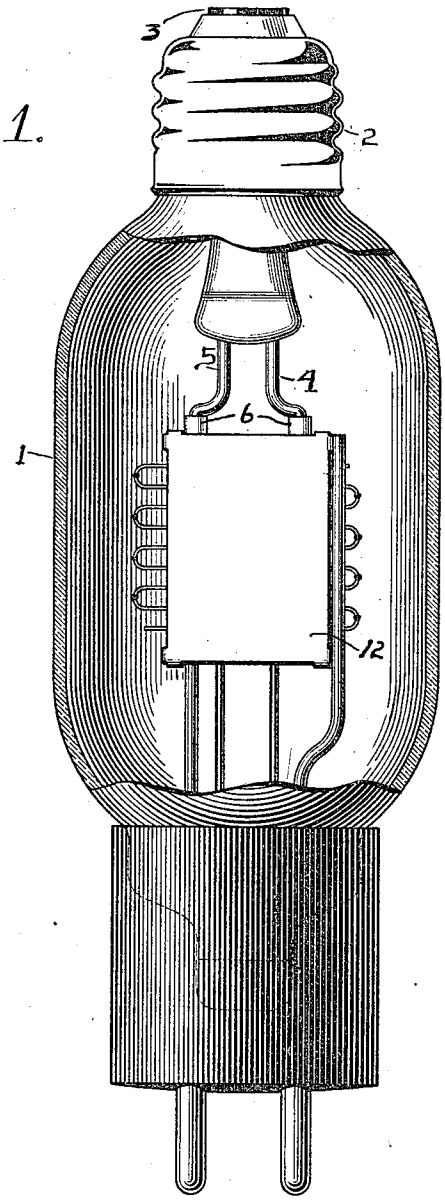
May 24, 1932. I. NACHUMSOHN 1,859,678

ELECTRON DISCHARGE DEVICE

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Fig. 1.



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Fig. 2.

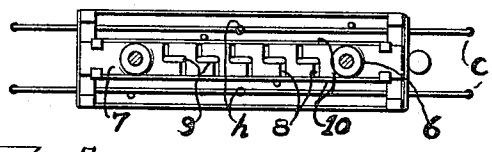


Fig. 3.

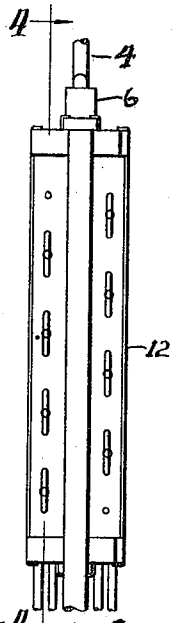


Fig. 4.

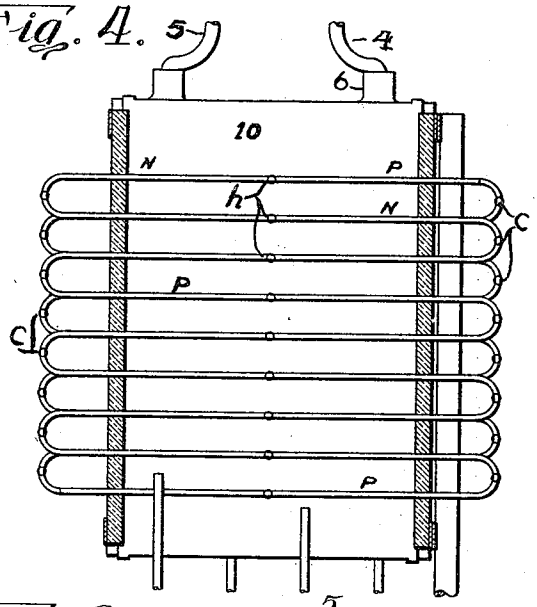


Fig. 6.

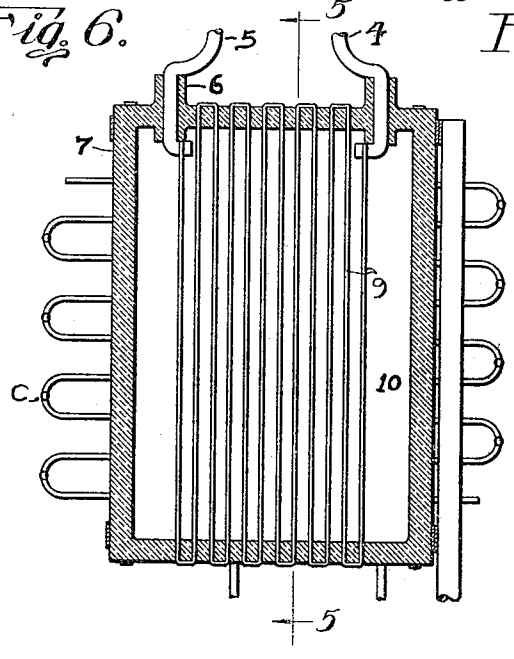
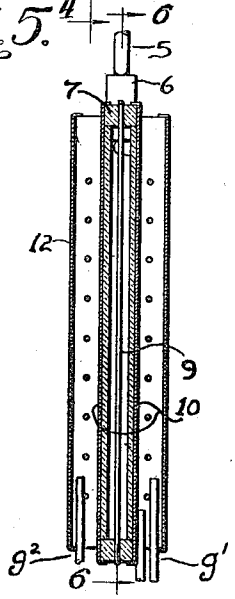


Fig. 5.



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Fig. 7.

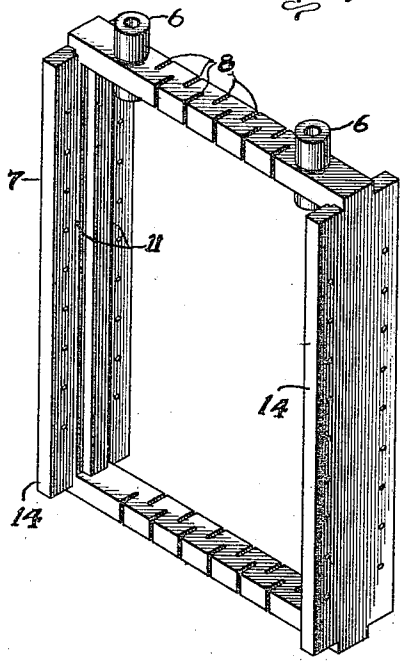


Fig. 8.

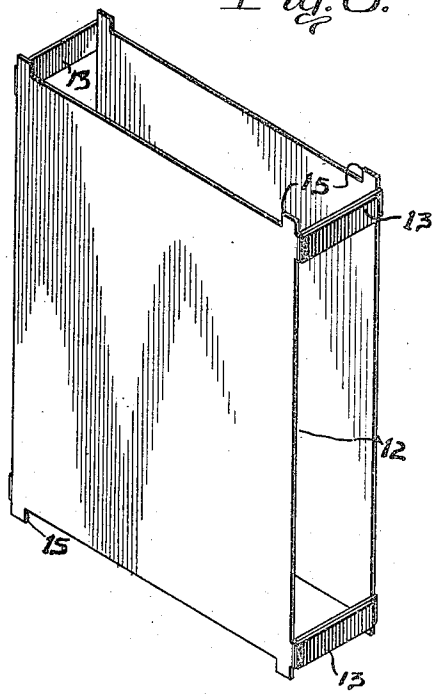


Fig. 9.

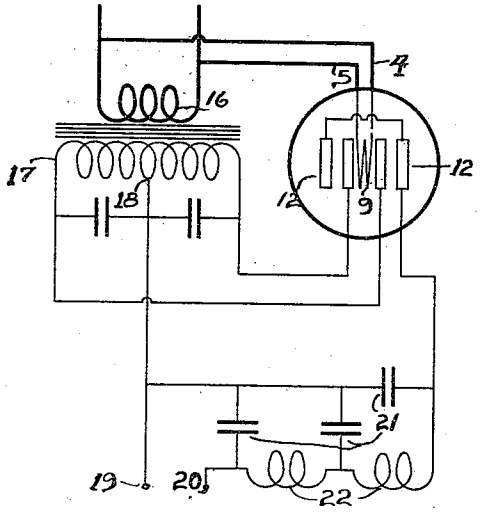
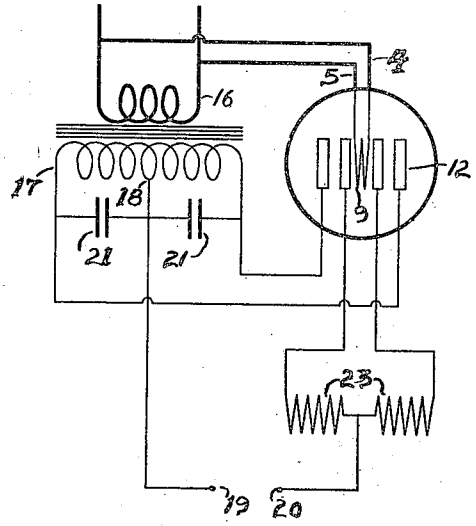


Fig. 10.



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1,859,678

UNITED STATES PATENT OFFICE

IRVING NACHUMSOHN, OF CHICAGO, ILLINOIS

ELECTRON DISCHARGE DEVICE

Application filed December 29, 1926. Serial No. 157,744.

My invention relates to the improvement in an electron discharge device and more particularly to such types that may be used with radio frequency or other electric currents. It consists of the combinations, constructions, and arrangements hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

Amongst the objects of my invention are: to provide a device of the character described that can be used in a large number of electrical circuits, particularly in connection with audio frequency and radio frequency currents; to provide a device of the class described that can be used as an amplifier or rectifier of radio-frequency currents and the like; to provide an electron discharge device having an electron producing area and a plurality of electron emitting cathodes adjacent said area; to provide a device of the character described that can be used in radio circuits and in which the filament or heater current, as well as the anode, or output current, can be taken direct from a source of alternating current; to provide an electron valve having a multi-potential grid; to provide a self-biasing grid member for a thermionic valve; to provide a structure in a device of the character described, that will permit of large electron-emitting surfaces; to provide a vacuum valve having a plurality of elements therein with supporting means that will maintain accurate alignment of said elements with respect to each other. Other and further objects and advantages will appear as the specification progresses with reference to the accompanying drawings and the novel features will be particularly pointed out in the appended claims.

In the drawings, Fig. 1 is a view of the assembly with a portion of the vessel broken away to disclose the internal structure; Fig. 2 is a plan view of the internal assembly; Fig. 3 is an end view of the assembly shown in Fig. 2; Fig. 4 is a section along line 4—4 of Fig. 3; Fig. 5 is a section showing the relative positions of the elements; Fig. 6 is a section of Fig. 5 along line 6—6; Fig. 7 shows the insulating frame that supports the elements; Fig. 8 is a showing of one method of constructing the anodes; Figs. 9 and 10 show circuits, which for the purpose of this patent make the improvement applicable.

In Fig. 1 the vacuum vessel is shown at 1. The upper end thereof is provided with a well-known type of socket connection comprising terminals 2 and 3 which connect to filament or heater leads 4 and 5 respectively. Said leads serve to support the elements of the tube by being fastened into sleeves 6, which sleeves form an integral part of insulating frame 7, made of lava rock, porcelain or any suitable material.

The horizontal portions of member 7 (Fig. 7) are provided with slots 8 adapted to receive heater element 9, which element terminates into leads 4 and 5. Where an equipotential cathode is desired, an electron emitting surface other than element 9 is provided. Said equipotential cathodes are in the form of plates 10, secured into longitudinal slots 11 of member 7. The outside faces of these plates are coated with an electron-emitting substance.

Member 7 is provided with four vertical rows of holes, arranged to receive the grid or input element. Said grid may be in the form of a continuous wire arranged in parallel portions adjacent the cathode, in a manner well-known to those skilled in the art. However, where it is desired to establish a potential bias on the grid, or where a multi-potential grid is required, I prefer making said grid of a plurality of thermo-couples, each consisting of two dissimilar wires.

In Fig. 4 the positive and negative metals are shown connected alternately and indicated as P and N, respectively. Thus, when the central rows of junctures h become heated by supplying a suitable current through the heater 9, the outer rows of junctures C will remain relatively cool, thereby generating an unidirectional thermo-electric current in the grid. Hence, each grid wire will have a different potential from its adjacent wire.

The anodes, Fig. 8, consist of plates 12 placed externally of the grid. Said plates are connected together by strap portions 13. The plates rest against surfaces 14 of member

7, and lugs 15 facilitate clamping the plates thereto. Where more than one anode is required, as is shown in Fig. 10, the sections may be secured to member 7 by lugs 15, the conducting strap portions 13 being omitted and individual leads brought out of the tube from the respective anodes. Likewise, where more than one cathode is preferred, the sections may be insulated from one another and separate leads provided for each cathode. Moreover, this may also be applied to the grid by bringing out two or more leads g^1 and g^2 (Fig. 5) as desired.

Among numerous applications, the device may be used in circuits requiring a plurality of grids or grid portions operating at different potentials and having a common input circuit.

Another application of the improvement is in connection with well-known types of battery-coupled audio frequency amplifiers in which a potential in series with the grid of vacuum tubes is required. With my improvement it can be seen that an internal thermo-electric potential is derived for use in such circuits.

To those skilled in the art, many other applications of the improvement will present themselves; particularly in circuits where a potential bias on the grid is desired, where a potential gradient of the grid is utilized, where it is desirous of varying the mean potential of the grid in direct proportion to the amount of heater or filament current, etc.

For simplicity of description and for the purpose of this patent further uses of the improvement are shown in Figs. 9 and 10, where it may be used in circuits to rectify alternating into direct current. A source of alternating current is applied to the heater 9 as well as to the primary winding 16 of a transformed, the secondary 17 of which has a middle tap 18 connected to one lead 19 of the D. C. terminals 19 and 20.

In Fig. 9 the two anodes 12 are connected in parallel and, as shown, lead into a series of condensers 21 and choke coils 22 before terminating at 20.

Fig. 10 discloses a somewhat similar full-wave rectifier circuit with the exception that the terminal 20 is derived from a tap between inductances or resistances 23, connected in series. The anodes are connected to the outside terminals of the secondary 17 and the cathodes to members 23.

It is obvious that the invention is not limited in its scope to the particular type shown in the preferred forms; that certain portions thereof may be utilized without the adoption of its entirety; and that numerous changes may be made in the details set forth without departure from the spirit and scope of the invention as defined in the claims.

I claim:

1. In an electron discharge device, a heater element, a plurality of separate cathode areas comprising flat elements disposed adjacent said heater element, a control element comprising thermoelectric means disposed in flat planes adjacent said cathode areas, unitary spacing means for said elements, and anode means held adjacent said control element by said spacing means, said anode and spacing means forming a closure for said elements.

2. In an electron discharge device, a vessel means therein comprising a heater element, a thermoelectric element and an anode element, spacing means for said elements, said anode and spacing means comprising an enclosure for said heater and thermoelectric elements, whereby heat generated in said enclosure will affect the hot junctures of said thermoelectric element and generate a current therein, and a plurality of cold junctures of said thermoelectric element disposed externally of said enclosure and within said vessel.

3. In an electron discharge device, a heater element, a cathode comprising a flat element disposed adjacent said heater element, a thermoelectric element disposed in a flat plane adjacent said cathode, anode means held in spaced relation to said thermoelectric element by spacing means, said anode and spacing means comprising an enclosure for said heater, cathode and thermoelectric element, whereby the heat given off by said heater will affect the hot junctures of said thermoelectric element and generate currents therein, and a plurality of cold junctures of said thermoelectric element disposed externally of said enclosure.

IRVING NACHUMSOHN.