

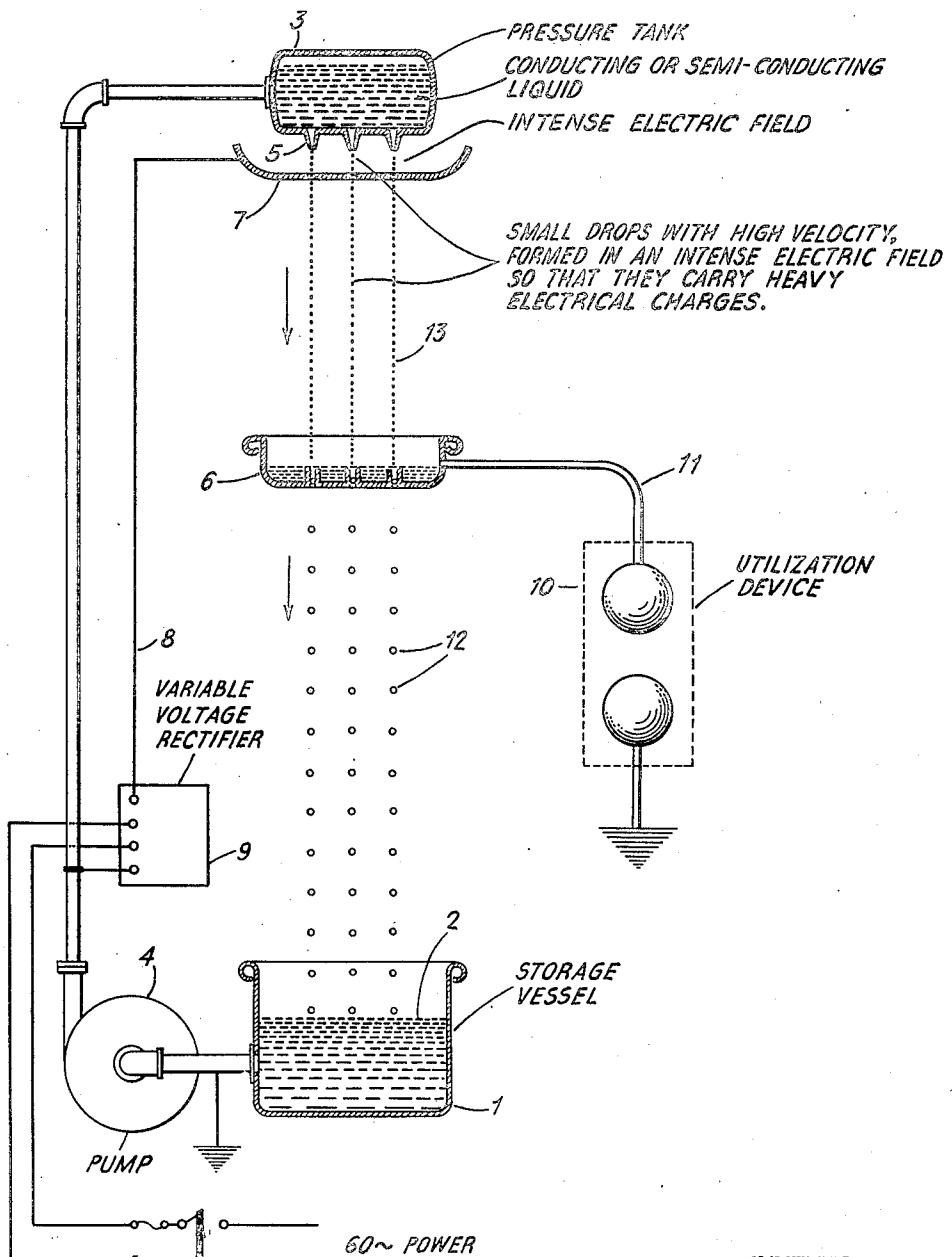
April 27, 1937.

C. W. HANSELL

2,078,760

HIGH VOLTAGE GENERATOR

Filed April 9, 1935



INVENTOR  
CLARENCE W. HANSELL  
BY *H. S. Brown*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,078,760

## HIGH VOLTAGE GENERATOR

Clarence W. Hansell, Port Jefferson, N. Y., assignor to Radio Corporation of America, a corporation of Delaware

Application April 9, 1935, Serial No. 15,408

9 Claims. (Cl. 171—329)

The present invention relates to high voltage generators.

One of the objects of the present invention is to provide a simple and highly efficient generator for the production of extremely high voltages.

5 Another object is to enable the generation of high voltages by the continuous accumulation of successively acting electrostatic charges upon a vessel or an electrode.

10 In brief, the invention comprises an arrangement in which small streams of conducting or semi-conducting liquid are broken up into drops which are subjected to an intense electric field in a direction parallel to the motion of the liquid. Each drop of the liquid as it is formed acquires a considerable amount of electric charge which, as soon as the drop separates from the main stream, is bound upon the drop and cannot escape from it. These drops with their electrostatic charges are caught in a vessel of conducting material and give up their respective charges as soon as they come in contact with the vessel or the liquid within it. In this manner the vessel continuously acquires charges from the conducting liquid drops and builds up a very high 20 potential. The vessel in its preferred form is insulated from ground in order to prevent leakage or energy dissipation, and the charge on the vessel utilized by any suitable circuit requiring extremely high voltage, such as X-ray apparatus.

25 30 The invention is hereinafter described in more detail in connection with the accompanying drawing, showing, by way of example, a preferred form of apparatus embodying the principles of the invention.

35 The single figure of the drawing is a schematic illustration of the invention.

In the drawing there is shown a storage vessel 1 containing a conducting or semi-conducting liquid 2, which is pumped up to pressure tank 3 by means of a suitable pump 4. The liquid in tank 3 escapes in the form of small drops through small nozzles or holes 5 and falls upon an intermediate storage vessel 6. An intense electric field caused by the application of voltage to a plate 7 through connection 8 and a variable voltage rectifier 9, the latter of which is supplied from a 60 cycle power source, as shown, causes the escaping liquid drops flowing from nozzles 5 to acquire an electric charge which is given up to vessel 6 when the conducting liquid drops contact either the vessel 6 or the liquid contained therein. The potential built up on vessel 6 is utilized by any suitable device 10, herein shown in conven-

tional box form, connected to vessel 6 by means of conductor 11.

In order that the production of the high voltage may be a continuous process, it is preferred to drain the liquid out of vessel 6 continuously but under such conditions that the liquid leaving the intermediate vessel carries no charge with it. This is accomplished by allowing the liquid in vessel 6 to flow therefrom in the form of relatively large drops 12 which have a small electrostatic capacity per unit of volume compared with the small drops 13 originally falling into the vessel 6. Thus the arrangement functions because of the difference in size of the drops 12 and 13. In the preferred embodiment, the large drops 12 are arranged to leave vessel 6 in such a location and under such conditions that there is no electrostatic potential gradient; in other words, drops 12 carry no charge, and all the charge carried to vessel 6 by small drops 13 are stored 10 in the electrostatic capacity of vessel 6, thus building up a maximum of voltage or delivering a maximum of power to utilization device 10. As shown in the drawing, the drops leaving vessel 6 do so at points which are electrically 20 shielded so that substantially no charge is carried 25 by the drops when they sever contact with the vessel.

It will be understood, of course, that the invention is not limited to the precise arrangement of parts shown since these may be modified without departing from the spirit and scope of the invention.

What is claimed is:

1. A high voltage generator comprising an electrical supply source, a storage vessel containing a liquid having conducting properties, an elevated pressure tank, a pump for drawing said liquid from said storage vessel up to said elevated tank, said tank having a plurality of apertures for enabling said liquid to escape in small drops, a second storage vessel for collecting said small drops, means comprising a metallic plate located near the path of travel of said small drops from said elevated tank to said second storage vessel for producing an intense electric field for causing said drops to acquire electrostatic charges, said charges being given up to said second storage vessel, means for enabling the liquid collected in said second vessel to escape therefrom in the form of larger drops having less electrostatic capacity per unit of volume than said smaller drops, and a utilization device connected to said second storage vessel. 35 40

2. A high voltage generator in accordance with

claim 1, characterized in this, that said first storage vessel is adapted to collect the larger drops escaping from said second vessel.

3. A high voltage generator comprising an electrical storage supply source, a storage vessel containing a liquid having conducting properties, an elevated pressure tank, a pump for drawing said liquid from said storage vessel up to said elevated pressure tank, said tank having a plurality of apertures for enabling said liquid to escape in small drops, a second storage vessel for collecting said small drops, means comprising a metallic plate located near the path of travel of said small drops from said elevated tank to said second storage vessel for producing an intense electric field for causing said drops to acquire electrostatic charges, said charges being given up to said second storage vessel, means for enabling the liquid collected in said second vessel to escape therefrom in the form of larger drops having less electrostatic capacity per unit of volume than said smaller drops, said second storage vessel being located underneath said pressure tank, and said first storage vessel being located below said second vessel for collecting the larger drops escaping from said second vessel, said escaping drops from said tank and second vessel being caused by the pull of gravity.

4. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, means for raising the level of said liquid, a tank elevated above the level of said liquid source, fluid communication means between said liquid source and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, an electrical connection between said elevated tank and said metallic plate whereby an electrical field is set up to charge said liquid as it drops, a storage vessel for collecting and accumulating the electrical charge of said drops, and a utilization circuit connected to said storage vessel.

5. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, means for raising the level of said liquid, a tank elevated above the level of said liquid source, fluid communication means between said liquid source and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, a rectifier having its input connected to said electrical supply source, the output of said rectifier being electrically connected to a metallic plate located below said elevated tank and being also connected to said elevated tank whereby an electrical field is set up to charge said liquid as it drops, a storage vessel for collecting and accumulating the electrical charge of said drops, and a utilization circuit connected to said storage vessel.

6. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, a pump for raising the level of said liquid, a tank elevated above the level of

said liquid source, fluid communication means between said pump and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, an electrical connection between said elevated tank and said metallic plate whereby an electrical field is set up to charge said liquid as it drops, a storage vessel for collecting and accumulating the electrical charge of said drops, and a utilization circuit connected to said storage vessel.

7. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, means for raising the level of said liquid, a tank elevated above the level of said liquid source, fluid communication means between said liquid source and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, a variable voltage rectifier having its input connected from said electrical supply source and its output connected to said metallic plate and said elevated tank whereby an electrical field is set up to charge said liquid as it drops, a storage vessel for collecting and accumulating the electrical charge of said drops, and a utilization circuit connected to said storage vessel.

8. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, means for raising the level of said liquid, a tank elevated above the level of said liquid source, fluid communication means between said liquid source and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, a rectifier having its input connected to said electrical supply source, the output of said rectifier being electrically connected to said metallic plate located below said elevated tank and being also connected to said elevated tank whereby an electrical field is set up to charge said liquid as it drops, a storage vessel for collecting and accumulating the electrical charge as it drops, a utilization circuit connected in series between said storage vessel and ground, and a ground connection to said liquid source.

9. A high voltage generator comprising an electrical supply source, a liquid source having conducting properties, means for raising the level of said liquid, a tank elevated above the level of said liquid source, fluid communication means between said liquid source and said elevated tank, means whereby said liquid escapes from said elevated tank in the form of small drops, said means comprising a metallic plate located below said elevated tank, an electrical connection between said elevated tank and said metallic plate whereby an electrical field is set up to charge said liquid as it drops, a storage vessel including shielding means for preventing said collected liquids from acquiring an electrical charge as they leave said storage vessel, and a utilization circuit connected to said storage vessel.

CLARENCE W. HANSELL.