

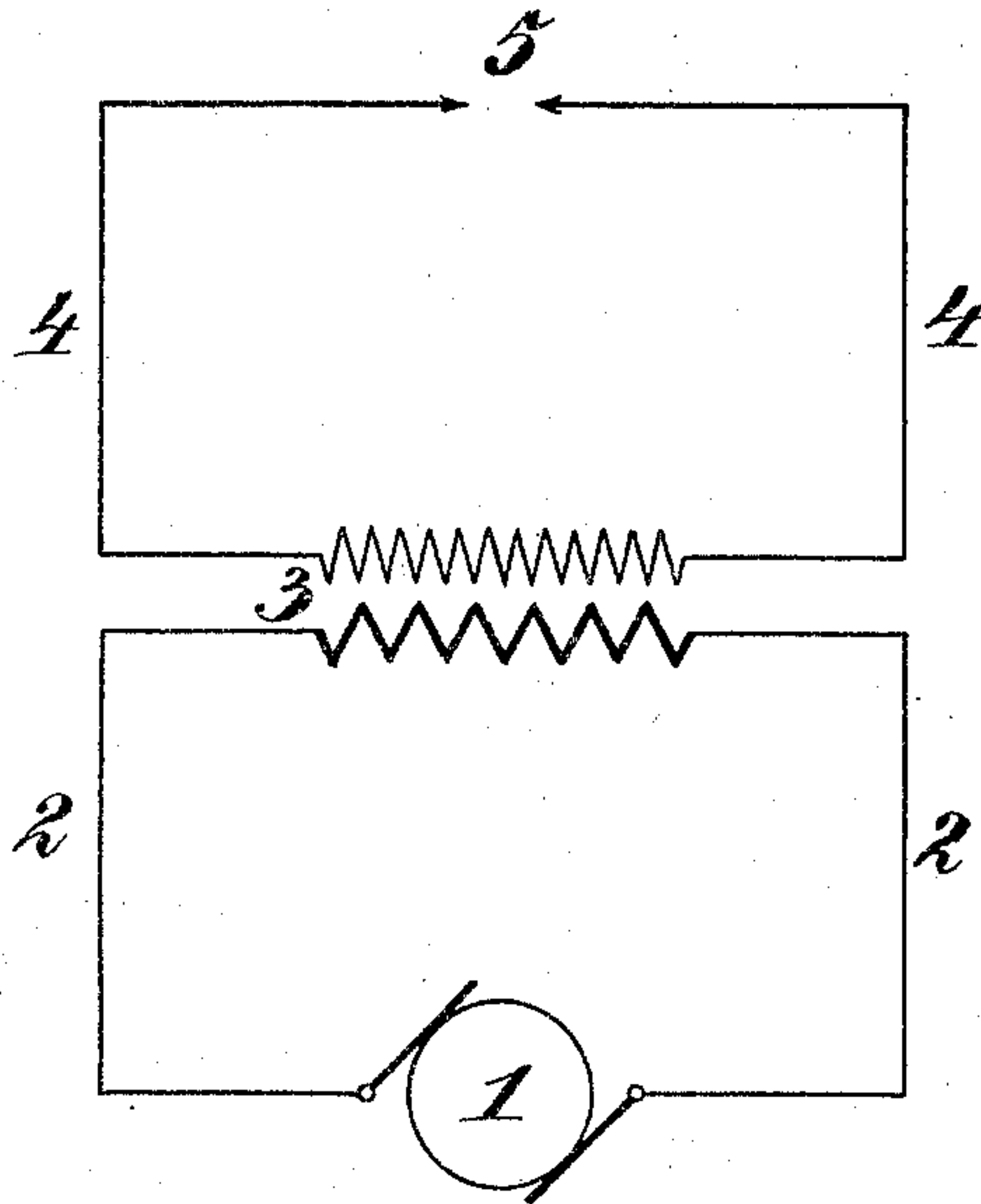
No. 850,392.

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A. NEUBURGER.

PROCESS OF OXIDIZING ATMOSPHERIC NITROGEN.

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Witnesses:

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ALBERT NEUBURGER, OF BERLIN, GERMANY.

PROCESS OF OXIDIZING ATMOSPHERIC NITROGEN.

No. 850,392.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed December 24, 1904. Serial No. 238,263.

To all whom it may concern:

Be it known that I, ALBERT NEUBURGER, a citizen of the German Empire, and a resident of Berlin, Germany, (whose post-office address is No. 4 Courbièrestrasse,) have invented certain new and useful Improvements in a Process of Oxidizing Atmospheric Nitrogen, of which the following is a specification.

The present invention relates to a process for electrically producing nitric acid and its compounds.

In the case of all experiments relating to the production of nitric acid by an electrical method in which electrical sparks or an electrical flame were caused to act on air pure nitric acid was never formed, but a mixture of equal parts of nitric acid and nitrous acid was always produced. Thus Muthmann and Hofer have already indicated in *Berichte der Deutschen Chemischen Gesellschaft*, thirty-sixth yearly volume, No. 2, page 452, line 2 from the bottom, that the electrical process furnishes a mixture of equal parts of nitrate and nitrite, the applicability of which is questionable and the oxidation of which to a pure nitrate would offer very great difficulties. Von Lepel confirms this fact in his work *On the Combination of Atmospheric Nitrogen Especially by Means of Electrical Discharges* (Greifswald, 1903) on page 39 and indicates that it has yet to be determined whether the presence of nitrite in a commercial article for manuring purposes which is intended to serve as a substitute for Chili saltpeter is injurious to the cultivation of plants. He himself then carries out the necessary experiments and reports in *Berichte der Deutschen Chemischen Gesellschaft*, thirty-seventh year, No. 4, page 719, that the solution of nitric acid containing nitrites, when neutralized with sodium carbonate, furnishes a foodstuff for plants which is of the same value as Chili saltpeter. Also Schulz in his inaugural dissertation *Einfluss von Nitriten auf Keime und Wachstum von Pflanzen*, ("The Influence of Nitrites on the Germination and Growth of Plants,") Königsberg, 1903, has taken up this question and has come to similar conclusions as Von Lepel. In spite of these apparently favorable results a saltpeter which contains nitrite is nevertheless not suitable for manuring purposes, because the nitrite is a very deliquescent body which very easily attracts water out of the air and

cannot be kept dry. This permanent percentage of water causes comparatively high costs of transport, as a certain weight of water must always be transported with it, and, finally, this water has the additional detrimental quality that it cakes the substance into lumps, and consequently the same cannot be spread by means of the manure-spreading machine. Moreover, nitric acid is not only the raw material in the manufacture of saltpeter for manuring purposes, but it also has another very extensive industrial application—for example, in the manufacture of gunpowder—an application in which the presence of nitrous acid is very unwelcome. As consequently nitrous acid impairs the quality of nitric acid in every respect, its formation must be suppressed as far as possible.

Now it has been found that the formation of nitrous acid in the production of nitric acid by an electrical method is considerably reduced or even entirely avoided without the yield of nitric acid being diminished if those nitrogen oxids out of which nitric acid is formed are produced by treating the nitrogen-oxygen mixture (air) with electric discharges in the production of which (contrary to the experiments mentioned above) less than one hundred and twenty watts have been employed. As a rule these discharges will be produced in a secondary circuit the energy in which is produced by suitable transformation from a primary circuit the power in which is less than one hundred and twenty watts. This secondary current then possesses a high potential and comparatively small strength, and its discharges generate a higher percentage of the nitrogen oxids which form nitric acid.

It is obvious that it is also possible to produce the discharges directly by a source of current which, with a total power in the circuit of less than one hundred and twenty watts, supplies current at suitably high potential.

The percentage of nitrous acid diminishes with the diminution of the power employed in the primary circuit. If one were to employ, for example, a power of two hundred watts and over, a mixture of equal parts of nitric and nitrous acid would be produced, as mentioned above, so that consequently fifty per cent. of the latter would be present.

When using a power of one hundred and fifty watts, the percentage of nitrous acid sinks to thirty per cent. On using one hundred and twenty watts it amounts to only eight-
5 een per cent. In this manner a gradual diminution of the percentage of nitrous acid takes place exactly with the diminution in the power employed, and when a very small
10 power is employed the production of nitrous acid completely ceases, and pure nitric acid is formed.

One arrangement of apparatus for carrying out the present process is illustrated by way of example in the accompanying diagram.
15 gram. In said diagram, 1 is a source of current, such as a dynamo. 2 is the primary current; 3, the transformer; 4, the secondary circuit, and 5 the spark-gap.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. The process of oxidizing nitrogen, which consists in subjecting a mixture of nitrogen and oxygen to the action of an electric arc employing a maximum energy of one
25 hundred and twenty watts.

2. The process of oxidizing atmospheric nitrogen, which consists in subjecting air to the action of an electric arc employing a maximum energy of one hundred and twenty
30 watts.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ALBERT NEUBURGER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.