M. J. BROWN.

ELECTRIC APPARATUS FOR BULLETIN BOARDS, SIGNS, &c.

APPLICATION FILED OCT. 14, 1916.

1,235,005.

Patented July 31, 1917.

4 SHEETS—SHEET 1.

Fig. 1.

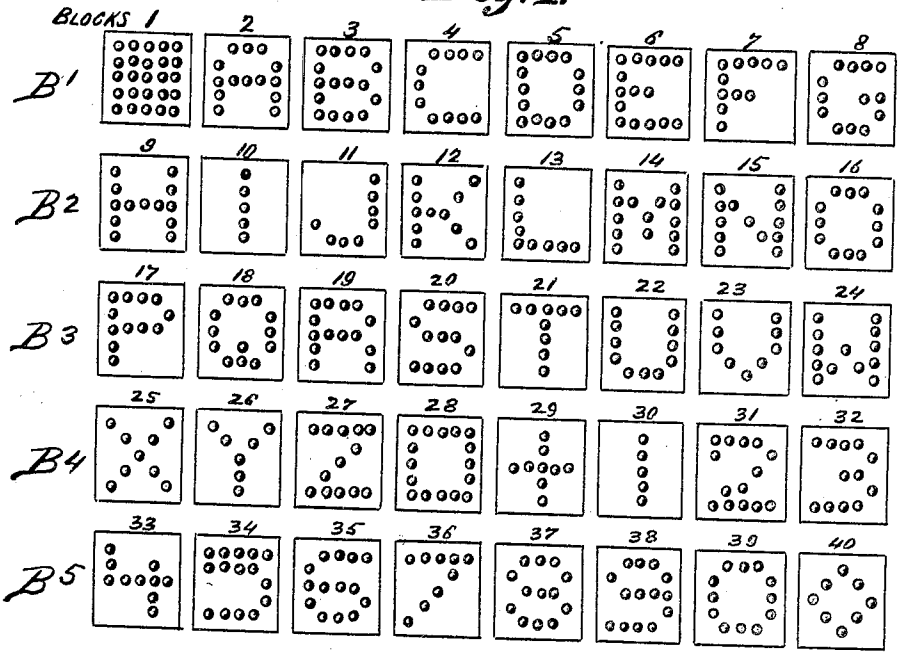
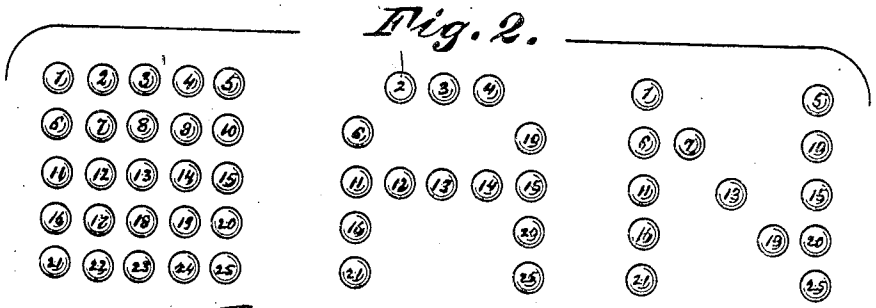


Fig. 2.



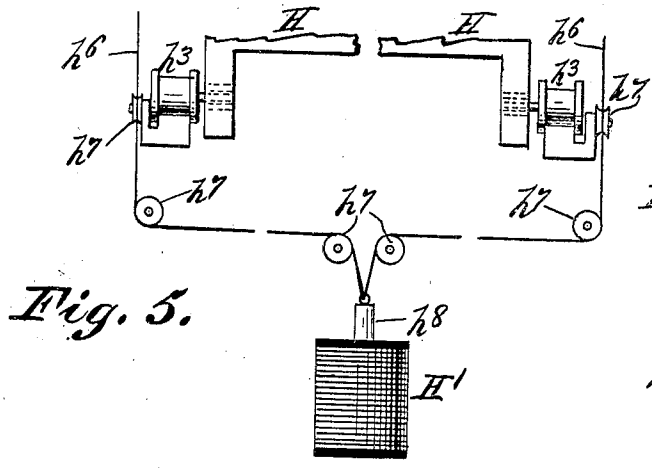


Fig. 5.

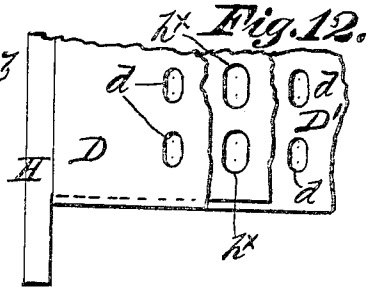


Fig. 12.

Inventor:
Michael J. Brown,
By His Attorney,
Geo. Wm. Mott

M. J. BROWN.

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Fig. 3.

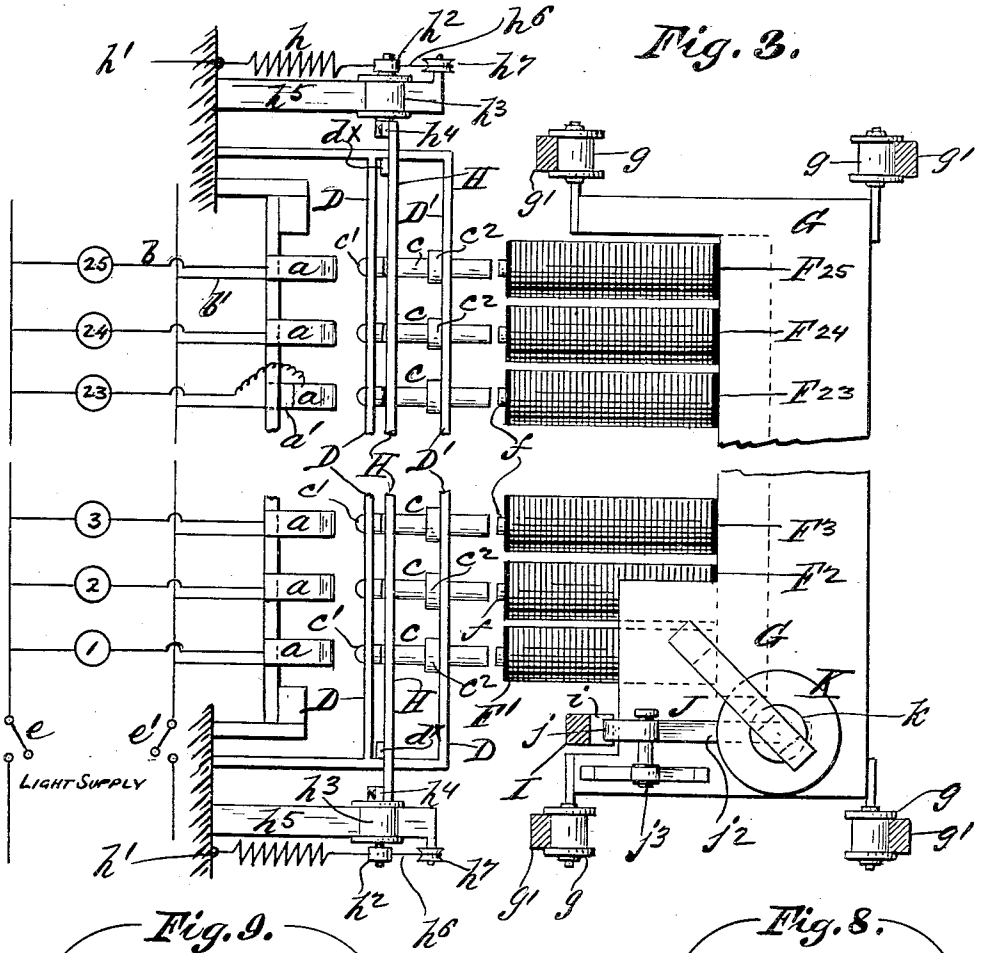


Fig. 9.

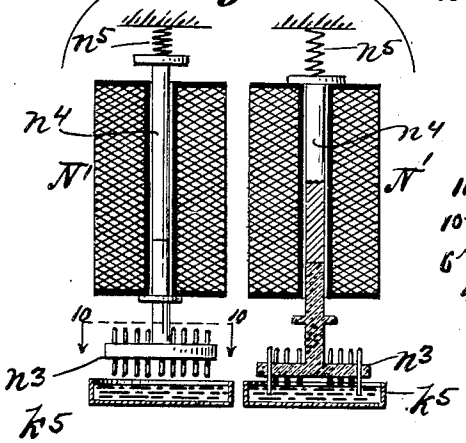


Fig. 10.

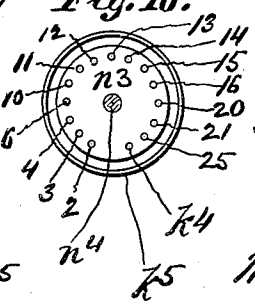
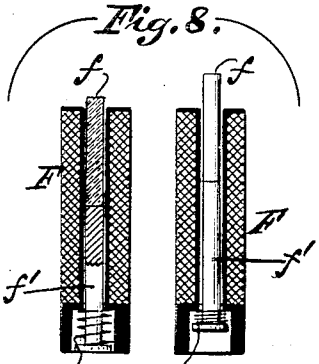


Fig. 8.



Inventor:
Michael J. Brown,
By his Attorney
Leo. Wm. Mich

M. J. BROWN.

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4 SHEETS—SHEET 3.

Fig. 4.

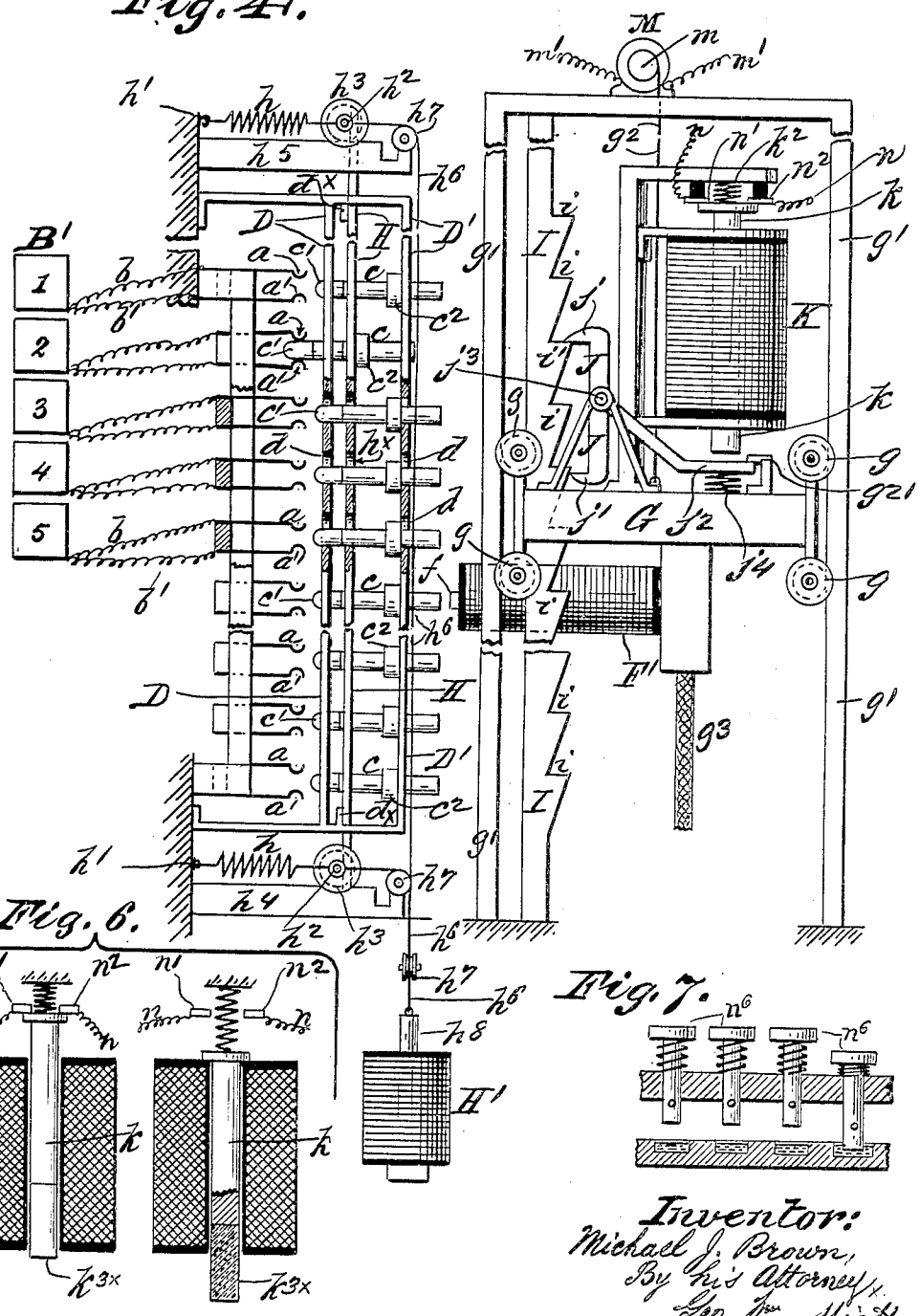

Fig. 6.

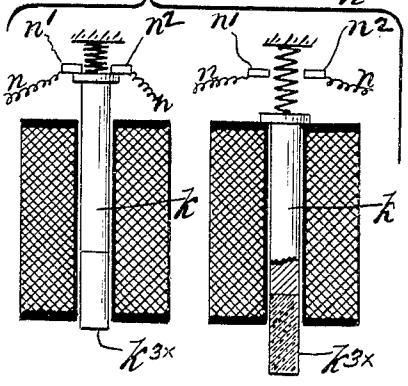

Fig. 7.

Inventor:
Michael J. Brown,
By his Attorney,
Leo. F. Miatt

M. J. BROWN.

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4 SHEETS—SHEET 4.

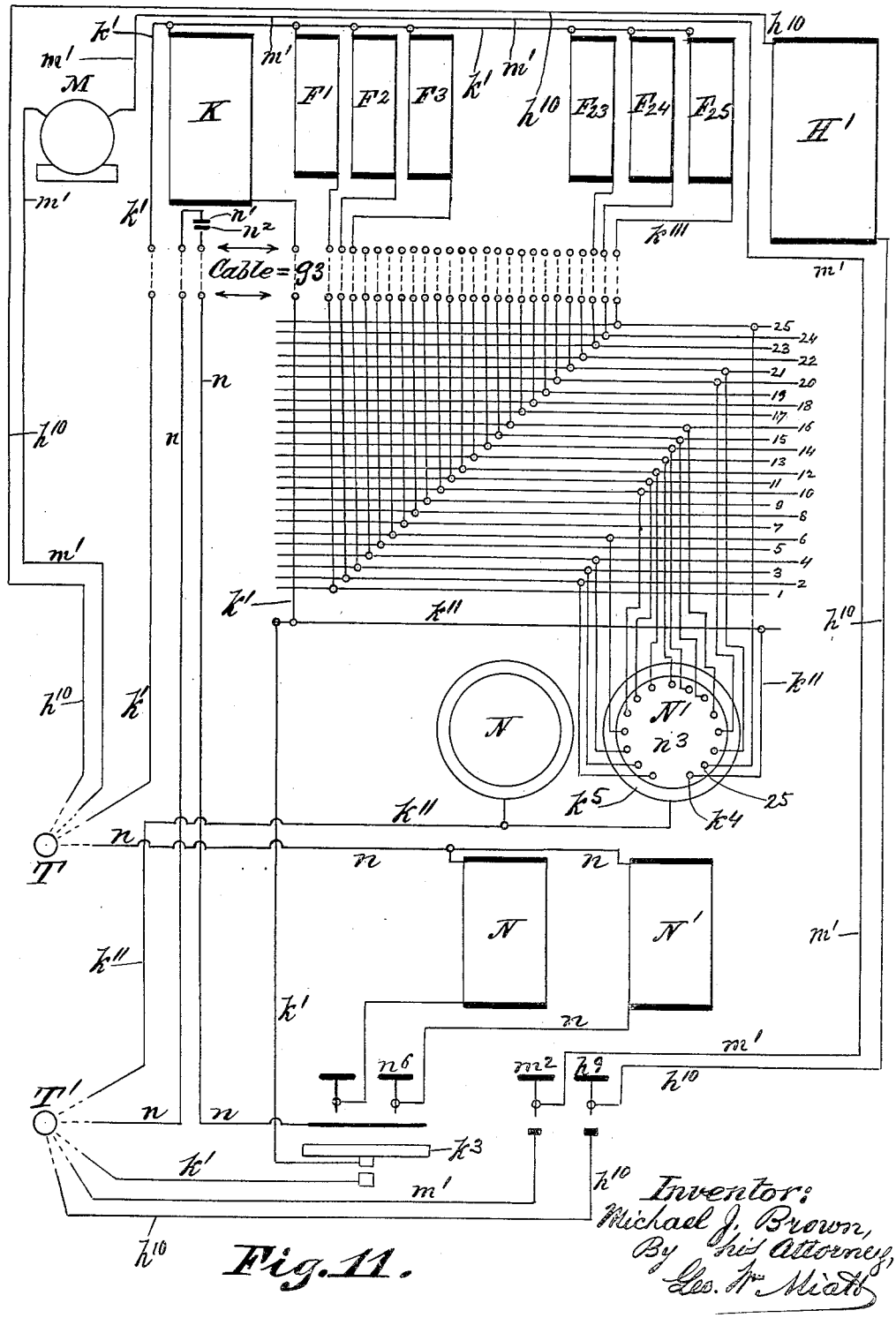

Fig. 11.

Inventor:
Michael J. Brown,
By his Attorney,
Geo. F. Miath

UNITED STATES PATENT OFFICE.

MICHAEL J. BROWN, OF JERSEY CITY, NEW JERSEY.

ELECTRIC APPARATUS FOR BULLETIN-BOARDS, SIGNS, &c.

1,235,005. Specification of Letters Patent. Patented July 31, 1917.

Application filed October 14, 1916. Serial No. 125,562.

To all whom it may concern:

Be it known that I, MICHAEL J. BROWN, a native of the Dominion of Canada, and a resident of Jersey City, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Electric Apparatus for Bulletin-Boards, Signs, &c., of which the following is a specification.

My improvements relate to the class of electric light signs, bulletins and the like, in which incandescent lamps are used to designate the desired letters, characters or designs,—the lamps being arranged in series or unit blocks each comprising a plurality of lamps capable of electric selection to represent specific letters, characters, designs, or portions thereof, and a sufficient number of such series or unit blocks being arranged in suitable relation to each other in such manner that words, sentences, etc., or component portions of ornamental designs may be readily displayed in illuminated correlation.

The main object of my invention is to effect the manipulation and control of such an equipment manually by means of a key-board or equivalent as hereinafter set forth, in contra-distinction to the method of automatic actuation and control by means of set cylindrical switches, perforated media, etc., so that by my method the operator can immediately change and vary the illumination of a bulletin-board, sign or decorative design at will.

While my invention is applicable particularly to electric light installations for the purposes designated it may also be utilized for the selecting, actuating and rendering visible of signal or exhibit devices other than incandescent lamps, the distinctive feature of my invention being the method herein set forth of independently controlling any of a series of individual visualizing device circuits by means of individual circuit closers actuated by selective solenoids, chosen and actuated in turn by prescribing solenoids controlled from a key-board or the equivalent thereof, together with a common means for reopening closed individual circuits.

In the accompanying drawings,

Figure 1, represents diagrammatically the front of a bulletin comprising forty unit blocks arranged in five rows, and illustrating selective groupings of lamps in the several blocks to represent alphabetical characters, numerals, etc.;

Fig. 2, is a similar view upon a larger scale of three unit blocks with the lamps enumerated, and more clearly illustrating the method of electric selection in the formation of characters;

Fig. 3, is a horizontal sectional view, more or less diagrammatic, illustrating the relation of the lamp-control carriage to other parts of the installation;

Fig. 4, is a vertical sectional elevation showing the selective solenoid carriage and its relation to the rows of plugs or individual lamp circuit closers, etc.;

Fig. 5, is a diagram showing a way of actuating the plug retractor plate by means of a solenoid core;

Fig. 6, represents sectional views of the spacing solenoid, showing the core-plunger in both retracted and projected positions;

Fig. 7, is a sectional elevation showing a preferred form of manipulating key;

Fig. 8, represents sectional views of two adjacent selective solenoids, the plug pushing core of one being projected and that of the other retracted;

Fig. 9, represents two sectional views of one of the prescribing solenoids, the core and contact-pin-carrier being retracted in one case and advanced to close the selective currents in the other;

Fig. 10, is a section taken upon plane of line 10—10 Fig. 9, showing a plan of a contact pin carrier and of the mercury terminal below;

Fig. 11, is a diagram showing symbolically the circuits, solenoids, etc., employed in the apparatus, other than the light or visualizing circuit;

Fig. 12, is a view of portions of the guide and retractor plates broken away to show the elongated slots therein for the accommodation of the circuit closure plugs.

For convenience of illustration and explanation I have herein shown and described my invention as applied to the illuminative control of forty "unit blocks" or groupings in series of twenty five incandescent electric lamps each,—it being understood that each "unit block" or series, might represent any combination or plurality of such lamps forming a component part of a bulletin, sign, ornamental design or other device for electrical illumination, so that I do not limit myself in this respect. In other words I do

not restrict myself to the display of letters and characters alone as herein depicted, since the same method and apparatus may be used for signs and decorative devices in which change of effect is desirable; and likewise any desired number of lamps or equivalent visualizing devices may be grouped in a series or block. And in this connection it is to be understood that by the term "lamp" as used herein I wish to include and designate any suitable visualizing device that may be substituted therefor.

With this understanding I have herein shown the forty "unit blocks", as arranged in five horizontal rows designated respectively B', B^2, B^3, B^4, and B^5, and have numbered the lamps in each series or "block" consecutively from 1, to 25, inclusive, although both apparatus and principle involved are adapted to any number of rows of blocks and any number of blocks in a row, as may be found most expedient in practice.

Each lamp in each block is connected individually with its own light circuit-closure terminals consisting of spring contacts a, a', or equivalent terminal contacts; and these are arranged twenty five in a horizontal row to provide for the twenty five lamps in each block. Hence there are twenty five pairs or parallel horizontal rows of individual lamp circuit terminals a, a', for each block of lamps,—said rows being also arranged in vertical alinement with relation to each other, and the terminals in each row being equi-distant with relation to those adjacent, both horizontally and vertically considered.

Opposed in longitudinal alinement with each pair of these individual lamp terminals a, a', is a plug or circuit closer c, adapted to be thrust between said spring contacts a, a', to close a lamp circuit and energize the film therein, or to be withdrawn therefrom to break said circuit and cut out said lamp. This connecting up of the lamps individually is illustrated diagrammatically in Figs. 3, and 4, it being understood that the connecting lines b, b', control a single lamp of the series in each block,—one plug c, being shown in Fig. 4, as projected to close a lamp circuit.

These circuit closers c, herein for convenience I simply designate as plugs c, are mounted upon and between fixed vertical guide plates D, D', each formed preferably with vertically elongated slots or perforations d, d, on the lower edges of which the plugs c, are seated. The corresponding holes h^x, in the retractor plate H, are larger than those in the guide plates D, D', as will be seen by reference to Fig. 12, so as to avoid frictional contact with the plugs c,—the sides of the holes h^x, only contacting with the shoulders c^2, of said plugs. This elongation of the plug holes d, and h^x, is shown in Figs. 4, and 12, and is to allow said plugs c, to yield vertically in case of necessity as hereinafter set forth, while supporting them against lateral horizontal movement, and allowing them to move longitudinally horizontally in either direction. Only the ends c' of the plugs c, adjacent to the lamp terminal contacts a, a', need be of metal; and each is formed with a shoulder c^2, which normally rests against the inner side of the guide plate D', or until the plug c, is projected forward into engagement with a pair of lamp-circuit-closers a, a', as hereinbefore mentioned, by means of a setting plunger f, formed by an extension (see Fig. 8) of the core f', of one of the lamp-circuit-closing or selective solenoids F, which are mounted upon the vertically traveling carriage G. The thrust of the setter plunger f, carries the plug c, forward until its shoulder c^2, rests against the retractor plate H, which is interposed between the guide plates D, D', in which position the metallic end c', of the plug c, protrudes in between the ends of the opposed spring contacts a, a', thereby closing the electric circuit for a particular lamp as hereinbefore set forth.

Obviously the retirement of a setter plunger f, under the action of the retractile spring f^2, when the core f', of the solenoid F, is deënergized will leave the plug c, in this advanced position, in which it will remain until forcibly retracted to its normal position with its shoulder c^2, again resting against the guide plate D', as before described. This retraction of a plug c, to normal position of course opens the electric lamp circuit and cuts out the lamp which has been in glow by reason of the advanced position of the plug c, set by the circuit-closing-solenoid F, provided of course that the light supply current switches e, e', Fig. 3, have been closed during the advanced position of the plug c. As shown in the drawings I accomplish the simultaneous return of each and all of the plugs c, to their normal positions when desired by means of the retractor plate H, which is held normally in advanced position by tension springs h, h, which tend constantly to hold the retractor plate H, against fixed rests d^x, d^x, projecting from the guide plate frame or any other stationary part,—one extremity of each of said tension springs h, h, being attached to a stationary part as at h', and the other extremity to a loop or collar h^2, encircling one end of the journal of one of the flanged rollers h^3, h^3, which latter support the retractor plate between them as by means of caps h^4, h^4, fitting over the inner ends of said roller journals, and attached to said retractor plate as indicated in Fig. 3, or by any other mechanical devices or expedients. Four of these retractor plate carrying rollers h^3, h^3, are shown in the drawings as supported on stationary

rails h^5, h^5, positioned two above and two below the guide plate frame; and each journal loop or collar h^2, is attached by a flexible connection h^6, to a device H′, for retracting the plate H, against the resistance of the tension springs h, said flexible connections passing over idler rollers h^7, h^7, interposed between the rollers h^3, h^3, and said retracting device H′, which latter may be of any desired character, such as a pedal or lever within control of the operator, or, as shown in the drawings it may consist of the core h^8, of a solenoid H′, (as in Figs. 4, and 5,) controlled by an electric key h^9, conveniently positioned as for instance on the operator's table and interposed in the electric circuit h^{10}, h^{10}, connected with the main energizing terminals T, T′, as indicated in the diagram Fig. 11. Whatever the form of retracting device H′, the result is the same in that by its use the retractor plate H, is drawn back in parallelism to and between the guide plates D, D′, until the shoulders c^2, on all the plugs c, rest against the inner side of the guide plate D′. The release of the retracting device H′, allows the tension springs h, to return the retractor plate to its normal position at rest against the stop shoulders d^x, d^x, as hereinbefore set forth.

It is obvious in this connection that other mechanical expedients may be resorted to for effecting the support and reciprocatory movement of the retractor plate H, with like result, and without departing from the spirit and intent of my invention in this respect, so that I do not limit myself to the identical construction and arrangement of parts herein shown for the purpose; and the same reservation is made as regards other parts of the apparatus in which by the substitution of well known mechanical expedients equivalent results may be attained. Thus, for instance the various circuit opening and closing devices herein shown more or less symbolically represent types rather than specific structures.

The carriage G, on which the selective lamp-circuit-closing solenoids F, are mounted, is provided with flanged rollers g, q, which engage vertical rails or ways g', g', of sufficient length to afford carriage travel commensurate with the requirements of the several horizontal rows of individual lamp terminal contacts a, a', provided in the apparatus. Thus, for the arrangement of forty blocks, of lamps shown in the accompanying drawings forty horizontal rows of lamp terminal contacts, each row containing twenty five pairs of lamp circuit terminals a, a', would be required, and the intermittent steps of travel in the descent of the carriage G, would be equal in extent of movement to the equi-distant vertical spaces between said horizontal rows of lamp terminals a, a'. This extent of drop is represented by the distance between the stepping shoulders i, i, of the vertical rack I, with which an escapement device J, pivotally supported on the carriage G, engages, said escapement J, being actuated, as hereinafter set forth, by a spacing solenoid K.

The carriage G, is suspended preferably by a wire cable g^2, (Fig. 4) attached to a drum m, positioned upon the shaft of a rotary motor M supported on a stationary part, both shown symbolically,—the motor M, being preferably of the electric type and interposed in a power circuit marked m', in the diagram Fig. 11, said power circuit being controlled by a key or switch m^2, as indicated therein. The function of the motor M, is to raise the carriage G, to its highest position, from which the carriage descends by gravity after the motor is cut out of circuit, step by step, under the control of spacing solenoid K, acting through the medium of the escapement lever J, the pawl arms j, j', of which alternately engage the step-shoulders i, i, each time the solenoid K, is temporarily energized sufficiently to cause its core k, to impinge against the long arm j^2, of said escapement lever J, thereby rocking the latter on its fulcrum j^3, against the resistance of the spring j^4, (Fig. 4) which, when the core k, recedes, restores said rockable lever J, to its normal position with its long arm j^2, resting against the stop g^{21}, and its upper pawl arm j, contacting with and slightly overlapping the edge of one of the step shoulders i, of the vertical descent rack I, as shown in Fig. 4. The core k, is retracted to and held in its normal position when the solenoid K, is not energized by a retractile spring k^2.

The spacing solenoid K, is shown in sectional detail in Fig. 6, which represents the lever-actuating core k, both retracted and advanced in position, and also shows its relation as a circuit closer to the terminals n', n^2, connected with the circuit n, n, in which the prescribing solenoids N, N, are interposed. The spacing solenoid itself is interposed in the circuit k', k', connected with the energizing terminals T, T′, in which circuit k', k', is also interposed the spacing bar or key k^3, forming part of the operative key-board as in typewriting machines, or otherwise positioned to suit the convenience of the operator, and by which he may operate the spacing solenoid K, independently to lower the carriage G, one or more steps i, when it is desired to skip one or more letter blocks B, or like unit series of lamps or their equivalent.

The core k, of the spacing solenoid K, is as usual of iron, but its lower extremity k^{3x}, which contacts with the long arm j^2, of the escapement lever J, is preferably made of non-magnetic material, especially as the up-

per part of the core k, acts as a circuit closer for the terminals n', n^2, as before stated; and the core k, is normally held retracted and in contact with said terminals n', n^2, by the aforesaid retractile spring k^2, which preponderates in force until the solenoid K, is energized electrically either by the independent closing of the spacing bar circuit k', k', as above stated, or by the closing of one of the prescribing solenoid circuits, as the circuit k', k'', in Fig. 11, by the contacting of the terminal k^4, with the opposed terminal k^5.

The terminal k^4, is mounted on a non-magnetic carrier n^3, of insulating material attached to and suspended from the lower end of the core n^4, of any one of a series of prescribing solenoids N, N, of which there are provided in the apparatus one for each letter, character or design, or part thereof to be produced by the lamps or other devices to be rendered visible.

The essential construction and operation of any one of these prescribing solenoids and accessories considered as a whole, is illustrated in Figs. 9, and 10, in which the terminal k^5, is a mercury cup into which the opposed terminal points are lowered against the resistance of the retractile spring n^5, when the solenoid is energized, as by the closing of the key n^6, in Fig. 11, see also Fig. 7, thereby closing the various circuits controlled by that particular prescribing solenoid.

Besides the spacer circuit closer k^4, the carrier n^3, supports a selective series of terminals representing a character to be illuminated or displayed in a block or series. Thus for instance I have presumed in the drawings that the block B'^{-2}, is to display the letter "A," in which case the prescribing solenoid N', devoted to that character will be actuated by the depression of its circuit-closing key n^6, immersing all the terminal points mounted on its carrier n^3, in the mercury terminal k^5. By reference to Fig. 10, it will be seen that these represent not only the spacer terminal k^4, but also fourteen other terminal points respectively corresponding in their circuits to lamps 2, 3, 4, 6, 10, 11, 12, 13, 14, 15, 16, 20, 21, and 25. Referring now to the diagram Fig. 11, the circuits closed as above stated can be traced to the corresponding selective solenoids F^2, F^3, F^4, F^6, F^{10}, F^{11}, F^{12}, F^{13}, F^{14}, F^{15}, F^{16}, F^{20}, F^{21}, and F^{25}, of which however only F^2, F^3, and F^{25}, are shown in Fig. 11, these being sufficient however to illustrate the principle involved. Thus for instance, the immersion of the point 25, closes a circuit which may be traced from the energizing terminal T, through the connection k', to the solenoid F^{25}, and thence through k''', to said point 25, and through it and the mercury cup k^5, and line k'', to the other energizing terminal T', thereby causing the selective solenoid F^{25}, to project its core f, and setting plug c, c', to close the light circuit for the lamp 25. Simultaneously with the closure of circuits for and by the solenoid F^{25}, the other circuits represented by the terminal points 2, 3, 4, 6, 10, 11, 12, 13, 14, 15, 16, 20, 21, 25, Fig. 10, are closed in like manner and the selective solenoids F^2, F^3, F^4, F^6, F^{10}, F^{11}, F^{12}, F^{13}, F^{14}, F^{15}, F^{16}, F^{20}, F^{21}, and F^{25}, are made to project their light circuit closure plugs c, c', which they oppose into engagement with the corresponding spring contacts a, a', thereby throwing into operative circuit the correspondingly numbered (for exemplification) lamps 2, 3, 4, 6, 10, 11, 12, 13, 14, 15, 16, 20, 21, and 25, to form the letter "A" as indicated in Fig. 2. Also, simultaneously with the closing of the several circuits represented by the terminal pins 2, 3, 4, 6, 10, 11, 12, 13, 14, 15, 16, 20, 21, 25, carried by the core of the prescribing solenoid N', the immersion of the terminal point k^4, in the mercury terminal k^5, closes the circuit T, k', k'', k^4, and k'', to T', energizing the spacer solenoid K; but the latter has to overcome the resistance of the retractile spring k^2, and is also so coiled as to allow the selective solenoids F', to F^{25}, to act to advance the light circuit closure plugs c, c', before its core plunger k, k^{3x}, impinges against and depresses the long arm j^2, of the rock lever escapement J, so that the plugs c, c', are set before the carriage is allowed to descend to the next succeeding step i, of the vertical rack I.

As soon as the core k, of the spacing solenoid K, starts to descend when the latter is energized it breaks contact with the terminals n', n^2, thereby opening the circuit n, n, and cutting out the prescribing solenoid N', when the spring n^5, immediately retracts the core n^4, and its terminal point carrier n^3, withdrawing its terminal points from the mercury cup k^5, and opening all the circuits of which they form a part. When this occurs the retractile springs f^2, return the setter-scores f, f', of the deënergized selective solenoids F, to their normal positions, leaving the advanced light-circuit closure plugs c, c', between the opposed spring terminals a, a', as before stated.

In the diagram Fig. 11, it will be understood that the dotted lines in the space marked "Cable" represent the continuation of the circuit wires through the cable g^3, shown in part in Fig. 3, and which extends from the carriage G, to the key-board and connections as in similar cases of communication between a movable carrier and fixed manipulating devices.

Thus it will be seen that by my system and apparatus the depression of a single key will set a plurality of lamps in a block or series in a prescribed manner; that the

release of the setting means will be automatic, as well as the shifting of the setting means from one block or series to position the same for selective action on the next succeeding block or series of lamps or other devices to be rendered visible; and that by the provision of an independent spacing bar one or any number of blocks or series may be "skipped" at will without interference with the prescribing or selective solenoids and connections.

Furthermore the letters, characters, or designs in the blocks or series may be selected and "set" whether the electric-light or display circuit be open or closed, so that the characters prescribed may appear successively, and simultaneously with their selection, or may be prescribed and "set" and be flashed into visibility altogether and simultaneously after selection, at the pleasure of the operator by means of a light-circuit control key conveniently positioned in a manner well known in the art.

The carriage G, may of course be raised whenever desired by closing the circuit by which the motor is energized; and to prevent possibility of injury by reason of derangement of any of the selective solenoids F, and consequent failure of retraction of a setter plunger f, f', the vertically elongated slots d, d, h^x, are provided in the guide plates D, D', and retractor plate H, so that should a protuberant setter plunger encounter the outer end of a light-circuit closing plug c, during the elevation of the carriage, the plug would simply yield to allow the defective setter plunger to pass, and thus avoid further injury or derangement of parts. In this connection it must be noted that the automatic opening of the circuit n, n, by the withdrawal of the core k, of the spacing solenoid K, from the contacts n', n^2, tends constantly to safeguard against accidental contact between the plugs c, and the setters f, even should the operator be careless and hold the key n^3, depressed.

I have herein shown and described the use of so-called solenoids in my apparatus and they are preferable for the purposes designated although it is obvious that other forms of electromagnets might be substituted with like results, so that I use the term "solenoid" herein, both in specification and claims, as the equivalent of the term "electro-magnetic means."

It is also obvious that the selective solenoids might be stationarily positioned and the bulletin, light-circuit terminals, closure plugs, guide and retractor plates, etc., made movable with relation thereto in case of a small installation, so that I do not wish to restrict myself in this respect as such alternative arrangement of parts could be made to effect like results and would be clearly within the spirit and scope of my invention.

Another alternative modification could be resorted to in that the light circuit plugs c, could all be held normally in engagement with the contacts a, a', and the selective solenoids F, arranged to withdraw the plugs of circuits not wanted in a given combination of lamps.

The accompanying drawings, especially Fig. 11, while exemplifying the method and apparatus employed, do not indicate the compactness and economy of space possible for an installation controlling a large field for display; and the duplication of parts render the operative control comparatively simple and inexpensive.

What I claim as my invention and desire to secure by Letters Patent is,

1. In electric display apparatus of the character designated, in combination, a plurality of series of independent electric circuits in each of which is interposed a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a series of selective solenoids adapted to actuate said circuit closing parts, a series of prescribing solenoids each adapted to actuate certain of said selective solenoids, means for energizing said prescribing solenoids independently, and means for restoring said movable circuit closing parts to normal position, for the purpose described.

2. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed therein a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a movable series of selective solenoids adapted to actuate said circuit closers, electromagnetic means for independently energizing said selective solenoids, and means for restoring said movable circuit closing parts to normal position, for the purpose described.

3. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed therein a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a movable series of selective solenoids adapted to actuate said circuit closers, a series of prescribing solenoids each adapted to independ-

ently energize a plurality of the said movable series of selective solenoids, means for independently energizing said prescribing solenoids and means for restoring said movable circuit closing parts to normal position, for the purpose described.

4. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed in it a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a row of selective solenoids mounted upon a carriage and adapted to actuate said circuit closers, a series of fixed prescribing solenoids each adapted to independently energize a plurality of said movable series of selective solenoids, means for independently energizing said prescribing solenoids, means for moving said carriage to bring said row of selective solenoids successively into coincidence with each of the several rows of said circuit closers, and means for restoring said movable circuit closing parts to normal position, for the purpose described.

5. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed in it a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a row of selective solenoids mounted upon a carriage and adapted to actuate said circuit closers, a series of fixed prescribing solenoids each adapted to independently energize a plurality of said selective solenoids, means for independently energizing said prescribing solenoids, said carriage being mounted between vertical ways, means for raising said carriage and allowing it to descend by gravity, a vertical step rack positioned with relation to said carriage, an escapement lever mounted on said carriage and engaging said step rack, electromagnetic means for actuating said escapement lever, and means for restoring said movable circuit closing parts to normal position for the purpose described.

6. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed in it a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a row of selective solenoids mounted upon a carriage and adapted to actuate said circuit closers, a series of fixed prescribing solenoids each adapted to independently energize a plurality of said selective solenoids, means for independently energizing said prescribing solenoids, said carriage being mounted between vertical ways, means for raising said carriage and allowing it to descend by gravity, a vertical step rack positioned with relation to said carriage, an escapement lever mounted on said carriage and engaging said step rack, a spacing solenoid positioned on said carriage and adapted to actuate said escapement lever, a circuit closed normally by the core of said spacing solenoid but opened thereby when the said spacing solenoid is energized, said spacing solenoid being connected with the prescribing solenoids in such manner as to deënergize them when said circuit is opened by the spacing solenoid core, and means for restoring said movable circuit closing parts to normal position, for the purpose described.

7. In electric display apparatus of the character designated, in combination, a fixed series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed in it a visualing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a row of selective solenoids mounted upon a carriage and adapted to actuate said circuit closers, a series of fixed prescribing solenoids each adapted to independently energize a plurality of said selective solenoids, means for independently energizing said prescribing solenoids, said carriage being mounted between vertical ways, means for raising said carriage and allowing it to descend by gravity, a vertical step rack positioned with relation to said carriage, an escapement lever mounted on said carriage and engaging said step rack, a spacing solenoid positioned on said carriage and in circuit with said prescribing solenoids so as to be energized by any one thereof to actuate said escapement lever, contact points in said prescribing-solenoid-circuit closed normally by the core of said spacing solenoid but opened by said core when the spacing solenoid is energized, thereby deënergizing the prescribing solenoid by which the circuit was closed, and means for restoring said movable circuit closing parts to normal position.

8. In electric display apparatus of the character designated, in combination, a fixed

series of independent electric circuits arranged in a plurality of correlated rows, each of said independent circuits having interposed in it a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, a row of selective solenoids mounted upon a carriage and adapted to actuate said circuit closers, a series of fixed prescribing solenoids each adapted to independently energize a plurality of said selective solenoids, means for independently energizing said prescribing solenoids, said carriage being mounted between vertical ways, means for raising said carriage and allowing it to descend by gravity, a vertical step rack positioned with relation to said carriage, an escapement lever mounted on said carriage and engaging said step rack, a spacing solenoid positioned on said carriage and adapted to actuate said escapement lever, a spacing key interposed in the circuit by which said spacing solenoid is energized so that the escapement lever may be operated independent of the prescribing solenoids, and means for restoring said movable circuit closing parts to normal position, for the purpose described.

9. In electrical display apparatus of the character designated, the combination of a series of independent electric circuits in each of which is interposed a visualizing device, each of said circuits containing a fixed and a movable circuit closing part, the movable circuit closing part after engagement with said fixed circuit closing part mechanically retaining its engagement therewith, selective electromagnetic means for manipulating said circuit closers, means for simultaneously retracting said circuit closers to normal position, and means for cutting out the selective means by automatically cutting off the energizing source.

MICHAEL J. BROWN.

Witnesses:
GEO. WM. MIATT,
ISAAC W. JACOBSON.