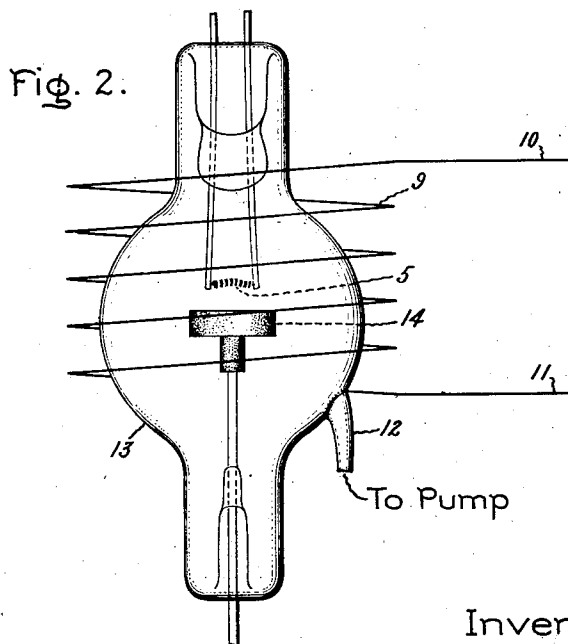
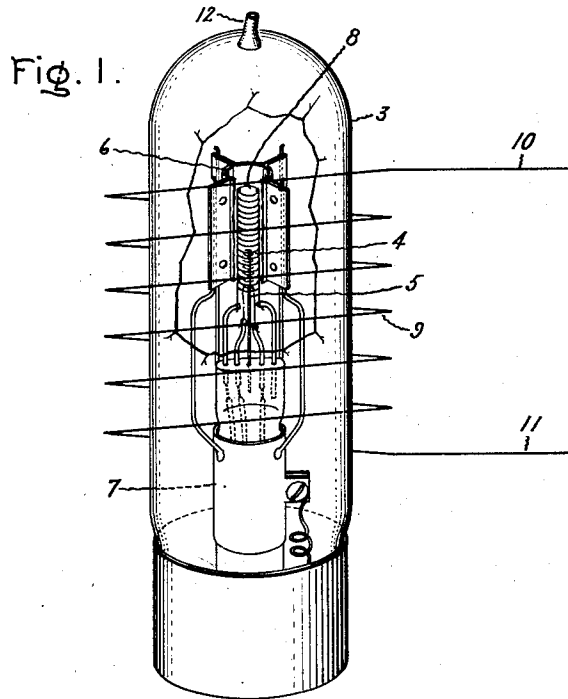


J. B. PRATT,  
DEGASIFYING PROCESS.  
APPLICATION FILED MAR. 15, 1920.

1,374,679.

Patented Apr. 12, 1921.



Inventor:  
John B. Pratt,  
by *Albert G. Davis*  
His Attorney.

# UNITED STATES PATENT OFFICE.

JOHN B. PRATT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## DEGASIFYING PROCESS.

1,374,679.

Specification of Letters Patent. Patented Apr. 12, 1921.

Application filed March 15, 1920. Serial No. 365,837.

*To all whom it may concern:*

Be it known that I, JOHN B. PRATT, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Degasifying Processes, of which the following is a specification.

The present invention relates to the removal of gas from solids and particularly to the removal of gas from conductive bodies or electrodes in electrical discharge devices, such for example, as pliotrons, tungar rectifiers, or the like.

My invention is of particular utility in the pretreatment of the electrodes in devices of the thermionic type comprising a sealed bulb containing an incandescent cathode and one or more relatively massive unheated electrodes. In some cases these devices are operated in a high vacuum and in other cases are operated in an atmosphere of some selected gas. In either case it is necessary to pretreat the electrodes to remove gases which otherwise would be driven off during the operation of the device and injuriously affect its operation.

In many cases it is possible during the manufacture of the device, to drive gases out of electrode masses by the heating effect of an operating current derived from an incandescent cathode, but even when this is possible the cathode is liable to be injured by sputtering and in fact the entire device is in danger of destruction by arcing due to ionization of the gases before they can be removed by a pump. In some cases such preliminary treatment of the electrodes during evacuation is not effective and may not be possible because of some peculiar structural features of the device.

In accordance with my invention, conductive masses are rendered free from gas by subjecting them, preferably in a maintained vacuum, to a magnetic field of sufficiently high frequency and intensity to heat these bodies to a desired temperature.

I have shown diagrammatically in the accompanying drawing a high frequency induction heater applied to Figure 1 to the preparation of a vacuum tube, and in Fig. 2, to the preparation of a gas-filled arc device.

The electron discharge device shown in Fig. 1 comprises a glass envelop 3 into which

are sealed conductors leading to a filamentary cathode 4, mounted on a support 5, and an anode 6 consisting, for example, of tungsten, molybdenum, platinum, or the like. The anode 6 is mounted upon a support 7 which is sealed into the container. A grid 8 is located between the anode and the cathode whereby the electron current in the device may be controlled. As this device, commonly known as a pliotron, is well known and is here shown as illustrative of a class of devices which may be advantageously treated in accordance with my invention, the structural features of the device need not be described in greater detail.

In accordance with my invention, conductive parts within the bulb 3 and particularly the anode, are heated by a magnetic field induced by a winding 9, which may be slipped over the device in any convenient way. The winding 9 is connected to a source of high frequency current (not shown) by the conductor 10, 11.

The pliotron preferably is given the usual preliminary bake-out to remove water vapor before being placed in the high frequency field. Before or during the application of the field the envelop is exhausted to a low pressure by a suitable vacuum pump (not shown) through a tubulature 12. Preferably the device to be exhausted is not subjected to the high frequency field until the residual gas pressure in the envelop 3 is as low as a few microns, or even lower.

The high frequency current induced in the anode 6 should be sufficient to heat the anode to bright redness and envelop gas occluded therein. The pump is continued in operation during this heat treatment to remove gases evolved from the anode. This degasifying treatment is continued until no more gases are evolved. In many cases, the deleterious gases are effectually removed in a few minutes. In other cases, the high frequency field may be applied advantageously for half an hour, or even longer.

The device shown in Fig. 2 is adapted for operation with an arc-like discharge in suitable gases, such, for example as nitrogen, argon, hydrogen, mercury vapor, or the like. A form now in general use in installations for charging batteries is known as the tungar rectifier. The bulb 13 likewise is connected to a pump (not shown) by a tube 12. The anode 14 in this case usually consists

of graphite, but may consist of various other conductive materials.

The bulb is baked out and exhausted in the usual manner, and when the residual gas pressure has been reduced to a low value, say, a few microns or less, the anode and other conductive bodies within the bulb are heated by a high frequency magnetic field, pumping being continued as described in connection with Fig. 1. After substantially all occluded gases have been removed, the high frequency coil is removed and a desired gaseous filling is introduced into the bulb 13, which is finally sealed.

My invention is applicable not only to the treatment of electrodes in vacuum tubes, but is equally applicable to heat any conductive body in an envelop rendering the usual methods of heating difficult or impossible. It is important in many cases to prevent the slow evolution of gas from conductive parts in vacuum tubes which are not ordinarily traversed by enough electric current to heat them to a high temperature. In other cases, it may be desired to heat or even to vaporize metal not connected in any way to an electric circuit but sealed within an envelop. This may readily be done by my improved method.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. The method of removing gas from electrically conducting masses which consists in

materially reducing the gaseous pressure in the environment of said masses and heating said masses to an elevated temperature by electric induction at sufficiently high frequency to make interlinkage with a magnetic core unnecessary.

2. The method of removing gas from conducting bodies inclosed within an envelop which consists in subjecting said bodies to a high frequency variable magnetic field of sufficient strength to heat said bodies sufficiently to eliminate said gas.

3. The method of preparing electric discharge devices having conducting bodies inclosed within an envelop which consists in heating said bodies by a high frequency magnetic field to remove gas therefrom, removing said gas from said envelop and sealing said envelop.

4. The method of preparing thermionic devices to be operable with a substantially pure electron discharge which consists in evacuating said devices at an elevated temperature, heating conductive masses in said device, such as an anode, to a high temperature with a high frequency magnetic field while continuing the evacuation to remove gas evolved from said masses, and sealing said devices while highly evacuated.

In witness whereof I have hereunto set my hand this 12th day of March, 1920.

JNO. B. PRATT.