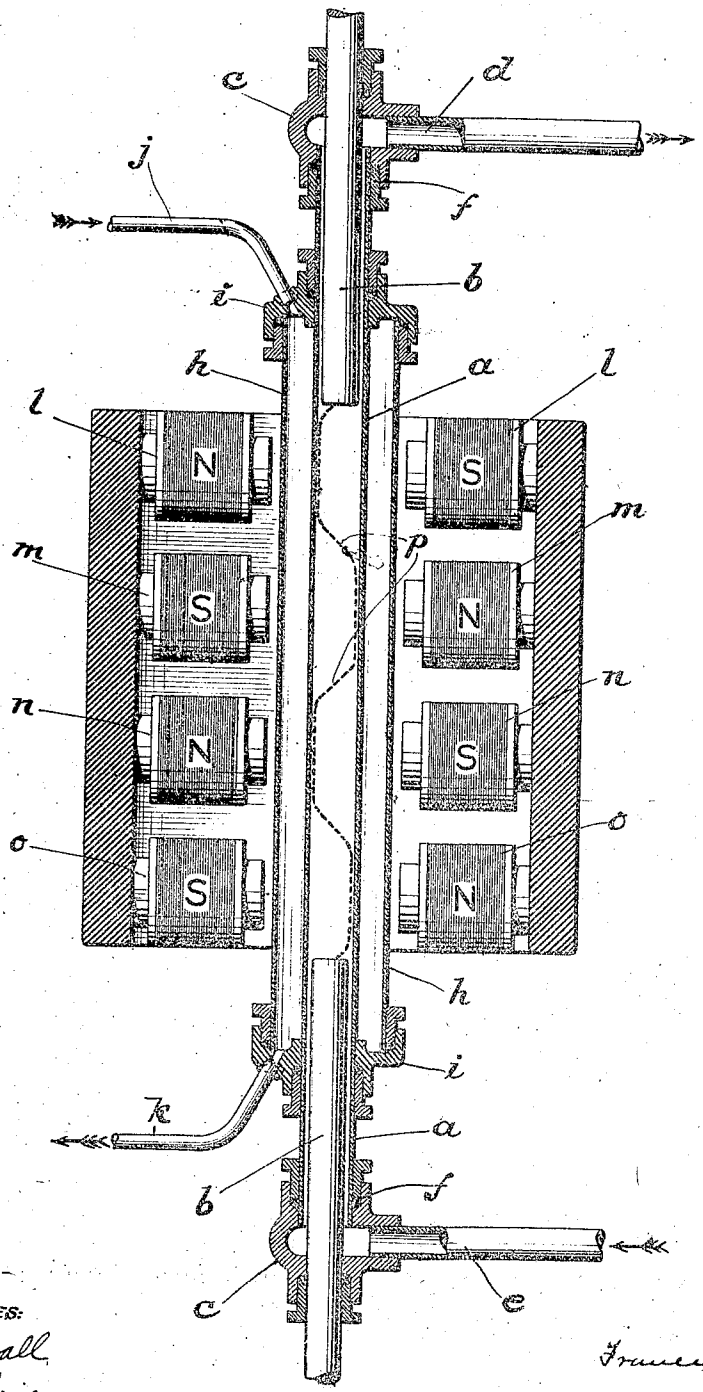
F. I. DU PONT.

PRODUCTION OF OXIDS OF NITROGEN FROM THE AIR.

APPLICATION FILED DEC. 18, 1908.

943,661. Patented Dec. 21, 1909.



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PRODUCTION OF OXIDS OF NITROGEN FROM THE AIR.

943,661. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed December 18, 1908. Serial No. 468,107.

To all whom it may concern:

Be it known that I, FRANCIS I. DU PONT, a citizen of the United States, residing at Wilmington, county of Newcastle, and State of Delaware, have invented a new and useful Improvement in the Production of Oxids of Nitrogen from the Air, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In an application filed by me November 14th, 1908, Serial Number 462,568, I have described and claimed a process for producing oxids of nitrogen from the air. The method as therein described and claimed consists in subjecting the air, in contact with a cooling medium, to the action of a moving or rotating arc whereby the high heating by the arc is immediately and rapidly reduced. In that case the air passing through the tube is subjected to the action of an electric arc therein, which is caused to rotate by means of a rotary magnetic field surrounding the tube at one point. I have discovered certain improvements upon this invention, which improvements consist in providing a plurality of rotating fields at different points, the fields being oppositely placed so that the arc not only rotates but is caused to move along the tube and crossing the space in the tube. By oppositely placed I mean having opposite poles of successive magnetic fields facing each other. By this arrangement throughout the passage of the air it is subjected several times alternately to the high heating of the rotating arc and to the cooling of the cooling medium.

The apparatus I can use to carry out my invention is quite similar to that shown and described in the hereinbefore mentioned application, Serial Number 462,568. Such an apparatus for carrying out my invention is illustrated in section in the accompanying drawing.

In this drawing, *a* is a silica tube within which are the electrodes *b*, connected with a source of current supply, not shown.

c is a cap applied to each end of the tube *a*, the upper cap having the passage *d* and the lower cap the passage *e*. Between the cap *c* and tube *a* is a packing *f* to hermetically seal the connection at that point. The electrodes *b* are hermetically sealed with respect to the cap. The electrodes are provided with proper feeding mechanism. The cap *c* is such that one portion of the cap closely surrounds the tube *a* and another portion closely surrounds the electrodes. Between these two portions of the caps *a* are, respectively, the passages *d* and *e* which connect with the space between the inner wall of tube *a* and the electrodes *b*. The tube *a* is surrounded by a tube *h*, preferably formed of glass in order to see the operation within the tube *a*. The ends of this tube *h* are closed by the caps *i*, one cap having the inlet opening *j* and the other the outlet *k* for the circulation of the cooling medium.

Surrounding the tube *h* between the electrodes *b* are a series of field magnets or rings *l*, *m*, *n* and *o*, which are energized by a polyphase current or currents, thus producing rotating magnetic fields. These field magnets are arranged as shown so that the poles N. and S. are alternately placed. This causes the arc formed between the electrodes not only to rotate but to pass from side to side of the tube, as shown at *p* in the drawing.

In operation, the air is forced through the passage *e* into the zone between the electrodes. When the arc is produced and the rotary magnetic fields in action, the arc is caused to rotate and to be blown from side to side of the tube. This spreads the arc in the tube. By this arrangement, the air will surely have to pass through the arc as many times as the arc crosses over the tube and between passages is cooled by contact with the surrounding cooling medium as in my hereinbefore mentioned previous application. The produced oxids of nitrogen, which are the lower oxids of nitrogen, pass into the space between the electrodes and the wall of the tube, escaping by the passage *d*, from which they may be led into water where they are converted into nitric acid in the ordinary manner.

With the construction forming the subject-matter of the present invention a current of high potential or voltage should be used. In practice I have found 5000 volts or more to be advantageous.

Having now fully described my invention,

what I claim and desire to protect by Letters Patent is:—

1. An apparatus for producing oxids of nitrogen from the air, comprising in combination a cooling surface, which is a non-conductor of electricity, in contact with which the air to be acted on is adapted to pass, electrodes between which an arc longitudinally with respect to said surface is adapted to be produced, and a plurality of oppositely placed rotary magnetic fields extending longitudinally between the electrodes.

2. An apparatus for producing oxids of nitrogen from the air, comprising in combination a container, which is a non-conductor of electricity, means to subject said container to the action of a cooling medium, electrodes, between which an arc longitudinally with respect to the inner surface of said container is adapted to be produced, and a plurality of oppositely placed rotary magnetic fields exterior of the container in the arc space, and extending longitudinally of the container.

3. An apparatus for producing oxids of nitrogen from the air, comprising in combination a surface, which is a non-conductor of electricity, in contact with which the air to be acted on is adapted to pass, electrodes between which an arc longitudinally with respect to said surface is adapted to be produced, and a plurality of oppositely placed rotary magnetic fields extending longitudinally between the electrodes.

4. An apparatus for producing oxids of nitrogen from the air, comprising in combination a container, which is a non-conductor of electricity, electrodes, between which an arc longitudinally with respect to the inner surface of said container is adapted to be produced, and a plurality of oppositely placed rotary magnetic fields exterior of the container in the arc space, and extending longitudinally of the container.

In testimony of which invention, I have hereunto set my hand, at Wilmington Delaware, on this 16th day of December, 1908.

FRANCIS I. DU PONT.

Witnesses:
WM. STANIAR,
FRANK H. MASON.