

P. A. & C. E. GUYE.
 APPARATUS FOR PRODUCING ENDOTHERMIC REACTIONS IN GASES.
 APPLICATION FILED DEC. 14, 1909.

1,035,581.

Patented Aug. 13, 1912.
 2 SHEETS—SHEET 1.

Fig 1

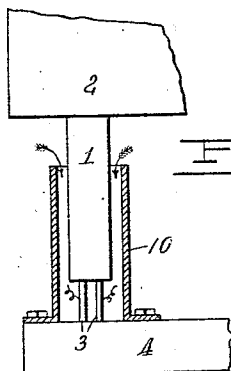
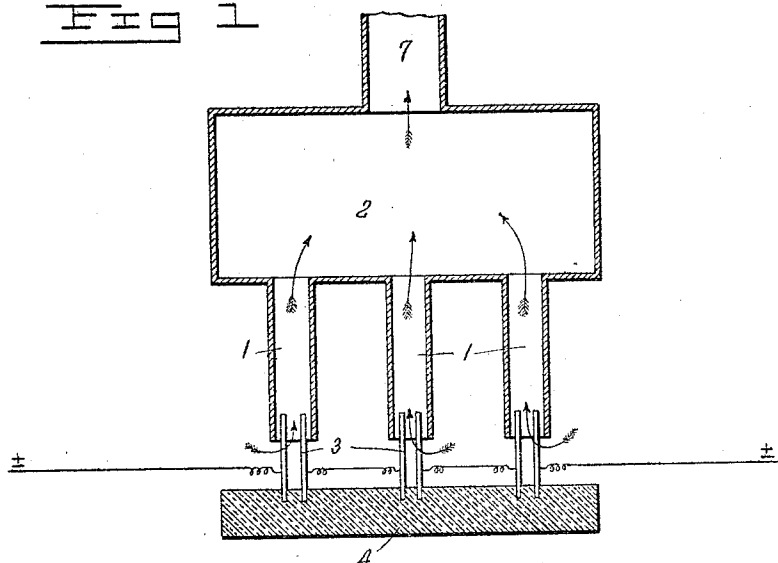


Fig 4

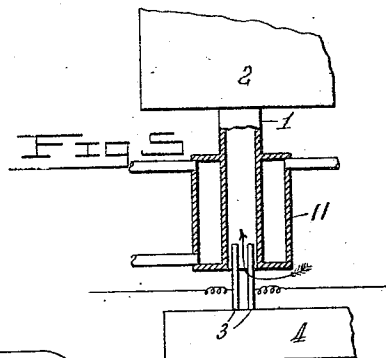


Fig 5

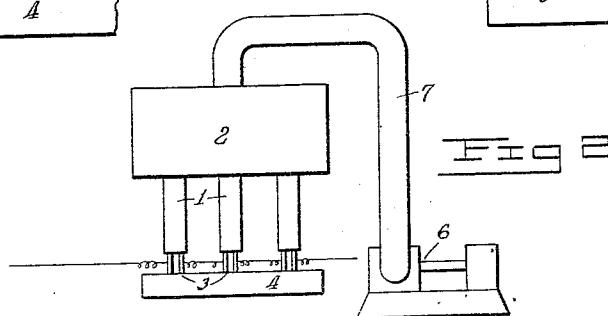


Fig 2

Witnesses
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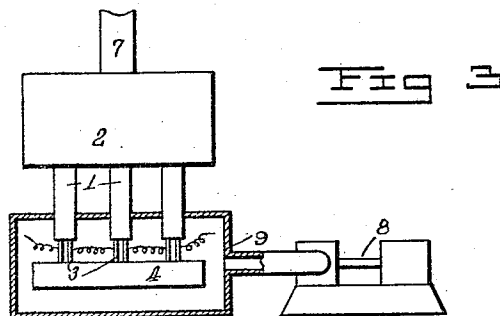


Fig 3

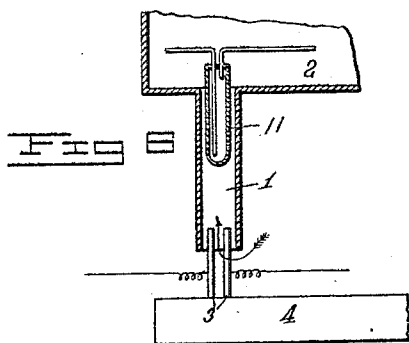


Fig 6

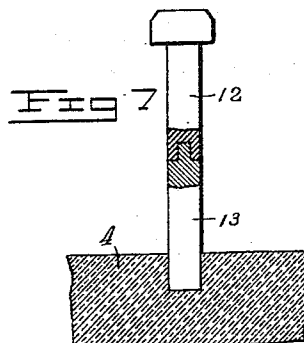
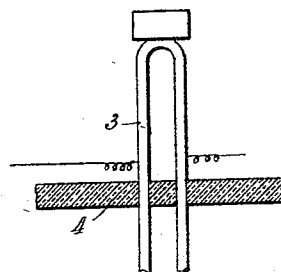
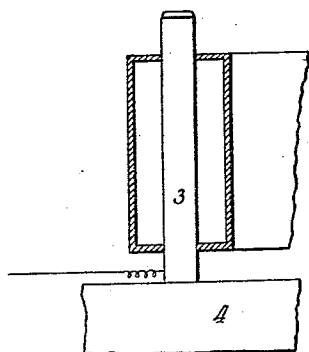


Fig 7



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UNITED STATES PATENT OFFICE.

PHILIPPE AUGUSTE GUYE AND CHARLES EUGÈNE GUYE, OF GENEVA, SWITZERLAND.

APPARATUS FOR PRODUCING ENDOTHERMIC REACTIONS IN GASES.

1,035,581.

Specification of Letters Patent.

Patented Aug. 13, 1912.

Application filed December 14, 1909. Serial No. 533,045.

To all whom it may concern:

Be it known that we, PHILIPPE AUGUSTE GUYE and CHARLES EUGÈNE GUYE, citizens of the Republic of Switzerland, residing at Geneva, Switzerland, have invented new and useful Improvements in Apparatus for Producing Endothermic Reactions in Gases, of which the following is a specification.

This invention relates to improvements in apparatus for submitting gases to a very high temperature for producing therein endothermic reaction.

One important use of the apparatus is the oxidation of atmospheric nitrogen, obtained by passing through the apparatus a current of air or a mixture of nitrogen and oxygen.

The invention resides in the apparatus hereinafter described and illustrated in the drawing.

That which is regarded as new is set forth in the claims.

In the said drawing, Figure 1 is a vertical sectional view of the apparatus. Fig. 2, a diagrammatic view of an installation in which the gases are moved through the apparatus by suction. Fig. 3, a similar view in which the gases are forced through the apparatus. Fig. 4, a detail showing an arrangement for preliminary heating of the gases. Figs. 5, 6, details showing means for cooling the tubes. Fig. 7, a detail of the electrodes. Figs. 8, 9, details showing means for cooling the electrodes.

The apparatus comprises a plurality of vertical tubes 1, circular or of other suitable cross-section, which constitute the furnaces in which the reactions take place, and which open at their upper ends into a collecting-chamber 2, common to the several tubes. At the lower end of each of the tubes, and preferably with their heads disposed slightly within the tubes, are pairs of electrodes 3, arranged vertically, parallel to each other, and in electrical tension or under electrical potential. The electrodes are insulated from each other; as shown they are mounted on a base 4 of insulating material and connected in series. The gases to be subjected to the action of the arcs enter at the lower ends of the tubes and pass upwardly there-through in as many parallel currents as there are tubes and may be caused to move by the suction of a pump, shown conventionally at 6, in the diagrammatic illustration, Fig. 2, in communication with a conduit 7 leading from the collection-chamber

2. If in use for the fixation of atmospheric nitrogen the lower ends of the tubes may conveniently be open to the atmosphere and the latter caused to move through the tubes by suction. Obviously, however, the atmospheric-air or gases may be moved by a force pump 8, as diagrammatically shown in Fig. 3, in which case the lower ends of the tubes communicate with a distributing trunk 9.

If it is desired to preliminarily heat the gases they may, as shown in Fig. 4, be caused to pass through jackets 10 surrounding the tubes before passing into the latter. If it is desired to keep the tubes cool, water may be circulated through appropriate vessels 11, as shown in Figs. 5, 6. The electrodes, also, may, if desired, be cooled by a circulation of water, as in Figs. 8, 9.

It is convenient and suitable to construct the apparatus on the basis of 100 kilowatt units at least.

In operation the arcs which form between the heads of the several pairs of electrodes develop, under the influence of the currents of gases passing through the tubes, into an elongated, inverted V-shape, as shown, and the degree of elongation varies according to the intensity of the air currents. No adjustment of the electrodes toward each other to compensate for wear while the apparatus is in use is necessary, because with the described parallel arrangement of the electrodes the distance between the heads of the electrodes is not increased as the latter wear away in use.

As shown in Fig. 7 of the drawing, the heads 12 of the electrodes may be separable from the stems 13 and connected thereto in any suitable way, as by a pin and socket connection. This arrangement is desirable as it enables ready renewal of the electrode heads.

Having thus described the invention, what is claimed is:—

1. Apparatus for the production of endothermic reactions on gases comprising a plurality of vertical tubes, a collecting chamber with which the upper ends of the tubes communicate, pairs of vertical electrodes arranged at the lower end of each tube and connected electrically in series, the gas to be treated being divided into as many parallel currents as there are tubes.

2. Apparatus for the production of endothermic reactions on gases comprising a plurality of vertical tubes, a collecting cham-

ber with which the upper ends of the tubes communicate, pairs of vertical electrodes arranged at the lower end of each tube and connected electrically in series, a gas distributing trunk with which the lower ends of the tubes communicate, the gas to be treated being divided into as many parallel currents as there are tubes.

3. Apparatus for the production of endo-
10 thermic reactions on gases, comprising a vertical tube, and a pair of vertically arranged, parallel electrodes at the lower end thereof.

4. Apparatus for the production of endo-
15 thermic reactions on gases, comprising a plurality of vertical tubes, a collecting chamber with which the upper ends of the tubes communicate, pairs of vertical electrodes arranged at the lower end of each tube and
20 connected electrically in series, and means in communication with the respective tubes

and through which the gas to be treated passes for preliminarily heating the gases to be treated before entering the vertical tubes.

5. Apparatus for the production of endo-
thermic reactions on gases, comprising a plurality of vertical tubes, a collecting chamber with which the upper ends of the tubes communicate, pairs of vertical elec- 30 trodes arranged at the lower end of each tube and connected electrically in series, and means for cooling said tubes.

In testimony whereof we have hereunto set our hands in presence of two subscribing 35 witnesses.

PHILIPPE AUGUSTE GUYE.
CHARLES EUGÈNE GUYE.

Witnesses:

L. H. MUNIER,
C. VILLIER.