

March 11, 1941.

L. M. POTTS

2,234,832

PHOTOELECTRIC TRANSMITTER

Filed Jan. 10, 1938

2 Sheets-Sheet 1

FIG. 1

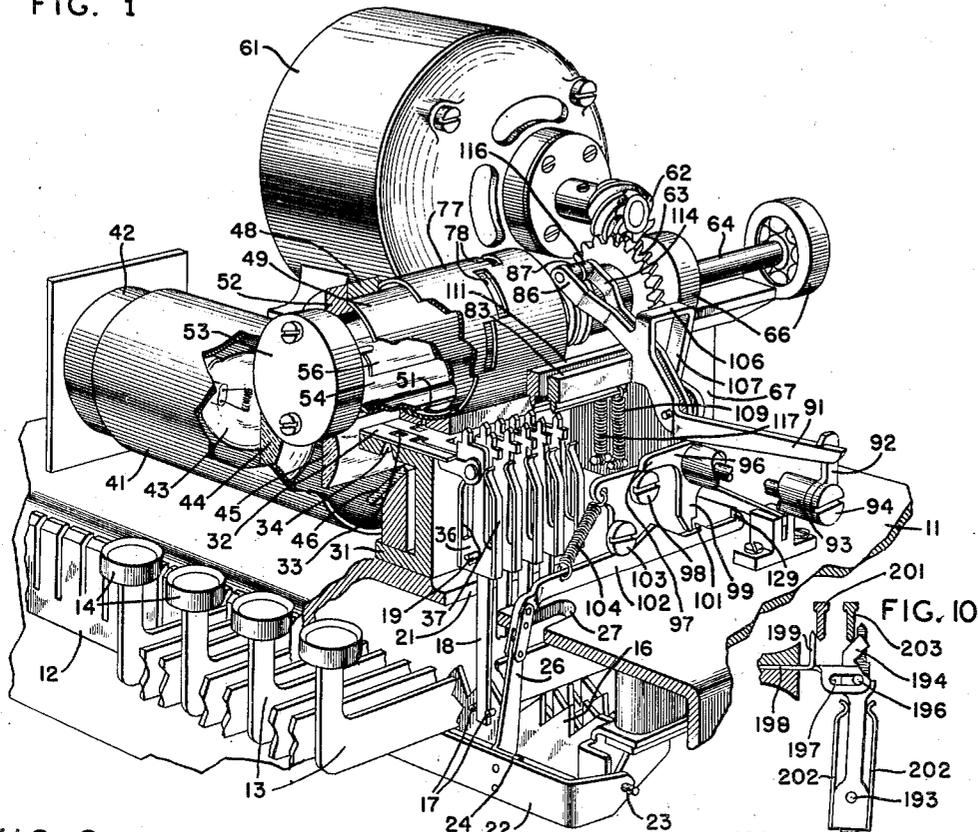
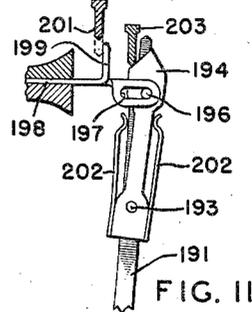
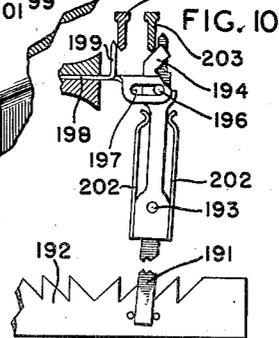
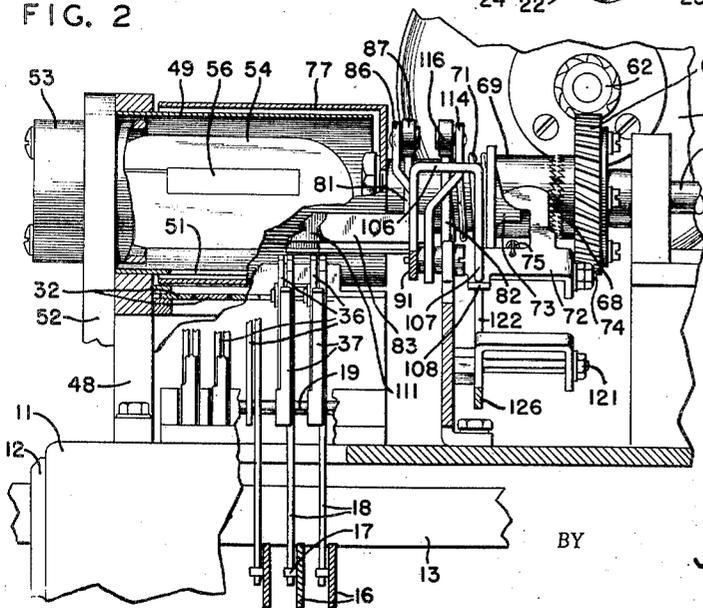


FIG. 2



INVENTOR.  
LOUIS M. POTTS

BY  
*N.B. Whitfield.*  
ATTORNEY.

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2 Sheets-Sheet 2

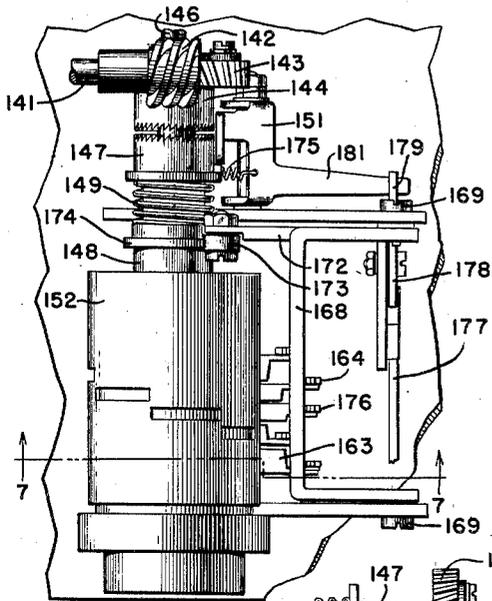


FIG. 6

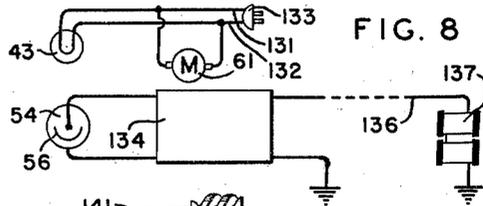


FIG. 8

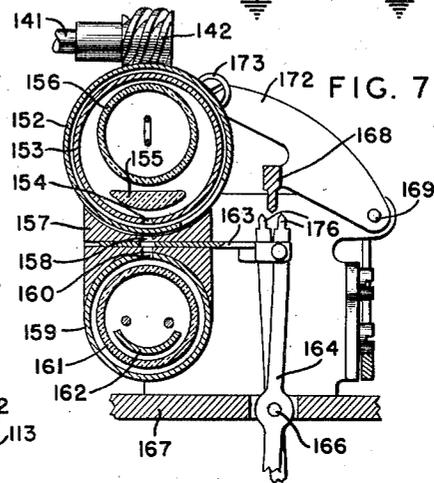


FIG. 7

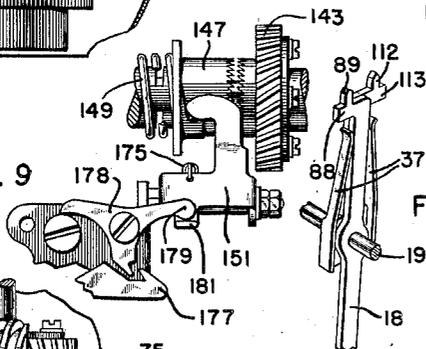


FIG. 9

FIG. 4

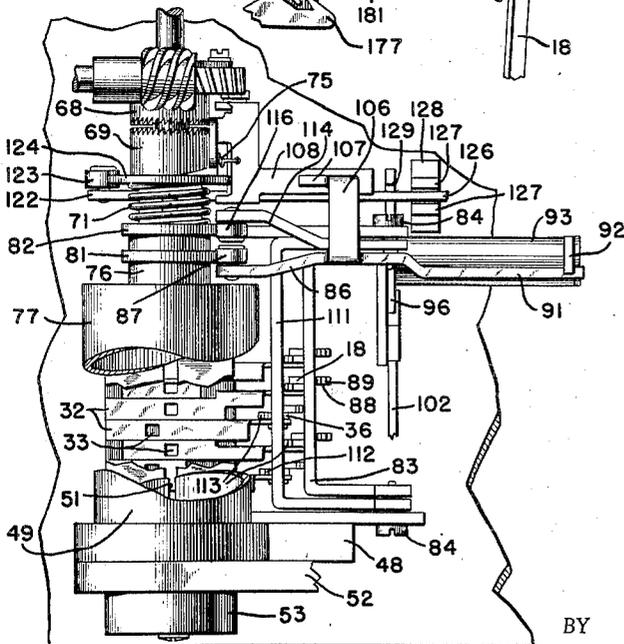


FIG. 3

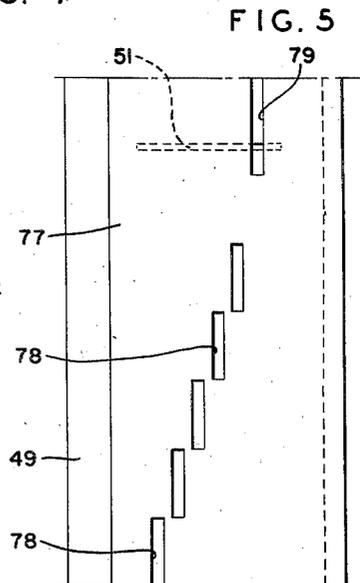


FIG. 5

INVENTOR.  
LOUIS M. POTTS

BY

*N.B. Whitfield.*  
ATTORNEY.

# UNITED STATES PATENT OFFICE

2,234,832

## PHOTOELECTRIC TRANSMITTER

Louis M. Potts, Evanston, Ill., assignor to Teletype Corporation, Chicago, Ill., a corporation of Delaware

Application January 10, 1938, Serial No. 184,138

37 Claims. (Cl. 178—79)

This invention relates to printing telegraph apparatus, and particularly to keyboard controlled signal transmitting mechanism.

An object of the invention is to generate telegraph signals in a photoelectric device through the cooperation of a distributor controlled from a keyboard.

Another object of the invention is to provide overlap between keyboard and distributor operations in a keyboard transmitter.

Briefly, the invention contemplates a keyboard mechanism including a set of code bars to be positioned characteristically according to the key lever depressed. Each of the code bars controls the corresponding positionment of an apertured slide bar. A beam of light from a source of illumination is directed toward a photoelectric device, and generally disposed in the path of the beam are the slide bars and two coaxial cylinders which house the photoelectric device. The wall of the inner cylinder contains a slot parallel to the axis of the cylinder and somewhat longer than the span of the slide bars, this slot being in the light path.

The outer cylinder is rotatable under the control of a single revolution clutch, and is provided with a plurality of peripheral apertures so positioned that they traverse the slot in the inner cylinder successively as the outer cylinder rotates. The apertures in the outer cylinder are aligned with the slide bars and particularly with the apertures therein. The slide bars rest on a stationary slotted member, and their range of movement is to position their apertures in or out of registry with the slot in the stationary member. When an aperture is in registry, it permits a portion of the beam of light to impinge upon the surface of the rotatable cylinder. Thereafter, as the peripheral slot of the rotatable cylinder, which is aligned with the particular slide bar, traverses the slot in the stationary cylinder, the beam of light transmitted through the aperture in the slide bar is also transmitted through the slots in the two cylinders and impinges upon the photosensitive element in the photocell, thus increasing the conductivity of the cell and generating a signal impulse of a particular kind. When, however, the aperture in a slide bar is positioned out of registry with the slot in the stationary support, light is prevented from passing through the corresponding slot in the rotatable cylinder, and the conductivity of the cell remains unchanged during traversal of the slot in the inner cylinder by the particular slot in the outer cylinder, thus generating a signal impulse of a different kind. The rotatable cylinder is released for one cycle of operation upon each depression of a key lever and is arrested automatically at the end of the cycle initiated by that key lever.

With regard to the arrangement of the light

source and the photoelectric device, the invention contemplates an alternative embodiment in which the positions of the two instrumentalities are reversed, the source of illumination being housed within the coaxial cylinders and the photocell being disposed externally of said cylinders.

In one embodiment of the invention, an overlap between successive operations of the keyboard mechanism and the generation of signal combinations is afforded by providing a two way operative yield between the code bars and the apertured slide bars which they control. The slide bars, upon being set by the code bars, are locked during the cycle of rotation of the distributor, but an instant after the start of the cycle, the code bars which had also been locked are unlocked and may be reset by the operation of another key lever. At the completion of the cycle of the distributor, the new setting of the code bars is transferred to the slide bars by the yield mechanism. A clutch release condition having been stored upon the operation of the key lever to reset the code bars, the distributor is not arrested but proceeds into the cycle contemplated by the resetting of the code bars.

According to another embodiment of the invention, the linkage between the code bars and the slide bars includes no yield, so that when the slide bars are locked, the code bars are also locked, and they cannot be reset until the distributor closely approaches its rest position.

For a complete understanding of the invention and of the manner in which the same may be accomplished, reference may be had to the following detailed description to be interpreted in the light of the accompanying drawings wherein,

Fig. 1 is a perspective view of one embodiment of the invention having portions broken away to show structural details;

Fig. 2 is a side elevational view of the apparatus shown in Fig. 1;

Fig. 3 is a plan view of the apparatus shown in Fig. 2;

Fig. 4 is a perspective of one detail of the transmitter shown in Figs. 1 to 3, inclusive;

Fig. 5 is a development of cylindrical scanning elements shown in Figs. 1 to 3, inclusive;

Fig. 6 is a plan view of another embodiment of the invention;

Fig. 7 is a vertical sectional view taken approximately on the line 7—7 of Fig. 6;

Fig. 8 is a diagrammatic showing of an electrical circuit;

Fig. 9 is an elevational view of the clutch tripping mechanism of the embodiment shown in Figs. 6 and 7;

Fig. 10 is an elevational view partly broken

away showing a modified keyboard mechanism at one stage of operation; and

Fig. 11 is a view similar to Fig. 10 showing the same mechanism at a later stage of operation.

5 Referring now to the drawings in which corresponding reference characters designate identical parts throughout the several views and particularly to Figs. 1 and 2, reference numeral 11 indicates a keyboard base casting to the front of  
10 which is secured a slotted comb 12. Key levers 13 extend through the slots in comb 12 to the interior of keyboard base casting 11 and are there pivotally supported on a common pivot rod (not shown) and are spring urged to their uppermost  
15 positions with respect to the slots in comb 12 by individual springs (also not shown). Each of the key levers 13 is provided with a keytop 14 by means of which manual operation of the several key levers may be performed.

20 Inside the base casting 11 a plurality of code bars 16 are slidably supported. Code bars 16 extend transversely of the keyboard mechanism directly below the entire set of key levers 13. The code bars are provided at their upper edges with  
25 notches which may be defined by one vertical edge and one oblique edge or by two oblique edges, the notching of the several code bars being variable with respect to the several key levers in accordance with the code which, in the preferred embodiment of the invention, is a permutation code  
30 comprising various combinations of marking and spacing signals. Code bars 16 are slidable transversely of the keyboard base 11 from one to the other of two positions, and the sliding movement  
35 of the code bars is effected by the camming action exerted by a key lever 13 upon the oblique edge of a notch during the operation of depressing the key lever. The notching of the code bars 16 is such that for each permutational setting of  
40 code bars 16 by a key lever, no other key lever may be fully depressed, the reason for this being that the simultaneous depression of two key levers involves the inconsistent condition of attempting to present at least one of the code bars in both  
45 of its possible positions.

Each of the code bars 16 supports on one face thereof a pair of spaced pins 17 between which is disposed the lower end of a lock lever 18 which is pivotally mounted upon a pivot pin 19 intermediate the ends of lock lever 18. Keyboard base casting 11 is provided with a slot 21 through  
50 which the several lock levers 18 extend to be presented between the pins 17 carried by the corresponding code bars 16.

55 A universal ball 22 is contained within keyboard base casting 11 and extends transversely thereof below all of the key levers 13 and in close proximity thereto. Universal ball 22 is pivotally supported at its opposite ends upon pivot  
60 pins 23 and is provided near one end with a bracket 24 which includes an arm 26 that projects upwardly from within the keyboard base 11 through a slot 27. The purpose of universal ball 22 is to trip a distributor clutch, and the manner  
65 in which this may be accomplished will be described later. It may be stated, however, at this point that upon the depression of any key lever 13, the universal ball 22 is rocked downwardly about its pivot pins 23, and the upper end of arm  
70 26 which it supports is thereby rocked outwardly.

Upon the upper surface of keyboard base 11 there is secured a bracket 31 the upper surface of which supports a plurality of flat slide bars  
75 32. Each of the slide bars 32 is provided with a single aperture 33 which, when sliding move-

ment is imparted to slide bars 32, is movable into or out of registration with a narrow slot  
34 in the upper part of bracket 31. Each of the slide bars 32 is articulated to an individual lever  
36 pivoted on pivot pin 19 adjacent to a corresponding one of the lock levers 18. The number  
5 of slide bars 32, levers 36, lock levers 18, and code bars 16 is equal to the number of code elements involved in each of the permutation code combinations, which is preferably five, but which may, 10  
under conditions requiring a more extensive code, be six or more. Each of the levers 36 has reed springs 37 secured to the opposite edges thereof, and the free ends of the reed springs are of sufficient width to engage the edges of the slide bar  
15 operating lever 36 and also the edges of the adjacent and associated lock lever 18, as is clearly disclosed in Fig. 4. Reed springs 37 are so tensioned that they seek engagement with both edges of slide bar operating lever 36 and associated  
20 lock lever 18, and it will be apparent from this that if a lock lever is rocked upon pivot pin 19 while the associated slide bar operating lever 36 is held stationary, one of the reed springs 37 will be moved by the lock lever out of engagement  
25 with the slide bar operating lever 36 which, in turn, will prevent the other reed spring from following the motion of lock lever 18. A condition of unbalance is thus created as between the two springs 37, so that each spring seeks to shift  
30 the lever which it alone is engaging in such direction as to restore engagement of both springs to both levers. Thus, when the restraint upon the slide bar operating lever 36 is removed, it is immediately shifted by one of the springs 37 in  
35 the same direction in which lock lever 18 was rocked.

Keyboard base 11 has secured to the upper surface thereof a cylindrical housing 41 in which is slidably fitted a cylindrical support 42 for an electric lamp 43. Within cylinder 41 are supported  
40 a spherical lens 44 and cylindrical lens 45, the function of which is to focus an elongated beam of light from lamp 43 upon reflector 46, so positioned as to reflect the beam upwardly through  
45 elongated slot 34 in bracket 31. The focusing of the beam upon the reflector may be accomplished by moving cylindrical lamp support 42 within cylinder 41 to vary the distance between lamp 43 and lens 44 and reflector 46, the latter  
50 being stationarily supported.

Keyboard base 11 supports, just forward of bracket 31, a bracket 48 which is provided near its upper end with a circular aperture into which is fitted, to be stationarily supported thereby, a  
55 cylinder 49 having both ends open. Cylinder 49 is provided, in the lower portion thereof, with an elongated slot 51 parallel to its axis and in a vertical plane with respect to slot 34 in bracket 31. Slot 51 is of sufficient length to span all of  
60 the slide bars 32 and to extend a short distance beyond the slide bars at one end. Slots 34 and 51 may be of substantially the same length. On its forward wall, bracket 48 supports an adapter 52 which, in turn, supports the base 53 of a photo-  
65 electronic device 54 that extends into stationary cylinder 49 and has its light sensitive cathode 56 substantially coextensive with slots 34 and 51. Upon the basis of the description thus far presented, it will be apparent that when any one  
70 of slide bars 32 is so positioned that its aperture 33 is presented in the vertical plane defined by slots 34 and 51, light from lamp 43 will pass through condensing lens 44 and will be directed by reflector 46 through slot 34, slide bar aperture  
75

33, and slot 51 to impinge upon light sensitive cathode 56. Likewise, those of the slide bars 32 which have been so positioned, under the control of lock lever 18 and code bars 16 that their apertures 33 are out of registry with slots 34 and 51, will intercept light transmitted through slot 34.

Keyboard base 11 supports electric motor 61 to the rotor shaft of which is secured pinion 62. This pinion meshes with a gear 63 secured to signal distributor shaft 64 which is rotatably supported in bearings 66 carried by bracket 67 supported by keyboard base 11. Shaft 64 has secured thereto the driving element 68 (Figs. 2 and 3) of a positive drive single revolution clutch mechanism, the driven portion 69 of which is supported by shaft 64 but is not secured thereto, is urged by compression spring 71 into engagement with driving member 68, and is normally restrained from such engagement by clutch throw-out lever 72 cooperating with clutch throw-out lug 73 formed on the periphery of driven clutch member 69. Clutch throw-out lever 72 is pivotally supported at 74 and is urged by the tension spring 75 (Fig. 2) into the path of clutch throw-out lug 73. When clutch throw-out lever 72 is rocked away from the throw-out lug 73, compression spring 71 urges driven member 69 into engagement with member 68 whereby rotation is imparted to driven member 69 from shaft 64. Toward the end of a revolution, clutch throw-out lever 72, if permitted to respond to the influence of its biasing spring, returns to its position in the path of clutch throw-out lug 73, shifts driven clutch member 69 axially of shaft 64 by a camming action, and thus affects disengagement of the clutch members and arrestment of driven member 69.

Driven clutch member 69, is slidably keyed to a sleeve 76 which is also supported by shaft 64. At its forward end, sleeve 76 engages and supports a cylinder 77 which is closed at its rear-most end, at which point it is supported by sleeve 76, and which is open at its foremost end, the words foremost and rearmost as used herein being related to the front of the keyboard, the foremost and rearmost ends of cylinder 77 being the left and right ends, respectively, as viewed in Fig. 2. Cylinder 77 is slightly larger than cylinder 49 and is fitted over the latter in coaxial relation with respect thereto and bears the same relation; namely, coaxial, with respect to sleeve 76 by which it is supported. It will be apparent from this that when sleeve 76 is rotated upon the tripping of clutch throw-out lever 72, cylinder 77 is also rotated.

As indicated in Fig. 1, and in complete detail in Fig. 5, cylinder 77 is provided with a plurality of circumferentially extending apertures that are offset both axially and circumferentially with respect to each other successively. There is an aperture 78 to correspond to each of the slide bars 32, and the slots 78 and mounting of cylinder 77 are such that as cylinder 77 is rotated, each of the slots 78 traverses the position occupied by the aperture of the corresponding slide bar 32 when the latter is presented in position to transmit light. In addition to the slots 78, cylinder 77 is provided with a slot 79 beyond the rearmost of the slide bars 32 but within the range of slots 34 and 51, so that as cylinder 77 is rotated, light may be transmitted invariably through slot 79 to cathode 56 of the photoelectric cell 54. It may be added that cylinder 77 is so mounted upon the sleeve 76 that when the latter is in its rest position, due to the sepa-

ration of the clutch elements 68 and 69 by clutch throw-out lever 72, slot 79 is in registry with slots 34 and 51 so that light impinges continuously upon cathode 56 during the rest interval. The blank portion of cylinder 77 between the end of slot 79 and the beginning of the first of the slots 78 provides for the complete exclusion of light from photoelectric cell 56 during a portion of a cycle of rotation of cylinder 77.

Between the point at which cylinder 77 is supported and the end against which compression spring 71 abuts, sleeve 76 is provided with cams 81 and 82. A lock bail 83 pivotally supported upon screws 84 has integral therewith an arm 85 supporting at its free end a cam follower roller 87 which may engage cam 81. At their upper ends, the lock levers 18 are provided with laterally extending projections 88 (rightwardly as viewed in Fig. 3) each of which has an upstanding locking lug 89. The position of locking bail 83 with respect to lugs 89 is such that when a code bar is shifted to its extreme right-hand position, thus rocking its associated locking lever 18 to its extreme counterclockwise position, the locking lug 89 of that lock lever is presented just to the left (as viewed in Fig. 3) of lock bail 83. When a code bar 16 is shifted to its extreme left-hand position which results in rocking of its associated lock lever 18 to its extreme clockwise position, the locking lug 89 of that lock lever is presented just to the right of lock bail 83 (also as viewed in Fig. 3). It will be apparent from this that when, after the setting of the code bars in particular permutational positions by the depression of the key lever 13, lock bail 83 is lowered to present its locking blade in the path of movement of locking lugs 89, none of the lock levers can be rocked while the lock bail is thus lowered, and consequently none of the code bars 16 can be shifted and no other key lever can be depressed.

Lock bail 83 also has integral therewith an arm 91 which, when follower roller 87 has been lifted to its outermost position with respect to cam 81, is engaged and held by a latch 92 secured to a sleeve 93 rockably supported upon a stud 94. At its opposite end, sleeve 93 has secured thereto a lever 96 which has an arm 97 engageable with a stop screw 98 for limiting the counterclockwise motion of lever 96, sleeve 93, and latch 92 and which also has a depending arm 99 the lower end of which is disposed in the path of a shoulder 101 integral with a link 102 which is articulated at its forward end to arm 26 carried by universal bail 22. Link 102 has a portion of its upper edge in an oblique plane adjacent to a screw 103 carried by a stationary bracket supported by keyboard base 11. Tension spring 104 supports link 102 so that its upper edge is in engagement with screw 103. When link 102 is moved forwardly by operation of universal bail 22 from a key lever 13, its shoulder 101 engages arm 99 of lever 96 and imparts clockwise rotation thereto. This clockwise rotation is transmitted through sleeve 93 to latch arm 92 which is also rocked clockwise and permits arm 91 to lock bail 83 to escape. As link 102 is moved forwardly by the universal bail, it is also rocked downwardly by the camming action of screw 103 upon the obliquely disposed portion of the upper edge so that the lower end of arm 99 of lever 96 is permitted to escape from shoulder 101, and lever 96 and latch 92 are restored to their normal or extreme counterclockwise positions by their biasing tension spring (not shown). The surface of link 102 immediately to 75

the rear of shoulder 101 slopes downwardly away from the shoulder, so that as the universal ball 22 returns to its normal position and link 102 is moved rearwardly, it is rocked downwardly about the point of articulation with arm 26 by the camming action of the lower end of arm 99 of lever 96 upon the sloping surface adjacent to shoulder 101, and shoulder 101 is thus restored to its position behind the lower end of arm 99 in which position it is prepared to rock lever 96 and latch 92 clockwise in response to the next operation of universal ball 22.

Locking ball 83 is also provided with a laterally extending projection 106 from which depends an arm 107 terminating directly above an arm 108 integral with clutch throw-out lever 72 and extending rightwardly therefrom (as viewed in Fig. 3). The relationship of depending arm 107 to clutch throw-out lever arm 108 is such that when arm 91 of lock bail 83 is engaged and held by latch 92, the lower end of arm 107 is held lifted sufficiently to permit the clutch throw-out lever to be presented against the periphery of driven clutch member 69 in position to engage clutch throw-out lug 73 and effect disengagement of the clutch. When lock bail lever arm 91 escapes from latch 92 due to operation of link 102 by universal ball 22, arm 107 depresses arm 108 of clutch throw-out lever 72 as lock bail 83 descends to locking relation to lock levers 18, and as clutch throw-out lever arm 108 is depressed, the clutch throw-out lever is rocked out of engagement with lug 73 and engagement of clutch elements 68 and 69 through the action of compression spring 71 is effected. The restoration of arm 91 to latched condition, which is accompanied by the lifting of bail 83 out of the path of movement of lugs 89 carried by lock levers 18, is effected by cam 81, having a single apex (not shown). This apex, when clutch driven member 69 and its associated elements are in normal or rest condition, is at a substantial angular distance from the point at which cam follower 87 may cooperate with cam 81. It follows from this that cam follower roller 87 is at this time held out of engagement with cam 81 by latch 92, and that upon rocking of latch 92 by link 102, lock bail 83 immediately is rocked into locking position under the influence of its biasing tension spring 109, and at the same instant clutch throw-out lever 72 is tripped by arm 107.

Another lock bail, designated by the reference numeral 111, is also pivoted on pivot screws 84 and is so positioned with respect to upstanding lugs 112 carried by leftwardly extending projections 113 of slide bar operating levers 36 (as viewed in Fig. 3) that the lugs 112 of those slide bar levers 36 that are rocked into extreme counterclockwise positions are presented to the left of the locking blade of lock bail 111, and the lugs 112 of those slide bar levers that are rocked to their extreme clockwise position are presented to the right of lock bail 111. Lock bail 111 has integral therewith an arm 114 which is provided with a cam follower roller 116 which continuously engages cam 82. In the rest condition of the apparatus, follower roller 116 engages the descending slope of the single apex (not shown) of cam 82 slightly below the uppermost portion of that slope so that lock bail 111 is held out of locking relation to the lugs 112 of slide bar controlling levers 36, and as bail 111 is biased into engagement with cam 82 by a tension spring 117, it applies a torque to cam sleeve 76 and therefore to driven clutch member 69, which is slidably

keyed to it, whereby the clutch elements are maintained fully separated, so that the chattering of the clutch teeth is prevented. As sleeve 76 begins to rotate in response to the tripping of clutch throw-out lever 72, cam follower roller 116 descends to the nadir portion of cam 82, and bail 111 is thus lowered into locking relation to the slide bar operating levers 36.

The function of bail 111 is to lock the slide bars 32 in whatever positions they may have been set, so that their setting shall not be disturbed during the scanning of slot 51 in stationary cylinder 49 by rotating cylinder 77. It is, therefore, desirable that bail 111 shall be lowered before that portion of slot 51 that is coextensive with the first of the slide bars 32 has been scanned by the first of the slots 78, and that it shall not be lifted until after that portion of slot 51, which registers with the last of the slide bars 32, has been scanned by the last of the slots 78.

At any time after the slide bar operating levers 36 have been locked, bail 83 may be lifted by its cam 81 to permit the lock levers 18 to be set in accordance with a new signal combination by operation of a key lever. The lifting of lock bail 83 by the operation of the apex of cam 81 upon cam follower roll 87 results in release of clutch throw-out lever 72, so that it returns to the position in which it may effect disengagement of clutch elements 68 and 69, and also results in clockwise rocking of arm 91 into position to be retained by latch 92. In this condition, the lock levers 18 are no longer blocked, and code bars 16 are free to be set in accordance with a new signal combination. However, should a key lever be operated, and through operation of universal bail 22, link 102, lever 96, and sleeve 93, latch 92, be rocked clockwise and restored to normal position at the instant that lever arm 91 is held in its extreme clockwise position by the apex of cam 81, lever arm 91 might not escape from latch 92, and the cycle of operation of distributor cylinder 77, intended to be initiated corresponding to the combination established by depression of the key lever, would not be initiated and, therefore, a signal combination would not be transmitted. To guard against the depression of a key lever at the exact instant that cam follower roll 87 is held at the most remote position radially of cam 81, an additional lock is provided upon the key levers, this lock being effective through the universal bail 22.

Referring particularly to Figs. 2 and 3, it will be observed that a lever pivotally supported on pivot rod 121 has arm 122 extending under the driven sleeve to which driven clutch element 69 is keyed and carrying at its free end a cam follower roll 123, which engages a cam 124 fixed to driven clutch element 69. An arm 126 extends in the opposite direction passing across link 102 near the free or rearmost end thereof, and also passing between upstanding arms 127 of a bifurcated block 128, Fig. 3, secured to keyboard base 11. At its free end, link 102 is provided with an upstanding shoulder 129 which must pass through the plane in which lever arm 126 is operable in response to operation of the universal bail 22 sufficient to effect tripping of clutch throw-out lever 72. Cam 124 normally holds lever arm 126 out of the path of shoulder 129. Once during a cycle of rotation of cam 124, cam follower roll 123 rides onto a nadir portion of cam 124 and rocks lever arm 126 into the path of shoulder 129 of link 102, this operation occurring just previous to the restoration of lever arm 75

91 by cam 81 into position to be retained by latch 92. Lever arm 126 remains in the path of shoulder 129 until after cam follower roll 87 has descended from the apex of cam 81 to the extent that unlatching of lever arm 91 by operation of link 102 can be effected. Cam follower roll 123 then rides out of the nadir portion of cam 124 and lifts lever arm 126 out of the path of shoulder 129. It will be evident from this that during the interval in which lever arm 126 is presented in its extreme clockwise position, link 102 cannot be operated sufficiently to effect rocking of latch 92. After the apex of cam 81 has cleared latch restoring cam follower roll 87, lever arm 126 is lifted and link 102 may then be operated through a full cycle by universal bail 22. Bifurcated block 128 serves as a guide for the free end of lever arm 126 and prevents link 102 from operating through a full cycle at a time when such operation is undesirable.

The electrical circuit for the transmitter herein described is shown schematically in Fig. 3. By reference to this figure, it will be observed that the previously identified lamp 43 and motor 61 are connected across conductors 131 and 132 which are intended to be connected to any suitable source of power, as by means of cord plug 133. Photoelectric cell 54 is connected to the input circuit of an amplifier 134, indicated only symbolically in Fig. 3. For a complete disclosure of an amplifier to which photoelectric cell 54 may be connected, reference may be had to U. S. Patent No. 2,177,077 granted on Oct. 24, 1939, to L. M. Potts. One of the output terminals of amplifier 134 may be connected to telegraph line 136 and the other may be connected to ground. At the remote terminal of line 136 there may be connected one of the terminals of the selector magnet of a printing telegraph apparatus indicated symbolically at 137, the other terminal of which may be connected to ground as indicated.

The photoelectric telegraph transmitter herein described is adapted to transmit start-stop permutation code signals each signal combination representing a character consisting of a definite number of impulses of marking or spacing nature preceded by a start impulse, usually of spacing nature, and followed by a stop or rest impulse, usually of marking nature. In operation, motor 61 is started, lamp 43 is illuminated, and amplifier 134 is placed in condition to be controlled by photoelectric cell 54. In the rest condition, as previously set forth, slot 79 in cylinder 77 registers with slot 51 in cylinder 49 and with slot 34 in bracket 31, and as there is no slide bar interposed between these slots, light from lamp 43 impinges upon the cathode 56 of photoelectric cell 54 thus rendering the photoelectric cell conductive, and in response to this condition of the photoelectric cell, amplifier 134 applies to line 136 a continuous marking signal. Mechanical conditions existing while the rest impulse is being applied to telegraph line 136 are that locking balls 83 and 111 are held in their uppermost or ineffective positions by latch 92 and cam 82 respectively. The apex of cam 81 is out of the position in which it may prevent the release of lever arm 91 by latch 92, and lever arm 126 is held out of the path of shoulder 129 carried by link 102.

Upon the depression of a key lever, code bars 16 are shifted to a permutational setting characteristic of that key lever. This permutational setting is imparted to lock levers 18 and near

the bottom of the key lever stroke, universal bail 22 is operated sufficiently to trip off lever arm 91 from latch 92 which permits lock ball 83 to be drawn downwardly by spring 109 to hold the lock levers 18 in the positions into which they have been moved, and simultaneously depending arm 107 integral with lock bail 83 trips clutch throw-out lever 72 and rotation of cam sleeve 76 and rotatable cylinder 77 begins. As lock bail 111 was held out of locking position with respect to slide bar operating levers 36 at the time the key lever was depressed, those levers followed the motions of lock levers 18 by reason of the oppositely presented springs 37 and were therefore positioned correspondingly to the lock levers 18. In the first few degrees of rotation of driven clutch element 69, lock bail 111 is lowered by cam 82 into locking relation to slide bar operating levers 36 to prevent disturbance of the permutational setting of slide bars 32 as determined by the setting of code bars 16. During the lowering of lock bail 111, the blank portion of cylinder 77 between slot 79 and the first of slots 78 traverses slot 51 of cylinder 49, and as no illumination reaches the photocell during this traversal, the current through cell 54 is reduced and possibly entirely interrupted, and the condition on telegraph line 136 is changed from marking to spacing, which is the start condition, and results in starting of printer 137.

Depending upon the setting of slide bars 32, certain of them may be positioned to intercept light transmitted through slot 34 in bracket 31, these being the slide bars that are presented in their extreme-left-hand positions, as viewed in Fig. 3, and others may be presented in their extreme right-hand positions with their apertures 33 in registry with slots 34 and 51 to permit light to impinge upon cathode 56 as the corresponding slots 78 traverse apertures 33. The rotating cylinder 77 thus serves as a transmitting distributor to cause photoelectric cell 54 to be rendered conductive or non-conductive alternatively in accordance with the setting of the several slide bars 32. Photoelectric cell 54 controls amplifier 134 which, in turn, impresses upon telegraph line 136 signaling impulses corresponding to the setting of slide bars 32. After the last of slots 78 has traversed slot 51, slot 79, which represents the rest impulse, comes into registry with slot 51, and if no key lever has been depressed during the cycle of operation of distributor cylinder 77, it comes to rest upon completion of one revolution.

In the foregoing paragraph no further reference was made to mechanical operations following mention of the lowering of slide bar lever locking bail 111, the remainder of the paragraph being devoted to the description of the method of generating signal impulses. After lock bail 111 has been lowered, lock ball 83 may be lifted, as resetting of the lock levers 18 cannot have any effect upon the setting of slide bars 32. The sooner the lifting of lock ball 83 is effected the greater is the extent of overlap between the transmission of a signal combination and the setting up of the next signal combination. However, before bail 83 is lifted, cam 124 operates upon its follower roll 123 to lower lever arm 126 into the path of shoulder 129 on universal bail link 102 so that the universal bail cannot be operated fully during the critical interval when lever arm 91 is being presented under latch 92 and the apex of cam 81 is being moved

out of range of cam follower roll 87. As soon as these conditions have been satisfied, cam 124 lifts lever arm 126 and link 102 is in condition to be operated fully. If at this time another key lever is depressed, the lock levers 18 will be set in a new permutational arrangement in accordance with the signal combination represented by the key lever, but the slide bar levers 36 being at this time locked will not be correspondingly moved and certain of the reed springs 37 will be shifted out of engagement with their slide bar levers 36 thus establishing an unbalanced condition which will result in setting of the slide bar levers 36 in correspondence to the setting of lock levers 18 when near the end of the cycle of rotation of cylinder 77, lock bail 111 shall be lifted. Simultaneously with the lowering of lock bail 83 to store the new setting of the lock levers 18, depending arm 107 withdraws clutch throw-out lever 72 from the path of clutch throw-out lug 73 so that upon the completion of a revolution cylinder 77 will not be arrested but will continue to rotate to achieve the transmission of the signal combination which had been stored in lock levers 18. Just before reaching the position in which cylinder 77 would have been arrested had the additional signal combination not been stored, lock bail 111 is lifted and the slide bars are permitted to be set in correspondence with the positions of lock levers 18, whereupon bail 111 is again lowered to lock the slide bars 32 in their new positions. Should another key lever be depressed after the restoration of lever arm 91 and the lifting of lever arm 126, another signal combination will be stored in the lock levers, and the distributing cylinder 77 will not be arrested at the end of the cycle but will continue to rotate to effect the transmission of the signal combination representing the key lever depressed. As long as an operator continues to depress key levers during the rotation of cylinder 77, the cylinder will not be arrested but will rotate continuously. Cylinder 77 will, however, be arrested after the transmission of the signal combination corresponding to the last key lever depressed.

Another embodiment of the invention is shown in Figs. 6 and 7, this embodiment differing from that already described in the positions of the source of illumination and of the photo-electric cell and in the further fact that there is no provision for overlap as between the transmission of a signal combination representing one character and the resetting of the code bars to represent another character.

As indicated in Figs. 6 and 7, motor shaft 141 carries pinion 142 meshing with gear 143 fixed to driving clutch portion 144 carried by distributor shaft 146. Driven clutch element 147 is slidably keyed to cam sleeve 148 also mounted on shaft 146 and is urged into engagement with clutch driving element 144 by compression spring 149 but is normally restrained from such engagement and held arrested by clutch throw-out lever 151. A slotted distributor cylinder 152 identical with cylinder 77 is rotatably supported by cam sleeve 148, and inside cylinder 152 is mounted a stationary cylinder 153 identical with cylinder 49 and having a single slot 154 parallel to its axis. The arrangement of elements thus far described is substantially identical with those appearing in Figs. 1 to 5, inclusive.

As shown in Fig. 7, a long filament lamp 156 and cylindrical lens 155 are mounted inside the

stationary cylinder 153, whereby a thin wide beam of light is focussed through slot 154.

Below rotatable cylinder 152 there is mounted a block 157 having a concave cylindrical surface conformed to the contour of rotatable cylinder 152 and presented in close proximity to the external surface of that cylinder. Block 157 has an elongated slot 158 in vertical alignment with slot 154 in stationary cylinder 153. Block 157 also has a concave cylindrical surface presented downwardly in conformity with a stationary cylinder 159 which is supported in engagement with the lower concave surface of block 157 and which has an elongated slot 160 coextensive with slots 158 and 154 and in vertical alignment with those slots. Cylinder 159 houses a photoelectric cell 161 having a cathode 162. It will be apparent that the positions of lamp 156 and photocell 161 could, if desired, be reversed.

Block 157 is provided with a horizontally extending slot of sufficient height and width to receive, confine, and guide a plurality of apertured slide bars 163 substantially identical with the slide bars 32 shown in Figs. 1 and 3. Slide bars 163 are arranged to be presented in either of two positions to dispose their apertures correspondingly in or out of alignment with slot 158 in block 157. Each of the slide bars 163 is articulated directly to a lock lever 164 pivoted on pivot pin 166 supported by keyboard base casting 167. Lock levers 164 are controllable from permutation code bars (not shown) in the same manner as the previously described lock levers 18 are controlled. There is no yield between lock levers 164 and slide bars 163 and, therefore, the setting of the lock levers 164 cannot be disturbed until the last of the several slide bars 163 has been scanned by the corresponding peripheral slot in rotatable cylinder 152.

A single lock bail is provided to prevent disturbance of the lock levers 164 and slide bars 163 during the transmission of a signal combination, this bail being designated by the reference numeral 168 pivoted on screws 169, as shown in Figs. 6 and 7. Bail 168 has integral therewith an arm 172 at the free end of which is supported a cam follower roll 173 which continuously engages a cam 174 secured to cam sleeve 148. In the rest condition of the apparatus, cam 174 holds lock bail 168 out of blocking relation to upstanding lugs 176 carried at the upper ends of lock levers 164. The operation of lock bail 168 is identical with that of lock bail 111 in the previously described embodiment, the bail being lowered as soon as the distributor cylinder 152 begins to rotate; namely, during the transmission of the start impulse while the blank portion of cylinder 152 is passing across slots 154 and 158 and being lifted after the last of the slide bar conditions has been scanned by the last of the peripheral slots, and while the rest impulse slot is traversing slots 154 and 158.

A universal bail link 177 is provided for tripping clutch throw-out lever 151 which is biased to clutch arresting position by spring 175, this link differing from previously described link 102 in that no blocking shoulder corresponding to the shoulder 129 of link 102 is required. Link 177 operates a bell crank lever 178 which is similar to the previously described lever 99 except that it is not associated with a latch controlling sleeve but has instead an arm 179 disposed above and in close proximity to the free end of a rightwardly extending arm 181 of clutch throw-out lever 151 (as viewed in Fig. 6). Bell crank

lever 178 is rocked in the same manner as lever 39 and in being so rocked its arm 179 depresses the free end of clutch throw-out lever arm 181 thus tripping the clutch and initiating rotation of distributor cylinder 152.

The generation of signal impulses under the control of the setting of slide bars 163 acting as shutters to control the transmission of light to photoelectric cell 161 is identical with that described with reference to the embodiment of Figs. 1 to 5, inclusive. The mechanical operation of the present embodiment is slightly different in that, there being no yield between slide bars 163 and lock levers 164, the lock levers cannot be rocked and, therefore, a key lever cannot be depressed except when the lock bail 168 is lifted by its cam 174, and the lock bail is lifted only within a few degrees each side of the rest position of the cylinder. It follows from this that after cylinder 152 has been set in operation by depression of a key lever, the earliest that the next key lever can be depressed is just before cylinder 152 completes its cycle of rotation and after the impulses controlled by the several slide bars 163 have been generated and transmitted.

No particular disadvantage arises out of the fact that the overlap contemplated by the first described embodiment of the invention is not present in the second as the photo-electric scanning and signal generating mechanism is capable of being operated as rapidly as standard commercially available telegraph printers can receive the signal combinations and execute the operations in accordance with such combinations. The principal difference between the two embodiments of the invention from the standpoint of overlap is that the embodiment disclosed in Figs. 6 and 7, when operated at or near its maximum speed, may require a rhythmic keyboard technique whereas the embodiment shown in Figs. 1 to 5, while not intended to transmit signal combinations any more rapidly, permits of more irregular keyboard technique, and might be preferred by operators who at times operate other kinds of keyboard devices, such as typewriters, and only occasionally operate a printing telegraph transmitter keyboard, so that they do not acquire the rhythmic touch.

A further embodiment of the invention is shown in Figs. 10 and 11, this being a modification of the overlap mechanism included in the transmitter exemplified in Figs. 1 to 5, inclusive. This embodiment differs from that of Figs. 1 to 5 in that in the overlap mechanism already described, the burden of flexing any number up to five of the springs 37 is directly upon the key levers 14, and due to the varying number of springs to be flexed, according to the sequence of characters, any key will require more effort to operate at one time than at another, and the touch will therefore be irregular, whereas, in the modification to be described, power available within the transmitter is employed for flexing the springs, and none of this labor burdens the keys, so that a uniform touch is afforded.

Referring to Figs. 10 and 11, lock levers 191, connected to code bars 192 in the same manner as lock levers 18 are connected to code bars 16 in Figs. 1 and 2, are pivoted on pivot rod 193. Also pivoted on rod 193 adjacent to individual lock levers 191 are slide bar controlling levers 194, each of which carries a pin 196 disposed in an elongated slot 197 of a light shutter slide bar 198. Slide bars 198 are provided with individual lock lug lugs 199, which are presented on either

side of a lock bail 201 as slide bars 198 are moved from one to the other of their two possible positions. Lock bail 201 corresponds to lock bail 111 in Figs. 1, 2, and 3.

The upper ends of lock levers 191 are relatively narrow, and the edges are substantially parallel to a center line through the levers. The upper ends of slide bar controlling levers 194 are relatively broad and the edges slope oppositely from a mid-point thus providing opposite camming surfaces. Reed springs 202, similar to reed springs 37, are presented on opposite sides of lock levers 191 and slide bar controlling levers 194, and at the points of engagement of a pair of springs 202 with a lock lever 191 and slide bar controlling lever 194, those levers are of the same width, so that the springs 202 tend to center levers 194 with respect to levers 191.

A single bail 203, corresponding to bail 83, serves to block lock levers 191 and to operate levers 194. The movement of a lock lever 191 under control of a code bar 192 need be only sufficient to present its narrow upper end on either side of the blade of bail 203. As bail 203 is held elevated when such movement occurs, there is no restraint on slide bar levers 194, and they follow levers 191 to have their apices presented on either side of bail 203, no flexing of springs 202 occurring during movement of levers 191 and 194 by operation of a key lever. The length of slot 197 in each slide bar 198 is such that when a slide bar is held in its extreme left-hand position, as in Fig. 10, movement of its associated lever 194 clockwise by a lock lever 191 will result in presentation of its pin 196 substantially in the right-hand end of the slot 197. Conversely, when a slide bar is held in its right-hand position and its associated operating lever 194 is presented counterclockwise by a lock lever 191, the pin 196 is brought substantially into engagement with the left-hand end of the slot.

When a slide bar operating lever 194 has been shifted by its associated lock lever 191, as for example, in clockwise direction, its associated slide bar 198 being held locked by bail 201, as shown in Fig. 10, it comes to rest with its pin 196 substantially prepared to impart rightward movement to slide bar 198 and with a portion of the left-hand sloping surface of its broad head in the path of bail 203. The bail may descend only until it is arrested by lever 194 assuming that lug 199 of slide 198 continues to be blocked by bail 201. No further clockwise movement is imparted to lock lever 191 by descending bail 203. The tension spring by which bail 203 is urged downwardly, which corresponds to spring 109 of Fig. 1, exerts greater force than the aggregate of force exerted by five or less of the springs 202, and as soon as bail 201 is lifted, bail 203 descends the remainder of the distance it is intended to move. The further descent of bail 203 produces a camming effect upon the sloping surface of the head of lever 194, which is thus moved further clockwise and which, through its pin 196, shifts slide bar 198 to its right-hand position. The further clockwise movement of lever 194 causes it to draw away from left-hand spring 202 and to draw right-hand spring 202 away from lever 191, thus tensioning the springs, as shown in Fig. 11.

Locking of slide bar 198 in the new position; namely, its right-hand position, as viewed in Fig. 11, is accomplished when bail 201 is lowered to its dotted line position into the path of lug 199. Thereafter bail 203 may be lifted and when it

is lifted, springs 202 restore lever 194 to centered position with respect to lever 191, pin 196 thus being moved away from the right-hand end of slot 197. When the slide bar 198 is to be restored to its left-hand position, lever 191 is rocked counterclockwise, whereby pin 196 is presented in the extreme left end of slot 197, and as bail 203 descends and bail 201 is lifted, slide bar 198 is shifted leftwardly by bail 203 operating through lever 194 and pin 196.

From the foregoing, it will be apparent that after the slide bars 198 have been locked, lock levers 191 and slide bar operating levers 194 may be unlocked and reset according to a new signal combination. Slide bar operating levers 194 are not locked during the transmission of a signal combination, as in the embodiment first described but only slide bars 198 are so locked. Furthermore, whereas reed springs 37 in the first described embodiment operate to set the slide bars 32 according to the setting of lock levers 18, in the embodiment shown in Figs. 10 and 11, the tension spring (not shown) which lowers bail 203 shifts the slide bars 198, and springs 202 operate subsequently to restore the slide bar operating levers 194 to alignment with the lock levers 191, such restoration being attended by idle movement of pins 196 within the slots 197 of the then stationary slide bars 198.

Although particular embodiments of the invention have been disclosed and described herein, it is to be understood that the invention is not intended to be limited to such embodiments but is capable of modification, rearrangement, and substitution without departing from the spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever operated selector mechanism, a plurality of light shutters controlled by said selector mechanism, a photoelectric impulse generator, and means for scanning said light shutters to control said impulse generator.

2. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever operated selector mechanism, a plurality of light shutters controlled by said selector mechanism, a photoelectric impulse generator, and a rotatable scanning member having an aperture in alignment with each of said light shutters for controlling said impulse generator.

3. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever operated selector mechanism, a plurality of light shutters controlled by said selector mechanism, a photoelectric impulse generator, and a rotatably mounted cylindrical scanning member having a circumferential aperture in alignment with each of said light shutters for controlling said impulse generator.

4. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever operated selector mechanism, a plurality of light shutters controlled by said selector mechanism, a photoelectric impulse generator, a rotatable scanning member for scanning said light shutters, means for rotating said scanning member, key lever controlled means for initiating the operation of said rotating means, and means controlled by said rotating means for locking said light shutters during the generation of impulses under control of said light shutters.

5. In a telegraph transmitter adapted to be

controlled by a keyboard device, a key lever controlled selector mechanism, an impulse generating mechanism, means controlled by said selector mechanism for controlling said impulse generating mechanism, means for locking said selector mechanism upon the operation thereof, means for locking said selector controlled means, and means for unlocking said selector means after the locking of said selector controlled means and during the generation of impulses under the control of said locked selector controlled means.

6. In a transmitting device, a keyboard including a plurality of keys, a set of permutation bars controlled by said keys, a transmitting circuit, photoelectric signal generating means connected to said circuit, and means controlled according to the operation of said permutation bars for determining the signals to be generated by said photoelectric means.

7. In a transmitting device, a plurality of selectively operable keys, a set of permutation bars controlled by said keys, a photoelectric instrumentality, means controlled according to the operation of said permutation bars for controlling the action of the photoelectric instrumentality, and means for transmitting code signals according to the action of the photoelectric instrumentality.

8. In a telegraph transmitter, a plurality of selectively operable keys, a plurality of light shutters, a photoelectric device, means controlled by the keys for operating said shutters in varying permutations, and means for controlling said photoelectric device in accordance with the operation of said shutters to effect the transmission of code signals.

9. In a photoelectric transmitter, a plurality of light shutters, key operated means for effecting the permutational setting of said shutters, and means including a photoelectric device for transmitting start-stop telegraph signals according to the control of said light shutters.

10. In a photoelectric transmitter including a plurality of keys, a master light shutter, a plurality of secondary light shutters, means for operating the master shutter invariably upon the operation of any key, means for operating the secondary shutters variably according to the key operated, and photo-sensitive means for generating code signals according to operation of the secondary shutters.

11. In a photoelectric signal transmitter, a light shutter device for determining the character of the signals, a light shutter device for timing the elements of the signals, selector mechanism for operating the first mentioned shutter device variably, and means for operating the last mentioned shutter device invariably.

12. In a photoelectric signal transmitter, a variably operable light shutter device, an invariably operable light shutter device, means for variably controlling the first mentioned light shutter device, and means associated with the last mentioned means for initiating operation of the second mentioned shutter device.

13. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, permutation bars controlled by said keys, primary signal controlling means controlled by said permutation bars, secondary signal controlling means controlled by said primary means, means for locking said primary and secondary means successively, and means for unlocking said primary means substantially immediately after the locking of said secondary means.

14. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, permutation bars controlled by said keys, primary signal controlling means controlled by said permutation bars, secondary signal controlling means controlled by said primary means, independently operable locking means for said primary and secondary signal controlling means, and yieldable means interconnecting said primary and secondary means for affording movement of either of said primary and secondary means while the other is locked for a particular signal to be transmitted.

15. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars controlled by said keys, primary signal controlling means controlled by said code bars, secondary signal controlling means controlled by said primary means, and yieldable means for biasing said secondary means to follow the movement of said primary means whereby signals in accordance therewith may be transmitted.

16. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars controlled by said keys, a rotatable signal distributor, key controlled means for releasing said distributor for rotation to transmit signals in accordance with the setting of said code bars, means for locking said key controlled means upon operation thereof, cam operated means for restoring said locking means to unoperated condition, and means for locking said key controlled means during the restoration of said first mentioned locking means.

17. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars controlled by said keys, a rotatable signal distributor, a key operated universal bail, means controlled by said bail for releasing said distributor for rotation to transmit signals in accordance with the setting of said code bars, means for locking said bail upon operation thereof, means associated with said distributor for restoring said locking means to unoperated condition, and means also associated with said distributor for imposing a locked condition upon said bail during the restoration of the first mentioned locking means.

18. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, a universal bail operable by said keys, a plurality of code bars also operable by said keys, means operable by said bail for locking said code bars, a signal distributor, and means operable by said locking means for setting in operation said distributor whereby signals in accordance with the operation of said bars will be transmitted.

19. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars to be set permutatively by said keys, a plurality of levers articulated to said code bars, a plurality of levers capable of being held stationary while the first mentioned levers are set by the code bars, a plurality of impulse controlling elements articulated to the second mentioned levers, and flexible members associated with said first and second mentioned levers and adapted to be distorted upon setting of the second mentioned levers while the first mentioned levers are held stationary, and to effect movement of said second mentioned levers upon release of the hold thereon.

20. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars to be set permutatively by said keys, a plu-

rality of levers articulated to said code bars, a plurality of levers individually associated with the first mentioned levers, flexible members for causing the second mentioned levers to follow movement of the first mentioned levers, a plurality of impulse controlling elements controlled by said second mentioned levers, and means operable by power independent of said keys and set in operation by said keys for moving said second mentioned levers through distances greater than those imparted by said first mentioned levers.

21. In a telegraph transmitter adapted to be controlled by a keyboard device, a photo-electric impulse generator, means for producing a light beam, means controlled variably by said keyboard device for dividing a portion of said beam of light into corresponding individual beams of light, and means operated invariably by said keyboard device for admitting to said photo-electric impulse generator a portion of the remainder of said first mentioned light beam and the individual light beams in predetermined succession.

22. In a telegraph transmitter adapted to be controlled by a keyboard device including a plurality of key levers, a permutation code device controlled by said key levers, a photo-electric impulse generator, means for producing a beam of light, means controlled permutably by said permutation code device for preparing variable light paths from said beam to said photo-electric impulse generator, and means operated invariably by said keyboard device for completing said light paths.

23. In a telegraph transmitter adapted to be controlled by a keyboard device, a permutation code device responsive directly to said keyboard device, means for producing a light beam, a photo-electric impulse generator, means having light transmitting apertures for distributing light to said photo-electric impulse generator, and means permutably controlled by said permutation code device for transmitting to the surface of said distributing means light from said beam in variably disposed areas.

24. In a telegraph transmitter adapted to be controlled by a keyboard device, impulse generating means, impulse distributing means, a timing element controlled by said keyboard device, a timing element controlled by said distributor, and means controlled by said timing elements for coordinating the operation of said keyboard device and said distributing means.

25. In a telegraph signaling apparatus, signal transmitting means, a set of elements, a set of selectors corresponding in number to said elements, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a power driven rotary mechanism cooperating with said elements in the operation of said transmitting means by light from said source, and means for setting said selectors.

26. In a telegraph signaling apparatus, signal transmitting means, a set of elements, a set of selectors corresponding in number to said elements, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a power driven rotary mechanism arranged for uniformly rendering said source of light effective on said transmitting means to control the length of each signal impulse transmitted thereby, and means for setting said selectors.

27. In a telegraph signaling apparatus, signal transmitting means, a set of elements, a set of

selectors corresponding in number to said elements, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a power driven rotary mechanism having means for uniformly rendering said source of light effective at the beginning of each signal, and means for successively rendering the source of light effective on said transmitting means as determined by the position of said elements.

28. In a telegraph signaling apparatus, signal transmitting means, a set of elements, a set of selectors corresponding in number to said elements, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a power driven rotary mechanism cooperating with said elements in the operation of said transmitting means by light from said source, means to start said rotary driven mechanism at the beginning of each signal, means to stop the same at the end of each signal, and a keyboard for controlling said starting and stopping means and for setting said selectors.

29. In a telegraph signaling apparatus, signal transmitting means, a set of elements, a set of selectors corresponding in number to said elements, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a rotary power driven mechanism cooperating with said elements in the operation of said transmitting means by light from said source, a start and stop clutch for rotating and timing the operation of said mechanism during each signal period, a keyboard for tripping said clutch and for setting said selectors, and a lock for said keyboard controlled by said mechanism and arranged to release said keyboard for reoperation at the end of each signal period.

30. In a signaling apparatus, signal transmitting means for controlling all transmitted impulses, a set of elements for controlling the operation of said transmitting means, a set of selectors, means operated permutably by said selectors for setting said elements correspondingly, a source of light, a rotary driven mechanism having a series of successively operating sections cooperating with said elements in the operation of said transmitting means by light from said source in accordance with the position of said selectors, a power driven start and stop clutch for continuously advancing and timing the operation of said rotary mechanism during each signal period, a keyboard, and means operated thereby independently of said transmitting means for tripping said clutch and for operating said selectors.

31. In a signaling apparatus, signal transmitting means, a set of selectors, a source of light, a rotary member having a series of successively operative sections for effecting the operation of said transmitting means by light from said source of light to transmit uniform starting impulses followed by a series of selecting impulses varied in accordance with the setting of said selectors, a power driven start and stop clutch for rotating said rotary member, and means independent of said transmitting means for tripping said clutch and setting said selectors.

32. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, code bars controlled by said keys, a rotatable distributor, key controlled means for releasing said distributor for rotation to transmit signals in

accordance with the setting of said bars, means controlled by said code bars for controlling the character of the signals transmitted by said distributor, means for locking said key controlled means upon operation of said distributor, and means for thereafter locking said code bar controlled means and releasing said key controlled means whereby they may be reset.

33. In a photo-electric signal transmitter, a light shutter device permanently associated with said transmitter for determining the character of the signals, a light shutter device for timing the elements of the signals, means for operating the first mentioned light shutter device variably, and means for operating the last mentioned shutter device invariably.

34. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, permutation bars controlled by said keys, primary signal controlling means controlled by said bars, latch controlled means for locking said signal controlling means, secondary signal controlling means controlled by said primary signal controlling means, cam controlled means for locking said secondary signal controlling means, and means for unlocking and relatching said latch controlled locking means following the locking of said secondary signal controlling means.

35. In a telegraph transmitter, a keyboard mechanism including a plurality of keys, permutation bars controlled by said keys, primary signal controlling means controlled by said bars, means for locking said primary signal controlling means, means for latching said locking means in unlocking position, means controlled by said keys for releasing said latching means, secondary signal controlling means controlled by said primary signal controlling means, means for locking said secondary signal controlling means, rotatable cam means for operating said last mentioned locking means, and rotatable cam means for relatching said first mentioned locking means following the operation of the second mentioned locking means to lock said secondary signal controlling means.

36. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever controlled mechanism, an impulse generating mechanism, means controlled by said key lever controlled mechanism for controlling said impulse generating mechanism, means for locking said key lever controlled mechanism, means for locking said impulse generating mechanism controlling means, and cam controlled means for operating both of said locking means in a predetermined sequential manner whereby said key lever controlled means is released before said impulse generating mechanism controlling means.

37. In a telegraph transmitter adapted to be controlled by a keyboard device, a key lever controlled mechanism, an impulse generating mechanism, means controlled by said key lever controlled mechanism for controlling said impulse generating mechanism, primary means for locking said key lever controlled mechanism, means for locking said impulse generating mechanism controlling means, means for releasing said primary locking means, secondary locking means for said key lever controlled mechanism, and means for operating said secondary locking means prior to the release of said primary means and for releasing said secondary means after the release of said primary means.

LOUIS M. POTTS.