

Patented Dec. 7, 1920.  
2 SHEETS—SHEET 1.

1,361,710.

Fig.1

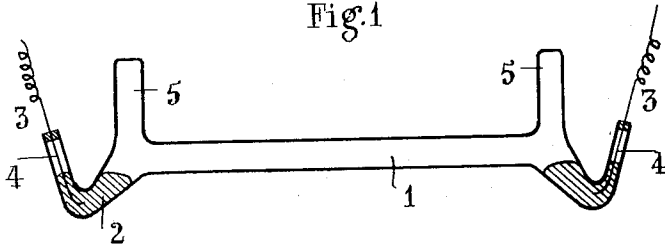


Fig. 2

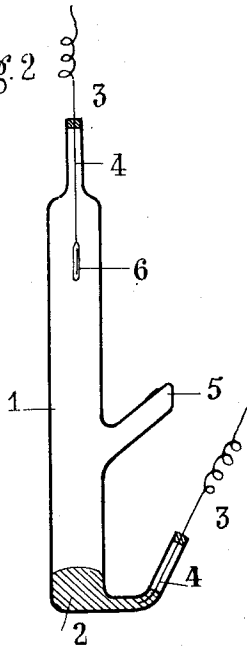
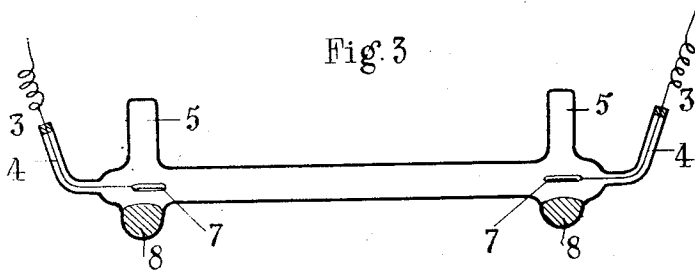


Fig. 3



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1,361,710.

2 SHEETS—SHEET 2.

A technical drawing of a mechanical assembly, likely a valve or actuator. The drawing includes the following numbered components:

- 1**: A long, angled arm or lever.
- 2**: A circular component, possibly a piston or a seal, at the end of the arm.
- 3**: A coiled spring attached to the arm.
- 4**: A rectangular block or housing.
- 5**: A large, U-shaped component, possibly a valve body or a housing.
- 9**: A curved, flexible component, possibly a bellows or a seal.
- 10**: A circular component, possibly a piston or a seal, at the end of the arm.
- 11**: A circular component, possibly a piston or a seal, at the end of the arm.
- 12**: A curved, flexible component, possibly a bellows or a seal.
- 13**: A curved, flexible component, possibly a bellows or a seal.

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# UNITED STATES PATENT OFFICE.

HENRI GEORGE, OF PARIS, FRANCE.

## QUARTZ MERCURY-VAPOR LAMP.

1,361,710.

Specification of Letters Patent.

Patented Dec. 7, 1920.

Application filed April 11, 1919. Serial No. 289,330.

*To all whom it may concern:*

Be it known that I, HENRI GEORGE, a citizen of the Republic of France, and a resident of 167 Rue de Vaugirard, Paris, France, have invented new and useful Improvements in Quartz Mercury-Vapor Lamps, of which the following is a specification.

Ordinary mercury vapor lamps can only work when a continuous current is used. The present invention relates to a quartz mercury vapor lamp that can work with an alternating current; this result is obtained by utilizing, for starting the arc, an inert gas such as nitrogen, neon or the like, the lamp working as a luminescence tube, until the mercury is vaporized and the arc can pass through the mercury vapor.

A lamp apparatus constructed according to the invention, in one form, comprises reservoirs into which, as soon as normal working is attained, the inert gas will flow back and be retained so as not to diminish the efficiency of the mercury arc.

The accompanying sheets of drawings represent diagrammatically, by way of examples, different ways of carrying out the invention. Figures 1, 2 and 3 are each an axial section, and show three different arrangements; and Fig. 4 is a section on an enlarged scale, of a portion of a further modification. In the several figures corresponding parts are denoted by the same reference numerals.

The lamp shown in Fig. 1 consists, essentially, of an illuminating quartz tube 1 connecting two small reservoirs or chambers 2 filled with mercury. These chambers are provided with electrodes 3, formed of tungsten wire 4 set in the quartz. The lamp contains an atmosphere of inert gas under a pressure of some centimeters of mercury. This pressure depends upon the diameter of the illuminating tube, for example, for a tube having an internal diameter of 15 mm., a mercury column of 1 cm. suffices. At each extremity of the tube 1 there is connected a reservoir 5. The lamp is mounted directly on the terminals of an alternating circuit whose voltage is in keeping with the nature of the gas constituting the atmosphere within the lamp; thus by employing an atmosphere of neon gas, the voltage can be 500 volts; this voltage can be increased if nitrogen be employed. It is well to have a self-inductance in series, but this is not absolutely necessary.

The functioning is as follows: On the closing of the interrupter, the tube is immediately lighted up as a luminescence tube, the arc passing through the inert gas atmosphere. The mercury which constitutes the electrode is at once vaporized; the intensity increases and passes from the order of luminescence to that of the arc in mercury vapor. The internal pressure exceeds 1 kilogram per square centimeter, and the arc assumes the form of a very brilliant cord. The presence of the inert gas necessary for starting off, should, it would seem, lower the efficiency of the mercury arc, but experience shows that, with the arrangement used, the gas and mercury vapor do not mix and that the gas tends, during the working, to localize itself apart from the arc in the cool portion of the tube. The gas localizes itself then in the reservoir 5, provided to receive it, and the illuminating tube will only contain vapor of mercury; these reservoirs thus have for effect the increase of efficiency.

The length of the illuminating tube 1 and its diameter are functions of the voltage of the connections. It may be of any form and the reservoirs 5 may also be of any form and be disposed anywhere on tube 1.

In the arrangement of Fig. 2, the lamp is constructed for working in a vertical position; the upper electrode 3 is formed by a tungsten plate 6.

In the arrangement of Fig. 3, the two electrodes are formed by tungsten blades 7, and the mercury vapor for forming the arc is produced by small quantities of mercury 8 situated in the neighborhood of the electrodes 7 in appropriate receptacles.

These lamps are suited for all usages and in particular for industrial lighting and the production of ultra-violet rays for all purposes.

Fig. 4 represents a form preferably employed for the construction of the lamp according to the invention.

The wire 4 traverses the quartz and conducts current to a spherical bulb 10 full of mercury and communicating with the chamber 2, containing also mercury, by the opening 11 arranged in the side of the bulb farther from the so-called illuminating tube 1. This arrangement has for its object to avoid, in case of the diminution of volume of the mercury in reservoir 2, the non-starting of the arc on the wire 4 and the putting of it out of use. It is also seen that with

this arrangement, the lamp contains a very small quantity of mercury, which permits of an almost instantaneous change from luminescence to arc.

5 The illuminating tube 1 is, in the vicinity of the electrodes, very restricted and narrow at 9. The level of the mercury is indicated at 12. This arrangement automatically assures the constancy of the levels of the mercury in the two reservoirs 2. In fact if for any reason one of the mercury electrodes is heated more than the other, mercury accumulates on the cool electrode; the mercury so condensed leads the end of the arc into the straight and narrow portion 9 of the tube. The mercury becomes more heated and the quantity which was condensed on the cooler electrode is vaporized and transferred to the other electrode where the level of the mercury has been lowered and is also cooler.

When the lamp is extinguished, the internal pressure falls and the mercury of the electrodes commences to boil; the illuminating tube 1 is suitably curved so that the drops of mercury projected at this moment of boiling into the illuminating tube will return to their place in 2 for the subsequent lighting.

30 The reservoirs 5, in which accumulates the inert gas serving for the starting passage of the arc, are connected to the illuminating tube 1 by restrictions 13 in order that the arc may not enter the reservoirs.

35 It is evident that, without departing from the principle of the invention, a large num-

ber of detail modifications in regard to the construction of the mercury vapor lamp can be made.

Having thus described the nature of the said invention and the best means I know for carrying the same into practical effect, I claim:

A mercury vapor lamp operated by means of an alternating current, comprising an illuminating quartz tube, a chamber containing mercury at each end of said tube, a spherical bulb, full of mercury, located within said chamber and communicating therewith by means of an opening arranged in the said bulb in the side opposite the illuminating tube, a wire leading the alternating current into said spherical bulb through a quartz seal, an atmosphere of inert gas under pressure filling the illuminating tube for starting the passage of the arc until the mercury be vaporized and the arc can pass through the mercury vapor, reservoirs provided on the illuminating tube for receiving said inert gas after starting and during normal functioning of the lamp, the said chambers, filled with mercury at both ends of the illuminating tube, communicating with the illuminating tube only by a restricted passage with thick walls.

I testimony whereof I have signed my name to this specification.

HENRI GEORGE.

Witnesses:

CHARLES JONY,  
H. DEFÉVRIMONT.