

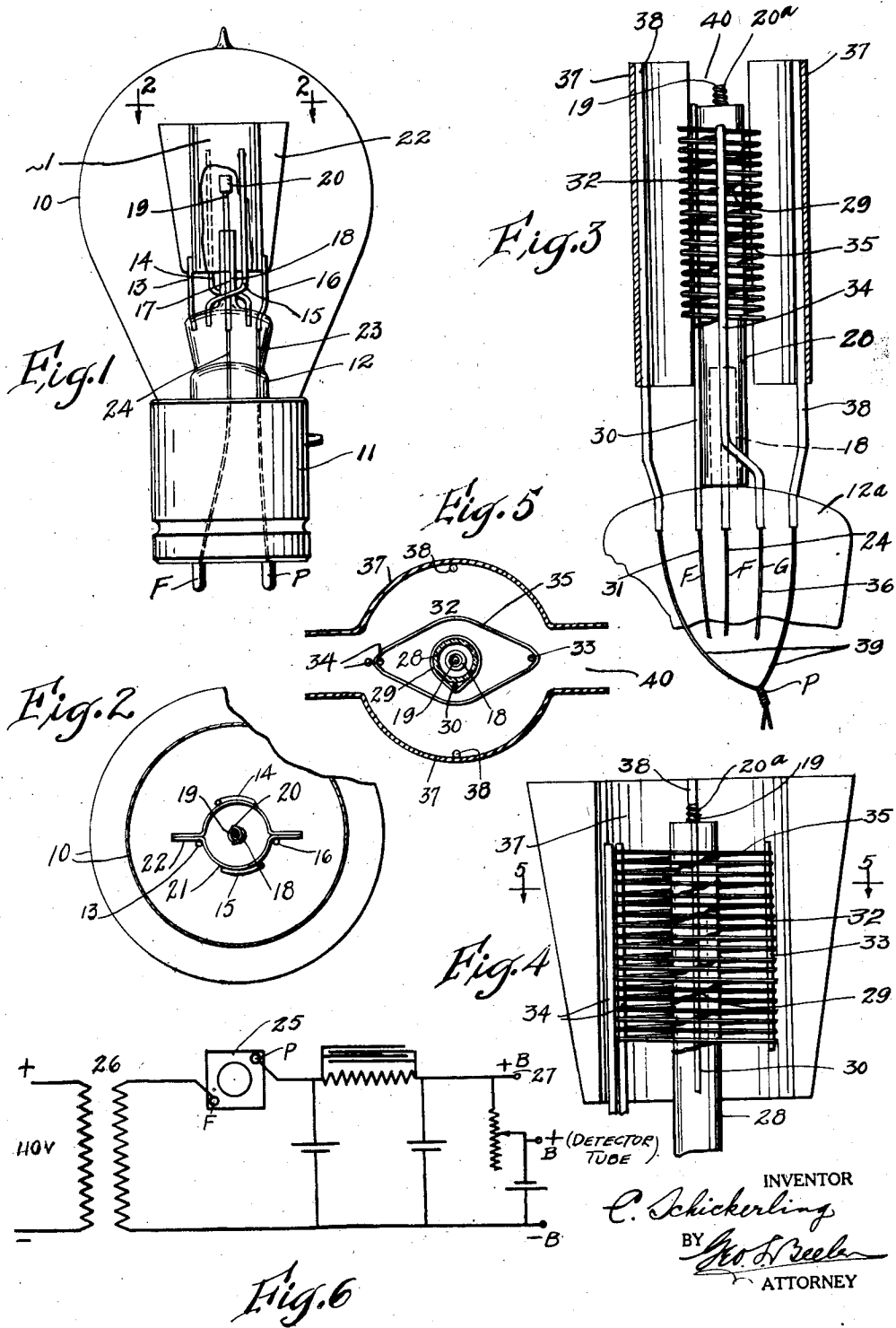
Oct. 16, 1928.

C. SCHICKERLING

1,687,898

RECTIFIER TUBE

Filed June 3, 1925



UNITED STATES PATENT OFFICE.

CONRAD SCHICKERLING, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO HORTENSE SCHICKERLING, OF EAST ORANGE, NEW JERSEY.

RECTIFIER TUBE.

Application filed June 3, 1925. Serial No. 34,530.

This invention relates to radio apparatus and has particular reference to the art of rectifying currents, broadcasting of messages, receiving the same, and particularly with reference to the elimination of storage batteries or their equivalent for the required energy in the operation of such apparatus.

More definitely stated, among the objects of this invention is to practicalize the direct connection of radio equipment to ordinary house lighting currents, thus eliminating the necessity for the use of batteries.

Another object of the invention is to rectify and stabilize the currents employed in connection with the operation of this intricate apparatus.

Another object of the invention is to provide an improved type of vacuum tube for the purpose of producing the most satisfactory degree of volume in the transmission or reception of radio waves and with the highest degree of perfection of quality of such tones.

With the foregoing and other objects in view the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed or suggested herein, still for the purpose of illustrating a practical embodiment thereof, reference is had to the accompanying drawings in which like reference characters designate the same parts in the several views, and in which—

Figure 1 is a front elevation of one form of this invention, parts being in section, this form being designed particularly as a B battery eliminator.

Fig. 2 is a horizontal detail view on lines 2—2 of Fig. 1 indicating the electrodes in plan.

Fig. 3 is a front elevation, partly in section, of that form of the invention designed especially for use as an A battery eliminator.

Fig. 4 is a side elevation of the electrode portions of this device as shown in Fig. 3, but with the adjacent plate removed.

Fig. 5 is a plan view of the inner mechanism,

Fig. 6 is a diagram showing a manner of use of the invention.

Referring now more particularly to the drawings, 10 is a vacuum tube shown as provided with a metallic base 11 and a series of contact pins including the pins P and F corresponding to the usual plate and filament pins of a standard radio tube.

This tube is provided with a pedestal 12 usually made of glass and adapted to support in erect position a series of posts or supports 13, 14, 15, 16, and 17. The support 17 is extended upward through a glass neck or extension 18 from the pedestal and bears at its upper end an electrode 19 of any suitable metal such as nickel, chrome nickel, or steel, and suitably charged or impregnated with a volatile metal such as magnesium or calcium, or having attached to it a small bit of such metal as indicated at 20.

Supported rigidly and securely upon the supports 13, 14, 15, and 16 is a tubular casing 21. This casing is made preferably of two metallic plates having registering semi-cylindrical body portions and with flat fins mating with one another in pairs at 22 which are preferably spot welded together forming a complete tube but having freely open upper and lower ends and spaced entirely from the electrode 19. A lead wire 23 is connected to one of the supporting posts as 16 and is extended thence to the contact P, so that the casing or tube made be thought of in the broad sense of a plate. The supports 14 and 15 are extended upward well toward the top of the tube for the best bracing purpose. The center electrode is provided with a leading in wire 24 having connection with the contact F, one of the filament contacts above alluded to. There is, however, no solid or physical contacts or connection in any manner between the electrode 19 and the plate which may be regarded as the companion electrode.

In the construction of this tube the bulb 10 is exhausted of air in any usual or well known manner as by a vacuum pump and in place of the air is introduced one or more gases of a suitable nature to produce the results desired. For this purpose I have employed helium, argon, neon, and nitrogen in

various proportions, but I believe for best results in approximately equal parts and at a suitable degree of pressure. The bulb 10 is made preferably of clear glass and requires no bombardment or coating. When the parts are completed and charged as indicated herein and the electrodes are heated up, the volatile metal or metals carried by the center electrode 19 are volatilized, producing a metallic gas such as magnesium gas or calcium gas, or any suitable combination of such gases, which mingling with the main gases filling the tube, serve to produce in the combination the results specified.

When the tube is introduced into a socket such as indicated in the diagram at 25 and in circuit with a suitable reactance transformer 26 in order to convert the alternating current to direct current, and to establish a sufficiently high voltage, say from 110 to 290 or 300 volts, the electric current causes the electrode 19 to glow and become incandescent, and co-incident therewith the plate or tube 21 glows and gives off a dull red light. The tube as a whole becomes warm but not hot, and the result is that the B battery is not necessary and the radio instrument coupled into the same circuit as at 27 produces the best possible radio results. The magnesium or calcium being of a highly reactive nature is capable of combining with the impurities in the gas in the tube. This is important, since the electrodes may generate nitrogen, oxygen, water vapor, or hydrogen, which must be removed to permit the potential of the tube to be uniform. At each discharge from the cathode, a minute quantity of magnesium or calcium is vaporized and this readily combines with the gaseous impurities. However, the tube should be initially operated a few times with a sufficiently high potential to vaporize some of the calcium or magnesium, thereby purifying the gas so as to insure that the dynamic current will follow the priming spark discharge.

In the A battery eliminator as shown in Figs. 3 to 5, I provide a center cathode 19 having a deposit of a metal of high chemical activity thereon at 20^a substantially or approximately in the manner as described above and this electrode has a leading in wire 24 connected with one of the filament studs of the standard or any suitable base. The tube, however, has no filament. The pedestal 12^a is provided with a glass extension or neck 18 around which is fitted and by it held in place, a quartz or other tube 28 of porous refractory insulating material leading up to but stopping slightly short of the end of the electrode 19. This quartz tube is impregnated with some suitable element or metal of high chemical activity such as thorium, strontium, calcium, barium, or the like, having the properties among others of giving off a metallic gas when warmed or heated.

Either in connection with this impregnation of the tube or as a substitute for such impregnation I employ a cathode coil 29 of fine wire such as tungsten and suitably thoriated, and wrapped spirally around the tube and having its ends attached to a support 30 from which a leading in wire 31 extends to the other filament post of the base. There is no connection nor contact between the electrode 19 or the metal 20^a and any part of the tube 28 or parts surrounding it.

Surrounding and spaced from the thoriated tungsten coil 29 is a wire grid 32 composed of two vertical parallel bars 33 and 34, the latter of which is double between and around which is coiled a fine wire 35 as shown best in Figs. 4 and 5. A wire conductor 36 leads from one of these bars as 34 to the grid post of the base.

Surrounding and spaced from the parts just described and from each other are a pair of anode plates 37 each having a sturdy supporting post 38 and from which leads a wire 39 downward through the pedestal where they are twisted or otherwise connected together and are united with the plate stud of the base. The plates 37 have the same general construction and characteristics as those described in connection with the B battery eliminator above described except that they are spaced from each other at all points, leaving a gap 40 instead of being united along the webs or fins. These plates except for the wire connection with each other at 39 are entirely separated from each other and from all the other solid portions of the structure.

This bulb is exhausted of its air and then charged with gases in substantially the manner above described in connection with Figs. 1 and 2 and is adapted for insertion into a standard socket such as 25 above indicated. This tube has the further peculiar qualification of being useful for broadcasting purposes either alone or in connection with the B battery eliminator herein described, as well as being useful for receiving purposes. It is to be noted also that the A battery eliminator herein described may in certain hook-ups, serve alone as an eliminator of both the A and B batteries. I wish to point out also that the plates 21 and 37 may be made of any suitable metal such as aluminum or iron, or any suitable alloys including preferably a suitable percentage of volatile metal such as magnesium. For example, the plates may be made of aluminum with a one per cent ingredient of magnesium. Or instead of such construction the plates may be made of plain metal suitably dipped or otherwise impregnated with a volatile metal coating or deposit.

I claim:

1. A rectifier tube comprising a plate element, a porous refractory tube impregnated with a metal of high chemical activity adjacent to the plate element, and a conductor

within said refractory tube and spaced from the wall thereof, said plate and said conductor constituting respectively the cathode and anode.

- 5 2. A rectifier tube comprising a plate cathode, a porous refractory insulating tube adjacent to the cathode but spaced therefrom, and an anode comprising an element

within said refractory tube and a member coiled about the insulating tube from within, said refractory tube and said element including a volatile metal of high chemical activity. 10

In testimony whereof I affix my signature.

CONRAD SCHICKERLING.