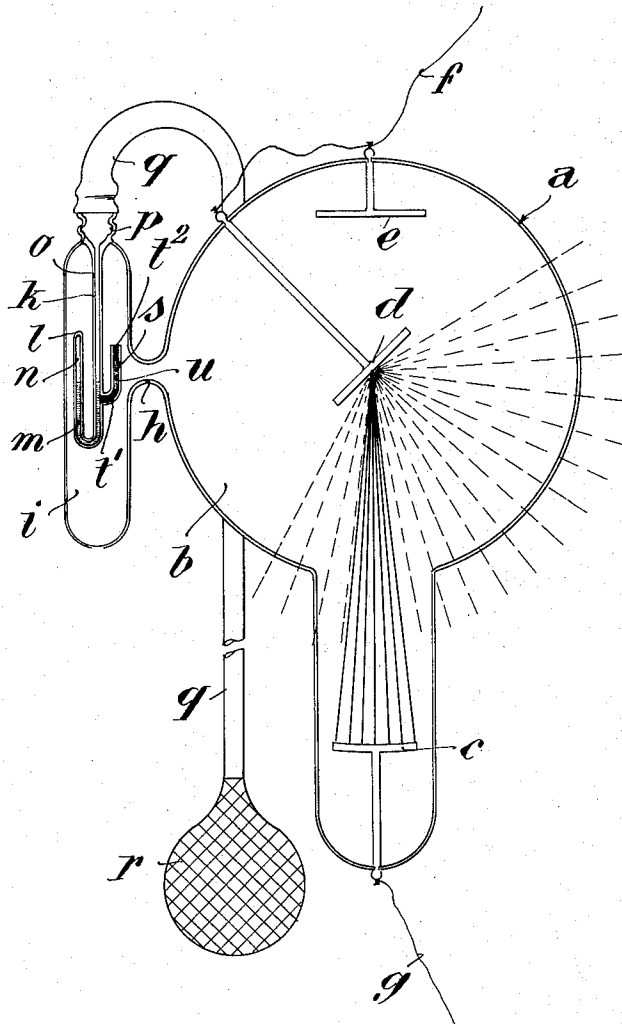


H. BAUER.
 REGENERATIVE DEVICE FOR ROENTGEN TUBES.
 APPLICATION FILED AUG. 28, 1911.

1,047,881.

Patented Dec. 17, 1912.



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UNITED STATES PATENT OFFICE.

HEINZ BAUER, OF BERLIN, GERMANY.

REGENERATIVE DEVICE FOR ROENTGEN TUBES.

1,047,881.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HEINZ BAUER, a subject of the German Emperor, and residing at Berlin, Germany, have invented certain new and useful Improvements in Regenerative Devices for Roentgen Tubes, of which the following is a specification.

My invention relates to regenerative devices for apparatus for producing Roentgen rays and the like.

It is well known that vacuum tubes within which electrical discharges take place obtain owing to these continued electric discharges a constantly higher vacuum which would finally render them unusable. To prevent this, such vacuum tubes are provided with a regenerative device by which small quantities of air or gas can be admitted into the tubes. Regenerative devices used heretofore require special care in manipulation and, above all, the operator attending them has to be in immediate proximity to the Roentgen tube.

Now a primary object of my invention is to provide a very simple regenerative device able to be actuated from a distance.

My device comprises a column of mercury or similar liquid which is to be moved by the pressure of air or gas, and by varying the pressure of the air or gas releases or closes means which are permeable to air and indeed all gaseous and vaporous substances, but are impervious to liquids.

One illustrative embodiment of my invention is represented by way of example in the accompanying drawing.

Referring to the drawing, *a* designates a Roentgen tube into whose evacuated chamber *b* project the cathode *c*, the anticathode *d* and the anode *e* connected with the latter. The anode *e* and the cathode *c* are connected by conductors *f* and *g* with a generator of high tension current, not shown.

The chamber *i* of the regenerative device is connected by a tube *h* of any suitable shape with the chamber *b* of the Roentgen tube. Into said chamber *i* projects a U-tube *k* or a tube of like shape closed at its one end at *l*. Mercury or a similar liquid is filled into the U-tube *k* in such manner that a chamber *n* filled with air or other gaseous body is formed between its one end and the end closed at *l*. The open limb *o* of the tube is formed as a branch *p* on which a tube *q* provided with a bulb *r* can be placed. Somewhat below the level of the mercury

in the open limb of the tube this limb is provided with a branch *s* which is closed both at its end located nearest the tube *k* and also at its other end opening into the chamber *i* with a porous stopper *t'*, *t''*. These stoppers are pervious to air and other gaseous or vaporous substances, but not to mercury and similar liquids. Between the two porous stoppers is a mass *u* of suitable material such as gold beaters' skin, metal shavings or the like.

The described apparatus operates as follows:—When the vacuum has become too high in the chamber *b*, the bulb *r* is pressed at any desired place. The mercury in the open limb *o* is hereby caused to sink and compresses the air or gas in the chamber *n* in the closed limb of the tube *k*. As soon as the mercury has sunk so far that the porous stopper *t'* is no longer contacted by mercury, the air or other gaseous substance in the tube *q* and the bulb *r* penetrates through the porous stopper *t'*. The gas traverses the filtering mass *u* and is here liberated from any particles of liquid or mercury which have been accidentally carried along. The gas purified in this manner flows through the second porous stopper *t''* into the interior *i* of the regenerative device and in this manner increases the pressure below atmospheric existing in the chamber *b* of the Roentgen tube *a*. When this pressure below atmospheric is sufficiently increased, for which purpose only very small quantities of gas or air are requisite, the bulb *r* is released whereupon the mercury or other sealing liquid employed rises so far in the open limb *o* of the tube *k* that the porous stopper *t'* is completely shut off by the liquid from the air or gas chamber in the tube *q* and its bulb *r*.

I claim:—

1. In apparatus for producing Roentgen rays, regenerative means comprising a tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means for producing gas pressure connected with the other end of said tube for moving the column of liquid, and means pervious to gases but impervious to liquids controlled by the column of liquid.

2. In apparatus for producing Roentgen rays, regenerative means comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means for producing gas

pressure connected with the other end of said tube for moving the column of liquid, and means pervious to gases but impervious to liquids controlled by the column of liquid.

5 3. In apparatus for producing Roentgen rays, regenerative means comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, a tube provided with a bulb
10 connected to the other end of the said bent tube, and means pervious to gases but impervious to liquids controlled by the column of liquid.

4. In apparatus for producing Roentgen
15 rays, the combination, with a Roentgen tube, having a branch, of regenerative means comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means connected with the said bent tube for moving
20 the column of liquid, and gas-filtering means connected to the said bent tube and in open relation with the said branch of the Roentgen tube, said filtering means being normally sealed at one end and shut off from
25 the said former means by the column of liquid.

5. In apparatus for producing Roentgen rays, the combination, with a Roentgen tube
30 having a branch, of regenerative means comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means connected with the said bent tube for moving
35 the column of liquid, and gas-filtering means comprising a tube, a stopper pervious to gas and impervious to liquid in the latter, and means for cleaning gas from liquid particles in the tube, the latter tube being connected
40 to the said bent tube and in open relation with the said branch of the Roentgen tube, said filtering means being normally sealed

at one end and shut off from the said former means by the column of liquid.

6. In apparatus for producing Roentgen
45 rays, the combination, with a Roentgen tube having a branch, of regenerative means comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means connected with the said bent tube for moving
50 the column of liquid, and gas-filtering means comprising a tube, a stopper pervious to gas and impervious to liquid in each end of the latter, and means for drying gas between
55 the stoppers, the latter tube being connected to the said bent tube and in open relation with the said branch of the Roentgen tube, said filtering means being normally sealed at one end and shut off from the said former
60 means by the column of liquid.

7. In apparatus for producing Roentgen
rays, the combination, with a Roentgen tube having a branch, of regenerative means
65 comprising a bent tube closed at one end and containing a column of liquid inclosing gas at the closed end of the tube, means connected with the said bent tube for moving the column of liquid, and gas-filtering means comprising a tube, a stopper pervious to gas
70 and impervious to liquid in each end of the latter, and gold beaters' skin between the stoppers, the latter tube being connected to the said bent tube and in open relation with the said branch of the Roentgen tube, said
75 filtering means being normally sealed at one end and shut off from the said former means by the column of liquid.

In testimony whereof, I affix my signature in the presence of two witnesses.

HEINZ BAUER.

Witnesses:

HENRY HASPER,
BRUNO A. BRUCE.