L. M. POTTS.

TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING.

APPLICATION FILED MAY 20, 1913.

1,135,322.

Patented Apr. 13, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

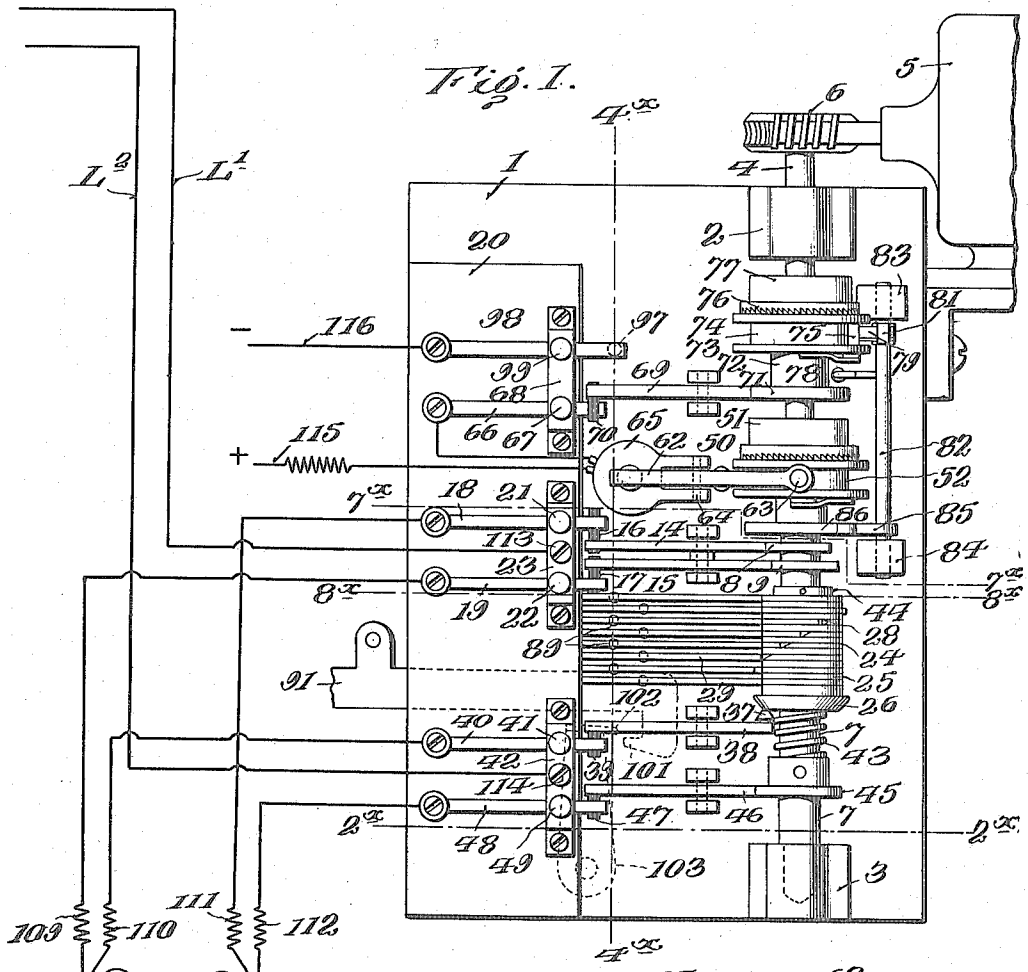
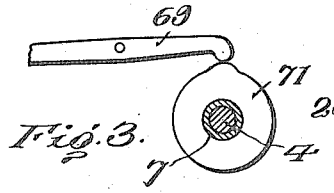
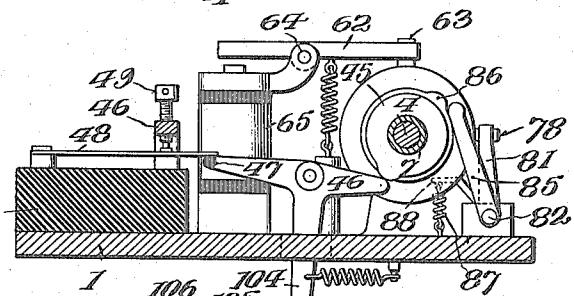


Fig. 3.





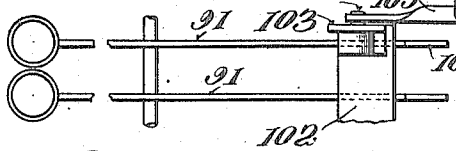


Fig. 2.

Witnesses

H. C. H. Murray

E. G. Marshall.

Inventor

L. M. Potts.

By

John N. Wolk

his Attorney

L. M. POTTS.

TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING.

APPLICATION FILED MAY 20, 1913.

1,135,322.

Patented Apr. 13, 1915.

4 SHEETS—SHEET 2.

Fig. 4.

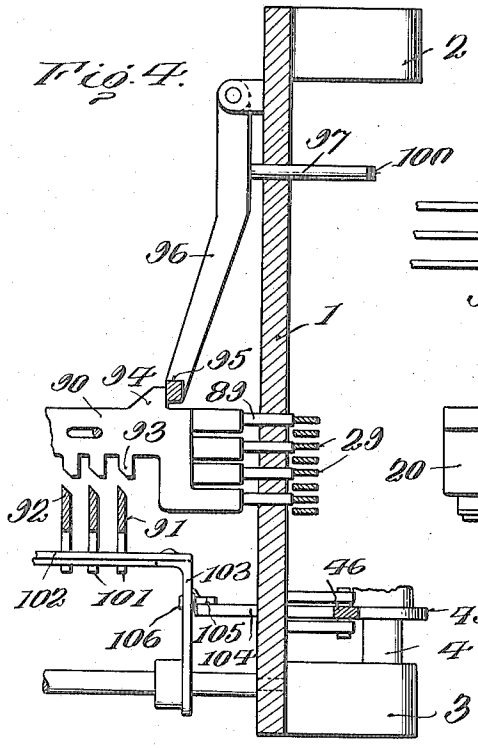
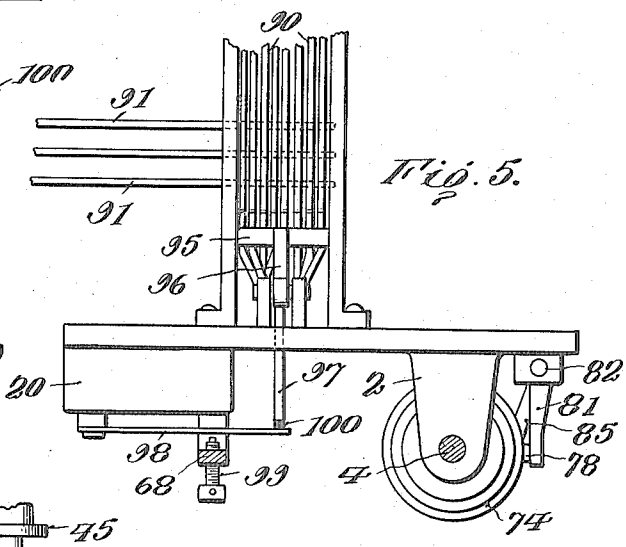


Fig. 5.



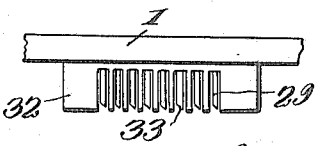


Fig. 9.

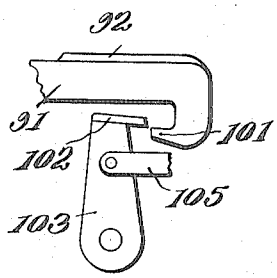


Fig. 6.

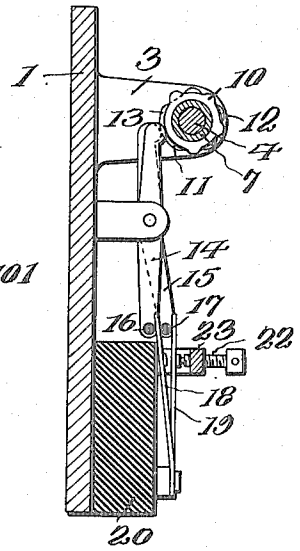


Fig. 7.

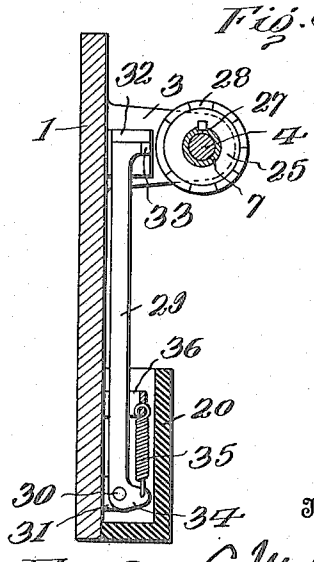


Fig. 8.

Witnesses

H. C. Murray

E. G. Marshall

Inventor

L. M. Potts,

By

John N. Wolf

his Attorney

L. M. POTTS.

TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING.

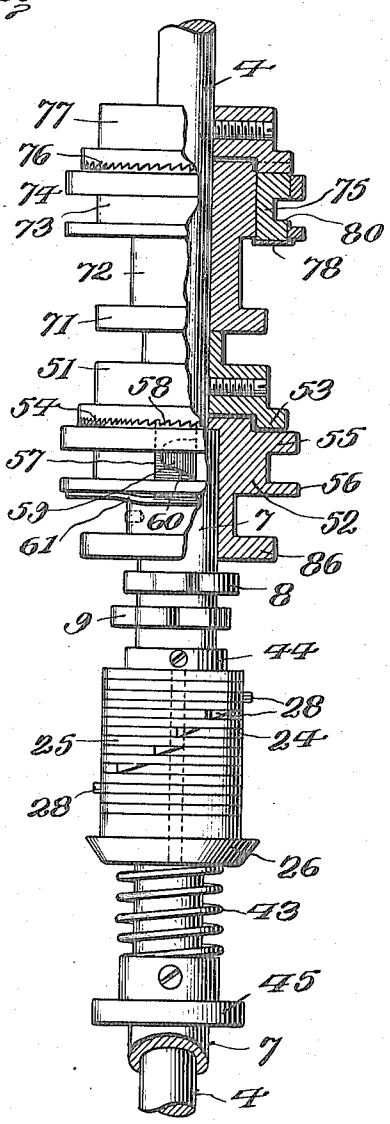
APPLICATION FILED MAY 20, 1913.

1,135,322.

Patented Apr. 13, 1915.

4 SHEETS—SHEET 3.

Fig. 10.



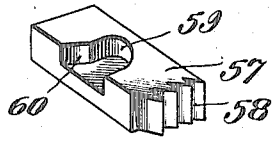


Fig. 11.

Witnesses

H. C. Murray.

E. G. Marshall.

Inventor

L. M. Potts,

By John N. Hall

his Attorney

L. M. POTTS.

TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING.

APPLICATION FILED MAY 20, 1913.

1,135,322.

Patented Apr. 13, 1915.

4 SHEETS—SHEET 4.

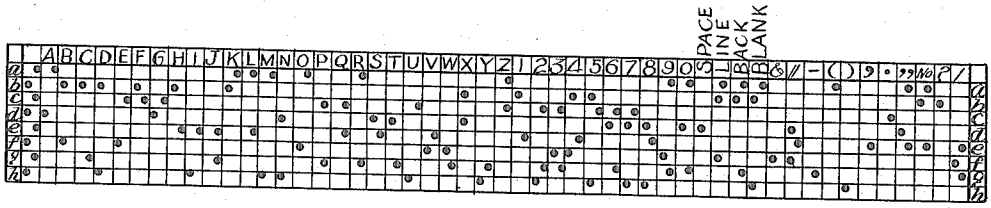


Fig. 12.

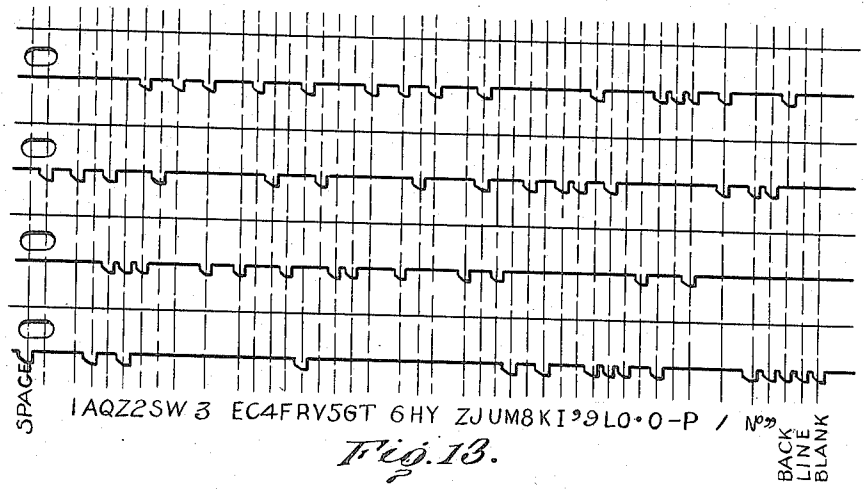


Fig. 13.

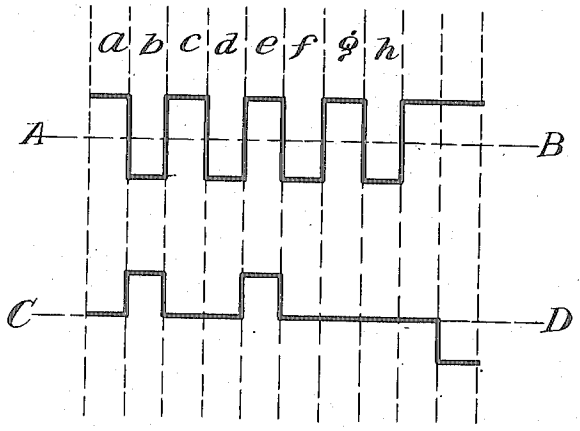


Fig. 14.

Witnesses

E. G. Marshall.

Inventor

L. M. Potts,

By John N. Holt

Its Attorney

UNITED STATES PATENT OFFICE.

LOUIS M. POTTS, OF BALTIMORE, MARYLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUSTIN McLANAHAN, OF BALTIMORE, MARYLAND.

TRANSMITTING APPARATUS FOR ELECTRICAL SIGNALING.

1,135,322. Specification of Letters Patent. Patented Apr. 13, 1915.

Original application filed May 7, 1910, Serial No. 559,967. Renewed April 13, 1912, Serial No. 690,659. Divided and this application filed May 20, 1913. Serial No. 768,773.

To all whom it may concern:

Be it known that I, LOUIS MAXWELL POTTS, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Transmitting Apparatus for Electrical Signaling, of which the following is a specification.

The apparatus constituting the subject of the present invention was originally embodied in an application for U. S. Letters Patent for improvements in selective electrical signaling filed by me May 7, 1910, Serial No. 559,967, forfeited, and renewal application filed April 13, 1912, Serial No. 690,659, and of which the present application constitutes a division.

The claims of said renewal application are directed more especially to a system of signaling and to the receiving apparatus of such system, and no claims are then made for transmitting apparatus *per se*.

The object of the present application is to protect the transmitting appartus *per se* regardless of the nature of the receiving apparatus with which it may be used.

This transmitting apparatus will be more readily understood from a reference to the accompanying drawings, wherein,

Figure 1, is a side elevation and diagram of circuits of one specific embodiment of said transmitting apparatus; Fig. 2, a section on line 2^x—2^x Fig. 1 looking upward, with many parts omitted; Fig. 3, a fragmentary detail plan view partly in section to show the position of one of the cams of Fig. 1, relative to its operated lever when the apparatus is at rest; Fig. 4, a section on line 4^x—4^x Fig. 1, with many parts omitted; Fig. 5, a top plan view of the transmitting apparatus Fig. 1, with many parts omitted; Fig. 6, a fragmentary detail end elevation of the key locking mechanism shown in Figs. 1 and 2; Fig. 7, a section on line 7^x—7^x, Fig. 1, with parts removed, and looking downward; Fig. 8, a section on line 8^x—8^x, Fig. 1, with parts removed, and looking downward; Fig. 9, a fragmentary stop plan view of the slotted guide block and its levers; Fig. 10, an enlarged detail side elevation partly in section of the clutch mechanism of the transmitter of Fig. 1; Fig. 11, an enlarged detail perspective view of one of the clutch connecting pins; Fig. 12, a diagram of combinations which may be used with my present system of signaling; Fig. 13, a diagrammatic view showing the arrangement of lugs on the selector bars shown in Figs. 4 and 5, and Fig. 14, is a diagram of the current on the line for a given signal.

The apparatus herein shown was designed originally for operation on the two wire circuit employed in the system of the parent application, and for that reason will be described in connection with such two wire circuit, though, as will be more particularly pointed out later, it is not limited to such a system. In other words, the present invention embodies novel features which apply as well to a one wire as a two wire system.

I shall next describe a form of transmitting apparatus which I have invented for use with the two wire method of signaling above described, though it should be understood that I do not wish to limit the receiving features of said method to use with any special form of transmitting apparatus.

Referring to the accompanying drawings, the transmitting mechanism therein shown comprises among other parts a suitable support in the form of a plate 1, provided with bearings 2, 3 in which is journaled a shaft 4 which is adapted to be connected with any suitable source of driving power. In the drawing I have shown this shaft driven from a small electric motor 5 geared to it through worm gearing 6.

The shaft 4 carries among other things a sleeve 7 loose thereon. Mounted fast on this sleeve, in addition to other parts, are two cams 8 and 9. Cam 8 has four similar projections 10 and an elongated intervening space 11 (see Fig. 7), and cam 9 has three projections 12, similar to 10, and one elongated projection 13 three times as long as projections 10 and 12. These cams are so arranged on sleeve 7 that elongated projection 13 lies opposite elongated space 11, so that the two cams together divide a circle into seven equally spaced projections 10, 12 and one projection 13 three times as long. The object of this spacing will be apparent later. These cams 8 and 9 engage respectively two pivoted levers 14 and 15 which carry respectively insulating studs 16 and 17, which in turn engage two contact springs

18 and 19 secured to an insulating base 20, and movable respectively by said levers into engagement with contact screws 21 and 22 in metal bridge 23 secured to insulating base 20. Also mounted on sleeve 7 are eight cam disks 24 separated by spacing disks 25 all of which are secured rigidly together and to a cam 26, so that they form a sleeve. This cam sleeve is slidable longitudinally on sleeve 7, but is made to rotate therewith by a feather engaging an elongated slot 27 in sleeve 7. (See Fig. 10). Each disk 24 carries a cam lug 28 and these lugs are spaced spirally around the sleeve formed by disks 24—25. Each of said lugs extends over approximately one tenth of the circumference of said sleeve, as shown most clearly in Fig. 8. These cam lugs 28 are adapted at times to engage each an end of one of a series of eight levers 29, all mounted on rod 30 as a common fulcrum, the said rod being supported at its ends in bearings 31, one only of which is shown. (See Fig. 8). The heads or upper ends of these levers 29 work in individual slots in a block 32 on the base plate 1, thereby holding the upper ends of said levers against the lateral thrust to which they are subjected in the operation of the device. The head of each lever 29 is provided with a cam lip 33. The lower end of each of these levers is provided with a short arm 34 to each of which is attached an individual coil spring 35, the other ends of which springs are secured to a bracket 36 made fast on the base plate 1. These springs normally hold the upper ends of levers 29 out of the path of cam lugs 28. (See Fig. 8).

The insulating base 20 is hollowed out for a portion of its length to receive the lower end of levers 29 and their associated parts.

Cam 26 is adapted to engage a conical cam roller 37 mounted on one end of a pivoted lever 38 which carries at its other end an insulating stud 39 adapted to engage a contact spring 40 to bring the same into engagement with a contact screw 41 on a metal bridge 42.

The sleeve made up of disks 24—25 is normally forced under tension of a spring 43 up against a collar 44 fast on sleeve 7, so that normally cam 26 does not operate on roller 37.

Spring 43 is held between cam 26 and the collar of a cam 45 also fast on sleeve 7. This last mentioned cam engages one end of a bell-crank lever 46, one of the arms of which carries a stud 47 adapted to operate a contact spring 48 to bring the same into engagement with a contact screw 49 on the bridge 42; while another arm of said lever actuates certain key-locking mechanism hereinafter described.

The sleeve 7 receives its motion from shaft 4 through a clutch 50, which consists among other parts of a normally rotating member 51 made fast on shaft 4, and a normally stationary member 52 fast on sleeve 7. For the details of this clutch, see Figs. 10 and 11.

The clutch member 51 is provided with an annular flange 53 on which are cut radial teeth 54. The member 52 has two annular flanges 55 and 56 in which are mounted for movement transversely thereto a cam latch 57 having teeth 58 at one end adapted to engage the teeth 54, and cut away as at 59 to receive the nose of a lever hereinafter described. One of the walls of the recess 59 forms a cam 60 adapted by engaging said nose to shift said latch. A spring 61 fast on member 52 presses against the end of latch 57 to force it toward member 51. The coupling of this clutch is controlled by lever 62 carrying at one end a pin 63 forming a nose adapted to engage the clutch pin 57. This lever is pivoted at 64 and forms the armature of an electro-magnet 65 made fast to the base plate 1. One terminal of this magnet is electrically connected to a contact spring 66 secured at one end to base 20. This spring 66 is adapted to normally engage a contact screw 67 on metal bridge 68, but is adapted to break contact with said screw at times under the action of a lever 69 which carries an insulating pin 70 adapted to engage spring 66.

Lever 69 engages at one end the periphery of a cam 71 made fast to a collar 72 forming a part of member 73 of a clutch 74. The member 73 of this clutch including collar 72 and cam 71 are all loose on shaft 4, that is, this shaft may rotate relative to said parts, but the latter cannot slide longitudinally of the shaft. The loose member 73 of clutch 74 carries a coupling pin 75 (see Fig. 10) which is a duplicate of pin 57 of clutch 50, and this pin 75 is adapted, as in the first described clutch, to engage teeth 76 of the member 77 fast on shaft 4, under the action of spring 78. The coupling and uncoupling of the fast and loose members of clutch 74 is controlled by a pin 79 which engages cam recess 80 in coupling pin 75, and this pin 79 is carried by one end of a lever 81 made fast on a rock-shaft 82 journaled in bearings 83, 84. Also mounted fast on shaft 82 is a lever 85 one end of which rests on the periphery of a cam 86 made fast to the loose member 52 of a clutch 50. This lever 85 is held against cam 86 under tension of a spring 87, attached to an arm 88 on shaft 82 and to the base plate 1.

The signals are formed in this apparatus by operating the levers 29 so as to bring combinations of said levers into the paths of the cam lugs 28. For this purpose I employ eight slidable pins 89 which are preferably arranged in two rows of four each and staggered as shown.

For the purposes of the present description, it will be assumed that these pins are operated according to the system of combinations illustrated in Fig. 12, where the vertical zigzag row of dots on the left correspond to the eight pins 89 and also to the eight code positions in a given signal interval, which positions we will call the *a*, *b*, *c*, *d*, *e*, *f*, *g* and *h* positions. These positions correspond respectively to eight equal unit impulse periods represented by the spaces *a* to *h*, inclusive, between the vertical dotted lines shown in Fig. 14, each signal interval being divided into the same number of such impulse periods. Along the upper edge of the diagram are shown the various transmittable characters, and under each, dots representing the particular pin 89 or combination of pins operated to send the respective characters. The dots corresponding to the words "Space," "Line," "Back" and "Blank" represent the pins which are operated to effect spacing, lining, backing, and blanking in certain recording apparatus with which we are not now particularly concerned.

The operation of pins 89 may be effected either automatically or manually. In the embodiment of my invention herein shown this operation is effected manually by means of a keyboard and associated mechanism. This mechanism comprises in the present case eight selector bars 90, one for each of said pins, mounted side by side for lateral movement. The movement of these selector bars, in the case shown, is effected by pivoted keys 91 having cam edges 92 adapted to engage cam lugs 93 on the selector bars. By arranging these lugs on said bars so as to be engaged in certain combinations by the several keys, the said bars are caused to operate said pins in these combinations. The manner of arranging these lugs on the selecting bars will be clear from a study of Fig. 13 which shows in side elevation four of the bars removed from the machine. These lugs are simply arranged so that there will be the required number in line with each key lever to shift that one or combination of bars which corresponds to the character or other signal which the particular key lever represents. For example, the letter "A" is formed by the *a* and *d* combinations or code positions. (See Fig. 12.) Therefore, the *a* and *d* bars 90 would each have a lug adapted to be engaged by the beveled edge of the "A" key lever, so that when the "A" key is operated the said *a* and *d* bars will be shifted. The various combinations of lugs 93 may be gotten from the combination diagram or key Fig. 12.

Each selector bar is provided on its upper edge with a lug 94 any one of which is adapted, when its bar is operated, to engage the yoke 95 of a lever 96 which operates a slidable pin 97 adapted to operate a contact spring 98 made fast at one end to insulation support 20 and in line with a contact screw 99 on bridge 68. Pin 97 carries at one end an insulating tip 100 which engages spring 98.

The keys of the keyboard, which may be of any desired number, are preferably held locked against operation during the cycle of sending each signal. This is effected in the present case by providing each key with a lip 101 which is adapted to be held against movement at times by a locking bar 102 extending across all the keys and mounted at its ends on pivoted uprights 103. This locking bar is rocked so as to lock and unlock the keys by lever 46, one of the arms 104 of which is connected to upright 103 through link 105 pivoted to the upright 103 as at 106 (see Figs. 2, 4 and 6).

The line current is supplied in the case shown by two direct current dynamos 107 and 108, a positive terminal of one and a negative terminal of the other of said dynamos being connected together and to earth as shown. Positive terminal of dynamo 107 is connected through resistances 109 and 110 to contact springs 19 and 40 respectively, while the negative terminal of dynamo 108 is electrically connected through resistances 111 and 112 to contact springs 18 and 48 respectively.

L^1 and L^2 represent the line wires of two individual transmission circuits. The object in employing two separate line circuits was to operate the receiving apparatus mentioned in the general introduction to this specification, the function of the current in line L^1 being to synchronize or time the step-by-step operation of a certain portion of said apparatus. The actual signal impulses, however, are transmitted over line L^2, which may be used with or without the line L^1, according to the nature of the receiving apparatus employed. Line L^1 connects to binding post 113, on metal bridge 23, and line L^2 connects to binding post 114 on metal bridge 42.

One terminal of a local source of current is connected to one of the terminals of magnet 65 while the other terminal of said source is connected to the binding post of spring contact 98.

The operation of the foregoing transmitting apparatus is as follows: Shaft 4 rotates continuously. Consider first the normal condition of the line when no signals are being transmitted: During this time line L^1 receives positive current continuously from dynamo 107 through contact spring 19, contact 22 and binding post 113. When the apparatus comes to rest, cams 8 and 9 always stop in such position that lever 15 rests on the elongated projection 13 so as to hold spring 19 into engagement with contact 22.

(See Fig. 2): Line L^2 during this time receives continuous negative current from dynamo 108 through contact spring 48, contact 49 and binding post 114. Cam 45 always stops so that its lug will be in that position (see Fig. 2) where it will cause lever 46 to hold spring 48 in engagement with contact 49. Lever 46 through arm 105 also during this time of rest holds locking bar 102 out of the paths of the lips 101 of the key levers, so that any of the keys may be operated. Next, suppose a key of the keyboard is operated. Let it be assumed that this is the key corresponding to the letter "H". The operation of this key will cause its cam edge to engage lugs 93 of two of the selecting bars 90. The selector bars thus operated will push forward two of the pins 89 corresponding to the dots in the vertical column under the letter "H" of the diagram of combinations Fig. 12. The pins thus pushed forward act on two corresponding levers 29 to place them in the path of the cam lugs 28. The selector bars 90 thus operated also actuate lever 96 causing it to act through pin 97 to effect engagement between spring 98 and contact 99 (see Fig. 5). This completes a circuit which may be traced from positive supply wire 115 through winding of magnet 65, spring contact 66, bridge 68, spring contact 98, to negative return wire 116. Magnet 65 thus being energized attracts its armature 62, thereby withdrawing pin 63 from engagement with clutch latch 57. This allows said latch to be forced under the action of its spring 61 into engagement with teeth 54 of the constantly rotating clutch member 51. The clutch member 52 then becomes coupled to the shaft 4 and so rotates sleeve 7. This sets in rotation cams 8 and 9 and the projections on these rock levers 14 and 15, thus causing them to send springs 18 and 19 alternately into engagement with contacts 21 and 22, sending to line L^1 an alternating current as shown at A—B, Fig. 14. These impulses, however, do not form the signals for they are the same for each signal transmitted; their function is to synchronize or time the operation of receiving mechanism as above pointed out. The rotation of sleeve 7 brings two cam lugs 28 successively into engagement with the two operated levers 29, and said cams engaging the cam noses of said levers will cause the sleeve formed by disks 24—25 to slide against tension of spring 43 once for each lug 28 which engages a lever 29. The effect of this is to force cam 26 twice against the cam roller 37 at intervals corresponding to the times of engagement of said lugs 28 with the levers 29. The effect of this is to rock the lever 38 so as to bring spring 40 twice into engagement with contact 41 at corresponding intervals, thereby sending to line L^2 current as shown at C—D in Fig. 14. When the lever 29 corresponding to the "*b*" pin sent the cam 26 into engagement with roller 37, this sent to line L^2 a positive impulse, and when the lever corresponding to the "*e*" pin sent cam 26 against roller 37, this sent to line a positive impulse corresponding to the "*e*" position of the code. Before sleeve 7 completes a revolution, cam 86 operating on arm 85 rocks shaft 82 and withdraws pin 79 from the latch of clutch 74, thus coupling the normally idle member 73 of that clutch to shaft 4. This rotates cam 71 which thereby removes its lug from lever 69, thus allowing spring contact 66 to break contact with contact 67, thereby breaking circuit of magnet 65. The effect of this is to cause the return of pin 63 to the path of clutch latch 57, and when said latch engages said pin the latter will be withdrawn from the clutch member 51, owing to the engagement of said pin 63 with the cam surface 60, thus uncoupling the clutch 50 and stopping the rotation of sleeve 7, with its various cams at the end of the signal interval. In like manner when any of the other keys are operated one or more pins 89 will operate to transmit a combination of positive impulses corresponding to the combination of pins operated.

While I have herein shown and described a specific mechanism, it should be understood that the same is subject to variation or modification without departing from the spirit of my invention. For example, I do not limit my invention to two wire transmission, since it is not at all necessary in some uses of the invention to employ line L^1 and its transmitting contacts at all. The signals are actually transmitted by the switch contacts of line L^2 and it is the operation of these contacts which constitutes the primary object of the present invention. Nor do I limit the scope of my invention to the particular form or arrangement of these contacts or the mechanism by which they are operated, nor to the particular form of signaling current described.

What I claim is:

1. Apparatus for transmitting electrical signals, comprising a signal transmitting contact, means entirely mechanical to operate said contact variably according to the signal to be transmitted, and means to allot equal time intervals to all the signals.

2. Apparatus for transmitting electrical signals, comprising a signal transmitting contact, a series of members, means to select said members in combinations, operative connection entirely mechanical between said members and said contact to operate the said contact variably according to the members selected, and means to start the contact operating means into operation at the commencement of each signal and to automatically stop the same at the end of each signal.

3. Transmitting apparatus for electric telegraphs of the kind in which there is allotted to each signal transmission the same number of equal impulse periods and the signals formed by the transmission of electrical impulses corresponding to combinations of such periods, comprising a plurality of mechanical elements corresponding in number to said impulse periods, means to selectively operate said elements in combinations, and a signal transmitting switch common to all said elements and mechanically controlled thereby to operate at different times according to the elements selected.

4. Transmitting apparatus for electric telegraphs, comprising a signal transmitting switch, a rotary power member, a member slidable on said rotary member, means operated by said slidable member to operate said switch, a series of elements selectively operated, and means controlled by said elements to operate said slidable member variably according to the elements selected.

5. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements, means to selectively operate the same, a single contact transmitting switch common to all said elements and variably mechanically controlled thereby, to transmit variable signals, and means to allot equal time intervals to all the signals.

6. Transmitting apparatus for electrical signaling, comprising a plurality of rotary members and a plurality of levers adapted to coöperate therewith, means to selectively operate said levers, and a single contact signal transmitting switch mechanically operated variably according to the signal to be transmitted by the conjoint action of said rotary members and levers.

7. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements to be selected in combinations corresponding to a combination of electrical impulses to form a given signal, permutation mechanism to operate said elements in said combinations, a plurality of rotary members, an electric circuit including a source of electricity, and a transmitting switch in said circuit and operated variably according to the signal to be transmitted by the conjoint action of said elements and rotary members.

8. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements to be selected in combinations corresponding to a combination of electrical impulses to form a given signal, permutation mechanism to operate said elements in said combinations, a plurality of movable members one for each of said elements, an electric circuit including a source of electricity, and a transmitting contact in said circuit variably operated by the conjoint action of said elements and movable members.

9. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements to be selected in combinations corresponding to a combination of electrical impulses to form a given signal, permutation mechanism to operate said elements in said combinations, a plurality of movable members, a main line transmission circuit including a source of electricity, and a transmitting contact in said circuit variably operated by the conjoint action of said elements and movable members.

10. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements to be selected in combinations corresponding to the combination of electrical impulses to form a given signal, permutation mechanism to operate said elements in said combinations, a plurality of rotary cams, one for each of said elements, an electric circuit including a source of electricity, and a transmitting switch in said circuit variably operated by the conjoint action of said elements and cams.

11. Transmitting apparatus for electrical signaling, comprising a plurality of mechanical elements to be selected in combinations corresponding to the combination of electrical impulses to form a given signal, permutation mechanism to operate said elements in said combinations, a plurality of power operated rotary members, one for each of said elements, an electric circuit including a source of electricity, a transmitting contact in said circuit common to all said elements and variably operated by the conjoint action of said elements and rotary members, means to start said rotary members into motion at the commencement of a signal interval and automatic means to bring the said members to rest between successive signals.

12. Selective signaling apparatus, comprising two line signal circuits, means to normally deliver to each of said circuits a direct electric current, and transmitting apparatus comprising means to change the direct current on one of said lines to a series of alternating current impulses for each signal but of the same character for all signals, and means to change the normal current on the other line to one or more impulses representing the particular signal.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS M. POTTS.

Witnesses:

VINCENT M. KEARNS,

ROBT. HOOPER.