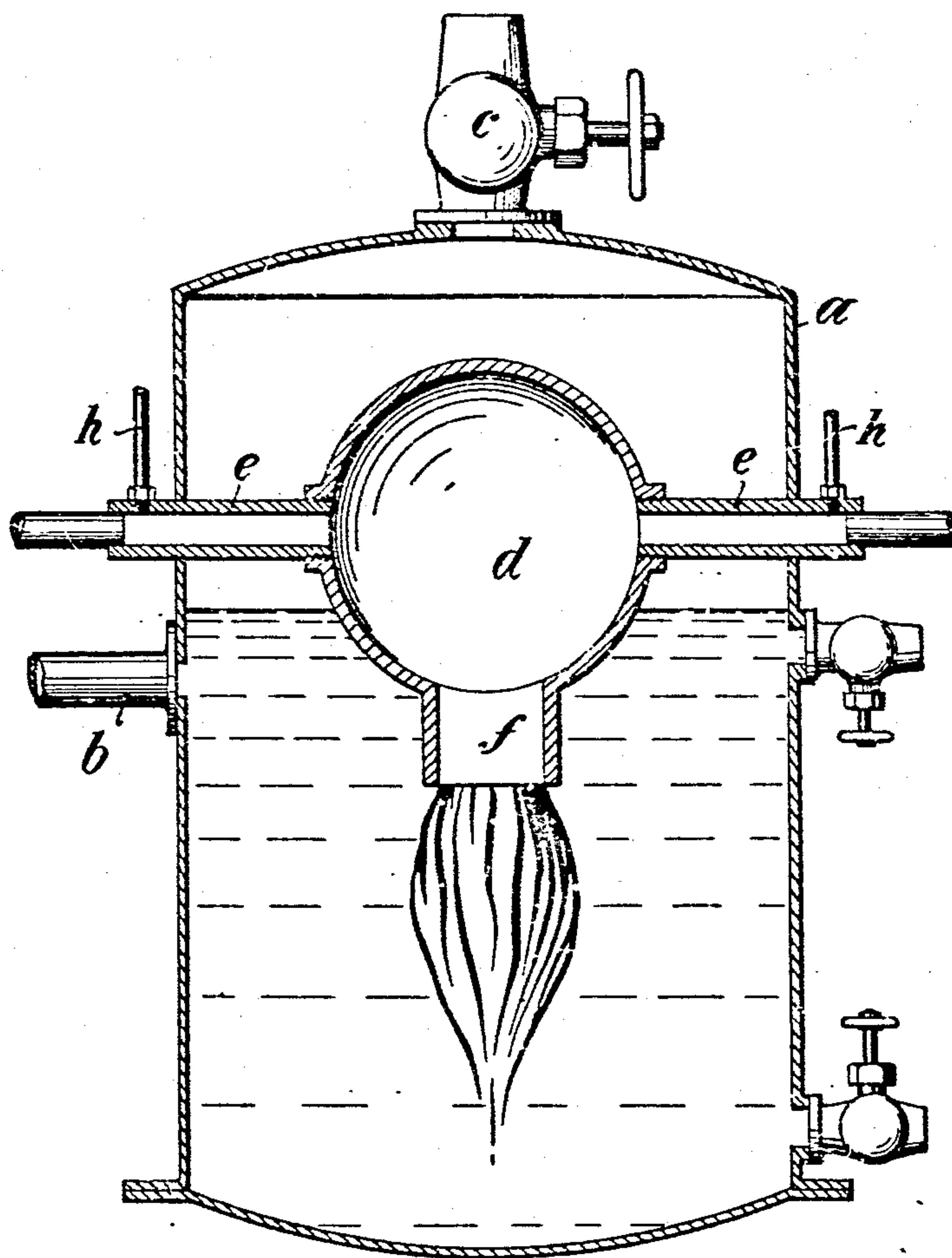


No. 898,032.

PATENTED SEPT. 8, 1908.

O. H. U. BRÜNLER.
PROCESS OF MAKING NITRIC ACID.
APPLICATION FILED MAR. 13, 1906.



Witnesses:
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UNITED STATES PATENT OFFICE

OSCAR HEINRICH ULRICH BRÜNLER, OF LEIPZIG-GOHLIS, GERMANY.

PROCESS OF MAKING NITRIC ACID.

No. 898,033.

Specification of Letters Patent.

Patented Sept. 8, 1908.

Application filed March 13, 1906. Serial No. 305,817.

To all whom it may concern:

Be it known that I, OSCAR HEINRICH ULRICH BRÜNLER, of 16 Politzstrasse, Leipzig-Gohlis, Saxony, Germany, a subject of the Emperor of Germany, engineer, have invented a new and useful Process of Making Nitric Acid or the Salts of Nitric Acid, of which the following is a specification.

In utilizing the nitrogen of the atmosphere for obtaining nitric acid hitherto the high temperatures have been used, which are produced by electrical means. This method is subject to the drawback, that with the expenditure of considerable quantities of energy the production of nitric acid is relatively very small. Hence the process becomes very expensive. To enable nitrogen to enter into chemical combination with oxygen, electricity itself was required merely in connection with the high temperature, which hitherto could only be attained by electrical means. For the oxidation of nitrogen a temperature of about 2500° centigrade is necessary.

In this process a furnace is wholly or partially immersed, mouth downwards, in water. A mixture of combustible gases and oxygen with a definite addition of nitrogen are brought to combustion in such a manner, that the burning gases force their way into and through the water. The addition of nitrogen, which is either mixed directly with the oxygen, or allowed to stream into the combustible mixture or also into the gases as they are burning, must be regulated in such a manner, that the temperature of the flame is not lowered, owing to the heat withdrawn by the nitrogen, below the point which forms the lower limit for the oxidation of nitrogen. While the burning gases penetrate the water and the products of combustion pass through the water, the oxidation product obtained from the nitrogen is converted into nitric acid.

If a solution of common salt is used instead of ordinary water, the sodium chlorid is decomposed by contact with the flame into chlorin and sodium, the sodium combining with the nitric acid to form sodium nitrate. Similarly solutions of other salts may be used to obtain other salts of nitric acid.

The process is carried out most effectively, when the combustion takes place with the gases under high pressure, because the greater density of the burning gases, together

with the development of more heat in a given space and the compression itself, aid essentially in furthering the chemical reactions, which occur.

The accompanying drawing illustrates a specimen of an apparatus suitable for carrying out the process.

a is a closed vessel, capable of withstanding pressure, which is partially filled with water.

b is a pipe for the inlet of water, *c* is a pipe for the outlet of the products of combustion, *e* are pipes for the admission of oxygen, containing a previous admixture of a sufficient quantity of nitrogen, *h* are inlets for combustibles, *d* is a combustion chamber with a mouth *f*.

The apparatus operates as follows: A mixture of oxygen and nitrogen admixes in the pipes *e* with the combustibles entering by pipes and the gases are then ignited either in the pipes or at their mouths. Thereby the combustion chamber becomes filled with burning gases. The chamber is of such a size, and the rate at which the gases enter is so regulated, that the gases still burning, in the form of a pointed flame, shoot through the mouth *f* and penetrate the water. The combustion at the same time is so regulated by the length of the furnace the mixture and rate of flow of the gases, that the highest temperature is already attained, before the flame comes into contact with the water.

The pointed flame is inclosed by an envelop of superheated steam. Owing to the high temperature the steam is decomposed into its elements and furthers the chemical action by the formation of new combinations. The production of nitric acid may be carried out thus as a profitable process.

What I claim as my invention, and desire to secure by Letters Patent, is: -

Process of converting the nitrogen of the air into nitric acid, by burning in a burner immersed, mouth downwards, in water a mixture of combustible gas, oxygen and nitrogen, which mixture contains more oxygen than the atmospheric air, as and for the purpose specified.

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

OSCAR HEINRICH ULRICH BRÜNLER.

Witnesses:

C. DIEDERICH,
FR. HOYERMAN.