

# Patent nr. 12961

Announcement by Patent Commission

Method for producing electric arcs of maximum surface, especially for useful for chemical fusion or dissociation of gas mixtures or gas types.

**Professor Kristian Birkeland of Christiania**

Representative: Engineer Alfred J. Bryn, (Kristiania.)

Patent in Norway from 20<sup>th</sup> of February 1903.

The presented invention comprise a method for chemical fusion or dissociation of gas mixtures and gas types by means of an electric arc of a special type. As known an electric arc impose chemical effects in gasses, and this effect is in addition to other factors mainly depending on the size of the surface between the arc and gas volume. In prior art aiming to expand of the contact surface it is proposed to arrange and move the electrodes in order to extend the length of the arc until it extinguishes due to the too long distance. This method is however limited to applying low currents and energies at every pair of electrodes.

The inventors method comprise a powerful magnetic field, wherein an electric current DC or AC is passing through a contact point between two conductors which have the ability to perform a vibrating movement. The inventor has verified that under these conditions an arc established between contact points, even if the distance is fractions of a millimeter, will be thrown upwards or downwards whereby a large flat stable disk shaped arc is formed. This disk shaped arc can absorb large energy and currents.

In the following this method, which is well suited for the aforementioned and especially for production of nitrogen – oxygen compounds from air, be given a closer description of the initial example, where the method is applied to oxidation of nitrogen.

The air is passed through a prismatic tube A B, wher the internal is refractory insulating (fig 1, 2 and 3).

A ring shaped electromagnet CDE is arranged as shown in the figures.

The prismatic tube is through separation walls parallel with magnet surface C and D divided in compartments of flat canals. In every compartment there is a special invented contact switch which functions for AC and DC currents and which is creating the described and functional flat arcs.

The contact switch consists simply of two metal rods a b and c d (fig. 2 and 3), which are fixed at the ends a and d, while the ends b and c is kept in well connected by the spring loaded rods. The rod a b is prevented by a stopper from

swinging up, which means the end b is only allowed to move downwards from the equilibrium position.

When a high voltage AC or even a low voltage current of suitable strength goes in parallel through all the contact switches, in which before a suitable inductive resistance is placed, will cause the end b will move down in one case and another case end c will move up, creating a frequent although small contact break. This case results in the aforementioned peculiar phenomenon, where even if the distance between the contact ends is only a fraction of a millimeter, the arc is thrown violently up or down filling the room with flat arcs. The footprints for the outer arcs is drawn on the platinum threads p p' towards the end a and d.

If a fairly high voltage is available, the current can pass partly or fully through the contact switches in series. If only DC current is available, only one of the spring on the contact switches will vibrate and the switches should in this case, not be placed in the center of the magnetic field.

The air can either pass directly through all the flat canals in parallel, or partly in series, or it flows as in the drawing show through the canals in series for the air to flow up passed the first arc and down passed the second, and up passed the third etc. In this way the same air volume comes in contact with a very large number arc disks.

In order for the gasses to come in contact with even more arc disks, several disks and their electromagnet can be placed side by side at suitable space between them.

Instead of the automatic contact switch, as explained above, the sequential fast contact breaks can be done in different ways. It may be possible to use a large tuning fork driven by a small electromagnet. All rods a b, can be connected to the one of the arms of the tuning fork, and when the tuning fork is vibrating the rods are alternatively closing and opening the contact with the rods c d. It is also possible to establish fast movement of the rods ab with c d by means of a small motor with an eccentric gear, or by means of other known principles.

Claims:

1. A method for production of electric arc disks or flat arcs with large surface for absorption of large energy and currents, by in a powerful magnetic field arranging anodic contact points between two conductors being part of an electric circuit which is brought to fast breaking and closing the contact.
2. An apparatus for production of electric arcs according to claim 1 comprising an electromagnet, an electrical circuit, one or more contact

switches inserted into the circuit and arranged in the mentioned magnetic field including means for fast opening and closing the contact switches.

3. An apparatus according to description in claim 2 for production of electric arcs characterized by, the mentioned contact switches are formed by two spring contacts, which is touching each other at their pointed tip, and where the movement is limited by stop pins.
4. Apparatus for production of nitrogen compounds by oxidation of the nitrogen in air by means of an electric arc disk or flat arc, characterized by claim 1 and by the application of what in claim 2 and 3 described apparatus in connection with tubes or canals, which is encompassing the contact switches whereby the air is passed, eventually in such a way, that it is passing several contact switches in series.