A. D. JONES.

ELECTRIC ARC LAMP.

APPLICATION FILED SEPT. 16, 1907.

935,518. **Patented Sept. 28, 1909.**

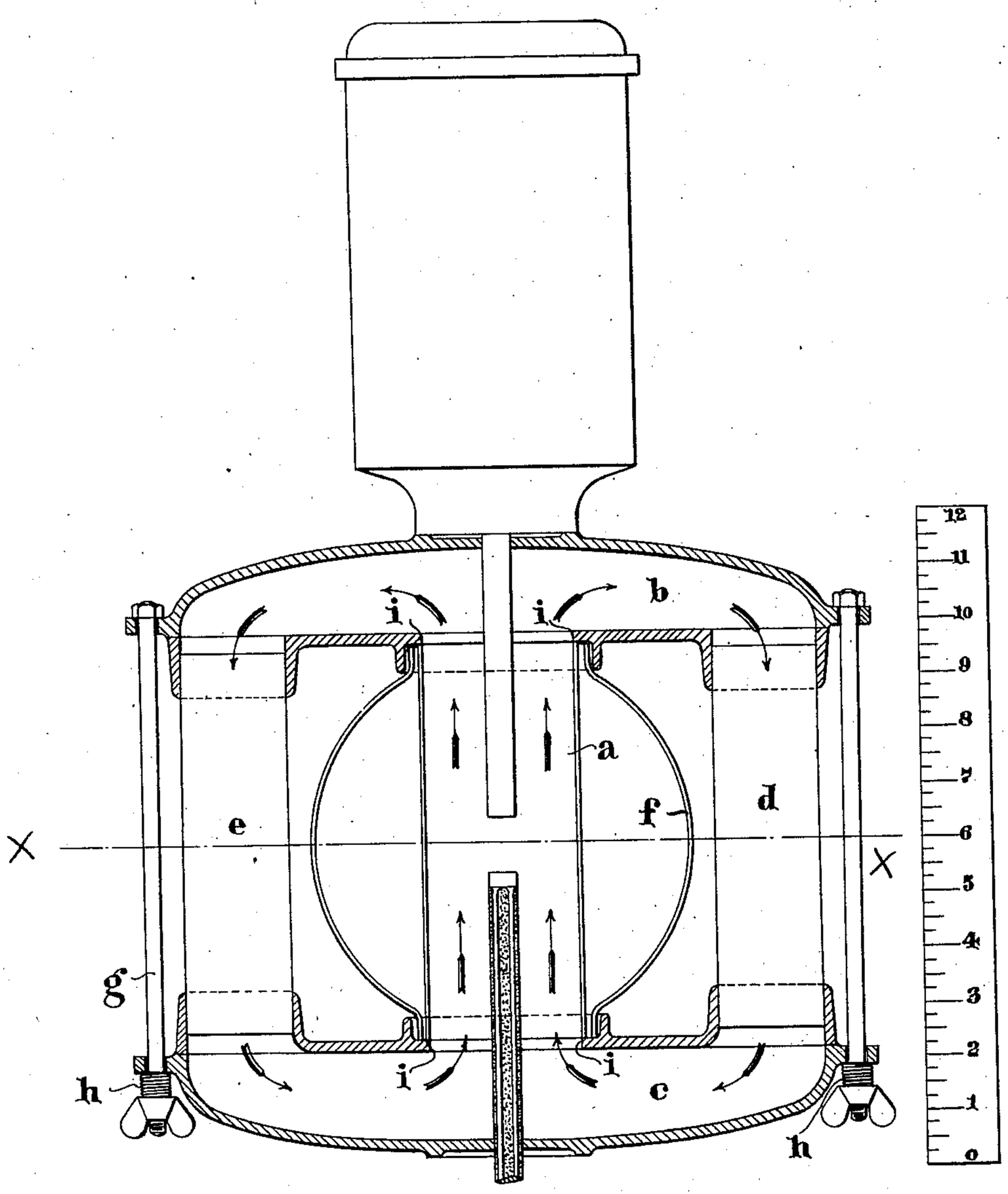

Fig. 1.

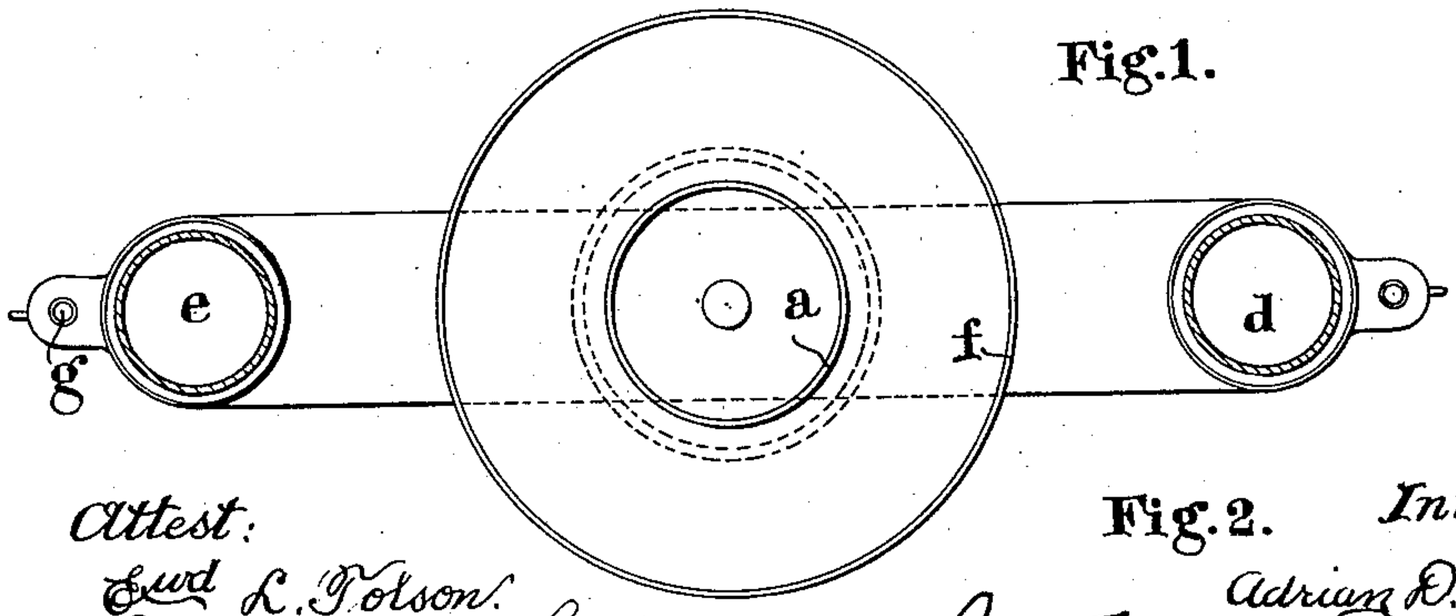

Fig. 2.

Attest:

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UNITED STATES PATENT OFFICE.

ADRIAN DENMAN JONES, OF HOLLOWAY, LONDON, ENGLAND.

ELECTRIC-ARC LAMP.

935,518. Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed September 16, 1907. Serial No. 393,145.

To all whom it may concern:

Be it known that I, ADRIAN DENMAN JONES, a subject of the King of Great Britain and Ireland, and residing at 39 Hartham road, Holloway, in the county of London, England, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to electric arc lamps of the inclosed type in which the arc is burned in an inclosure substantially air-tight.

The object of the invention is to construct an inclosed arc lamp having compound carbons containing chemicals adapted to increase the power and steadiness of the light, the form of the inclosure being such that the chemical vapors are maintained for a long time in the flame, while efficient circulation of the gases is provided for, so that the walls of the chamber surrounding the arc are kept clear of deposit.

I have found that for successful working of inclosed arc lamps using carbons carrying chemicals, it is necessary that the chemicals added should give off vapors having a high vapor density and thus forming a comparatively small arc and therefore a small region within which the electrical energy is dissipated, the effect of this being to raise the vapors in the arc to a high degree of incandescence giving a high light efficiency. I have also found that it is desirable to add salts having a high melting point, and for this reason it is desirable to add a steadying salt which acts as a flux in melting the chemicals to form a uniform liquid before vaporization. I find that with such mixtures no liquid slags are formed, and therefore the troubles caused in other lamps in which chemicals are used are completely avoided.

My invention consists in an inclosed arc lamp in which the electrodes are disposed in a substantially air tight chamber of small capacity formed of a transparent or translucent arc inclosing part and one or more short passages connecting the ends of said part whereby the gases are circulated in such a manner as to substantially prevent the formation of eddies and deposit on the arc-inclosing walls, the hot ascending gases sweeping the walls in a rapid current.

My invention further consists in an inclosed arc lamp having compound carbons containing a mixture of salts of high vapor density and high melting point with the addition of a steadying salt, the carbons being situated in an inclosure of small capacity having a passage or passages connecting its upper and lower ends in such a manner that a current of gases is caused to sweep through the chamber containing the arc.

My invention also consists in the improved flame arc inclosed lamp hereinafter described.

Referring to the accompanying drawings, Figure 1 shows a sectional elevation of a lamp constructed according to my invention; Fig. 2 is a horizontal section on the line X—X, Fig. 1.

In carrying my invention into effect according to one form I provide a transparent or translucent chamber, *a*, in which the electrodes are disposed and which communicates at each end with chambers, *b* and *c*. Passages *d* and *e*, interconnect the chambers, *b* and *c*, so as to provide definite paths for the circulation of the gases and also to provide for condensation of the fumes arising from the combination of the chemicals with which the positive carbon of the electrodes is generally incorporated. A globe, *f*, of any suitable description surrounds the chamber, *a*. The lamp is constructed of three principal parts as shown the center one of which carries the chamber, *a*, and the passages, *d* and *e*, while the upper and lower parts form the top and bottom respectively of the chambers, *b* and *c*. The three parts are connected together by the rods, *g*, in such a manner that the parts can be assembled or taken apart as required with facility and expedition.

The transparent envelop seats against shoulders, *i*, and to maintain air tightness the top and bottom parts must be free to move with the expansion and contraction of the inclosure. To effect this conveniently the tubes forming the passages *d* and *e*, are sweated at one end and a sliding fit in their

sockets at the other while the parts are kept in position by springs, *h*, on the clamping rods, *g*.

The positive electrode is preferably disposed underneath the negative one, and mechanism of the usual type is provided for feeding forward the electrodes as they are consumed.

The heat of arc in the chamber, *a*, causes a strong upward draft of the heated gases therein the gases being then carried over into the chamber, *b*, and from thence being returned to chamber, *a*, by way of the passages, *d* and *e*, and the chamber, *c*. As the temperature of the passages, *d* and *e*, is much lower than that of the chamber, *a*, a large portion of the fumes will be condensed in these passages while the uncondensed portions being returned to the chamber, *a*, their temperature is again raised by the heat of the arc so that deposit on the transparent envelop of the chamber, *a*, is practically prevented below or in the region of the arc.

For the purpose of the compound electrodes I form a mixture of one part calcium tungstate and one part of calcium fluorid, and with this I mix one half part of sodium tungstate or potassium sulfate. This mixture is preferably held in grooves or flutings in the positive carbon electrode and may be pasted or applied to the carbon with any suitable binder, such as dextrin solution, the other electrode being an ordinary carbon electrode. The arc with electrodes of this kind is long and narrow, and with a current of 5 amperes of 70 volts may be 1 inch long and is quite thin. The electrodes may be of considerable dimensions and the positive electrode is preferably at the bottom. In an arc lamp having carbons so arranged, the lower carbon tends to burn away to a point, and as the chemical is placed in flutings around the electrode the point will consist of pure carbon so that when the arc is broken and the electrodes again brought together there will be a contact of pure carbon between the positive and negative electrodes so that the arc is readily restarted.

I find that the mixture I have above described greatly increases the efficiency of the lamp. Calcium tungstate alone would give the arc a purple white color, while calcium fluorid gives a whitish yellow color. The two together however give a brilliant yellow of many times the luminosity given by either separately. The object of the addition of the sodium tungstate or potassium sulfate or other suitable salt is to steady the arc, and I find that the mixture I have above described gives extremely satisfactory results as the arc retains its color and efficiency and burns steadily in inclosures shut off from atmospheric air.

It is found that in an inclosure of the kind above described the uncondensed portions of the fumes arising from the combination of the chemicals as they return through the arc regenerate the chemical vapors therein and increase the efficiency of the light.

The construction of the transparent or translucent chamber and the passage or passages coöperating with it should be such that the gases are introduced below the arc and pass up through the chamber without forming eddies therein. The passages also should be short and unobstructed and so disposed as to produce efficient circulation while the translucent chamber should be substantially air-tight and of as small dimensions as is consistent with the working conditions of the lamp. The translucent chamber should be hotter than the passage or passages, as this will tend to increase the circulation, and prevent deposit on the translucent wall. An outer inclosing globe *f* around the arc will conveniently effect this.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In an electric arc lamp, the combination with an arc inclosing chamber and draft chambers communicating with the upper and lower ends thereof, of an air conduit located outside the arc inclosing chamber and serving to connect the upper and lower draft chambers, said parts being constructed to form a substantially air tight structure and provide an unobstructed passage from the upper to the lower end of the arc inclosing chamber, substantially as set forth.

2. In an electric arc lamp, the combination with an arc inclosing chamber and unobstructed draft chambers communicating with its upper and lower ends, of a plurality of air conduits located outside the arc inclosing chamber and serving to connect the upper and lower draft chambers, said parts being constructed to form a substantially air tight structure and provide unobstructed passages from the upper to the lower end of the arc inclosing chamber, substantially as set forth.

3. In an electric arc lamp, the combination with an arc inclosing chamber, an outer globe, and unobstructed draft chambers communicating with the upper and lower ends of the arc inclosing chamber, of a draft conduit located outside the outer globe and communicating with the upper and lower draft chambers, substantially as set forth.

4. In an electric arc lamp, the combination with an arc-inclosing chamber, an outer

globe and unobstructed draft chambers communicating with the upper and lower ends of the arc inclosing chamber, of a plurality of unobstructed draft conduits located outside the outer globe and communicating with the upper and lower draft chambers, substantially as set forth.

5. In an electric arc lamp, the combination with an arc inclosing chamber, and unobstructed draft chambers communicating with its upper and lower ends, of unobstructed draft tubes connecting said upper and lower draft chambers, and forming therewith a substantially air tight receptacle, substantially as set forth.

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

ADRIAN DENMAN JONES.

Witnesses:
S. NASH,
H. D. JAMESON.