May 5, 1931. R. M. CRAIG 1,803,596

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Filed Feb. 28, 1930 3 Sheets-Sheet 1

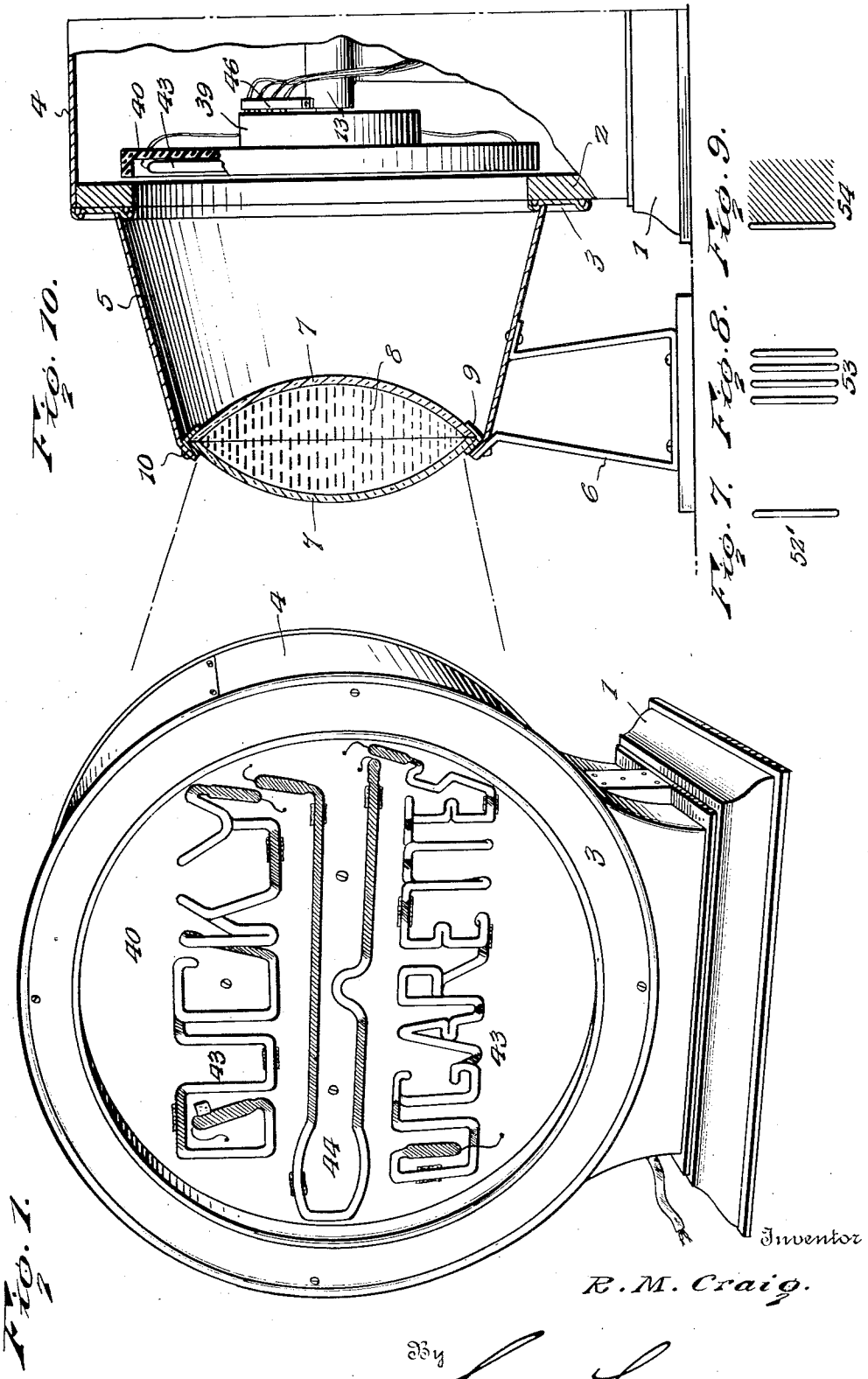


Fig. 10.

Fig. 9.

Fig. 8.

Fig. 7.

Fig. 7.

Inventor

R. M. Craig.

By Lacey & Lacey, Attorneys

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Fig. 2.

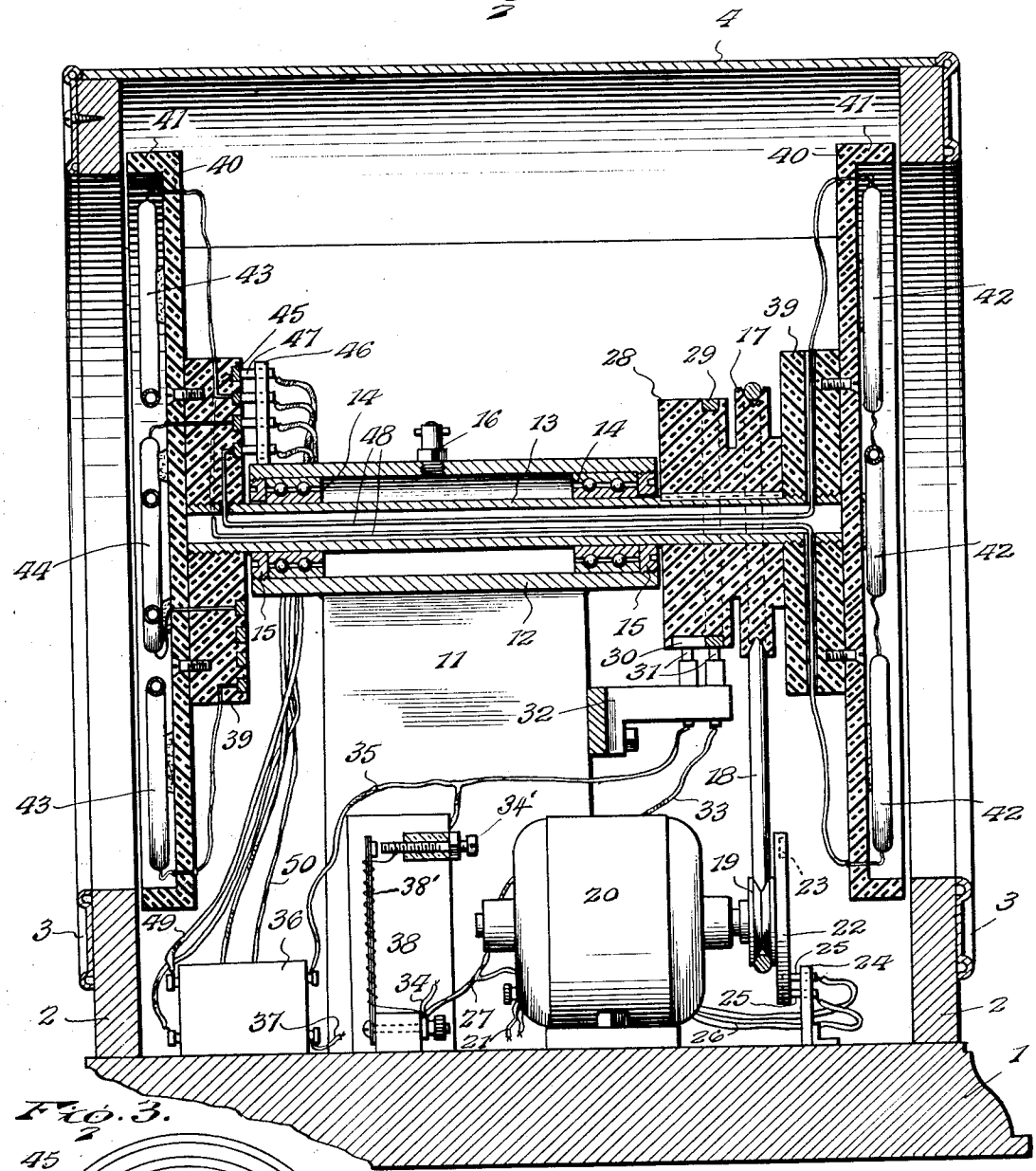


Fig. 3.

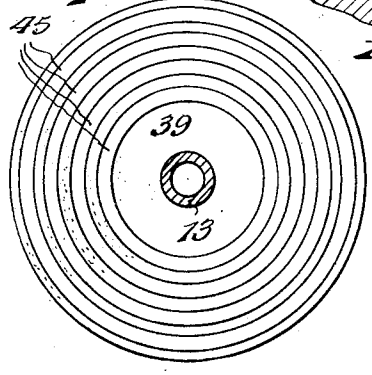
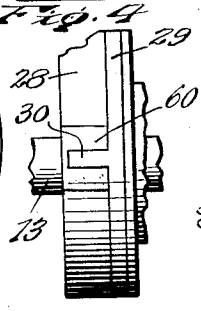


Fig. 4.



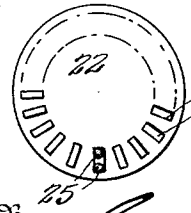


Fig. 5.

Inventor

R. M. Craig.

By Lacey & Lacey,

Attorneys

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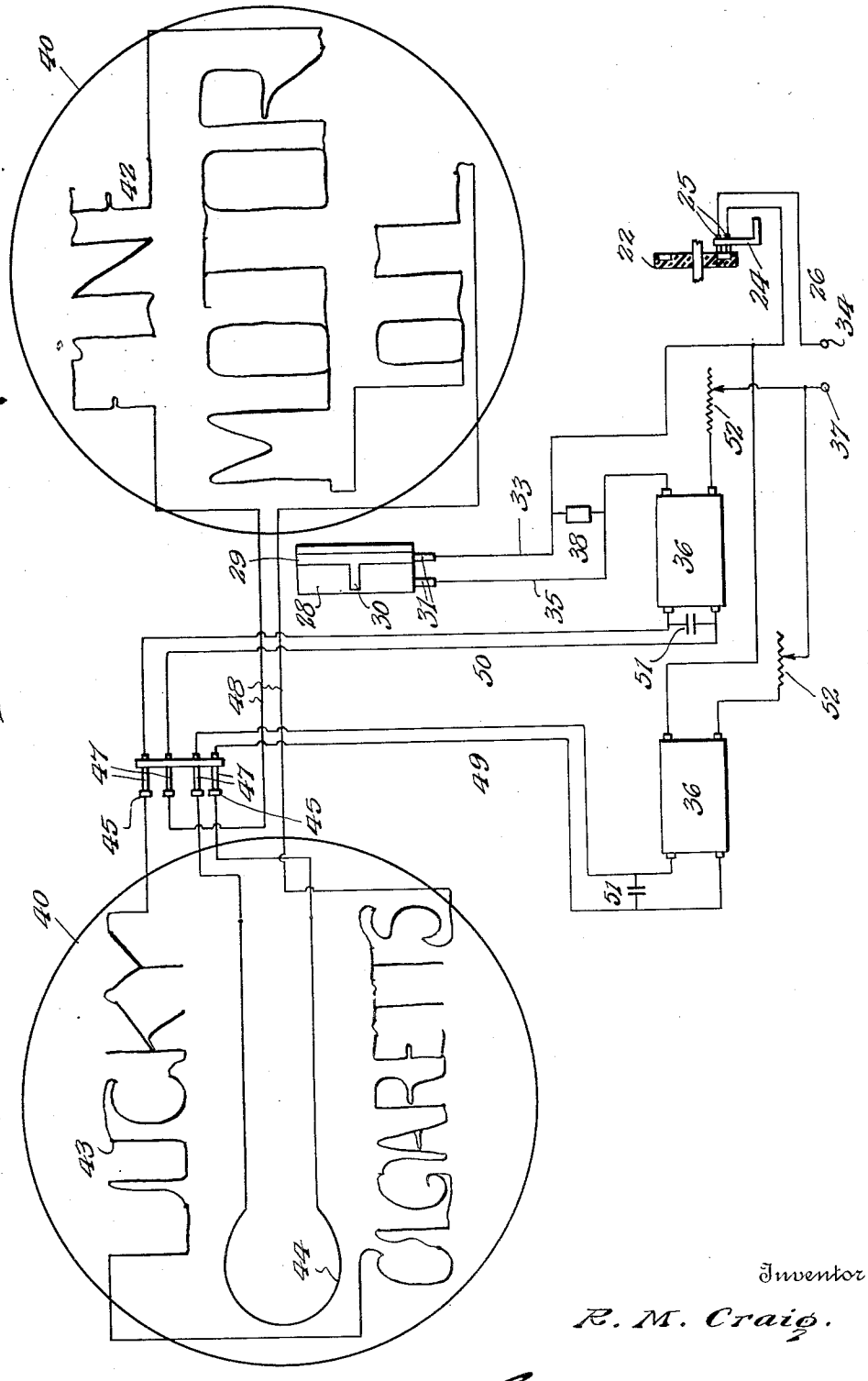


Fig. 6.

Inventor

R. M. Craig.

By Lacey & Lacey, Attorneys

Patented May 5, 1931

1,803,596

UNITED STATES PATENT OFFICE

RICHARD M. CRAIG, OF SAN ANTONIO, TEXAS

SIGN

Application filed February 28, 1930. Serial No. 432,169.

The present invention has for its object the provision of display mechanism or signs which will employ luminescent gas-filled tubes which are given a desired shape according to the announcements to be displayed and which will be rotated so as to produce attractive and fascinating designs whereby the attention of passers-by will be attracted. The invention also provides means whereby the words of an announcement may be defined more or less sharply and further provides means whereby the recurrence of a display may be controlled so as to vary the design produced by the rotating tubes. Other objects of the invention will appear incidentally in the course of the following description, and the invention resides in certain novel features which will be particularly pointed out in the appended claims.

In the annexed drawings:

Figure 1 is a perspective view of a display apparatus or sign embodying the present invention,

Fig. 2 is an enlarged longitudinal section taken through the axis of the apparatus,

Fig. 3 is a detail view of one of the rotating disks showing conductor rings therein,

Fig. 4 is a detail side view of a circuit controlling disk forming a part of the apparatus,

Fig. 5 is a detail of a portion of means provided whereby the gas filled tubes may be operated successfully when the line current is direct,

Fig. 6 is a diagram,

Figs. 7, 8 and 9 are detail diagrams illustrative of variations which may be obtained in the width or definition of the words displayed by the apparatus, and

Fig. 10 is a sectional elevation showing an accessory whereby the light from the sign may be projected to a considerable distance so as to increase the range of visibility.

The particular apparatus illustrated in the accompanying drawings comprises a base 1 of any suitable form upon which are mounted open circular frames 2 having ornamental bands 3 secured upon their outer faces so as to impart a neat appearance to the apparatus. Extending between the two end frames 2 is a wall or casing 4 which serves to enclose the operating mechanism and protect it from the weather and chance blows. If desired, the bands 3 may support panes of glass or other transparent material so as to permit the signs to be read through the openings of the frames 2 while preventing the access of the elements to the signs. It will be understood that the announcements are to be displayed in such position that they may be read through the openings of the frame 2 and, of course, the distance from which the announcements may be read will vary with the strength of the current, the size of the tubes and other conditions, as well as the strength of the observer's vision. To increase the distance from which the signs may be read, I provide a tubular housing 5 which may be arranged in coaxial alinement with the openings of the frames or either of them and may be secured to the band 3 or supported by a pedestal 6 of any suitable form. In the outer open end of the tubular housing, I secure a lens which is preferably composed of two convex glasses 7 arranged edge to edge so that they will define an enclosed space which is filled with alcohol or distilled water or other clear liquid, as indicated at 8. A lens of this character may be produced at a very low cost and, if broken, may be replaced at slight expense. Of course, if the light passing through the lens be projected upon a wall, the sign might appear inverted but this contingency is overcome by so setting the controlling contacts that the display of the announcement would occur at the lowest point in the orbit of the tubes instead of the highest point. The edges of the glasses are fitted in a retainer ring 9 which may be of any suitable material and cemented or otherwise firmly secured to the lens, this encircling strip preventing leakage of the contained liquid and also constituting a cushion to avoid chipping of the lens through its contact with the tube 5. The outer end edge of the tubing is bent inwardly somewhat, as indicated at 10, whereby it will conform to and closely engage the edge of the lens or the retainer ring 9.

Upon the base 1 within the housing com-

posed of the end frames 2 and the wall 4 is erected a standard or other support 11 provided at its upper end with a cylinder 12 extending longitudinally of the housing and coaxial with the openings in the end frames 2. A hollow shaft 13 extends through the cylinder 12 and is journaled at its ends in anti-friction bearings 14 which may be of any well known or approved construction, plugs 15 being threaded into the ends of the cylinder at the outer sides of the bearings so as to retain the bearings in place and also effectually close the ends of the cylinder so that the shaft may run in lubricant. To permit filling of the cylinder with oil or other lubricant, a filling nipple of any approved construction is fitted in the top of the cylinder, as shown at 16. Upon one end of the shaft 13 is keyed or otherwise secured a pulley 17, and a belt 18 is trained around said pulley and a pulley 19 on the shaft of an electric motor 20 whereby the shaft may be rotated when the device is in operation. The motor 20 is a small electric motor and current is supplied thereto from any convenient source through conductors, indicated at 21 in Fig. 2. It is well known that luminescent gas-filled tubes will operate commercially only on alternating current closed core transformers and where the only available supply is direct current such tubes have been heretofore incapable of use. Now, if a wire carrying direct current be placed against the primary side of a closed core transformer, there will be a flash in the connected tube on the make and also on the break but not while the primary circuit is held closed. Such arrangement is impractical with ordinary stationary tubes owing to the flicker in the tubes and the heating of the transformer, but, in the sign of my invention, the flicker adds to the beauty and variety of the patterns shown, and the transformer is inactive so frequently that it does not get hot. When the words of the sign are being shown, the transformer is off through about 99% of the revolution. Copper electrodes and terminals in stationary tubes get very hot, but in my apparatus they become heated only in an inconsequential degree so that the life of the tubes is prolonged as it is the hot electrode that eventually absorbs the gas in the tube. I have provided an exceedingly simple means whereby the tubes may be successively operated when the source of supply is a direct current and to that end I have secured on the end of the motor shaft a disk 22 of insulation having set in its outer face around its margin separated conductor blocks 23, and secured adjacent the disk is a bracket 24 upon which are mounted brushes 25 arranged to bear upon the several blocks 23 as the disk rotates. These brushes 25 are connected by conductors 26 into the transformer primary side supply cables, as shown at 27 in Fig. 2, so that, as the motor operates, the primary or low tension circuit will be rapidly alternately broken and closed and pulsations thereby set up which will produce a pulsating or alternating current in the secondary or high tension side and permit the use of the luminescent gas-filled tubes.

Secured upon the shaft 13, preferably immediately adjacent the pulley 17 and, if preferred, integral with said pulley, is a circuit closing disk 28 of insulation and in the periphery of said pulley is a conductor ring 29 having a lateral lug or projection 30, the conductor ring and said projection being embedded in the disk flush with the peripheral surface of the same so that they may ride easily past the brushes 31 in contact therewith without setting up excessive vibration in the brushes. In passing onto or leaving the lug 30, the brushes have a tendency to spark and burning of the fiber bushing is apt to occur, especially on the break side of the lug. I, therefore, insert in the edge of the disk, at the sides of the lug, a piece of mica 60 which will resist a high degree of heat so that the burning of the fiber is overcome. The brushes 31 are secured in and insulated from a bracket 32 which is secured upon the main standard or support 11, as clearly shown in Fig. 2, and one of said brushes bears upon the conductor ring 29 while the other brush is arranged in the path of the lug 30 and makes contact therewith once during the rotation of the disk, as will be understood. The brush which is in contact with the ring 29 is electrically connected by a conductor 33 with one of the input lines, indicated at 34, while the other brush is connected by a conductor 35 with one terminal of the primary side of a transformer 36, the other intake line 37 being secured to the other terminal of the transformer, and it may be noted at this point that the transformer employed is the usual closed core commercial transformer now on the market. A flasher of the thermo or other type, indicated at 38, is set across the primary circuit of the transformer, one terminal of said flasher being connected to the conductor 35 and the other terminal being connected to the conductor 33. Normally, the inflowing current flows through the conductor 33 to the ring 29 and, once in each revolution, through the lug 30, brush 31 and wire 35 to the transformer 36 and thence out at 37. This has the effect of lighting the announcement tubes once in each revolution and the lug is so located that the lighting occurs when the words formed by the tubes are in reading position. A very small portion of the current flows through the flasher to heat the same and cause its movable arm 38′ to swing into contact with the terminal set screw 34′, whereupon the current is shunted from 33 to 35 and the transformer will be acting continuously, the tubes being

lighted during the entire revolution and the impressions therefrom overlapping to form beautiful patterns or designs.

Threaded onto or otherwise secured upon the ends of the hollow shaft 13 are hubs or disks 39 of insulation, and these disks have secured upon their outer faces display heads or circular plates 40 which are preferably constructed with annular flanges or beads 41 and are arranged close to the openings through the end frames 2 so as to coincide with said openings. Upon the outer face of each head 40 are secured luminescent gas-filled tubes 42 and 43 which are shaped to form various letters, words, emblems or designs according to the announcement or decoration which it is desired to display. It is, of course, possible to have the tubes upon the two heads duplicates so that the same announcement will be displayed at each end of the apparatus, but I have illustrated, most clearly in Fig. 6, different announcements upon the separate heads. It will here be noted that, inasmuch as the gas-filled tubes are mounted directly on the rotating display heads, a transmitted light is produced, which not only renders the characters on the sign more brilliant, and increases the effective range of visibility of said characters, but also permits the transmitted light rays to be used in the manner shown in Fig. 10 of the drawings. Upon one head 40, there is also a tube 44 which is given an arbitrary shape and is intended in the operation of the device to form a geometrical design. Referring particularly to Fig. 6, it will be noted that the tube is illustrated as having parallel side arms extending across the rotary head parallel with a diameter of the same between upper and lower word-forming tubes and connected at one end by an arcuate portion which, when illuminated, will represent a horseshoe. The side portions of this tube may be coated with some opaque material or may be so colored as to present a contrast with the arcuate portion of the same whereby in the operation of the device the arcuate end or horseshoe will be distinguished from the rest of the tube. The disk 39 at the left hand end of Fig. 2 is shown as having conductor rings 45 set in its inner surface and adjacent said surface a bracket 46 rises from the cylinder 12 to carry brushes 47 corresponding in number and location to the conductor rings 45 so that each brush will bear upon one of the rings. In the present illustration, there are shown four conductor rings, the outer two rings being connected electrically with the terminals of the tubes 43 which form words of an advertisement while the inner two rings are connected with the terminals of the tube 44 which may be called the pattern tube to distinguish it from the announcement tubes, and it may be noted at this point that the pattern tube contrasts in color with the announcement tubes which may also contrast with each other. The outer conductor rings are also connected by conductors 48 with the terminals of the tubes 42 at the opposite end of the shaft, said conductors 48 extending through the hollow shaft and out through the right hand hub 39, as clearly shown in Fig. 2. With this arrangement, the announcements at the two ends of the apparatus will be in series but it will, of course, be understood that, if desired, conductor rings may be set in both hubs 39 and the announcements, consequently, independently displayed. It may be noted also that in the right hand sign there is no equivalent of the tube 44 but in actual practice such a tube may be used or may be omitted as may be preferred. Two transformers 36 are employed and they are connected in parallel with the supply lines but they are independently connected on their secondary sides one with the tube 44 and the other with the tubes 42 and 43, it being noted that conductors 49 extend from one transformer to the brushes 47 which rest upon the inner conductor rings 45, while conductors 50 extend from the other transformer to the outer conductor rings 45. A condenser, indicated at 51, is inserted across the secondary or high tension side of each transformer and in the primary side of each transformer there is inserted a variable resistance, indicated at 52, the purpose of these parts being presently made to appear.

It will be observed that, when the machine is in operation, the flasher 38 will periodically short circuit the primary side of the transformer and, therefore, the several tubes will be continuously illuminated during each period as the heads rotate. At the intervening periods, however, the lug 30 on the disk 28 will engage electrically the brushes 31 arranged to cooperate therewith and thereupon the primary circuit will be intermittently closed through the conductor ring 29 and said lug 30 across the brushes so that the announcement will be illuminated once only in each revolution and in readable position. It will thus be seen that when the flasher circuit is closed the current passes into the tubes continuously and said tubes are, therefore, constantly illuminated as long as said flasher circuit is closed, thereby forming artistic geometric patterns or designs and these pattern effects continue as long as the flasher circuit is closed which may be for quite a number of revolutions of the display head. When the flasher circuit opens, the current can only flow to the tubes as the contact 30 permits which is once each revolution of the disk 28. Consequently, it follows that the tubes will be illuminated to display a word or character in readable position once each revolution of the disk 28 and this display of the word will continue as long as the flasher circuit is open. As soon

as the flasher circuit closes, however, the circuit is shunted from the contact 30 and again passes continuously to the tubes so as to cause the pattern to repeat itself and the pattern will continue to be displayed until the flasher again opens. It will, of course, be understood that the flasher is adjustable so that the periods of display for the pattern and announcement may be varied at will. The gas-filled tubes have the property of instantly becoming fully energized when proper current is permitted to flow thereinto so that in about one ten-thousandth of a second the full strength of the illumination is had, and the darkening of the tubes is equally instantaneous when the current is cut off. This characteristic of the tubes results in clear definition of the characters formed by the tubes so that these tubes are very desirable for changeable exhibition purposes. The display heads are rotated at a speed greater than the speed of vision and due to the persistency of vision the characters formed by the tubes when the flasher 38 shunts the current across 33 and 35, making 30 inoperative, will appear to be continuously displayed at several points around the area of the display heads so that a geometrical design will be formed by the characters which will be dependent upon the shape of the characters themselves. The lug 30 is so disposed that, when it engages the corresponding brush 31, the characters formed by the tubes 42, 43 will be in a horizontal or reading position and as the full strength of the current is then permitted to pass into the tubes so desired the words will be brilliantly lighted and stand out from the design or back ground formed by the horse shoe tube as though stationary and may be easily read. It will be understood that, while the lug 30 engages its brush 31 only once in each revolution, the speed of revolution is so great that the words are apparently seen by the eye as though stationary, whereas, in fact, they are repeatedly seen at the one location but the change is too rapid for the eye to follow. The tube 44 is constantly illuminated with the permitted strength of the current flowing thereto so that this tube will always be seen with the same definition and the eye will apparently see this tube at successive points around the area of the head so that it will create the effect upon the eye of an ornamental bordered design or background for the design formed by the words and for the words themselves when they are displayed in the reading position.

I have discovered that, if A. C. closed core transformers are used and the full strength of the secondary current is permitted to pass into the tubes without any means of controlling the strength of that current, the design or letters formed by the respective tubes will be of such intensity that the letters appear as broad bands and the pattern tube will produce merely a band or circle without particular detail. By inserting the condensers across the secondary circuits, the proper definition of the characters will be attained and by employing variable condensers I am enabled to obtain a letter, such as indicated at 52′ in Fig. 7, in which the outline of the letter will be a thin very sharply defined single line, whereas by permitting less of the strength of the current to flow the letters appear to be formed of parallel lines, as indicated at 53 in Fig. 8, and by setting the condensers so that they interpose even less resistance I may obtain a shaded letter, such as indicated at 54 in Fig. 9, in which the definition at one side or edge of the letter will be sharp while the rest of the letter will appear as a shadow or ghost. I have also discovered that by interposing a variable resistance, such as indicated at 52 in the primary side of the working circuits, I am enabled to vary the pattern produced by the pattern tube 44. For instance, if no resistance be interposed, the horseshoe will appear so as to be many times multiplied, the several representations overlapping so as to form a practically continuous band. If, however, the resistance be adjusted to its full strength, the horseshoe may appear only at two points in the revolution of the display head, while cutting out some of the resistance will permit it to appear four times in each revolution and as the resistance is cut out further the number of impressions of the horseshoe will be increased, always, however, appearing in multiples of two. This permits the design exhibited by the apparatus to be varied, and the variation of the design is very mystifying until the secret has been made known. The tube may be shaped to form a rectangular outline resembling the tooth of a cogwheel and by regulating the resistance the number of teeth displayed and, therefore, the number of teeth in the apparent cogwheel may be varied at will. Other designs may, of course, be produced and it is to be noted that the control of the designs is all accomplished in the primary side of the working circuits so that sparking and other objectionable features are eliminated. The condensers may be adjusted when the apparatus is set up so as to obtain the exact sharpness of definition desired and no additional adjustment will be needed but they may, of course, be varied from time to time as the taste or wishes of the owner or user of the apparatus may suggest. As the load upon the trunk lines varies, there will be a slight variation in the speed of the motor and the relative oscillations in the tubes and due to this variation the pattern or design produced by the rotation of the display heads will at times seem to stop and creep backward or in the direction opposite

the direction of rotation of the head. The tubes forming the letters may be given any desired color and generally each word of an announcement will have a different color and the pattern tube will have a color contrasting with the colors of the announcement tubes, and the colors will at times blend and at other times will cross so that an infinite variety of designs will be produced. Notwithstanding the exceedingly attractive results which are attained by the use of my apparatus, the mechanism is very simple and compact and is not apt to get out of order and it may be set up at any point and will operate at a very low cost inasmuch as the cost of maintenance will be practically negligible and the only expense will be the cost of the current used. I have found that as the speed of rotation increases the distance to which the light will be projected and at which the sign will be legible also increases, although there is no increase in the consumption of current.

While I have illustrated and found it very satisfactory to use a thermo flasher for periodically cutting in and out the circuit closer, it will, of course, be understood that any automatic shunt device capable of performing this function may be used if desired.

Having thus described the invention, I claim:

1. A sign comprising a rotatable shaft, light-transmitting display heads carried by the shaft, luminescent tubes fixed on the heads and having character forms, a primary circuit for rotating the shaft, secondary circuits for illuminating the several tubes, means in the primary circuit for pulsating the current, condensers inserted across the secondary circuits to vary the frequency of illumination of the tubes while the latter are rotating, and means in the primary circuit to control the periodicity of the illumination whereby at intervals the tubes will display readable legends.

2. A sign comprising a rotatable shaft, a light-transmitting display head carried by the shaft, luminescent tubes fixed on the display head and having definite character forms, a primary circuit for rotating the shaft, secondary circuits for illuminating the tubes, means in the primary circuit for pulsating the current, a variable resistance interposed in the primary circuit for varying the intensity and frequency of illumination of the tubes while the latter are rotating, and means to control the periodicity of the illumination whereby at intervals the tubes will display readable legends.

3. A sign comprising a rotatable shaft, a light-transmitting display head carried by the shaft, luminescent tubes fixed on the display head and having definite character forms, a primary circuit for rotating the shaft, secondary circuits connected with the respective tubes for illuminating the same, means for pulsating the current, condensers inserted across the secondary circuits, a variable resistance in the primary circuit whereby to vary the intensity and frequency of illumination of the tubes while the latter are rotating, and means to control the periodicity of illumination whereby at intervals the tubes will display readable legends.

4. A sign comprising a rotatable shaft, a display head carried by the shaft, luminescent tubes mounted on the display head and having definite character forms whereby during rotation of the head the tubes will produce geometrical designs and some of the tubes will be adapted to display announcements, a primary circuit for rotating the shaft, secondary circuits controlled from the primary circuit and connected with the respective tubes to illuminate the same, a flasher interposed in the primary circuit whereby the announcement tubes will be periodically illuminated to produce designs, and a circuit breaker carried by the shaft and arranged to close the primary circuit at intervals whereby to illuminate the announcement tubes intermittently and permit the announcements to be read.

5. A sign comprising a rotatable display head, luminescent tubes mounted on the display head, a motor connected with the display head for rotating the same, a primary circuit, secondary circuits including the respective luminescent tubes, and a circuit breaker connected with the primary circuit and driven directly by the motor whereby a direct current may be utilized for operating the luminescent tubes.

6. A sign comprising a rotatable head, luminescent tubes mounted on the head and having definite character forms, a primary circuit controlling the illumination of the tubes, secondary circuits connected with the respective tubes to illuminate the same, a motor for rotating the display head, a member rotated directly by the motor and having a series of separated contacts in its marginal portion, brushes disposed adjacent the member to bear upon the contacts, and means for connecting said brushes into the primary circuit.

7. A sign comprising a rotatable display head, luminescent tubes mounted on said head and having definite character forms, means for rotating the display head, means for illuminating the tubes, a tubular casing disposed in coaxial relation to the display head, and a lens mounted in the outer end of said tubular casing.

8. A sign comprising a rotatable display head, luminescent tubes fixed on the head and having definite character forms, circuits for illuminating the tubes, and condensers inserted across said circuits whereby to vary the definition of the characters formed by the

illuminated tubes while the latter are rotating and means to control the periodicity of illumination whereby at intervals the tubes will display readable legends.

9. A sign comprising a rotatable display head, luminescent tubes on said head having distinctive spectral colors and forms and rotatable with the head whereby to form geometrical designs, and means for varying the definition of the tubes while the latter are rotating and means to control the periodicity of illumination whereby at intervals the tubes will display readable legends.

10. A sign comprising a rotatable display head, luminescent tubes on said head to rotate therewith and having distinctive colors and forms whereby when rotated to form geometrical designs, a supply of electrical energy, closed core transformers in the path of said supply, the secondary circuits of the transformers being connected to the tubes, means in said secondary circuits to control the definition in the illumination of the tubes, and means in the primary circuits of the transformers to control the periodicity of the illumination whereby at intervals the tubes will display readable legends.

11. In a display apparatus, a luminescent tube, and means for rotating the tube, said means including a rotatable insulated disk, a conductor ring encircling the disk and having a lateral lug, a heat-repelling element set in the disk at the side of the lug, and brushes and conductors cooperating with said conductor ring and lug.

12. A display apparatus comprising a rotatable display member, luminescent tubes mounted for rotation with the display member and fashioned to form characters, an electric circuit controlling the illumination of the tubes and including a transformer, means in the circuit for causing periodic illumination of the tubes whereby the characters appear in a readable position, and a thermo flasher in the primary circuit of the transformer for causing constant illumination of the tubes at intervals thereby to produce a composite design.

13. A display apparatus comprising a rotatable display member, a luminescent tube mounted on said member and rotatable therewith, an electric circuit controlling the illumination of the tube, a circuit closer in said circuit movable with the display member and operable to effect periodic illumination of the tube, and an automatic shunt device in the circuit operable to cut out said circuit closer and effect constant illumination of the tube.

14. A display apparatus comprising a rotatable display member, a luminescent tube mounted on the display member and rotatable therewith, an electric circuit controlling the illumination of the tube, a circuit closer in said circuit operable to effect periodic illumination of the tube, and a thermo flasher in the circuit operable to cut out said circuit closer and effect constant illumination of the tube.

15. A display apparatus comprising a shaft, display members mounted on opposite ends of the shaft, luminescent tubes carried by said display members and rotatable therewith, an electric circuit controlling the illumination of the tubes, a circuit closer in said circuit movable with the display members and operable to effect periodic illumination of the tubes, and an automatic shunt device in the circuit operable to cut out said circuit closer and effect constant illumination of the tubes.

16. A display apparatus comprising a casing having oppositely disposed display openings, a shaft mounted for rotation within the casing and provided with display members located one adjacent each display openings, luminescent tubes mounted on said members, means for rotating the shaft, an electric circuit controlling the illumination of the tubes, a circuit closer mounted on the shaft and operable to effect periodic energization of the tubes, and an automatic shunt device in the circuit operable to cut out said circuit closer and effect continuous energization of the tubes.

17. A display apparatus comprising a support, a shaft mounted for rotation on the support, a display member mounted for rotation with the shaft, luminescent tubes arranged on one side of the display member, an insulating block arranged on the other side of the display member, concentric contact rings embedded in the insulating block, an electric circuit connected with the contact rings for controlling the illumination of the tubes, means for rotating the shaft, a circuit closer mounted for rotation with the shaft and operable to effect periodic energization of the tubes, and a thermo flasher in the circuit operable to cut out said circuit closer and effect continuous energization of the tubes.

18. A display apparatus comprising a rotatable display member, luminescent tubes mounted on said member and rotatable therewith, an electric circuit controlling the illumination of the tubes and including transformers, a circuit closer in circuit with one of the transformers and operable to effect periodic illumination of the tubes, and an automatic shunt device connected in the circuit with the circuit closer and operable to cut out said circuit closer and effect constant illumination of the tube.

19. A display apparatus comprising oppositely disposed rotatable display members, luminescent tubes mounted on said members and rotatable therewith, an electric circuit controlling the illumination of the tubes of both display members, a circuit closer in said

circuit and operable to effect periodic illumination of certain of the tubes, and an automatic shunt device arranged in the circuit and operable to periodically cut out said circuit closer and effect constant illumination of all of the tubes.

In testimony whereof I affix my signature.

RICHARD M. CRAIG.