C. C. MEIGS.

ELECTRICAL APPARATUS FOR EFFECTING THE CHEMICAL COMBINATION OF GASES.

APPLICATION FILED JAN. 23, 1914.

1,116,606. Patented Nov. 10, 1914.

2 SHEETS—SHEET 1.

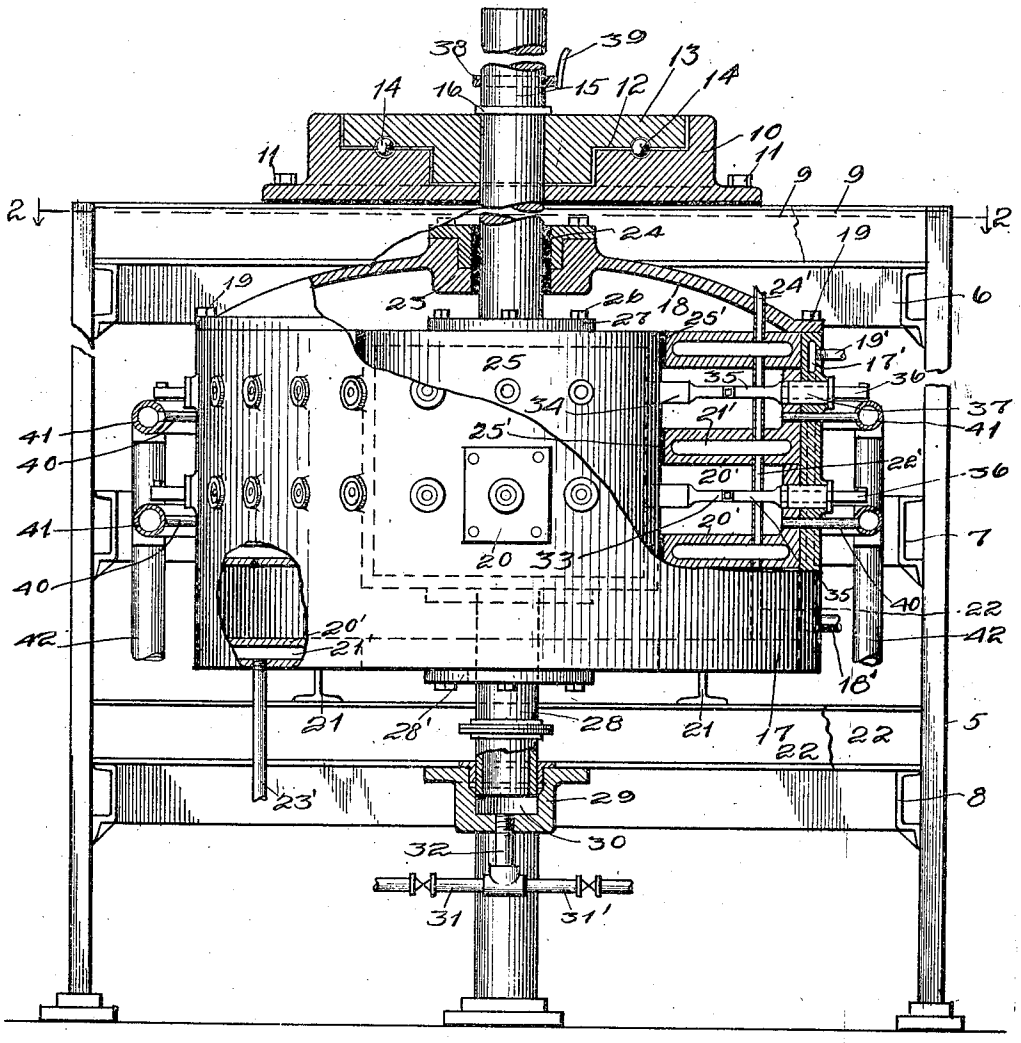


Fig. 1.

Witnesses

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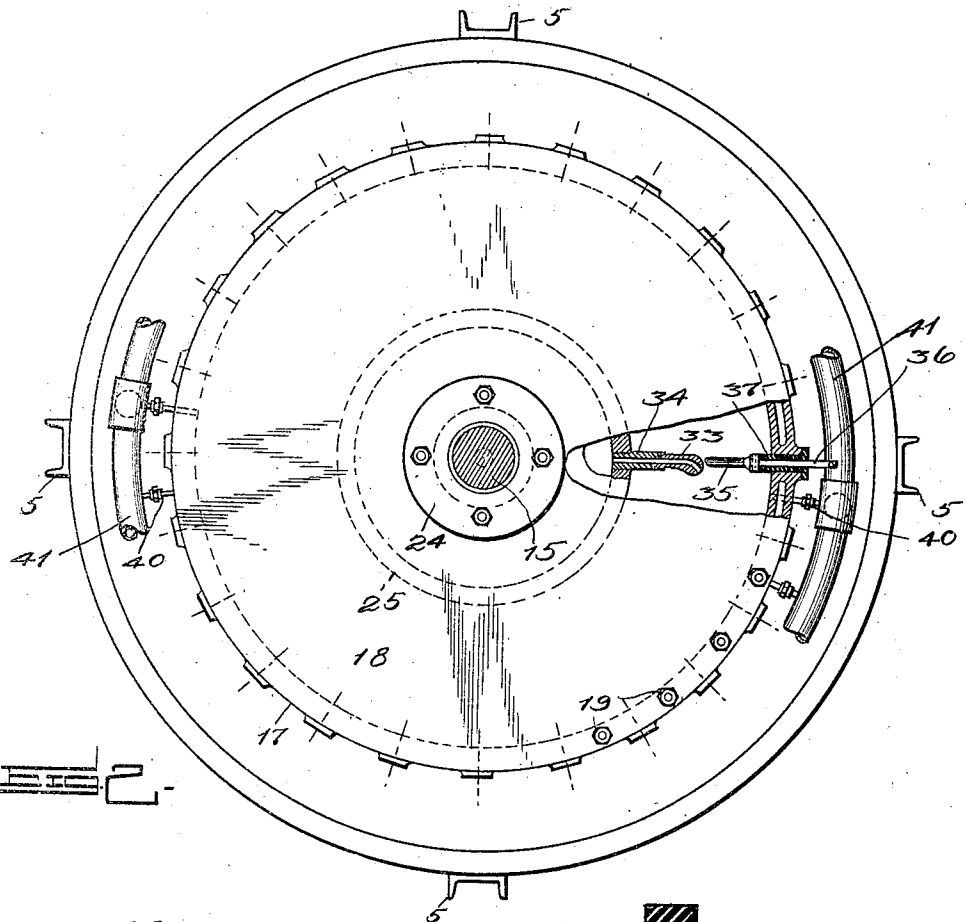


Fig. 2.

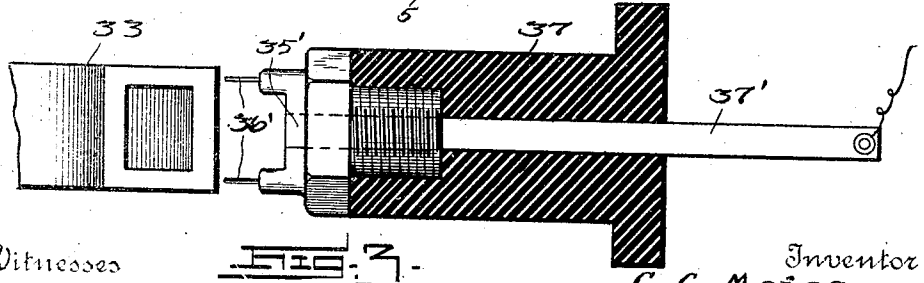


Fig. 3.

Witnesses

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ELECTRICAL APPARATUS FOR EFFECTING THE CHEMICAL COMBINATION OF GASES.

1,116,606. Specification of Letters Patent. Patented Nov. 10, 1914.

Application filed January 23, 1914. Serial No. 814,014.

To all whom it may concern:

Be it known that I, CURTIS C. MEIGS, a citizen of the United States, residing at Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Electrical Apparatus for Effecting the Chemical Combination of Gases, of which the following is a specification.

My invention relates to improvements in apparatus for effecting the chemical union of gaseous elements by electrical discharges in the presence of such elements.

An important object of this invention is to provide means of the above mentioned character, which is highly expeditious and continuous in operation.

A further object of the invention is to provide apparatus of the above mentioned character, which is simple in construction, inexpensive to manufacture, reliable in operation, strong, and durable.

A further object of the invention is to provide spark producing means including tubular elements through which the gases pass to be combined.

A further object of the invention is to provide means to properly cool the apparatus during operation.

Other objects and advantages of this invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same, Figure 1 is a side elevation of apparatus embodying my invention, parts thereof being shown in section for the purpose of illustration, Fig. 2 is a horizontal sectional view taken on line 2—2 of Fig. 1, and, Fig. 3 is an enlarged detail view of a slightly different form of contact element.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 5 designates upstanding legs or posts connected with annular frames 6, 7 and 8, as shown.

Extending across the outer annular frame 6 is a pair of upper horizontal beams or supports 9, upon which is rigidly mounted the lower member 10 of a thrust bearing, the same being insulated from the beams 9, as shown. The bearing member 10 is secured to the beams 9, which are slightly spaced, by means of bolts 11 or the like. The bearing member 10 is provided upon its upper surface with a preferably stepped recess 12, receiving the lower stepped face of an upper bearing member 13, there being bearing balls 14 arranged between certain of the faces of these bearing members, as shown. Extending between the beams 9 and through the bearing members 10 and 13 is a vertical metallic rotatable shaft 15, provided with an annular flange 16, rigidly connected therewith, engaging the upper bearing member 13, as shown.

The numeral 17 designates a stationary cylindrical metallic shell, having its lower end or bottom closed and its upper end formed open and normally closed by a removable cover or lid 18, secured to the upper end of the shell 17 by means of bolts 19 or the like. The shell 17 is provided with hand holes normally closed by doors 20, detachably secured to the shell 17, to form an air-tight joint therewith. The stationary outer shell 17 is mounted upon T rails 21, in turn supported by a pair of lower beams 22, which rest upon the annular frame 8, as shown. The shell 17 has its periphery preferably formed of a double wall, providing a water jacket or space 17′, the cooling liquid or water being supplied to the lower portion of this jacket 17′ through a pipe 18′ and discharged therefrom through a pipe 19′, such water being supplied under suitable pressure, if desired.

Mounted within the outer shell 17 are a plurality of spaced superposed annular cooling members or rings 20′, provided with water spaces or jackets 21′, in communication with each other through the medium of pipes 22′. The lowermost cooling ring 20′ is connected with a supply pipe 23′, while the uppermost cooling ring is connected with an outlet 24′, the water being supplied to these cooling rings under suitable pressure, if desired.

The cover 18 is provided with a stuffing box 23, for receiving the shaft 15 therethrough and forming an air-tight joint therewith to prevent the passage of gases from the shell 17 around or about the shaft 15. The stuffing box 23 is provided with a packing ring 24, serving to thoroughly insulate the shaft 15 from the cover 18.

Rotatably mounted within the outer stationary shell 17 is an inner closed preferably cylindrical metallic shell 25, rigidly connected at its upper end by means of bolts

26 or the like, with a preferably circular head 27, which is rigidly formed upon its lower end of the shaft 15. Rigidly secured to the lower end of the rotatable shell 25 is a tubular shaft or spindle 28, formed of a suitable insulating material, preferably hard wood. The tubular spindle 28 passes through a stuffing box 28′, secured to the bottom of the shell 17 and its lower end extends into a guide bearing 29, there being a space or chamber 30, provided by the same in free communication with the intake end of the tubular shaft or spindle 28. The inner cylindrical shell 25 rotates within the openings of the annular cooling members or rings 20′ and is thoroughly insulated therefrom by means of packing rings 25′, preferably secured to the shell 25 to rotate therewith. The shell 25 is preferably rotated by power applied to the metallic shaft 15 by any suitable means (not shown).

The gases to be combined are fed through valve controlled pipes 31 and 31′, under pressure or otherwise connected with a pipe 32, leading into the chamber 30. These gases then pass upwardly through the tubular shaft or spindle 28 and are discharged into the interior of the rotating shell 25. The gases within the rotating shell 25 are discharged from the same through tubular contacts or elements 33, arranged upon the exterior of and connected with the shell 25 by means of couplings 34 or the like. These tubular contacts are preferably formed of platinum although they may be formed of copper or any other metal. The tubular contacts 33 are arranged in superposed annular sets, the contacts in each set being spaced, as shown. The tubular contacts 33 are preferably bent laterally slightly, in an opposite direction to the direction of rotation of the shell 25, as shown.

The numeral 35 designates outer contacts, arranged upon the interior of the shell 17, in superposed annular sets, the contacts in each set being suitably spaced, the same preferably corresponding in number and arrangement to and with the contacts 33. The outer contacts 35 are preferably brushes, formed of platinum or any other metal. Brush contacts 35 are used when they engage or wipe the contacts 33, during their movement. The brush contacts 35 are secured upon the inner ends of connecting elements or binding posts 36, passing through openings in the periphery of the shell 17, and thoroughly insulated therefrom, as shown at 37. The sets of contacts 33 and 35 are arranged within chambers formed between the spaced cooling rings 21′, as shown.

In Fig. 3, is shown an outer contact member 35′, to be used in place of the brush contact 35, when a jump spark is to be used instead of a wipe spark. This contact member 35′ includes points 36′, preferably formed of platinum, which are permanently spaced from the tubular contact 33. A rod 37′ serves to electrically connect the points 36′ with one pole of the source of current.

The inner tubular contacts 33 are in electrical connection with the metallic shaft 15 carrying a contact ring or rings 38 slidably engaging brush or brushes 39, connected with one pole of a suitable source of current (not shown), while the outer contacts 35 are suitably connected with the opposite pole of the source of current.

The chemically combined gases are withdrawn from the lower portions of the chambers occurring between the cooling rings 20′, through pipe 40, in communication with annular pipes 41, connected with a common take-off pipe 42.

As illustrative of the operation of my improved apparatus, I will describe the production of ammonia gas by use of the same. The inner shell 25 is rotated at the desired speed, while hydrogen and nitrogen are supplied through the pipes 31 and 31′ respectively, the same becoming mixed or mechanically combined while passing through the pipe 32 in the chamber 30. These mixed gases now pass into the shell 25, and are forced outwardly through the tubular contact 33, the same, when passing out of the contacts, being surrounded by wipe sparks occurring between each pair of contacts 33 and 35, when they are brought into engagement with or in proximity to each other. The gases chemically combine in the presence of the electric discharge, as is well known. I have discovered, however, that this chemical combination is substantially aided by the use of a wipe spark or arc, as stated, which as far as I am aware has never been used before. The chemically combined gases, forming ammonia gas, are now withdrawn through the pipes 40 and conducted to a suitable storage tank, (not shown). The uncombined gases may be again returned to the apparatus. In the combining of the gases, as above described, it is necessary to retain the gas and apparatus cooled to a certain degree, which is accomplished by circulating the cooling water through the water jackets of the shell 17 and rings 20′.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having described my invention, I claim:—

1. Apparatus of the character described, comprising an outer shell, a closed shell arranged within the outer shell, tubular con-

tacts carried by one shell, contact brushes carried by the other shell and arranged to slidably engage with the tubular contacts to provide wipe-sparks, means to effect a relative movement between the shells, and means to supply gases to be combined into one shell.

2. Apparatus of the character described, comprising an outer shell, electrodes connected therewith and extending interiorly thereof, a closed rotatable shell arranged within the outer shell, tubular electrodes connected with the closed rotatable shell and adapted to coöperate with the first named electrodes, a spindle connected with one end of the closed rotatable shell and passing through an opening in the corresponding end of the outer shell, a tubular spindle connected with the opposite end of the closed rotatable shell and passing through an opening in the corresponding end of the outer shell, means to supply gases to be combined into the tubular spindle, and means to rotate the rotatable shell.

3. Apparatus of the character described, comprising an upstanding support, a thrust bearing element connected with the upper end of the support, a co-acting rotatable thrust bearing element, a relatively stationary outer shell arranged within the support, contact elements connected with the outer shell and extending interiorly thereof, a rotatable shell arranged within the outer shell and provided with tubular contacts, a spindle connected with the upper end of the rotatable shell and passing through the upper end of the rotatable shell and passing through the upper end of the outer shell and through the thrust bearing elements, means to rotate the spindle, a tubular spindle connected with the lower end of the rotatable shell and leading into the same, a guide bearing connected with the lower portion of the support and receiving the lower open end of the tubular spindle, and means to supply gases to be combined into the guide bearing.

4. Apparatus of the character described, comprising an outer shell provided with electrodes, an inner shell provided with co-acting electrodes, a plurality of spaced hollow members arranged between the inner and outer shells and provided with cavities for receiving a temperature controlling medium, and means to effect a relative movement between the two shells.

5. Apparatus of the character described, comprising an outer shell provided with electrodes, an inner shell provided with electrodes to coöperate with the first named electrodes, means for supplying gases to be combined into one of the shells, means to effect a relative movement between the shells, and a plurality of spaced cooling members arranged between the outer and inner shells.

6. Apparatus of the character described, comprising an outer shell, spaced superposed cooling rings mounted within the outer shell and provided with water receiving chambers in communication with each other, a rotatable shell arranged within the cooling rings and provided with inlet means, and means for providing electrical sparks within the outer shell including elements carried by the rotatable shell.

7. Apparatus of the character described, comprising an outer shell, spaced superposed cooling rings mounted within the outer shell and provided with water receiving chambers, and means for providing electrical sparks within the spaces between the cooling rings.

8. Apparatus of the character described, comprising an outer shell, spaced superposed cooling rings mounted within the cooling shell provided with water receiving chambers, means for introducing gases to be chemically combined into the spaces between the cooling rings and providing electrical sparks therein in the presence of the gases, and means leading into the spaces to withdraw the chemically combined gases.

In testimony whereof I affix my signature in presence of two witnesses.

CURTIS C. MEIGS.

Witnesses:
H. W. HANAHAN,
M. N. HUNTER.