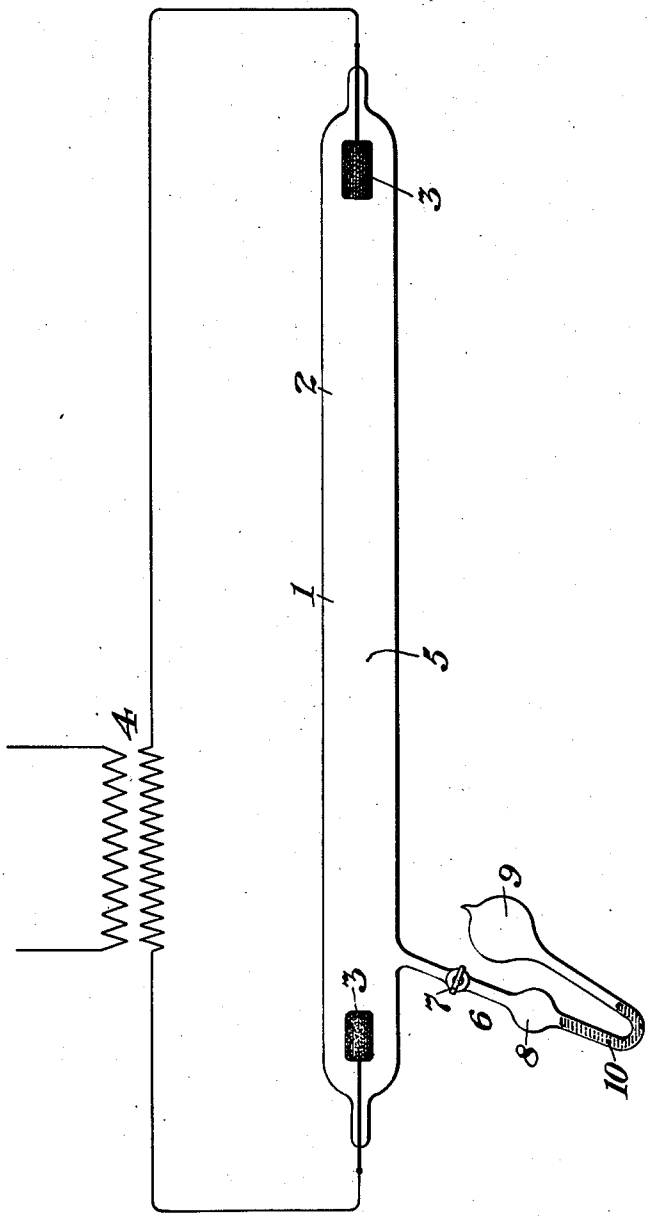
F. G. KEYES.

APPARATUS FOR PRODUCING ULTRA VIOLET RADIATION.

APPLICATION FILED JULY 1, 1913.

1,186,993. Patented June 13, 1916.



Witnesses:
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PRODUCING ULTRA-VIOLET RADIATION.

1,186,993. Specification of Letters Patent. Patented June 13, 1916.

Application filed July 1, 1913. Serial No. 776,758.

To all whom it may concern:

Be it known that I, FREDERICK G. KEYES, a citizen of the United States, and resident of Boston, county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Producing Ultra-Violet Radiation, of which the following is a specification.

My invention relates to means for producing ultra violet light or ultra violet radiation such as is sometimes used for photographic purposes, bleaching, oxidization, sterilization, &c. It has been customary to secure such ultra violet light from mercury vapor apparatus, using, preferably, a quartz tube, which is known to be transparent to such radiation. While such apparatus, which is more commonly constructed with a mercury cathode, is well suited to this purpose, I have discovered that certain advantages can be secured by the use of the present invention which is illustrated in the accompanying drawing, wherein—

1 represents the source of radiation and consists of an inclosing chamber, 2, which may be made of fused silica, certain electrodes, 3, 3, in said tube, and an alternating supply transformer, 4. Within the vapor space indicated at 5 I introduce a gaseous material having the property of generating a large amount of ultra violet radiation. I have found hydrogen to be a suitable material for this purpose. I find it most satisfactory to use a reduced pressure of hydrogen, although any pressure desired in a particular case may be freely utilized. It is well known, especially where a low pressure is used within the container, that an electric discharge tends to dissipate or reduce the amount of gas and disturb the desired condition of operation. I, therefore, provide means for renewing the supply of gas which may, for example, be as shown at 6.

7 represents a gas tight cock separating the main tube chamber from the supplemental chamber, 8, containing hydrogen. I prefer to maintain a relatively low pressure in the chamber, 8, so that a finer control of gas can be obtained by the cock, 7. To provide a larger supply I add a second supplemental chamber, 9, filled with gas at a higher pressure, I maintain the separation between the two chambers, 8 and 9, by means of the mercury trap, 10.

The operation of the apparatus is as follows: When alternating voltage is supplied to the primary of the transformer, 4, a suitable voltage is impressed upon the electrodes, 3, and alternating discharges pass between. These discharges I have found to give large quantities of the desired radiation, partly in virtue of the character of the discharges, partly from the nature of the gas. I make the electrodes, 3, of graphite, tungsten, or other material, though in many cases mercury may be used for one or both, should occasion require. With the apparatus I have shown, I find that there is no deposit of oxid on the inside of the tube since the hydrogen present will combine with any traces of oxygen, making water, which may be present in small quantities without disturbing the operation. Furthermore where there is no liquid electrode material utilized there will be no spattering or condensation of vapor from the liquid upon the walls of the container. As the discharges continue, they may tend to somewhat lessen the vapor pressure in virtue of the occlusion of some of the free gas and I may admit, by means of the cock, 7, a little additional hydrogen from the chamber, 8, to replace that which has disappeared. When upon repeated withdrawals from the chamber, 8, the supply therein has become nearly exhausted, the pressure on the top of the mercury trap, 10, will become less, permitting the mercury to rise until a bubble of hydrogen from the chamber, 9, escapes around the bottom of the trap and reaches the chamber, 8, thus replenishing the supply.

I find hydrogen a particularly advantageous material because it is practically impossible to form solid products from any impurities likely to be found in the tube, when properly prepared, that is when, as I prefer, foreign gases are carefully exhausted and the operating gas introduced in the desired quantity. I recommend as well as hydrogen the use of argon, neon, kyrpton, xenon or helium.

Another advantage of my lamp is that it may be run at a relatively low temperature which is a great advantage in certain classes of work such as the sterilization of milk.

I do not wish to limit my invention to the particular embodiment illustrated in this case, but include all systems producing the same result by equivalent means. For example, for quartz may be substituted any

other material transparent to the ultra violet rays, other forms of electrodes may be used, and other means for producing alternating current.

I claim as my invention:

1. As a means for regulating the supply of gas to a place where the same is to be utilized, a chamber containing a supply of the said gas under comparatively high pressure, a second chamber containing a gas supply under comparatively low pressure, a mercury trap between the two chambers and a cock between the second chamber and the point of utilization.

2. As a means for regulating the supply of gas to a point of utilization, two chambers containing supplies of the gas at different pressures, a mercury trap between the chambers, and means for permitting the withdrawal of a portion of the gas supply from the chamber having the lower pressure, whereby the supply in said last named chamber may be successively replenished from the supply in the low pressure chamber.

3. As a means for regulating the supply of hydrogen to a place where the same is to be utilized, a chamber containing a supply of the said gas under comparatively high pressure, a second chamber containing a gas supply under comparatively low pressure, a mercury trap between the two chambers, and a cock between the second chamber and the point of utilization.

4. As a means for regulating the supply of hydrogen to a point of utilization, two chambers containing supplies of the hydrogen at different pressures, a mercury trap between the chambers, and means for permitting the withdrawal of a portion of the hydrogen supply from the chamber having the lower pressure, whereby the supply in said last named chamber may be successively replenished from the supply in the higher pressure chamber.

Signed at New York in the county of New York and State of New York this 27th day of June A. D. 1913.

FREDERICK G. KEYES.

Witnesses:

WM. H. CAPEL,

THOS. H. BROWN.