

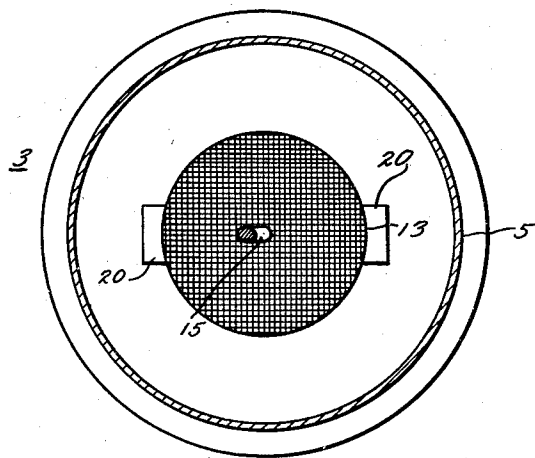
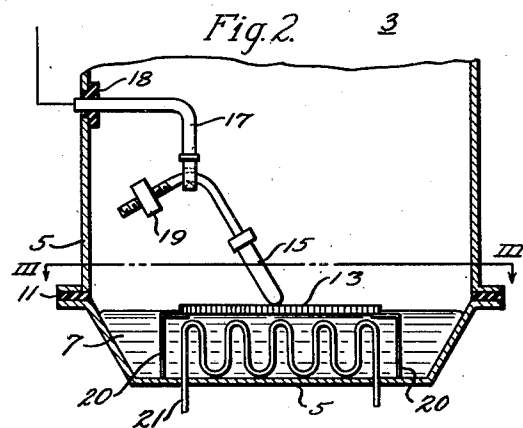
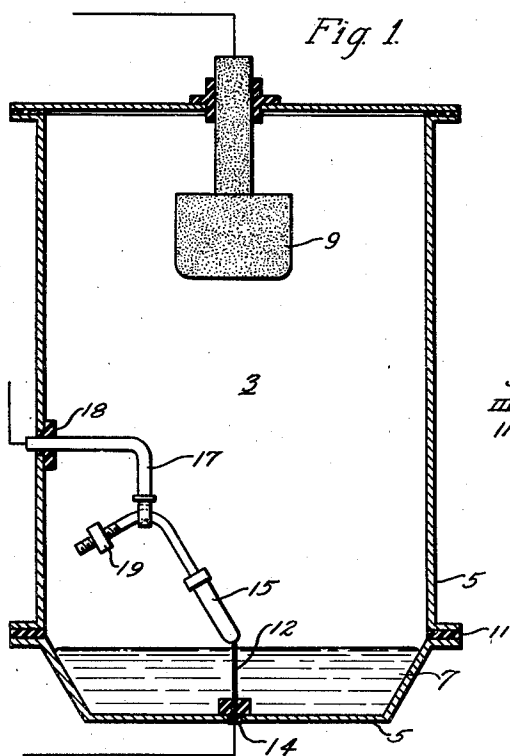
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2,169,032

VAPOR-ELECTRIC CONVERTER

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WITNESSES:

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VAPOR-ELECTRIC CONVERTER

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5 Claims. (Cl. 250—27.5)

My invention relates to a vapor electric converter and more particularly to refractory electrodes of the type mounted in a mercury pool and in contact with a make-alive electrode.

5 In the operation of vapor electric converters of the type provided with a make-alive electrode in contact with a pool-type cathode, one of the disadvantages was found to be in the operating current required. Various solutions of this prob-
10 lem have been proposed and appear to be substantially satisfactory with regard to reliability. One solution is to maintain in a fixed position the cathode spot of the mercury arc by mount-
15 ing some suitable spot-fixing body in the mercury cathode. By such a construction, the liability of the arc to excessive movements over the cathode surface, which produces violent agitation of the mercury, is in part reduced. However, as
20 a practical matter, spot fixing does not in itself reduce the starting current.

Investigations, according to my invention, have led me to believe that a substantial part of the operating current that passes through the make-alive electrode represents wasted power. Where
25 a make-alive electrode of the usual type is dipping into a pool-type cathode and a current allowed to pass through, it will be observed that there is a high density of current at the perimeter of the contact area and hence a high gradient there, whereas that portion of the current within
30 the contact area passes through with no useful purpose accomplished. Briefly then, the smaller the contact area between the metallic body and the high resistance electrode, the lower will be the
35 wasted power. I maintain a light contact by immersing a cooperating electrode having the properties of high refractiveness such as one made of molybdenum or tungsten in a pool-type cathode. A cooperating electrode of this type is mounted so
40 that a portion protrudes above the surface of the mercury. A make-alive electrode of the usual type having a high resistivity is suitably mounted to be in light contact with the projected portion of the cooperating electrode. I maintain this
45 light contact between the two bodies by providing a suitable counterbalancing means to offset a portion of the weight of the make-alive electrode. With the passage of the current through the make-alive electrode, an arc strikes with the
50 cathode on the cooperating electrode and at once the cathode spot spreads to the mercury cathode.

It is, therefore, an object of my invention to provide means for reducing the operating current required in starting an arc discharge in a
55 vapor electric converter.

Another object of my invention is to provide means for reducing the contact area between two cathode spot producing bodies by maintaining such bodies in light pressure engagement.

Another object of my invention is to provide
5 a converter construction whereby the arc drop and energy loss are reduced.

Still further, it is an object of my invention to provide an improved vapor electric converter which will overcome the disadvantages of prior
10 art arrangements and which will be simple and reliable in operation.

Other objects and advantages of my invention will be apparent from the following detailed description taken in conjunction with the accom-
15 panying drawing, in which:

Figure 1 represents diagrammatically a vapor electric converter provided with a cooperating
20 electrode of the type mounted in a pool-type cathode and in contact with a make-alive electrode according to my invention;

Fig. 2 shows one modification of a vapor converter structure according to my invention; and

Fig. 3 represents a detailed view of one modification of the cooperating electrode taken along the line III—III of Fig. 2 in accordance with my
25 invention.

The apparatus according to Figure 1 of my invention comprises a simple vapor electric converter 3 having a metal container 5 and a quan-
30 tity of mercury or other suitable material in a lower portion thereof which forms the cathode 7. An anode 9 is mounted in another portion of the container 5 and is directly exposed to the cathode 7, but is separated therefrom by some suitable insulation 11. A suitable cooperating
35 electrode 12 made of refractive material such as molybdenum or tungsten is mounted in the cathode 7 by means of a support 14 and has a portion projecting above the cathode 7. The portion of the cooperating electrode 12 projecting
40 need not be any particular distance, but I have found that one-sixteenth of an inch proved most satisfactory.

A suitable make-alive electrode 15, preferably
45 one of some resistance material such as boron carbide or silicon carbide, is mounted to be in light contact with the cooperating electrode 12, and is held in such a position by means of a
50 suitable support 17 which extends out from the metal container 5 and insulated therefrom by a suitable insulation 18. In order to maintain a
55 light pressure contact between the cooperating electrode 12 and the make-alive electrode 15, I attach a suitable weight 19 to another side of the

make-alive electrode 15, in order to counterbalance a portion of the weight of the make-alive electrode 15. It is to be understood, however, that the make-alive electrode 15 is not held firmly by the support 17, and I prefer to maintain a rocking action so that if a portion of the tip of the make-alive electrode 15 is burnt off, the unbalance maintained in the electrode structure is sufficient to continually maintain the make-alive electrode 15 in contact with the cooperating electrode 13.

Likewise, it is to be understood that the anode 9 and the cathode 7 are connected externally with a load and some suitable source of supply potential. The make-alive electrode 15 is also intended to be connected externally through a suitable unidirectional device (not shown), such as a half-wave rectifier to a source of exciting potential so as to pass current to the make-alive electrode 15 at a predetermined time with respect to the anode potential. The support 17 serves as a lead-in for the make-alive current in addition to supporting the make-alive electrode 15.

Referring to Fig. 2, the arrangement of the parts is the same as described with reference to Fig. 1, except that the cooperating electrode 13 is of a different pattern as compared to the cooperating electrode 12 of Fig. 1. In Fig. 3, I show a detailed structure of the cooperating electrode 13 such as I have illustrated in Fig. 2. It is to be understood that I do not wish to limit myself to any particular form of the cooperating electrode 13 for that is inconsequential. Nevertheless, I illustrate, by way of example, a cooperating electrode 13 having a gauze-like pattern, although a single wire or any such similar design may be utilized. Where a gauze-like electrode 13 is used, the cathode 7 is cooled preferably by circulating a cooling medium through copper tubings 21 placed beneath the gauze-like electrode 13. Such cooling may be necessary to reduce the quantity of material evaporating from the cathode 7. In this modification, the make-alive electrode 15 is likewise placed in light pressure contact with a portion of the gauze-like electrode 13. In practice, it may be found that a gauze-like electrode 13 suitably supported from the metal container 5 by means of a support 20 is preferred to a single-wire type of electrode in that the danger of losing contact between the cooperating electrode 13 and the make-alive electrode 15 is eliminated.

In the operation of my converter 3, an exciting potential is applied to the make-alive electrode 15 and a cathode spot is produced on the cooperating electrode 13 which is immediately carried over to the mercury cathode 7. Since nearly all of the exciting potential is consumed in the neighborhood of the contact area, that is, between the cooperating electrode 13 and the make-alive electrode 15, due to the fact that the contact area is maintained small, the arc should start with a lower voltage and a lower exciting current, than in the usual type of vapor electric converters which require a minimum operating current of approximately three amperes. According to the present invention, an operating current in the neighborhood of one ampere may be realized without difficulty.

While I have shown and described certain specific embodiments of my invention, it will be apparent to those skilled in the art that many changes and modifications can be made therein without departing from the true spirit of my invention or the scope of the appended claims.

I claim as my invention:

1. A vapor-electric converter comprising an evacuated container, an anode and a pool-type cathode therein, a cooperating electrode of high refractive material immersed in said cathode and having a portion projecting above the surface of said cathode, a starting electrode of high resistance material in point contact with the tip of the projected portion of said cooperating electrode and means for counterbalancing part of the weight of said starting electrode whereby the contact area between said cooperating electrode and said starting electrode is reduced.

2. A vapor-electric device comprising an evacuated container, an anode and a mercury-type cathode therein, a cooperating electrode of high refractive material embedded in said cathode and partially projecting above the surface of said cathode, a make-alive electrode having a resistance portion in point contact with the tip of the projected portion of said cooperating electrode, a counterweight attached to another portion of said make-alive electrode and a support for said make-alive electrode, said make-alive electrode capable of being rocked about said support.

3. In an electric current rectifier of the metallic vapor type, an anode, and a cathode therein, a conducting element immersed in said cathode and partially projecting therefrom, a starting electrode of high resistance material in light pressure engagement with the tip of the projected portion of said conducting element and means associated with said starting electrode including a counterweight for decreasing the weight of said starting electrode.

4. A vapor-electric converter comprising an evacuated container, an anode and a mercury-type cathode therein, a cooperating electrode of refractive material partially immersed in said cathode, a make-alive electrode having a resistance portion substantially in permanent point contact with the tip of the exposed portion of said cooperating electrode, a counterweight attached to another portion of said make-alive electrode and a support for said make-alive electrode, said make-alive electrode being hinged about said support so as to decrease the contact pressure between said cooperating electrode and said make-alive electrode.

5. In a vapor-electric converter comprising an evacuated container, an anode and a mercury-pool cathode therein, a gauze-like element of refractive material immersed in said cathode, a portion of said gauze-like element projecting beyond the surface of said cathode, a make-alive electrode of high resistance material substantially in point contact with a part of the projected portion of said gauze-like element, a supporting means for said make-alive electrode including means for decreasing the weight of said make-alive electrode and a cooling element arranged within said cathode to provide a path for the circulation of a cooling medium therethrough.

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