G. W. PICKARD.

VALVE DETECTOR FOR WIRELESS.

APPLICATION FILED JULY 3, 1912.

1,128,817. Patented Feb. 16, 1915.

Fig. 1.

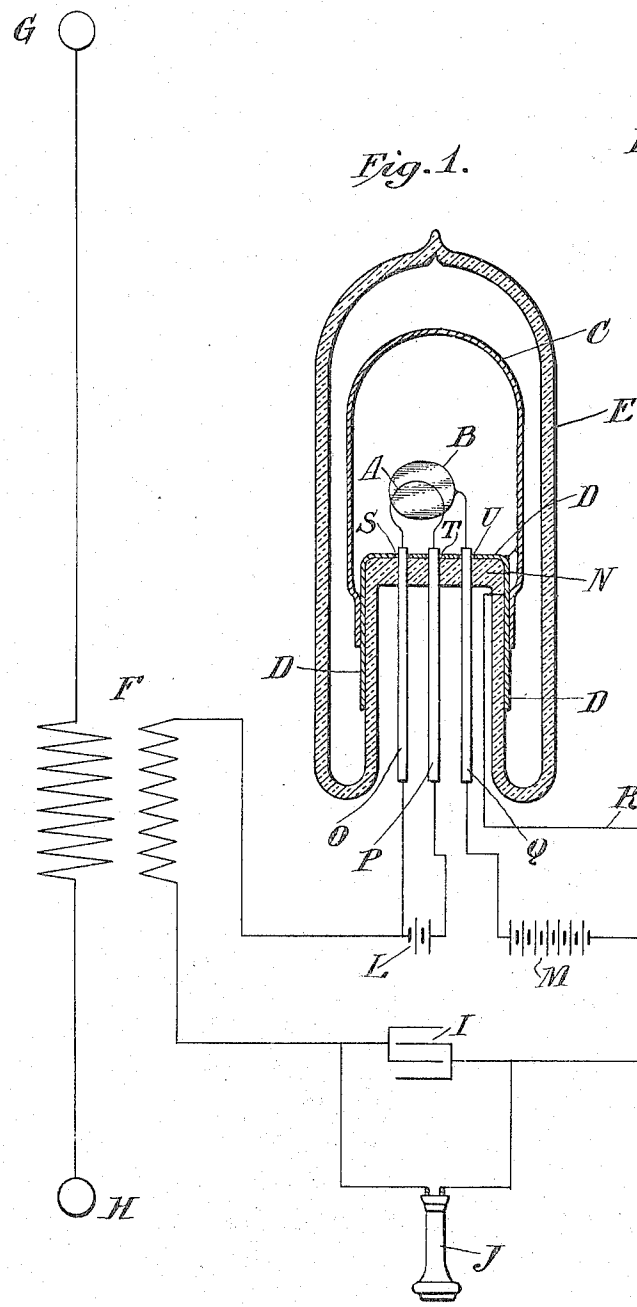
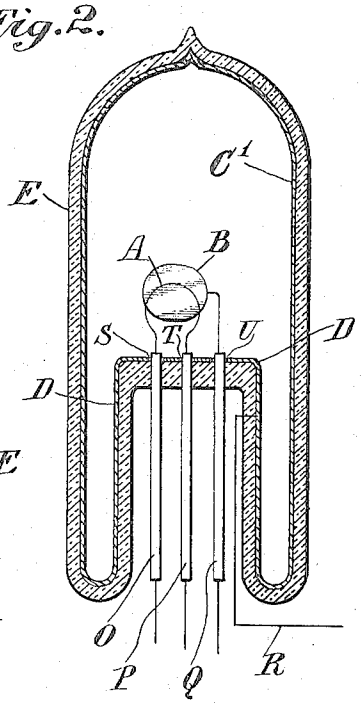


Fig. 2.



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VALVE-DETECTOR FOR WIRELESS.

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To all whom it may concern:

Be it known that I, GREENLEAF WHITTIER PICKARD, a citizen of the United States of America, and a resident of Amesbury, Massachusetts, have invented certain new and useful Improvements in Valve-Detectors for Wireless, the principles of which are set forth in the following specification and accompanying drawing, which disclose the form of the invention which I now consider to be the best of the various forms in which the principles of the invention may be embodied.

This invention relates to wireless detectors of the rectifier type embodying the well known "Edison" effect of uni-lateral electrical conduction between hot and cold terminals, and commonly termed "valves" or "audions" in the commercial art. All prior forms of this detector have consisted of an exhausted glass tube, containing a heated terminal in the form of a small incandescent lamp filament, and one or more cold terminals, in the form of plates, grids, etc. All of these prior forms have been subject, by virtue of their construction, to a most serious defect, *i. e.*, inoperativeness by temporary loss of sensitiveness when exposed to "static" disturbances, such as are daily experienced in commercial wireless working, particularly in the tropics. I have carefully investigated this loss of sensitiveness, and have discovered that it is in some way caused by an accumulation of static charge on the interior wall of the glass bulb; and I have also discovered how to prevent the trouble. Apparantly the stream of negative ions passing from the hot to the cold terminal is in some way momentarily scattered or diverted by an excessive rush of current, caused by "static," so that instead of substantially all the ions reaching the cold terminal, a very material part of them reaches the wall of the dielectric bulb, building up therein a static charge. In some way, which I do not now know, this static charge renders the detector practically inoperative until it can be discharged, and the operator loses a word or two of the message he is receiving. In working in tropical climates or seasons, these interruptions are intolerable, as they occur several times a minute.

The object of the invention is to prevent the serious troubles above described, and the invention consists of the herein-described means for accomplishing that object.

The drawings show the application of my invention to one of the various forms of "valves" or "audions." The detector itself is here shown in section, approximately to scale.

The external "wireless" circuits of Figure 1 are diagrammatic, and shown by way of example, and the detector may be used with any desired and suitable circuits. Fig. 2 is a section of one simple form of the various possible embodiments.

The hot and cold terminals, *i. e.*, the filament A and the plate B, are provided in the customary manner wit hsuitable leads O, P, and Q respectively, sealed in the glass bulb E. The surface of the glass stalk N of bulb E, which stalk supports the upper ends of said leads or detector terminals, is covered (Fig. 1) with a conducting layer D, which may be a deposit of silver or other metal. This deposit or layer D is continuous, except that it is cut away in minute circles S, T, U, immediately surrounding the leading in wires O, P, Q, so that these are not short-circuited by said conducting layer D. It is important, however, that no substantial amount of glass be exposed at these points, for this would form to that extent a dielectric surface for the lodgment of static charge. Over the stalk N, and preferebly in good electrical contact with the conducting layer D, is placed a conducting bulb or chamber C, which may be aluminum. This conducting chamber should preferably fit the stalk N so closely that the joint is almost, but not quite, a hermetical seal; although this is not so important if the outer air-tight bulb E be also employed. Chamber C and layer D constitute a conducting sheath which substantially incloses terminals A, B, and provides means for collecting substantially all the negative ions which may be caused to be scattered in passing from the hot to the cold terminal. A lead R is connected to this sheath, either to conducting layer D or to the conducting chamber C, (or both, as shown, if they are not in good contact), and connected to a ground or other leading-away connection K. A glass or other air tight bulb E may be placed over the chamber C, and the space within be ex-

hausted to a good vacuum. The outer bulb or vessel E is not essential, although this is probably the best form for the following constructional reasons. If the bulb E is not used, the conducting chamber C should then form as nearly as is possible an air tight joint with the stalk N, and the inclosure exhausted in the usual manner; but owing to the difficulty of making an air-tight joint between chamber C and stalk N, the form shown, employing outer air-tight bulb E, is the easiest to construct.

The invention is directed particularly to the substantially complete inclosure of the hot and cold terminals by the complete conducting sheath C, D; and in Fig. 1 it includes particularly a substantial closure of the upper end of chamber C, and also as nearly a complete closure as is permitted by the entrance of the leads O, P, Q, of that part of layer D which is exposed to the interior of chamber C. The above applies also to Fig. 2, wherein sheath C, D is replaced by sheath C^1, *i. e.*, a silver plating or deposit on the entire interior surface of glass bulb E, save for the removal of little specks of the metallic deposit at S, T, U (as in Fig. 1) around the leading-in wires O, P, Q.

The reason for the importance of the substantially complete closure, lies in the fact which I have discovered, that the tendency of the ions, under the conditions of static disturbance, is to scatter away from all surfaces into free space, such that not even a metallic surface has an attraction for them, although if it lies in their path, it will conduct them away or at least prevent them from rendering the detector inoperative. Thus, if the metallic closure be not substantially complete, but have any substantial opening, the same constitutes a leak to the dielectric E for a material part of the ions. They have to be positively stopped substantially in all possible directions, and thence discharged from the detector.

When bulb E is employed in the Fig. 1 form, an air leak is left at the joint between chamber C and layer D, in order to permit the exhaustion of the air from inside chamber C. This leak, however, being between metal walls, lying close together, does not permit the escape of the scattered ions. This joint is not involved in the simple Fig. 2 form.

This detector is connected to any oscillation receiving circuit in the usual manner. As shown in the drawing, oscillations are impressed upon the terminals G, H by the transmitted ether waves, and through the transformer F the oscillations are transferred to the circuit of the rectifier detector. The hot terminal A is heated by the battery L through the leads O, P, and is also connected to one terminal of the secondary of transformer F. The cold terminal B is connected through the lead Q through a local battery M and a telephone receiver J, (preferably shunted by a condenser I), to the other terminal of the secondary of transformer F. The local battery M, while not essential to the operation of this detector, gives enhanced sensitiveness.

The operation is as follows: Oscillatory currents flowing through transformer F are impressed upon hot and cold terminals A, B. As the conduction across the vacuous space between these terminals is unilateral, (only the negative currents passing from A to B), the oscillations are rectified, and cause a signal in telephone J, in the well known manner common to all rectifier detectors. A sudden discharge of "static" may cause a scattering of negative ions, but those reach and collect on the conducting walls of the special sheath of this invention, are at once carried away, and cannot build up a disturbing static charge. The conducting sheath, or that part of it, which is supported on the bulb E, may be applied thereto in any suitable way, not only by a plating or deposit, as above, but by applying a conducting paint, or in any other desired manner.

I claim:

1. A rectifier detector of the Edison-effect type, which comprises hot and cold terminals and an electrically conducting sheath substantially completely surrounding the same.

2. A rectifier detector of the Edison-effect type, comprising hot and cold terminals, a dielectric container for the same, and an electrically conducting sheath supported by said container and substantially completely surrounding said terminals.

3. A rectifier detector of the Edison-effect type, which comprises hot and cold terminals, a conducting sheath substantially completely inclosing the same, and a leading away conductor connected to said sheath.

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