W. A. FRICKE.

DISPLAY APPARATUS.

APPLICATION FILED MAY 3, 1915.

1,222,092.

Patented Apr. 10, 1917.

2 SHEETS—SHEET 1.

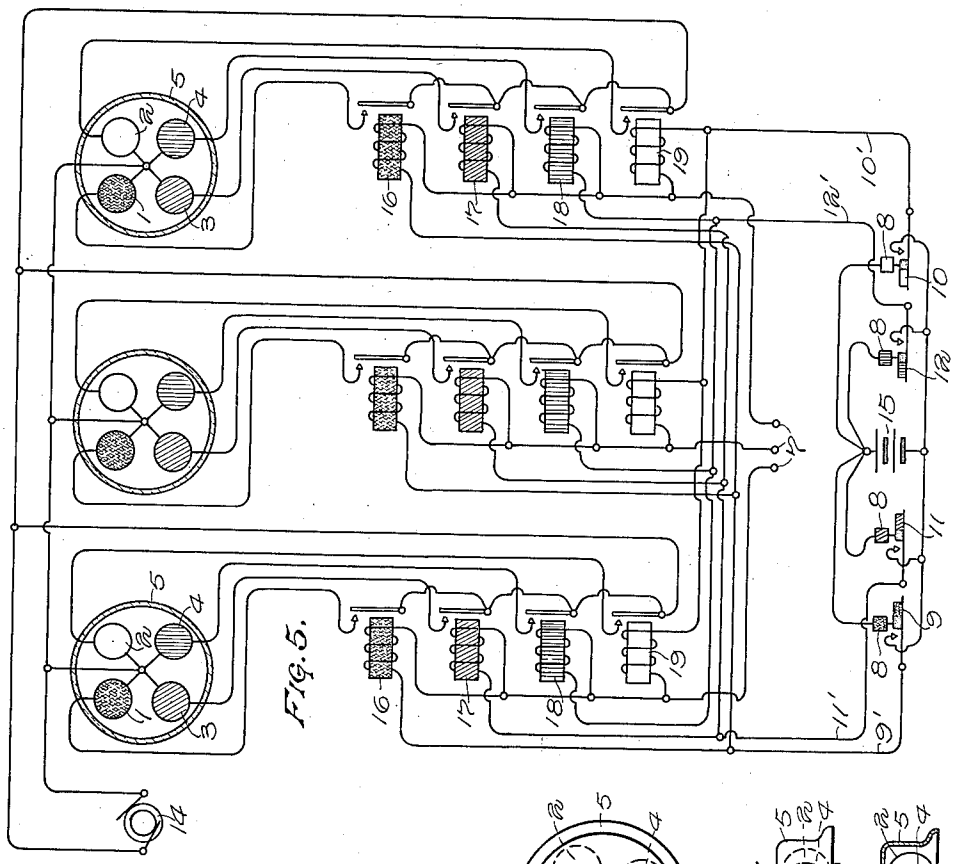


Fig. 5.

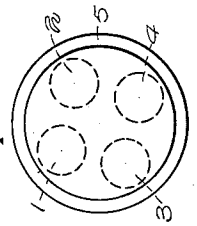


Fig. 2.

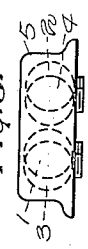


Fig. 3.

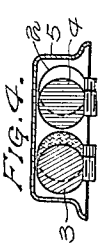


Fig. 4.

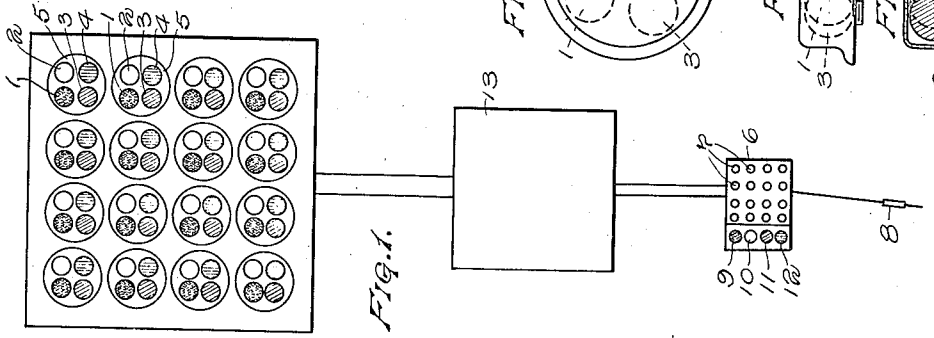


Fig. 1.

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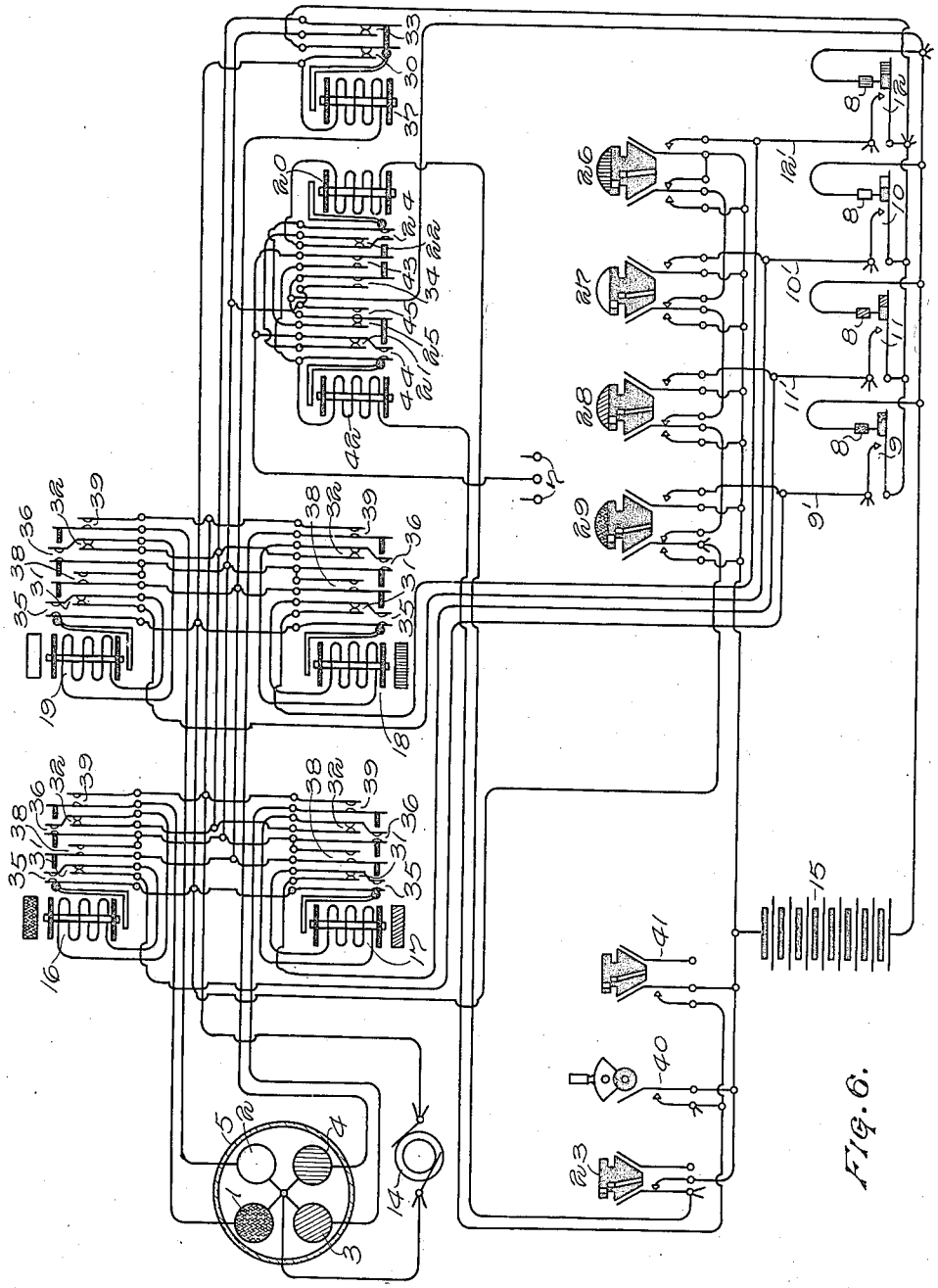


Fig. 6.

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DISPLAY APPARATUS.

1,222,092. Specification of Letters Patent. Patented Apr. 10, 1917.

Application filed May 3, 1915. Serial No. 25,356.

To all whom it may concern:

Be it known that I, WILLIAM A. FRICKE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Display Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to display apparatus constituting in its preferred embodiment an improvement upon the system disclosed in my co-pending application Serial No. 824,914, filed March 16, 1914.

In practising my present invention display elements of differing character are arranged in sets or groups, the elements in each set being selectable to the exclusion of others in the same set and the sets themselves being desirably selectable.

In the preferred embodiment of the invention all or any combination of the display elements in each set or group may be selected and all of the sets may be employed or any combination thereof as well as varying combinations of the elements in each set.

As I have practised my invention the display elements are desirably in the form of small incandescent lamps, the lamps being divided into sets with the lamps in each set having bulbs of differing colors. The sets of lamps are desirably segregated and the lamps of each set desirably shine through a translucent cover each set having such a cover which is preferably distinct from the covering of each of the other sets.

By means of the preferred embodiment of the invention the sets of lamps and the lamps in the sets may be variously selected to produce a wide variety of color combinations, the lamps in each set or group being similar in color to lamps in each of the other sets or groups.

I will explain my invention more fully by reference to the accompanying drawings in which Figure 1 is a general schematic view illustrating one embodiment of the invention; Figs. 2, 3 and 4, are respectively plan, side and sectional views of a group of display elements as preferably arranged; Fig. 5 is a diagram, also schematic, illustrating certain interrelationship of three sets or groups of display elements; and Fig. 6 indicates the preferred circuit arrangement of each group of display elements.

Like parts are indicated by similar characters of reference throughout the different figures.

In Fig. 1 I have diagrammatically indicated sixteen display centers at each of which a set or group of four display elements 1, 2, 3, 4 is located. The display elements may be in the form of variously colored lamps, such as small incandescent lamps, the bulb of lamp 1 being (for example) colored orange; the bulb of lamp 2, white; the bulb of lamp 3, green; and the bulb of lamp 4, red; these lamps being shaded in the drawings to denote these colors. The sets or groups of display elements are desirably segregated, each set having lamps 1, 2, 3 and 4 being desirably covered by a translucent cap or container 5, clouded glass being suitable material of which to form such cap. Each covering 5 is thus somewhat in the nature of a screen for the lamps of its set and serves to diffuse the light of the lamps behind it to prevent material shifting of the lighting center so far as may be apparent to the observer, the light produced at each set being substantially fixedly localized by the diffusing cover irrespective of the location of the lamp or lamps glowing within the cover. I do not wish to be limited, however, to the employment of the segregating elements 5. The transmitting board 6 contains a plurality of contact terminals 7, each individual to a set or group of display elements, Fig. 1 thus illustrating sixteen contact elements 7, there being sixteen sets of display elements 1, 2, 3, 4. The transmitting board is provided with circuit closing contact means, preferably in the form of a stylus 8, for engagement with the terminals 7 to effect the operation of the display apparatus. Four switches 9, 10, 11, 12 are provided upon the display board each individual to the character or color of a display element, the switch 9 being thus associated with the orange color, the switch 10 with the white, the switch 11 with the green, and the switch 12 with the red, these switches being shaded according to the colors to which they are individual. There are only as many switches as there are colors or characters of display elements, the stylus 8 and the contact 7 en-

gaged thereby associating the switches with the set of lamps whose contact 7 is touched by the stylus, that switch being operated which corresponds with the color to be displayed in the selected set. By means of a feature of the invention later to be set forth one, all or any number of lamps in each selected set or group may be caused to glow by operation of the corresponding switches at the left of the transmitting board illustrated in Fig. 1, the translucent covering 5 of the selected set then serving to blend the colors of the glowing lamps behind it. The relay equipment, later to be described, is interposed at 13 between the display board and the transmitting board 6.

The display elements may be supplied by a common source of current such as the power driven generator 14, having one terminal permanently connected with one of the terminals of each of the display elements on the entire display board, the other terminal of the generator being brought into connection with the selected display element or elements in a selected set or selected sets with the aid of the equipment at the transmitting board 6 and the relay equipment at 13, as will now more fully be explained, first generally in connection with Fig. 5 and then more specifically in connection with Fig. 6. The switches 9, 10, 11 and 12 are preferably of the nature indicated in Figs. 5 and 6, each being free to close its circuit when relieved of pressure. There are desirably 4 styli 8 each individual to an employed color and each, when idle, resting upon and opening a switch pertaining to the same color. In operating the apparatus the stylus corresponding to the color to be employed is taken for use and is applied to the contact 7 individual to the set of lamps where the selected color is to appear. When the employed stylus is applied to a selected contact 7, a circuit is established traceable from a source of current 15 (which may be in the form of a battery or other direct current source that would preferably be distinct from the source 14 if the latter source furnishes alternating current), through the contact of the switch (9, 10, 11 or 12) released by the stylus 8 taken for use, the conductor 9^1, 10^1, 11^1 or 12^1 extending from such switch, the relay 16, 17, 18 or 19 connected with the employed contact 7 and individual to the employed switch 9, 10, 11 or 12, such employed contact 7, the employed stylus 8, to the battery 15. There is a set or group of four such relays for each set of lamps, each relay being individual to a lamp of its set, these relays being shaded to indicate the colors of the lamps to which they are individual. It thus appears that each relay has two openings in its circuit, one governed by its switch 9, 10, 11, or 12 to which it is individual and the other governed by the contact 7 to which its set is individual and the selected stylus 8. It will be observed that each group or set of four relays has one contact 7 common thereto and that each relay of such set has but one switch 9, 10, 11 or 12 associated therewith, though each such switch is common to all of the relays in the different sets pertaining to the same color.

Whenever a selected relay is energized circuit for the lamp individual thereto is established at the armature switch of such relay, the circuit being traceable from one terminal of the generator 14, the armature switch of the employed relay, the contact of such armature switch, the lamp individual to the employed relay, to the other terminal of the generator 14. In the simplified arrangement illustrated in Fig. 5, a lamp is caused to glow only so long as the employed stylus is in engagement with the contact terminal 7 pertaining to such lamp. If it be desired to have concurrent display at more than one lighting center 5, as many styli 8 are used, according to the simplified arrangement of Fig. 5, as there are lighting centers to be employed but the lamps at each employed lighting center corresponding to the switches released by the employed styli will glow. By employing the circuit arrangement illustrated in Fig. 6 in association with each set or group of lamps I am not only enabled to select one or more lighting centers 5 but am enabled to cause any one, more or all of the lamps at each selected lighting center to glow irrespective of the lamp or lamps at the other selected lighting centers then glowing and to maintain the selected lamp or lamps at each lighting center in circuit without maintaining the styli upon the employed contacts 7.

Referring now more particularly to Fig. 6, each lighting center 5 is individually provided with a set of relays 16, 17, 18 and 19 as in the case of the simplified system illustrated in Fig. 5, each set of these relays having a relay 20 common to the relays of such set for the purpose of maintaining the initially energized relay or relays in circuit independently of the employed stylus. Each such set of relays has its own relay 20 which does not pertain to the relays of any other set. When the lamp or lamps pertaining to a relay 20 are to be permanently excluded from circuit the circuit of such relay 20 is opened. In describing the operation more in detail, any stylus 8 applied to the contact 7 individual to the selected lighting center establishes a circuit traceable from the battery 15, said stylus, the contact to which the stylus is applied, through the normally connected pair of contacts 21, the normally connected pair of contacts 22, the winding of relay 20, the contacts of key 23, to the battery 15. The relay 20 is now energized and establishes a locking circuit

through itself traceable from the battery 15, the contacts of switch 23, the winding of relay 20, the contacts 24, the contacts 25, to the battery 15. The contact 7 which was touched by the stylus is now in open circuit owing to the separation of the contacts 22 consequent upon the energization of the relay 20, it thus being necessary only momentarily to apply the stylus to effect the energization of said relay. When a stylus is removed from engagement with its switch 9, 10, 11 or 12 to enable such switch to close its contacts, one gap in the circuit for the relay 16, 17, 18 or 19 corresponding to such relay is closed, the remaining gap in such circuit being closed due to the energization of the relay 20. The energizing circuit for the selected relay 16, 17, 18 or 19 is traceable from the battery 15, through the serially related normally engaged contacts of the switches 26, 27, 28 and 29, the contacts 30, the contacts of the released switch 9, 10, 11 or 12, the conductor 9^1, 10^1, 11^1, or 12^1 belonging to such released switch, the contacts 31, the winding of the relay 16, 17, 18 or 19 pertaining to the released switch 9, 10, 11 or 12, the contacts 32 of such relay, the contacts 33, the now engaged contacts 34, to the battery 15. The selected relay now has a locking circuit established for itself traceable from the battery 15, the serially related normally closed contacts of the switches 26, 27, 28 and 29, the contacts 35 of the selected relay, the winding of such relay, the contacts 36, the contacts 34, to the battery 15. The energized relay 16, 17, 18 or 19 now establishes a circuit for the relay 37 (there being one relay 37 for each set or group of relays 16, 17, 18 and 19) which is traceable from the battery 15, the serially related normally closed contacts of the switches 26, 27, 28 and 29, the winding of relay 37, the contacts 38, the contacts 34, to the battery 15. The relay 37 now opens its contacts and dissociates those of the relays 16, 17, 18 and 19 which have not been energized owing to the separation of the contacts 30 and 33 upon the closure of which each of the relays 16, 17, 18 and 19 depends for its initial energization. If it should be desired to operate more than one or all of the relays 16, 17, 18 and 19 the styli upon the switches 9, 10, 11 and 12 which correspond with such relays to be operated are removed from their switches before application is made to the contact 7 belonging to such relays and after such removal of the styli one stylus may be applied to such contact 7 whereupon all of the relays individual to the released switches are energized, as will be apparent. In this way one or more relays 16, 17, 18 or 19 in each of any number of sets may be energized and the energization of the relays among the several sets may be simultaneous. Each energized relay 16, 17, 18 or 19 will establish a circuit for the display lamp individual thereto, one of the similar lamp circuits being traceable, for example, from the generator 14 through the lamp, say lamp 1, the contacts 39, to the generator 14.

If lamps of different colors are being simultaneously displayed and it is desired to have lamps of but one color displayed or if all the lamps in circuit are displaying but one color and it is desired to change to another color, the switch 26, 27, 28 or 29 (respectively corresponding to red, white, green and orange) corresponding to the uniform color desired is operated to open the circuit through the normally connected serially related contacts of these switches for the purpose of opening the circuits of the energized relays 16, 17, 18 or 19 in the selected groups to open the circuit of the glowing lamps preparatory to causing lamps of but one color to glow. The employed switch 26, 27, 28 or 29 will close its right hand contacts to energize all of the relays 16, 17, 18 or 19 in the selected sets, the extreme left hand contacts of such employed switch serving to enable the newly energized relays to establish locking circuits for themselves, these circuits being apparent from the circuits previously traced and from the clear illustration of such circuits in Fig. 6. From the description which has been furnished it is apparent that the employed switch 26, 27, 28 or 29 will not cause the energization of the relays to which they correspond in unselected sets so that the color at the selected lighting centers is only changed at such centers and the changed color does not extend to other and unselected lighting centers. The change in the circuit conditions effected by the employed switch 26, 27, 28 or 29 remains only as long as such switch is operated and if it is desired to maintain the altered condition the switch 9, 10, 11 or 12 corresponding to the employed switch 26, 27, 28 or 29 is closed by the removal of the corresponding stylus 8 from engagement therewith. By means of the invention, a color or combination of colors may be manifested at the display board and another color may be uniformly manifested over the entire display board as a back ground without excluding the other color or colors and other variations in the arrangement and selection of the colors may be made as will be apparent to those who acquaint themselves with my invention and it will not therefore be necessary to describe all the uses to which the invention may be put.

If it should be desired to exclude certain glowing lamps from circuit this may be accomplished by closing the switch 40 or the switch 41 and thereafter applying a stylus to the contact 7 of the lamp or lamps in the previously selected set to be excluded from circuit. The switch 40 may be set for this

purpose and allowed to remain in its set position whereas the switch 41 has to be maintained in position by hand pressure, the circuit control effected by both switches being the same. When one of these switches is closed circuit is established for the relay 42 (there being one relay 42 for each group of relays 16, 17, 18 and 19) which is traceable from the battery 15, the contacts of the closed switch 40 or 41, the winding of relay 42, the contacts 43, the employed contact 7, the stylus applied to this contact, to the battery 15. When the relay 42 is energized its contacts 25 are opened whereupon relay 20 is deënergized, this relay in turn opening the circuit for the previously energized relay or relays 16, 17, 18 or 19 at the contacts 34. After the deënergization of relay 20, relay 42 is maintained energized through the now engaged contacts 44 directly through the stylus as long as the stylus is applied to the corresponding contact 7. As long as the stylus remains in engagement with the engaged contact 7, the relays 16, 17, 18 or 19 will not be deënergized owing to the establishment of a circuit for the relay 42 at the contacts 45, by which contacts and the engaged stylus circuit for such previously energized relays is maintained. When the stylus is removed the deënergization occurs and the lamps corresponding to the deënergized relays are excluded from circuit. When the switch 40 or 41 is depressed and the stylus is applied to the contact 7 of a lighting center which was previously unselected a lamp or lamps in such center having such contact 7 is caused to glow as long as the stylus is in engagement with such contact and according to the switch or switches 9, 10, 11 or 12 released. In this latter operation relay 20 is first to be energized establishing a circuit for relay 42 which is maintained through the stylus as long as it is applied to the contact of such previously unselected lighting center.

When all of the glowing lamps are to be effaced the key 23 is depressed which will remove the battery 15 from circuit with those relays upon which the lamps are dependent for their inclusion in circuit, the relays 20 being first to be deënergized, these relays in turn then opening the circuit through the relays 16, 17, 18 or 19.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention, but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. Display apparatus including a plurality of sets of differing display elements, display elements in each of said plurality of sets being similar to display elements in the other sets; circuits for the display elements; and switching apparatus for selecting sets of display elements and display elements in selected sets, said switching apparatus being inclusive of switches one for each set of display elements to enable its selection and other switches, one for each plurality of similar display elements to enable its selection.

2. Display apparatus including a plurality of sets of differing display elements, display elements in each of said plurality of sets being similar to display elements in the other sets; circuits for the display elements; switching mechanism for selecting sets of display elements and display elements in selected sets, said switching mechanism being inclusive of switches one for each plurality of similar display elements; a relay for each display element governed by the switch pertaining thereto; an additional relay common to the relays of each set pertaining to each set of display elements; a contact terminal individual to such relay; and circuit changing means coöperatively related with each such contact and coöperating with the switches selected for use and the common relays related thereto to operate the relay or relays pertaining to the selected display elements in selected sets.

3. Display apparatus including a plurality of sets of differing display elements, display elements in each of said plurality of sets being similar to display elements in the other sets; circuits for the display elements; switching mechanism for selecting sets of display elements and display elements in selected sets, said switching mechanism being inclusive of switches one for each plurality of similar display elements; a relay for each display element governed by the switch pertaining thereto; an additional relay common to the relays of each set pertaining to each set of display elements; a contact terminal individual to such relay; circuit changing means coöperatively related with each such contact and coöperating with the switches selected for use and the common relays related thereto to operate the relay or relays pertaining to the selected display elements in selected sets; and another relay provided for each of the sets of display elements and common to the relays pertaining thereto for excluding the relays pertaining to unselected display elements.

4. Display apparatus including a plurality of sets of differing display elements, display elements in each of said plurality of sets being similar to display elements in the other sets; circuits for the display elements; switching mechanism for selecting sets of display elements, and display elements in selected sets, said switching mechanism being inclusive of switches one for each

plurality of similar display elements; a relay for each display element governed by the switch pertaining thereto; an additional relay common to the relays of each set pertaining to each set of display elements; a contact terminal individual to such relay; circuit changing means coöperatively related with each such contact and coöperating with the switches selected for use and the common relays related thereto to operate the relay or relays pertaining to the selected display elements in selected sets; another relay provided for each of the sets of display elements and common to the relays pertaining thereto for excluding the relays pertaining to unselected display elements; and a further relay provided for each of the sets of display elements and common to the relays pertaining thereto for excluding the first aforesaid additional relay to exclude the operated relay or relays to which such additional relay is common.

In witness whereof, I hereunto subscribe my name this twenty-sixth day of April, A. D., 1915.

WILLIAM A. FRICKE.

Witnesses:
G. L. CRAGG,
E. L. WHITE.