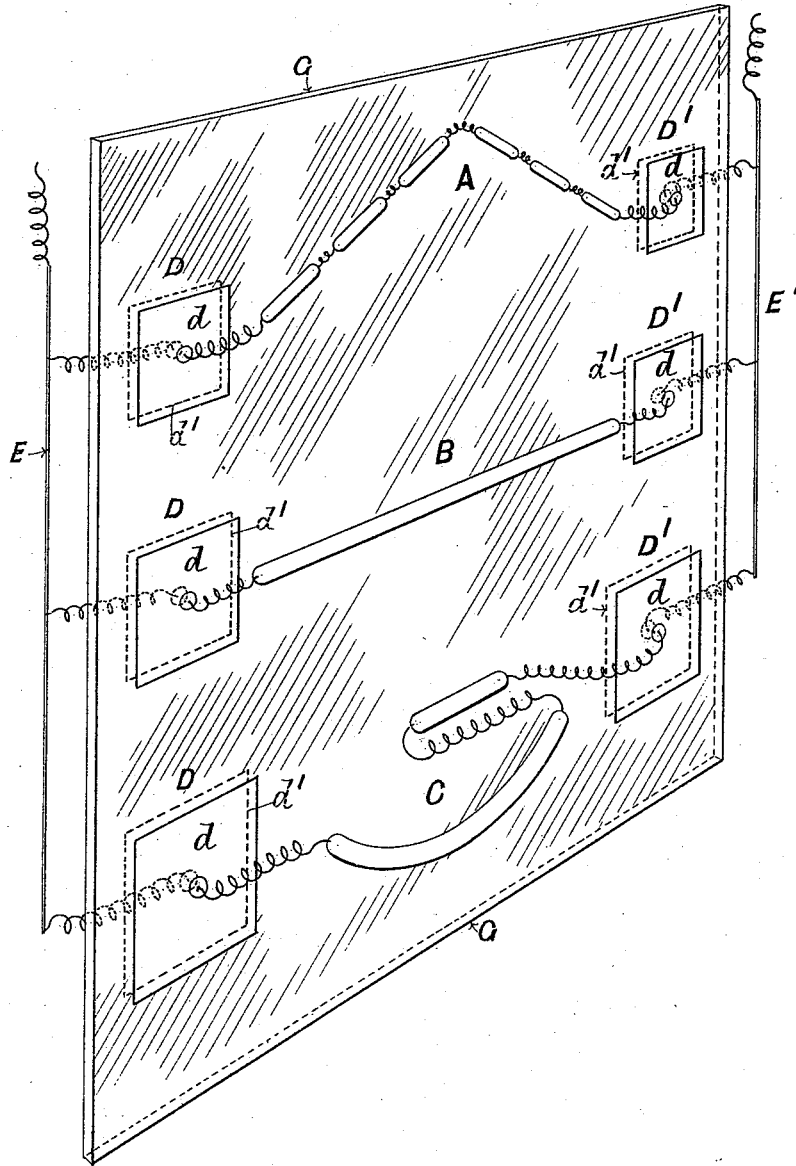


(No Model.)

H. T. BARNETT.
ELECTRICAL EXCITATION OF VACUUM TUBES.

No. 494,239.

Patented Mar. 28, 1893.



Witnesses:
L. M. Hackschlag,
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UNITED STATES PATENT OFFICE.

HARRY THEODORE BARNETT, OF LONDON, ENGLAND.

ELECTRICAL EXCITATION OF VACUUM-TUBES.

SPECIFICATION forming part of Letters Patent No. 494,239, dated March 28, 1893.

Application filed February 5, 1892. Serial No. 420,450. (No specimens.) Patented in England March 14, 1890, No. 4,004.

To all whom it may concern:

Be it known that I, HARRY THEODORE BARNETT, electrical engineer, a subject of the Queen of Great Britain, residing at 16 Hotham Road, London, England, have invented certain new and useful Improvements in the Electric Excitation of Vacuum-Tubes, (for which I have received Letters Patent in Great Britain, No. 4,004, dated March 14, 1890,) of which the following is a specification.

My invention has for its object to render possible the simultaneous and uniform illumination of a number of vacuum tubes by the electric discharge whether the tubes are all alike or of widely different sectional area and length, and when two or more tubes or series of tubes are arranged in parallel. These tubes may be of any desired shape even spherical but for the purpose of this description are always referred to as tubes.

Hitherto it has not been possible to illuminate vacuum tubes by joining them in parallel circuit (in the same way as incandescent lamps) even when they are approximately similar because one will be of slightly lower resistance than the rest and the electric current *in vacuo* being more of the nature of a discharge than a flow will pass entirely or in a far too great quantity through the path of least resistance.

The invention consists essentially in an arrangement of condensers on opposite sides of an independent glass plate, one set of these condensers being connected with a vacuum tube or series of vacuum tubes, while the other set of these condensers are connected with the leads substantially as hereinafter described and set forth. The several condensers have an inductive capacity preferably proportional to the minimum sectional area of, or to the degree of illumination required in, the particular tube or series of tubes with which they are combined so that by this means the electric discharge produced through each path will be under control.

Reference is to be had to the accompanying drawing, forming part of this specification, which illustrates an example of a number of vacuum tubes of different lengths and diameters coupled in multiple series, and showing the general arrangement of the condensers, tubes and connections. Tubes of different

average minimum internal diameters may be arranged in parallel on the leads from the terminals of the secondary wire of an induction coil, a condenser being interposed between both ends of each tube or series of tubes and the adjacent lead or leads, but tubes of the same class only, or of the same average minimum internal diameter should be coupled in series with each other if equal illumination is desired. In either case, the length of any one tube or series is only limited by the sparking length of the coil.

In the example illustrated the length of the coil is supposed to be sufficient to illuminate the greatest length of tube shown.

A B C are the several tubes or series of tubes arranged in parallel and each not exceeding in the aggregate the length which the source of electric energy employed is capable of illuminating all the tubes of one series being of the same class or average minimum diameter, that is to say A comprises a series of six short tubes say one-sixteenth of an inch diameter and having an aggregate length of four feet. B is a single tube of say three thirty-seconds of an inch diameter four feet in length.

C is a series of two tubes of say one-eighth of an inch diameter and of unequal lengths say one foot and three feet in length respectively.

D D' are the condensers at the opposite ends of each tube or series of tubes each composed of two sheets of tinfoil d d' of equal areas affixed to opposite sides of a sheet of glass G which may be common to all the condensers. The terminals of each tube or series of tubes are connected to the respective foils d on the front of the dielectric while the foils d' at the back of the glass are connected with the respective leads E E' from the secondary terminals of the coil (if a coil be used) so that the several tubes or series A B C are as it were in parallel between such leads. The inductive areas of the respective condensers should be directly proportioned to the diameters of the respective sets of tubes, say in the ratio of one square foot of foil to one square inch of tube, sectional area. The inductors of each condenser may however be mounted on a separate sheet of glass and

they need not be affixed to the glass but may be placed at variable distances apart at opposite sides thereof so as to vary their inductive capacity, sheet-tin or other conveniently
5 firm substance being used.

The form of induction coil most suitable for the purpose of illuminating these vacuum tubes is the inductorium without make and break, excited by alternating currents, and
10 insulated by liquid hydrocarbon, which is described in another application for Letters Patent of even date herewith filed by Lazarus Simon Magnus Pyke and myself, Serial No. 420,441, filed February, 1892.

15 What I claim is—

1. In a system of electrically illuminating vacuum tubes, the combination of glass plate G, condensing plates *d d* secured to the same side of said plate, a vacuum tube B connected
20 at each end with a condensing plate *d*, con-

densing plates *d' d'* arranged opposite said plates *d d*, and leads E. E' connecting said plates *d' d'* with an induction coil, all said parts being adapted to operate substantially as described and for the purposes set forth. 25

2. The glass plate G combined with the condensers *d d'*, glass tube or series of tubes A connected at one end with condenser *d*, conductor E connected with condenser *d'* and conductor E' connected with the other end of
30 said tube, said condensers being on opposite sides of the glass plate G, substantially as described and for the purposes set forth.

Dated this 12th day of January, 1892.

HARRY THEODORE BARNETT.

Witnesses:

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