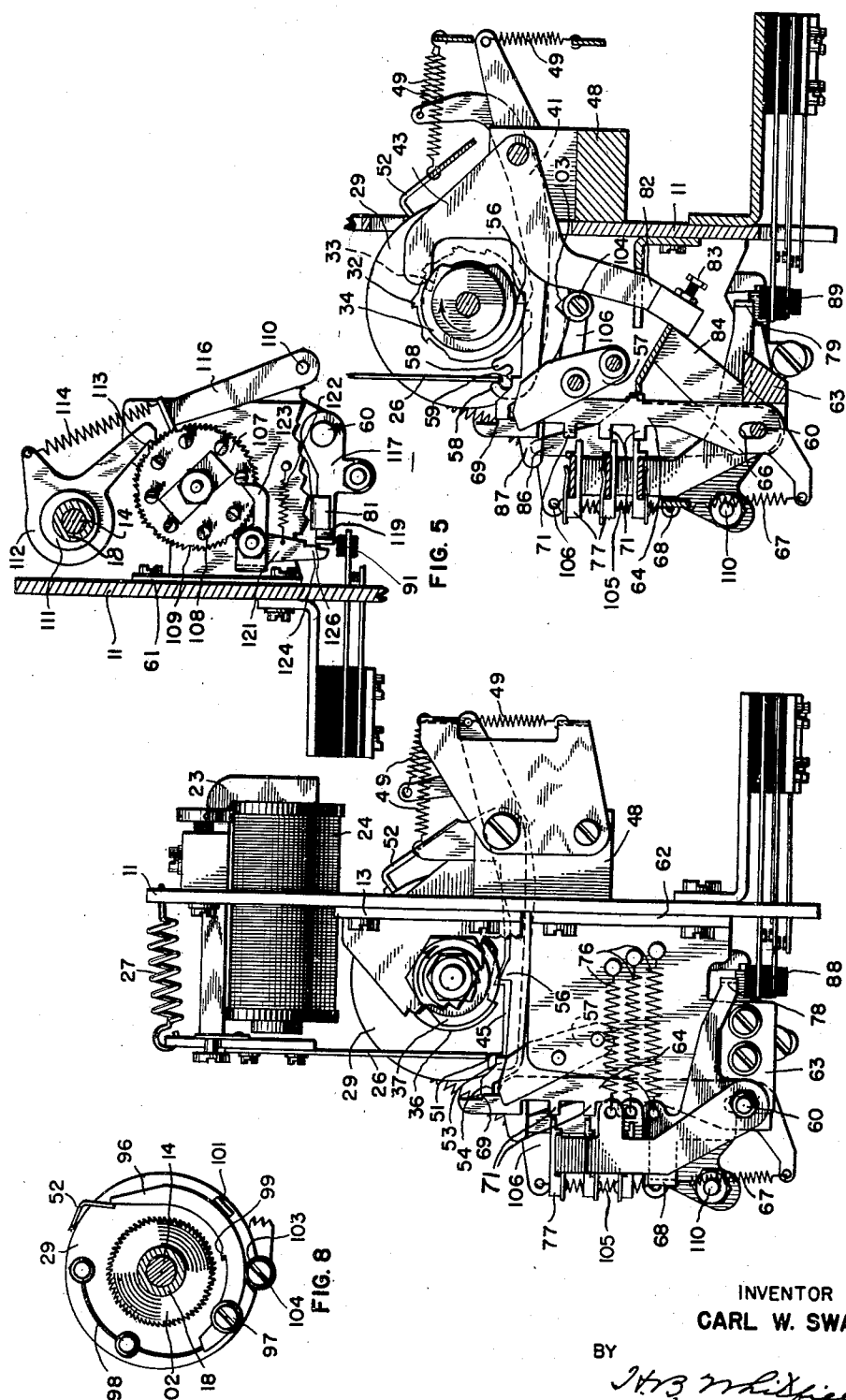
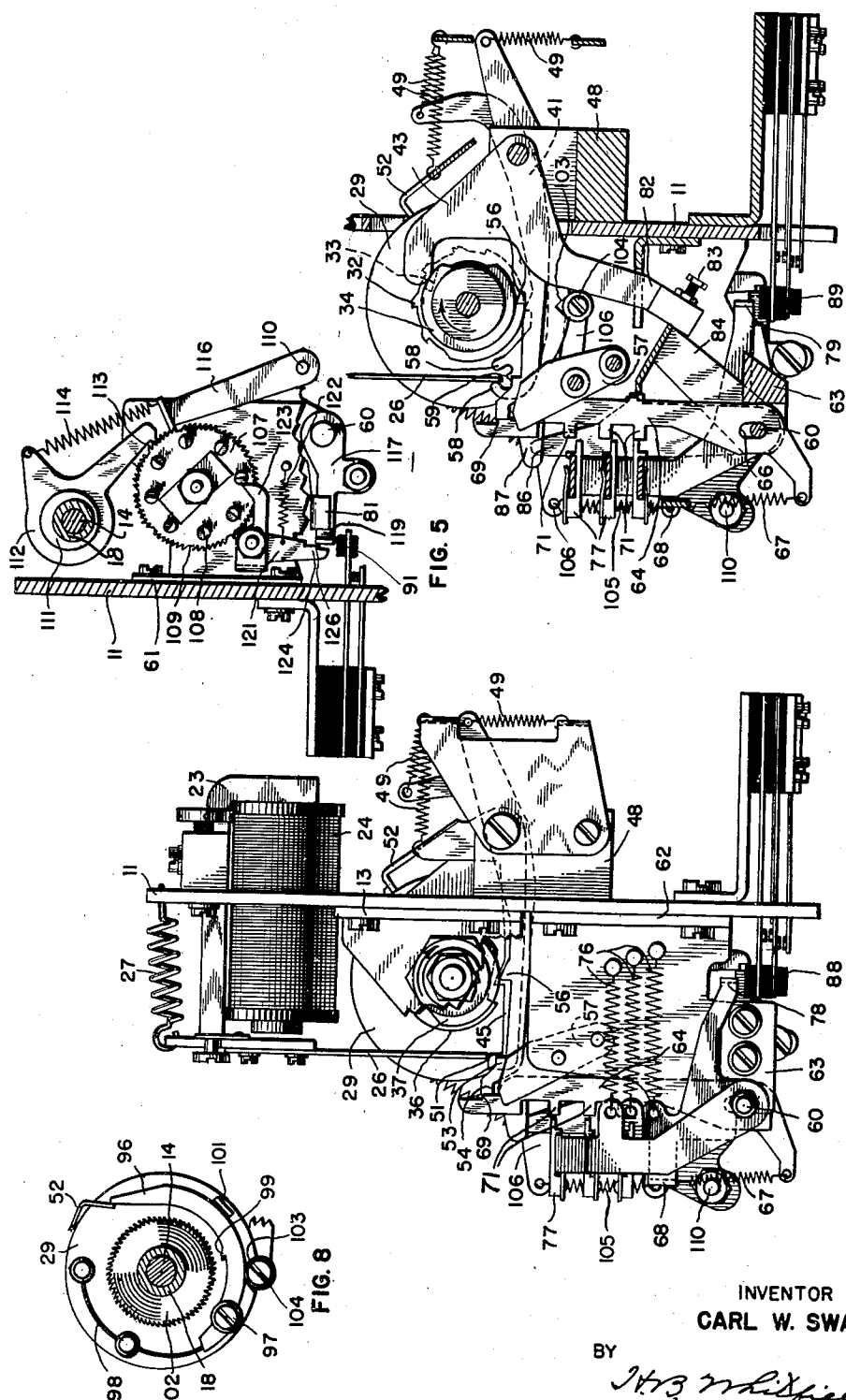
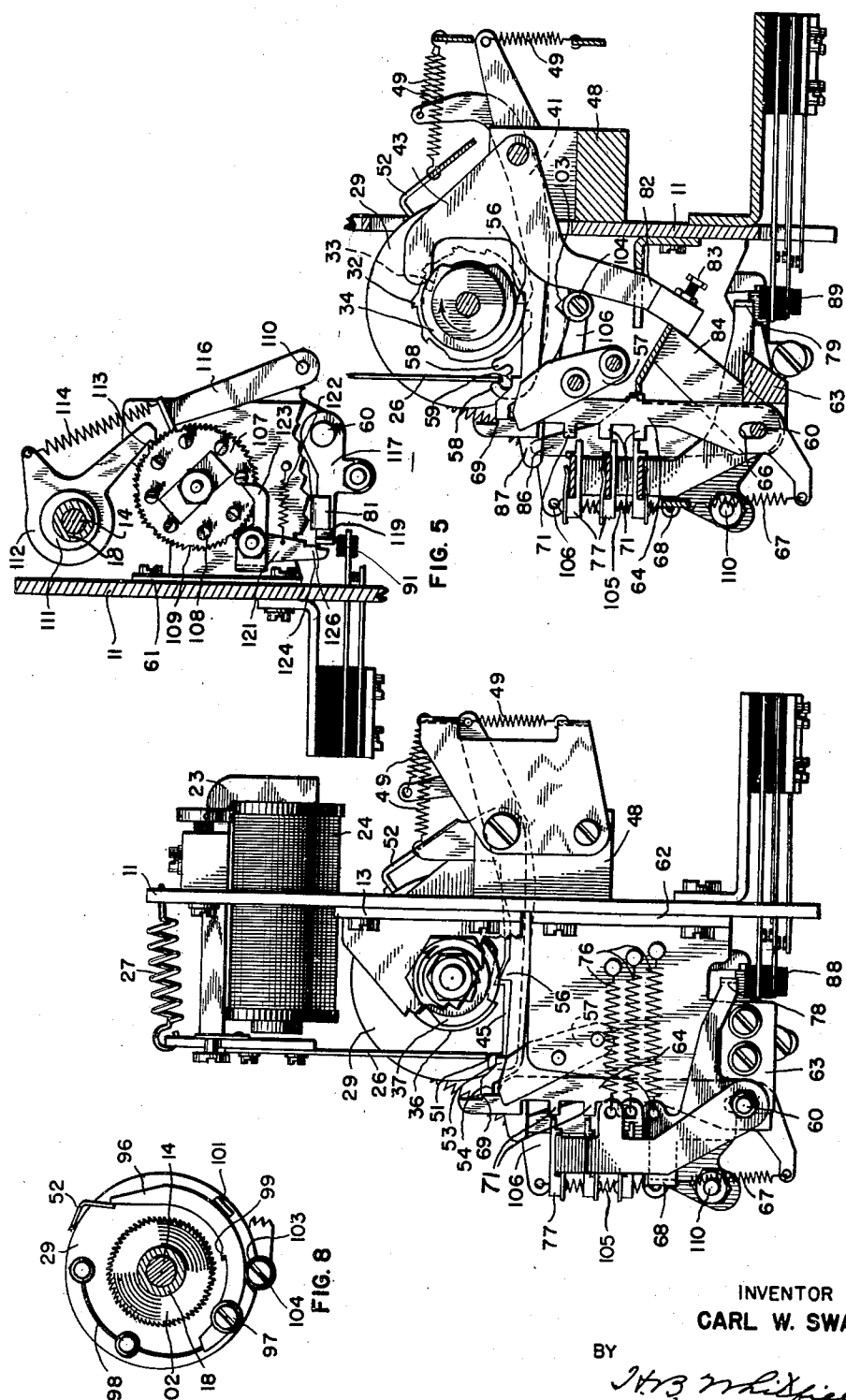
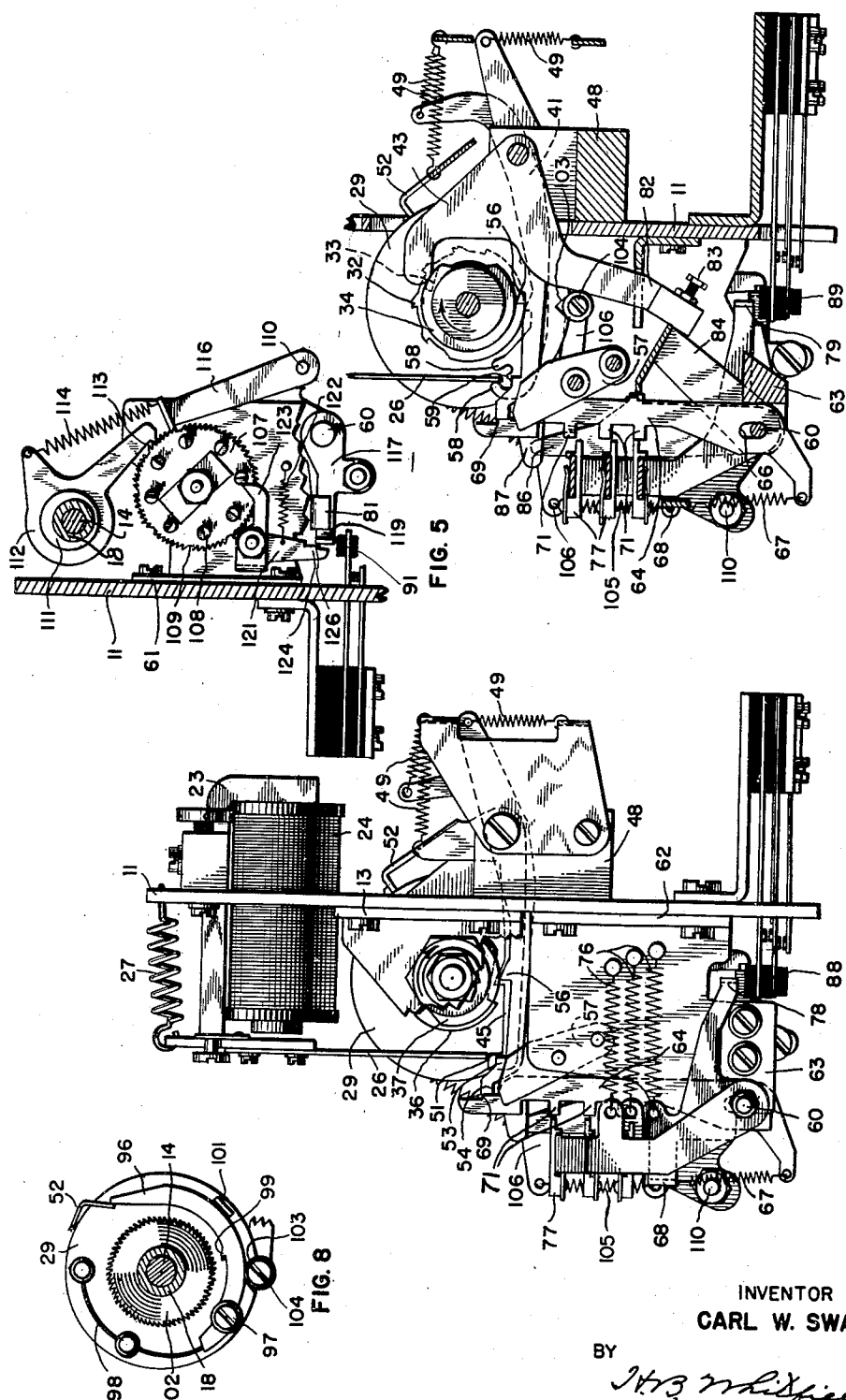
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UNITED STATES PATENT OFFICE

2,419,799

RECEIVER TRANSMITTER

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Application August 6, 1943, Serial No. 497,592

2 Claims. (Cl. 177-353)

1 This invention relates to telegraph apparatus and more particularly to start-stop telegraph apparatus.

It is often desired to have code signal receiving apparatus wherein certain predetermined code signals may be received, where visible indications will be given that a certain signal has been received, and which will then transmit a single predetermined code signal as an acknowledgment of the received signal.

The object of the present invention is to provide an apparatus which is responsive to predetermined code signals and which transmits a single predetermined code signal as an acknowledgment of the received signal.

A further object of the invention is to provide indicating means which are operable upon the receipt of an incoming signal to identify the particular signal received.

The apparatus in general comprises a selector magnet, which upon energization in response to received signals releases a receiver-distributor for rotation. The incoming signal permutably controls a plurality of code bars, which, in turn, control a plurality of code balls. An extension on each code ball controls an electrical switch, to establish an electrical circuit to light a lamp and indicate the particular code signal received. The selector magnet also releases a transmitter-distributor for rotation which transmits a predetermined code signal over an associated signaling channel to indicate that the selector mechanism has operated.

The features and advantages of the invention will become apparent from the following detailed description of a specific embodiment thereof, when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevational view, partly broken away, showing the apparatus embodying the invention;

Fig. 2 is a sectional plan view, taken approximately on the line 2-2 of Fig. 1,

Fig. 3 is a side elevational view, partly broken away, of the apparatus shown in Fig. 1;

Fig. 4 is a side sectional view, taken approximately on the line 4-4 of Fig. 1,

Fig. 5 is a fragmentary side sectional view taken approximately on the line 5-5 of Fig. 1;

Fig. 6 is a schematic wiring diagram showing the electrical circuit of the received signal indicator;

Fig. 7 is a schematic wiring diagram showing the electrical circuit of the transmitting signal acknowledger; and

2 Fig. 8 is a detail view showing the construction of the clutch mechanism.

The apparatus comprises a vertical base 11 which may be secured to any suitable equipment, such as a panel, etc. A pair of bearing brackets 12 and 13 are secured by means of screws to the base 11, on opposite sides thereof. A shaft 14 is rotatably journaled in the bearing brackets 12 and 13, extending horizontally almost the entire width of the base 11.

The shaft 14 is composed, toward the right end, of a receiving-distributing assembly designated generally by the numeral 16, and a transmitter-distributor assembly designated generally by the numeral 17 toward the left end. The assemblies 16 and 17 are separated by a somewhat thinner section of shafting, around which is positioned a freely rotatable sleeve 18. The sleeve 18 has a gear 19 firmly secured to its left end, as seen in Fig. 1, which in turn engages with a pinion 21 which is situated at the end of a shaft extending from the motor 22 (Fig. 2). The motor shaft constantly rotates, causing the pinion 21 to do likewise, thus causing the sleeve 18 to be constantly rotated. The shaft 14, however, is intermittently driven, the driving force being imparted by the constantly rotating sleeve 18 by means of clutching mechanism which will hereinafter be explained in detail.

A bracket 23, better seen in Fig. 3, is securely fastened to the plate 11, and supports an electromagnet 24 which is positioned adjacent the upper end of an armature 26. The armature 26 is normally positioned away from the electromagnet 24, by means of a spring 27 which is secured to the upper end of the armature 26 and to the base 11. The magnet 24 is responsive to code signal impulses, preferably of the Baudot type, which are received by the receiving apparatus over a signaling channel, as will be hereinafter explained.

The receiver-distributor assembly 16 comprises a disc 29 and eight cams 30 to 37, inclusive, all firmly secured to the shaft 14 in such a manner as to rotate with the shaft. The cams 30 to 37, inclusive, each have an associated cam follower 39 to 46, respectively, which are each shaped with a lug 56, thereon to be operated by the corresponding cam during a predetermined portion of the cycle of operation of the shaft 14, the time of operation depending on the individual contour of the cams. The cam followers 39 to 46 are each pivotally mounted in a block 48 which is secured to and extends from the back of the base 11. The cam followers are normally pivoted

so as to be in engagement with their associated cams by means of individual springs 49.

The cam follower 45 is formed at its forward end with an upwardly-extending lug 51, and at its opposite end with an upwardly extending member 52 which acts as a clutching and clutch release member (Fig. 8). The cam follower 45 is normally held in a downward position as the lower end of the armature 26 is normally above the upturned lug 51. This pivots the member 52 which is a part of the cam follower 45, in a counterclockwise direction, as viewed in Fig. 3, and allows it to disengage the clutching mechanism, as will be explained later. In the event that the armature is moved from above the upturned lug 51, due to the energization of the magnet 24, the cam follower 45 will pivot in a clockwise direction, as viewed in Fig. 3, under the tension of the spring 49, which will result in the member 52 also being moved in a clockwise direction to thereby allow the clutching mechanism to engage and cause rotation of the shaft 14. The cam follower 45 is under the control of its associated cam 36 and will only be permitted to rise during a certain period of the cycle of operation of the shaft 14, even though the armature 26 may not be above the upturned lug 51.

Cam followers 39, 40, 42, 44 and 46 are each formed, toward their forward end, with a shoulder 53 and a square end 54, as better seen in Fig. 3. These cam followers are normally urged toward the contour of their associated cams 30, 31, 33, 36, and 37, respectively, by means of the individual springs 49, which causes engagement of the upwardly extending lug 56, on the cam followers, with the cam surface. During a certain portion of the cycle of operation of shaft 14 an indentation in the contour of the cam will be presented to each lug 56 on each cam follower which, due to the spring 49 pivoting the cam follower in a clockwise direction, as viewed in Fig. 3, will cause the cam followers to rise to their upper position. The forward end of the cam followers are held in a lateral position by means of a pair of guide plates 57, one plate being positioned to either side of the individual cam followers.

The cam follower 41 is formed at its forward end in a configuration, as seen in Fig. 4, wherein the forward end is formed of two opposite, rounded lugs 58 with an opening between them in the shape of a semi-circle which has an upwardly extending lug 59, in the center thereof. The cam follower 41 is normally held with its front end in an upward position, with the armature 26 extending into the opening between the lugs 58 and to one or the other side of the upwardly extending lug 59. Thus, the lug 59 acts to lock the armature 26 in its forward or backward position. During a predetermined portion of the cycle of operation of the shaft 14 the cam 32, which is associated with the cam follower 41, will force the cam follower 41 to its downward position, overcoming the tension of the spring 49. During the interval that the cam follower 41 is in its downward position the upwardly extending lug 59 will be at a lower elevation than the bottom of the armature 26, which will allow the armature to be moved to its inward or outward position, depending on the nature of the impulses of the code signal being received by the receiving apparatus. This interval is relatively short in duration and the cam immediately thereafter allows the cam follower 41 to

rise again due to the force of its associated spring 49, thereby causing the upwardly extending lug 59 to be positioned above the elevation of the bottom of the armature 26 and either in front or behind it. When this occurs the armature 26 will be locked in whichever of its two positions it happens to be in at that time, until a subsequent downward movement of the cam follower 41.

A pair of brackets 61 and 62 are secured perpendicularly to the base 11, on either side of the cam followers previously described, and, in turn, support between them, toward their lower forward edge, a block 63.

Pivotally mounted on a pivot shaft 60 carried in the block 63 are a series of selector levers 64, one positioned in front of and corresponding to the cam followers 39, 40, 42, 44 and 46. The selector levers 64 are formed with a slot 66 toward their bottom, by means of which they are mounted pivotally in the block 63. However, the slot is longer in length than the rod on which the levers are pivoted, so that there can be a limited upward and downward movement of the selector levers. The forward lower end of the selector levers has secured therein a spring 67 which is connected at its top to a bracket 68 which extends outwardly from the bracket 62. The springs 67 normally pivot the selector levers 64 in a clockwise direction, as viewed in Fig. 4, which causes their upper ends to be positioned in engagement with the square end 54 of the corresponding cam follower. The selector levers 64 are laterally aligned with respect to their associated cam followers 39, 40, 42, 44 and 46, by means of the previously mentioned pairs of guide plates 57, one of which extends on either side of a portion of the selector levers 64. The upper inner edge of each of the selector levers 64 is formed with a shoulder 69 which may or may not be engaged by the square end 54, of the associated cam follower, depending on the position of the cam followers. The forward edge of the selector levers 64 is formed of three outwardly extending lugs 71, spaced substantially as indicated in Fig. 4. The selector levers 64 are normally held in their upward position by means of the springs 67. In the event that the square end 54 of the cam followers rise to a high enough position, due to their corresponding cam contours, the selector levers will move inwardly so that the square end of the cam follower will rest upon the shoulder 69 of each selector lever 64. Upon a subsequent counterclockwise actuation of the cam follower, due to the contour of their associated cams, the selector levers 64 will also be depressed, a distance limited by the length of the slot 66 at their pivot point, because of the pressure exerted by the cam followers upon the shoulders 69.

Three code balls 72, 73, and 74 are mounted pivotally to the block 63 and are urged inwardly under the tension of their individual springs 76. These balls each have five reversible code lugs 77 connected thereto, which may be positioned with their body projection either above or below the ball. Each of the lugs 77 are connected to the ball so as to be aligned with one of the selector levers 64. The code balls 72, 73, and 74 have rearwardly extending arms 78, 79, and 81, respectively (Figs. 3, 4, and 5), the utility of which will be explained later.

As mentioned above, there are five reversible code lugs 77 positioned on each of the code balls,

one each in front of each of the five selector bars 64. The reversible code lugs are positioned with a body projection extending either above or below the code bail, with a leaf spring of the code lug on the opposite side of the code bail holding it in place. Thus, it is possible to reverse the code lugs 71 to a position with its body projection either above or below the code bail. Depending on whether the body projection of the code lug is above or below the code bail will determine whether the body projection will engage the lug 71 on the selector lever 64 and thus prevent the code bail from moving to its inward limit under the force of its associated spring 76 or whether it will enter the space between the lugs 71. The code lugs are positioned in predetermined positions so as to predetermine the code signal to which the particular bail 72, 73, or 74 will be responsive; in other words, the position in which the bails will move clockwise in response to predetermined positions of the selector levers 64 responsive to a received code signal.

The cam follower 43 which is under the control of the cam 34, is formed with a depending portion 82 which is terminated in a block having an adjusting screw 83 therein. Adjacent the depending portion 82 (of the cam follower 43) is a member 84 pivoted in the block 83, which extends the width of the five selector levers 64 and which controls a lever 86 which is also mounted pivotally in block 83. The lever 86 is laterally positioned by means of a pair of guide plates 87, one being positioned on each side of the top of the lever. The front edge of the lever 86 is positioned against the code bails 72, 73, and 74, so that when the lever 86 is in its forward position, the bails will not be able to move inwardly, even though a correct setting of the selector bars has occurred. The member 84 has an edge which, as previously mentioned, extends across the back of the five selector bars 64; this limits the inward movement of the selector bars. During a certain portion of the cycle of operation of the shaft 14 the cam follower 43 is presented with a recess in the cam 34, which results in the cam follower being free to pivot in a counterclockwise direction, as viewed in Fig. 4. When this occurs the depending portion 82, of the cam follower 43, likewise moves in a counterclockwise direction allowing the member 84 to move to a limited extent in a clockwise direction, as viewed in Fig. 4. Any movement of the member 84 allows the member 86 to move inwardly, under the force exerted by the springs 76 urging the bails 72, 73 or 74 inwardly, providing that a proper signal has been received. After a limited period of counterclockwise movement of the cam follower 43 it will again be moved in a clockwise direction, as viewed in Fig. 4, due to the contour of the surface of the cam 34. This device acts as a lock to prevent the bails from moving from an outward position except during a limited period of the cycle of operation of the shaft 14.

Positioned below the arms 78 and 79 and adjacent the arm 81 are three electrical switches 88, 89 and 91, respectively (Figs. 3, 4, and 5). Whenever one of the bails 72, 73 or 74 moves in a clockwise direction, as viewed in Fig. 4, its associated arms 78, 79 or 81 will likewise move in a clockwise direction and cause pressure to be exerted upon an insulated portion of the associated electrical switch, which in turn results in an electrical contact being closed and an electrical circuit established. The electrical circuit,

as shown in Fig. 6, includes three electric lights 92, 93 and 94, which are illuminated upon the closing of one of the electrical switches. This acts as a visible indicator, to make it possible to readily ascertain which one of the bails has moved inwardly in response to the predetermined code signal which controls it.

The clutch mechanism, as disclosed in Fig. 8, comprises three pawls 96 which are pivotally connected to the disc 29 by means of a post 97. The pawls 96 are normally urged in a counterclockwise direction, as viewed in Fig. 8, by means of their individual springs 98. Each of the pawls 96 has a single tooth 99 thereon, the teeth being positioned in a staggered relation to each other on the respective pawls, for a reason which will be later explained. The disc 29 is provided with a post 101 which acts as a limit for the clockwise movement of the pawls 96. Secured firmly to the sleeve 18 is a ratchet wheel 102 which is positioned adjacent the three pawls 96, so that engagement is possible under certain circumstances. The periphery of the disc 29 has a V-shaped notch 103 in it in which a roller 104 (Fig. 4) may rest, depending on the position of the disc 29. The roller 104 is positioned at one end of a lever 106 which is mounted pivotally to the bracket 61 and urged against the periphery of the disc 29 by means of a spring 105 (Figs. 3 and 4) at its opposite end. In a normal position the member 52, previously mentioned, engages the end of the pawls 96 and pivots them in a clockwise direction against the tension of their springs 98 as viewed in Fig. 3. This results in the teeth 99 of the pawls 96 being separated from the teeth in the ratchet wheel 102, resulting in no rotation being imparted from the sleeve 18 to the shaft 14. Under certain conditions the member 52 will move in a counterclockwise direction (Fig. 8) thus freeing the ends of the pawls 96, which in turn are urged in a counterclockwise direction under the force of their individual springs 98. The teeth 99 will be urged toward the ratchet wheel 102 until one of the teeth engages the teeth on the periphery of the ratchet wheel. This permits rotation to be imparted to the shaft 14 from the constantly rotating shaft 13. As mentioned above, the teeth 99 were positioned in a staggered relation to each other on the individual pawls 96. This is done so that no matter what the position of the teeth of the ratchet wheel 102 are in respect to the teeth 99, there will always be an immediate and positive engagement of drive between the two members. Only one tooth will engage the ratchet wheel. The member 52 is only held in a counterclockwise position for a short interval during the cycle of operation of the shaft 14 and will almost immediately reassume its clockwise position. As the pawls 96 are secured to the disc 29 they will rotate with the disc and upon making a full cycle of operation of three hundred and sixty degrees will again come in contact with the member 52, thus being moved in a clockwise direction resulting in the tooth being released from the ratchet wheel. The roller 104, which enters the V-shaped notch 103 in the disc 29 simultaneously with the member 52 forcing the pawls 96 in a clockwise direction, acts as an anti-singing device for the clutching mechanism. In other words, it positively acts to cause the tooth 99 to be disengaged from the teeth of the ratchet wheel 102 so that there will be no partial engagement during the unoperative periods of the shaft 14 and the disc 29.

A timing device is disclosed in Fig. 5 which is

utilized to hold the electrical switch 91 in its closed position and thus insure illumination of the indicator lamp 94 for a definite predetermined period of time. Connected rotatably to the bracket 61 is a ratchet wheel 107 which has a plurality of posts 108 secured to and extending outwardly from the ratchet wheel near its periphery. The periphery of the ratchet wheel 107 is formed of a series of teeth, there being omissions in certain positions, such as is designated by the numeral 109. Secured to the sleeve 18 is an eccentric 111, which rotates with the sleeve 18. Placed around the eccentric 111, but free to move in respect to the eccentric, is a pawl 112. The pawl 112 is normally held with its arm 113 against the surface of the ratchet wheel 107 by means of a spring 114. A second pawl 116 is secured pivotally at 110 to a portion of the code bail 74 so as to be able to move vertically as the bail 74 rocks about pivot shaft 60. The upper end of the pawl 116 is also normally held in engagement with the teeth of the ratchet wheel 107, by means of the same spring 114. A lever 117 is mounted loosely adjacent the block 63, so as to be pivotable under the control of the arm 81 extending rearwardly from the code bail 74. The end 119 of the lever 117 is perpendicular to the main body of the lever and is positioned immediately above the electrical switch 91. A bell crank lever 121 is pivotally connected to the bracket 61 and is normally urged in a counterclockwise direction, as viewed in Fig. 5, by means of a spring 122. One arm 123 of the bell crank lever 121 is positioned adjacent the ratchet wheel 107 in such a manner that upon engagement with a post 108 the bell crank lever 121 will be moved in a clockwise direction. An arm 124 forms the second arm of the bell crank lever 121 and is positioned with its lowest end adjacent to the end 119 of the lever 117. The end of the arm 124 is formed with a shoulder 126 thereon, which under certain circumstances engages the end 119 of the lever 117 and holds it in its depressed or counterclockwise position, as viewed in Fig. 5, thereby holding the electrical switch 91 in its closed position until the lever 117 is released. The release of lever 117 occurs when the ratchet wheel 107 is stepped to a position whereat one of the posts 108 will engage the arm 123 of the bell crank lever 121, pivoting the lever in a clockwise position against the tension of the spring 122, and thereby freeing the end 119 of the lever 117 from the shoulder 126, which had previously held it downward in a latched position. The ratchet wheel 107 is moved in a step-by-step manner by means of the constantly, eccentrically, moving pawl 112 whose arm 113 engages the teeth on the periphery of the ratchet wheel. Rotation of the ratchet wheel 107 will cease when the arm 113 of the pawl 112 reaches a position where the teeth are omitted, such as is designated by the numeral 109. At this point the ratchet wheel will not be rotated further, which acts as a pause in the timing device. However, in the event that the bail 74 is selected, the pawl 116 will move upwardly and cause the ratchet wheel 107 to step one notch, which is sufficient to allow the pawl 112 to again start the ratchet wheel 107 into step-by-step rotation. The omitted portions 109 of the teeth on the ratchet wheel 107 are so placed with respect to the posts 108 that the rotation of the ratchet wheel 107 will not stop while the electrical contact 91 is closed and the lamp 94 is illuminated but rather, the omitted space is encountered by

the arm 113 just after the post 108 has pivoted the bell crank lever 121 and freed the lever 117 from the shoulder 126 which locked it down. By various spacings of the posts 108 on the ratchet wheel it is possible to vary the length of time which the switch 91 will be closed and the visible indication maintained.

The transmitting-distributor, which is located toward the left end of the shaft 14, and to the left of sleeve 18, is formed of six cams 128 to 133, inclusive. Positioned adjacent each of the cams 128 to 133 inclusive are a set of electrical switches 135 to 140, inclusive. The electrical switches are successively closed upon rotation of the shaft 14 by means of their corresponding cams. The electrical contacts 135 to 140, inclusive, act to supply the impulses in a standard five-unit transmission code. The switch 135 when closed acts to transmit the start impulse, whereas the switches 136 to 140, inclusive, act to transmit the five code impulses, the proper combination of which in marking or spacing relation designates a certain code signal. As shown in Fig. 7, the electrical switches 136 and 139 have been connected to ground over an obvious circuit. When these two switches are closed, by their respective cams 129 and 132, marking impulses will be transmitted. However, as electrical switches 137, 138 and 140 are not grounded, spacing impulses will occur when their respective cams 130, 131 and 133 close the switches. Upon the cycle of operation of the shaft 14, the six cams will have been closed and reopened which will have resulted in the letter D, as designated in a well known code, being transmitted over an associated line. This predetermined signal may be transmitted back to the unit which is transmitting to the receiver or may be transmitted to any other receiving unit at any desired location.

The incoming code signal may be transmitted by means of any convenient type of transmitting apparatus. However, a type of apparatus which is especially adapted for sending signals to the present receiver is disclosed in copending United States application Serial No. 497,591, filed on August 6, 1943, by Carl W. Swan.

A description of operation of the present unit is very similar, regardless of which one of the three possible signals is received. The three code bails 72, 73 and 74 correspond to the letters A, B and C, such correspondence being predetermined by the position of the body projection of the code lugs 77 either above or below the bail. However, as bail 74 has a timing device associated with it, which the other two signal bails do not have, the operation of code bail 74 will be described upon receipt of the letter A.

The operation of the apparatus is as follows:

Contrary to the usual practice, wherein the start impulse is normally of spacing nature (or no-current) and the stop impulse is of marking nature (or current), the apparatus according to the present invention is operable in a system wherein the start impulse is of marking nature (or current) and the stop impulse is of spacing nature (or no-current). Accordingly, the start impulse of an incoming code signal energizes the magnet 24, which in turn causes the tension of the spring 27 to be overcome and the armature 26 to be drawn toward the magnet. The armature 26 will thus be moved toward the right, as viewed in Fig. 3, with the result that the lower end of the armature will no longer be above the upturned lug 51 of the cam follower 45. The cam follower 45 is then free to pivot under the tension of its asso-

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ciated spring 49 if the low portion of the associated cam 36 is presented to the lug 56 on the cam follower 45 at that time. The cam follower will pivot in a clockwise direction, as viewed in Fig. 3, causing member 52 to likewise move in a clockwise direction. Such a movement of the member 52 releases the pawls 96, which will then move in a counterclockwise direction, as viewed in Fig. 8, under control of their individual springs 98. One of the teeth 99 on the pawls will engage the teeth on the ratchet wheel 102 thereby imparting rotation from the constantly rotating sleeve 18 to the shaft 14. Upon rotation of the shaft 14, the cam 36 will likewise rotate so that its low portion is no longer presented to the cam follower 45 and which results in the cam follower being depressed. As the start impulse was only momentary the magnet 24 has become deenergized and the armature 26, under the tension of its spring 27, has been moved to its normal position where its lower end will once again be positioned above the upturned lug 51 of the cam follower, and hold it down. The member 52 is likewise moved to its bottom position so as to be in readiness to again engage the pawls 96 and disengage the clutching mechanism, upon the completion of a cycle of operation of the shaft 14.

The cam 30 will then present its low point to the lug 56 of the cam follower 39, thus allowing the cam follower to be pivoted in an upward direction, as viewed in Fig. 2, under the tension of its associated spring 49. The cam follower 39 will be raised a distance sufficient to allow its forward end 54 to be above the shoulder 69 of the selector lever 64 said lever being pivoted in a clockwise direction (Fig. 4) by its associated spring 67. Immediately thereafter the cam 30 will cause the cam follower 39 to be pivoted in a downward direction, as viewed in Fig. 2, which will result in the square end 54 of the cam follower 39 engaging the shoulder 59 on the selector lever 64 and moving the lever downwardly, the downward movement being limited by the length of the slot 66 in the selector lever 64 at the pivot point 60. The selector lever 64 will be held in its downward position through the entire cycle of operation of the shaft 14, as there is only one low spot on the associated cam 30.

The description immediately above has gone on the assumption that a marking impulse, during the first unit of the 5-unit code, has been transmitted to the receiving unit thereby energizing the magnet 24 which causes the armature 26 to be attracted, as previously explained. In the event that a spacing or no current impulse has been transmitted to the receiving apparatus the magnet 24 will not be energized and the armature 26 will remain in its normal or released position. The lower end of the armature 26, in its normal position, is immediately above the shoulder 53 on the cam follower 39 and thus will engage the shoulder and prevent the cam follower from rising, under the force of its associated spring 49, even though the low portion of the cam 30 was presented to the lug 56 on the cam follower. Thus, the cam follower 39 will not be able to rise and the selector lever 64 will not be engaged thereby to be moved downwardly by the cam follower.

The cam 32 has five low portions, corresponding to the number of selector levers 64, which control the armature 26 and allow the armature to be locked either in its attracted or in its normal released position, depending on whether a marking or a spacing impulse has been transmitted. The

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cam 32 presents a low portion to its cam follower 41, thus allowing the cam follower 41 to rise under the force of its associated spring 49. The armature 26 will thus be locked in its marking or spacing position, by means of the lug 59 at the forward end of the cam follower 41. This is to insure that the armature 26, if moved inwardly under a marking impulse, will not return to its normal position on a shoulder 53 of a selector lever 64 and block the upward movement of a cam follower. The cam follower 41 will be allowed to rise five times, once after each impulse has been received, thus locking the armature 26 in the position in which it has been placed, for a short interval of the cycle of operation of the shaft 14.

The above description, which has described the operation of one cam follower and its associated selector lever, is then successively carried out to allow the other four selector levers to undergo the same operation. After the five impulses have been received the selector levers will either be in their upward position or held in their downward position by their associated cam followers, depending on whether a spacing or marking impulse was received. Immediately thereafter, the cam follower 43 is presented with a low portion on its associated cam 34 which allows the cam follower to move in a counterclockwise direction (Fig. 4), thus removing the pressure which its depending portion 82 exerted on the pivoted lever 84. The lever 84 will then release the pivoted lever 86, which is normally held in an outwardly position and which, in turn, held the bails 72, 73 and 74 in an outwardly position, thus preventing any inward movement of the bails to be caused by their associated individual spring 76. In the event that the code lugs 77 have been positioned with their body projection above the code bar, corresponding to the marking impulses of the code signal which has been just received, or positioned below the bail corresponding to the spacing impulses received, the bail will be free to move inwardly under the tension of the spring 76. For the present description we have assumed that bail 74 has had its five code lugs 77 positioned to correspond to the letter A in the 5-unit Baudot code, namely two marking impulses followed by three spacing impulses. Assuming this to have been the signal received by the apparatus, the code bail 74 will move inwardly under the tension of its corresponding spring 76. As the bail 74 moves inwardly its arm 81 will be pivoted in a counterclockwise direction, as viewed in Fig. 5, thereby causing the pivoted lever 117 to also move in a counterclockwise direction. This will result in the end 119 of the lever 117 engaging the insulated portion of the electrical switch 91, forcing it downwardly, and thus making an electrical contact. As shown in Fig. 6, the closing of the electrical switch 91 establishes a circuit which causes the light 94 to be illuminated, indicating that bail 74 has been selected and that the letter A has been received.

Immediately thereafter cam 34 causes the cam follower 43 to be moved in a clockwise direction, as viewed in Fig. 4, which results in its depending position 82 pivoting the lever 84 in a counterclockwise direction which exerts pressure on the pivoted lever 86 and thus causes the bail 74 to be forced to its outward position, against the tension of its spring 76.

As previously mentioned, the pivoted lever 117 was moved in a counterclockwise direction, as

viewed in Fig. 5, with its end 119 exerting pressure on the electrical switch 91. The bell crank lever 121 will now be allowed to move in a counterclockwise direction, as viewed in Fig. 5, under the force of the spring 122, so that its shoulder 126 will engage the top of the end 119 of the lever and lock the lever 117 in its downward position. The electrical switch 91 will thus be held in its downward, closed, position for a predetermined time. The constantly operating pawl 112, which moves in an eccentric manner from its position on the eccentric 111, imparts a step-by-step rotation to the ratchet wheel 107. The ratchet wheel 107 will be moved one step, or an amount equal to the distance between adjacent teeth on the periphery of the ratchet every time the pawl 112 makes an eccentric rotation, as a result of the hook at the end of the pawl arm 113. The ratchet wheel 107 will finally be moved to a position where one of its posts 103 will engage the arm 123 of the bell crank lever 121 and cause it to be pivoted in a clockwise direction, as viewed in Fig. 5. As the arm 124 is an integral part of the bell crank lever 121 the lever will likewise be pivoted in a clockwise manner, causing the end 119 of the pivoted lever 117 to be freed from the shoulder 126. As the bail 74 in the meantime had been returned to its outward position, its arm 81 will no longer exert pressure on the lever 117, which allows the lever 117 to pivot in a clockwise direction, as viewed in Fig. 5, moving to a position so that the shoulder 126 on the bell crank lever 121 can no longer lock it in a downward position. However, during the interval that the pawl 112 has advanced the ratchet wheel 107 a distance equal to the distance between adjacent posts 103, the lever 117 has been held in a locked downward position, with the result that the electrical switch 91 has been closed during this time and its associated electric light 94 illuminated.

Immediately after, the post 103 causes the bell crank lever 121 to be pivoted in a clockwise direction, the hook on the arm 113 on the pawl 112 will come in contact with a space on the periphery of the ratchet wheel whereon a tooth has been omitted such as is designated by the numeral 109. This acts as a pause in the timing mechanism so that the pawl 112 can no longer cause step by step rotation of the ratchet wheel 107. Upon a succeeding inward movement of the bail 74, its associated pawl 116 moves the ratchet wheel 107 one step, which is enough to allow the hook on the arm 113 to again impart step-by-step movement to the ratchet wheel 107 for a distance equal to that between two adjacent posts 103. As the timing device just described is only associated with the letter A, and its bail 74, no motion will be imparted to the ratchet wheel by a pawl similar to the pawl 117 when the B or C signals are received and their respective bails 72 and 73 move inwardly.

The electrical contacts 135 to 140, inclusive, which were previously mentioned, as being under the control of the cams in the cam assembly 17, have been previously connected such as is shown in Fig. 7. The electrical switch 135 is of the start-stop variety whereas the other five switches 136 to 140, inclusive, correspond to the five units in the Baudot code. As previously mentioned, these switches may be predeterminedly connected so as to correspond to any desirable code signal, such as in the present instance, as illustrated in the Fig. 7, by the letter D. Upon the rotation

of the shaft 14 the cams 128 to 133, inclusive, will cause the electrical switches to close successively. Electrical contact 135 is closed to transmit a start signal over the outgoing line. The cams 129 to 133 inclusive will then successively close the switches 136 to 140, inclusive, resulting in a marking impulse being transmitted by switches 136 and 139, whereas spacing impulses will be transmitted by the switches 137, 138 and 140, as they have not been grounded and will not establish an electric circuit. Thus, the letter will be transmitted by the present apparatus over an associated signaling channel, which acts as an acknowledging signal to distant receiving apparatus that the receiving apparatus of the present unit has operated in response to an incoming signal.

As previously mentioned, the member 52 had been returned to its counterclockwise position, as seen in Fig. 4, thus being in position to engage the pawls 96 upon completion of a cycle of operation of the shaft 14 and pivot them in a clockwise direction, as seen in Fig. 8, against the tension of their associated springs 98, thereby removing their associated teeth 99 from the teeth in the periphery of the ratchet wheel 102, and thus releasing the clutching mechanism so that no further rotary motion will be imparted to the shaft 14 from the constantly rotating sleeve 18, until another start signal is received by the apparatus, thereby again setting the above described mechanism into operation. The roller 104 will be forced into the notch 102 in the periphery of the disc 29, thereby positioning the disc in respect to the member 52 so as to insure that the tooth 99 has been completely withdrawn from the teeth of the ratchet wheel 102.

The operation of the above apparatus is identical upon the receipt of a B or C signal, with the exception that there is no timing device associated with the B and C bails 72 and 73 to act to hold the associated electrical switches 88 and 89 closed for a period of time and thus illuminate the lights 92 and 93 to cause the visible indicator to remain illuminated for a predetermined interval.

Although a specific embodiment of the invention has been shown and described, it will be understood that this embodiment is but illustrative and that various modifications may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. In start-stop telegraph apparatus, a single shaft, a selector magnet responsive to received code signal impulses for releasing said shaft for operation, a plurality of code bars operating upon the release of said shaft and permutably selectable under the control of said magnet, a plurality of code bails, each of said code bails responsive to the setting of said code bars in accordance with a predetermined code signal, an electrical contact associated with each of said code bails, means responsive under the control of said electrical contact to visibly indicate the received signal, and a cam distributor forming part of said shaft and having a plurality of electrical contacts predeterminedly set to correspond to a code signal associated therewith, said electrical contacts being under the control of said cam distributor to be closed successively to transmit an answer back signal, said cam distributor and electrical contacts operating concurrently with the operation of said code bars.

2. In start-stop telegraph apparatus, a single

shaft, a selector magnet responsive to received code signal impulses for releasing said shaft for operation, a plurality of code bars operating upon the release of said shaft and permutably selectable under the control of said magnet, a plurality of code bails, a plurality of code lugs on each of said code bails, each of said code bails responsive to the setting of said code bars in accordance with a predetermined code signal as set by said code lugs, an arm on each of said code bails, an electrical contact associated with each of said code bails, each of said electrical contacts controlled by one of said arms, means responsive under the control of said electrical contacts to visibly indicate the received signal, and a cam distributor forming part of said shaft and having a plurality of electrical contacts predeterminedly set to correspond to a code signal associated therewith, said electrical contacts being under the control of said cam distributor to be closed successively to transmit an answer back signal, said cam distributor and electrical con-

tacts operating concurrently with the operation of said code bars.

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