

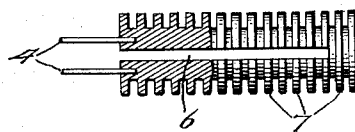
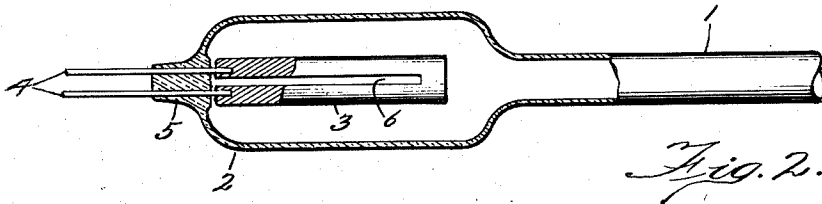
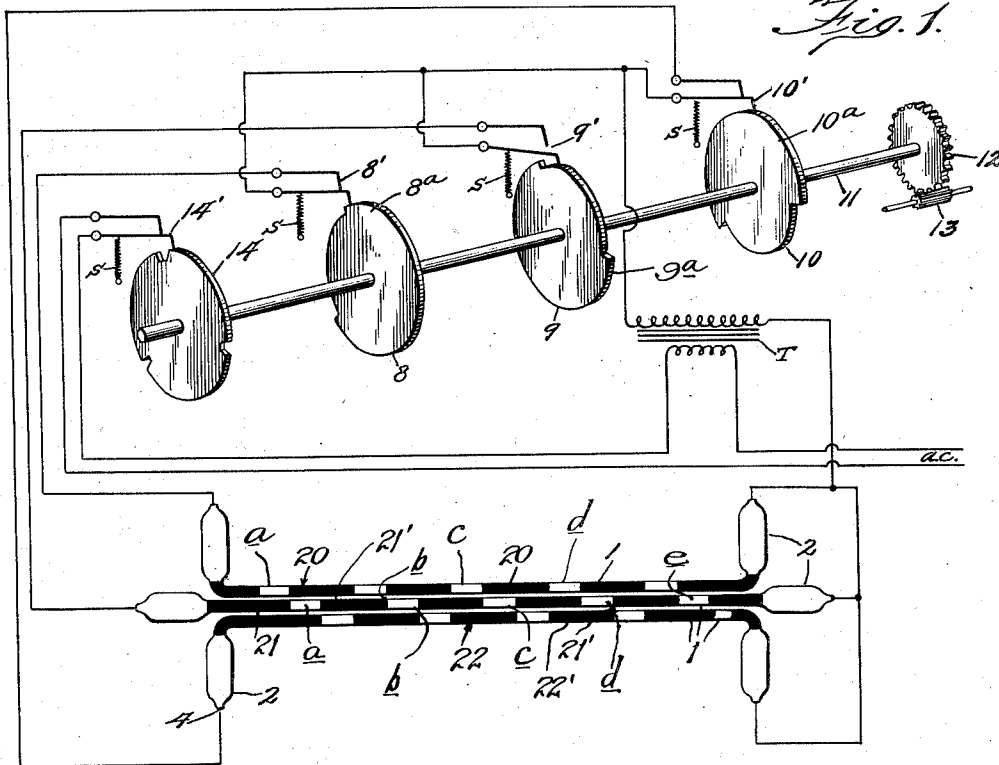
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My invention relates to signs and luminous devices, and more particularly to such types which are rendered luminous by the ionization of rarefied gases when placed in a suitable electric field.

One object of my invention is to provide a device of the character described which is thoroughly practical to produce. Other objects provide a simplified method of production; a moving effect not obtainable with rarefied gas signs in use heretofore; a novel electrode and a method of treating the same.

Further objects and advantages will appear as the specification progresses and the novel features will be particularly pointed out in the appended claims.

In the drawing, Fig. 1 is essentially a diagrammatic view showing a method of accomplishing a luminous moving effect and showing one arrangement of tubes for this purpose. Fig. 2 is a detailed view of one form of the electrode. Fig. 3 shows an improved form of electrode, suitable for use in the tubes shown in Fig. 1.

Glass tubes 1, Figs. 1 and 2, are provided with enlarged terminal portions 2 into which are sealed electrodes 3 of suitable material, such as carbon, copper or iron. Fastened into said electrodes are lead wires 4 and said wires extend through and externally of the walls of the vessel, as at 5, for the purpose of making electrical connection to the electrodes.

The electrodes have a shape which is practically cylindraceous. To within a short distance of one of the ends of the electrodes is a longitudinal slot 6 extending diametrically of its circular cross-section.

Normally, the tubes operate with unipotential electrodes; that is, without a potential gradient along the length of the electrodes for the purpose of heating them, as would be used were it desired to facilitate electron emission with a given ionizing potential. Since it is advantageous to degasify the electrodes during the pumping and treating process, I provide the extra wire 4 so that sufficient current may be conducted through the electrode to heat the latter, thereby liberating therefrom undesirable

gases which may be evacuated from the tubes.

This process of treating unipotential electrodes, as applied to vacuum tubes, has been more fully described and claimed in my co-pending application for patent, Serial No. 265,391, filed March 28, 1928, and, therefore, requires no further description here.

To cause the tubes 1 to glow the electrodes at the extremities thereof are connected to a source of high potential. Since, as already mentioned, no potential difference is normally required along the length of the electrode (other than that drop in potential due to the ionizing current), connection to the electrodes may be made by using either one, or both, of the lead wires 4 of each electrode.

A modification of the electrode 3, Fig. 2, is shown in Fig. 3. This electrode is provided with a series of annular flanges 7, thus presenting a larger surface exposed to the rarefied gas or gases contained within the vessel. In addition this electrode has the advantage of being able to more rapidly give off the undesired gases during treating and to more readily absorb the desired gases introduced into the tube for ultimate ionization.

In order to produce a moving or so-called chaser effect, particular reference is made to Fig. 1 in which a plurality of tubes, three in this instance, as 20, 21 and 22 are shown. The tubes are disposed close together and have alternate opaque or relatively darkened and luminous portions arranged as shown. The darkened portions of the respective tubes are designated as 20', 21' and 22' and each tube is shown as having luminous portions *a*, *b*, *c*, *d* and *e*. A step-up transformer T, fed from an A. C. line, is provided for feeding 2 or more tubes in parallel, although provision may be made for connecting them in series or for utilizing individual transformers for each tube. The choice of connection, such as series or parallel, is usually determined by the characteristics of the circuit, the regulation and voltage of the transformer or transformers, and the characteristics of the tubes. Although for convenience of illustration a parallel connection

has been shown, it is obvious that any other arrangement may be employed without departure from the spirit and scope of the invention.

5 It is obvious from the arrangement shown in Fig. 1 that if the tubes are caused to glow successively the optical effect produced will be to cause a group of lighted portions to glide apparently along in one direction. To
10 illustrate this more fully switching means, used to cause two of the tubes to glow at one time while one remains dark and to continually alternate this condition among the different tubes, are shown which comprise
15 a plurality of cams 8, 9, 10, mounted on a shaft 11. This shaft has also fastened thereon a gear 12 which may be driven by any suitable gear, such as a motor pinion 13.

In the form illustrated the cams have
20 arcuate portions of their peripheries cut away in such a manner that their corresponding switches 8', 9', 10' are held closed during 240 degrees rotation of the shaft 11 and permitted to open, by means of respective
25 springs *s*, during 120 degrees rotation. The low parts of the peripheries of the cams are disposed in a rotatively advanced relation to each other, as shown.

For convenience of illustration I have
30 shown a single transformer T operating a plurality of tubes 1 through cam-controlled switching means operating in the secondary circuit of said transformer. If such an arrangement is used and the secondary voltage of the transformer high, it may be preferable to briefly interrupt the primary, or
35 low-voltage, side of the transformer during the interval of operation of any of the secondary switches. For this purpose an extra
40 cam 14 and corresponding switch 14' is provided, the former having narrow cut away portions which permit the switch 14' to open during, and somewhat overlapping, the period of operation of any of the secondary
45 switches; the switch 14', of course, being connected in the primary circuit of the transformer.

By looking at the tubes in Figure 1, it becomes apparent that each longitudinal
50 step in the progression of the luminous portions will also be accompanied by a lateral shift due to the width of the tubes.

When it is desired to minimize this lateral shift, the tubes may be placed close together
55 and the luminous and darkened portion made relatively long with respect to the tube widths, thereby minimizing the lateral shift encountered in each step or compared with the longitudinal shift.

60 While it is obvious that the tubes may be bent into any desired shape to meet the many requirements encountered in applying the invention to signs or luminous devices, it is further manifest that with the disclosure in Figure 1 it would readily occur to
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those skilled in the art that the lateral shift of moving light may be entirely eliminated by disposing the tubes in such a manner that the successive luminous portions occur in a straight line.

70 More specifically through the switching means shown in the drawing the tubes are illuminated for overlapping periods of time equal to the period which elapses while the cam shaft 11 is rotating 120°. However,
75 each tube, as previously stated, remains illuminated for the period during which shaft 11 rotates 240°. In other words, the length of the active cam surfaces 8^a, 9^a and 10^a of the cams 8, 9 and 10, respectively, is
80 240°. The initially acting end of said active cam surfaces which first engages the circuit switches are separated circumferentially speaking a distance of 120°. Therefore, referring to Figure 1, it will be evident that the circuit of tube 20 is about to
85 be broken by switch 8' riding off the rear end of the cam surface 8^a. This figure also shows the initial active portion of the cam surface 9^a as being about to actuate the
90 switch 9' to close the circuit of the intermediate tube 21. The midway position of the switch 10' on the cam surface 10^a indicates that the tube 22 has been illuminated for approximately one-half of its illumination
95 period. Since the cut-out areas of the cam disks amount to 120° it will be evident that when the switch 10' has traversed the remaining 120° of active cam surface 10^a, the switch 8' of cam disk 8 will have reached
100 the initial end of the cam portion 8^a of disk 8 and will ride up thereon to close the circuit of tube 20 as the circuit of tube 22 is opened. At the time that the circuit of tube 20 is closed through cam portion 8^a and switch 8', the switch 9' of the circuit of tube
105 21 will occupy upon its cam surface 9^a, the same midway position as switch 10' occupies upon its cam in Figure 1.

As is believed to be manifest, corresponding
110 spaces *a*, *b*, *c*, etc. of the respective tubes 20, 21, 22 comprise lineal luminescent areas *a,a,a*, *b,b,b*, *c,c,c*, etc., it is perfectly plain from Figure 1 of the drawing that in the consecutive illumination of tubes 20, 21, 22
115 in the order named that the area *a,a,a*, may be progressively illuminated to disclose a word or figure, or to give the effect of a lineally moving light bar of the length of one or more luminous portions *a* depending
120 upon the electric circuit control of the tubes and the number thereof.

Furthermore, it is desired to emphasize the fact that Figure 1 shows the areas *a,a,a*, *b,b,b*, etc. are arranged in merging substantially lineal series. This enables a "chaser" or chasing light effect to be produced without the usual multiplicity of filament bulbs and associate connections to each bulb and particularly a chaser or moving effect de-
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void of gaps, because the luminous areas heretofore described overlap one another.

While I have shown the luminous portions of the tubes 1 of equal length and the intermediate darkened portions all of equal length it is obvious that the speed or optical effect of apparent unidirectional motion, heretofore mentioned, may be changed at different portions along the length of the tubes 1 by exposing shorter or longer luminous portions, than shown.

It is obvious that numerous changes may be made in the details set forth without departure from the essentials of the invention, as defined in the claims.

I claim:

1. In a device of the character described, a plurality of straight adjacent and substantially parallel gaseous conduction lamps having alternate darkened and illuminable portions, said illuminable portions of the lamps being arranged in substantially lineal series, electrodes for said lamps, and switching means for applying current to said electrodes in predetermined order to produce a chaser effect.

2. In a device of the character described comprising illuminable chambered means, an ionizable medium within said means, a plurality of spaced selectively operable ionizing electrode means for said medium, said chambered means with said ionizable medium comprising a plurality of straight and continuous gaseous conductors between said electrode means, means effective upon the energization of each electrode means for effecting illumination of different lineal areas of said chambered means, said lineal areas being arranged in substantially merging lineal series, and means for actuating said ionizing electrode means to progressively illuminate said series of areas.

3. In a display device, means for producing a plurality of straight, parallel, adjacent and lineal light sources, and means for shielding spaced portions of said sources, said shielding means for each of said sources being displaced longitudinally with respect to the shielding means of the adjacent sources.

4. In a display device, means consisting of discharges between spaced electrodes for producing a plurality of straight, parallel, adjacent and lineal light sources, and means for shielding spaced portions of said sources, said shielding means for each of said sources being displaced longitudinally with respect to the shielding means of the adjacent sources.

5. In a luminous device comprising illuminable chambered means, an ionizable medium within said means, a plurality of spaced ionizing electrode means for said medium, said chambered means with said ionizable medium comprising a plurality of

closely spaced, transversely arranged, elongated gaseous conductors disposed substantially in the same spaced relation for all transverse sections thereof, means effective upon the energization of each ionizing electrode means for effecting illumination of different areas thereof for the production of a predetermined optical effect, and said areas being disposed in a lineal series extending in the direction of said gaseous conductors.

6. A device of the character described comprising a plurality of adjacent, transversely arranged, elongated gaseous discharge members each having illuminable and darkened portions, the illuminable portions of said members combining to form a substantially lineal area and said members being substantially in the same spaced relation for all transverse sections thereof, and means for consecutively illuminating said members to progressively illuminate said area.

7. In a sign, a plurality of substantially straight illuminable tubes having luminous and darkened portions, and the luminous portions of said tubes being arranged in substantially merging series extending in the direction of the length of the tubes.

8. In a device of the character described comprising a plurality of adjacent, transversely arranged, elongated gaseous discharge tubes substantially in the same spaced relation for all transverse sections thereof, electrodes for each of said tubes, and means effective upon the energization of the electrodes of each tube for causing illumination of spaced portions of said tube.

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