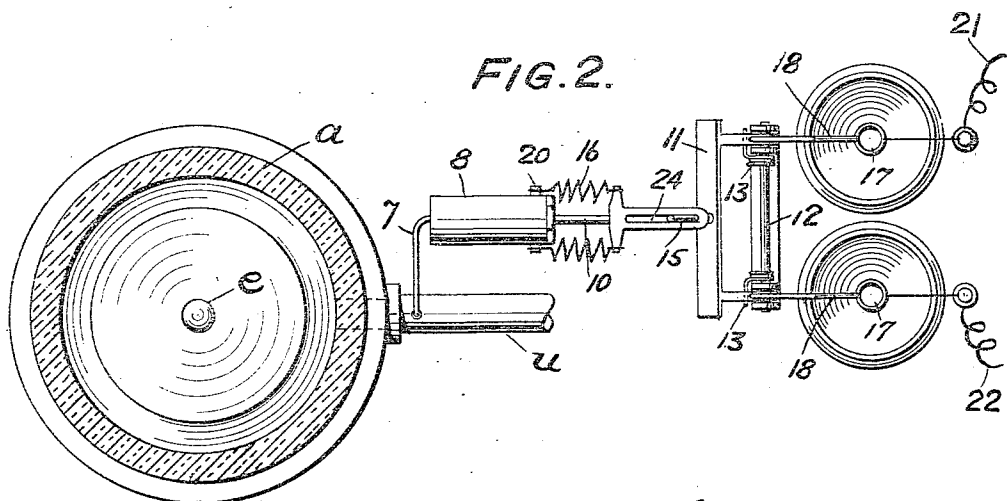
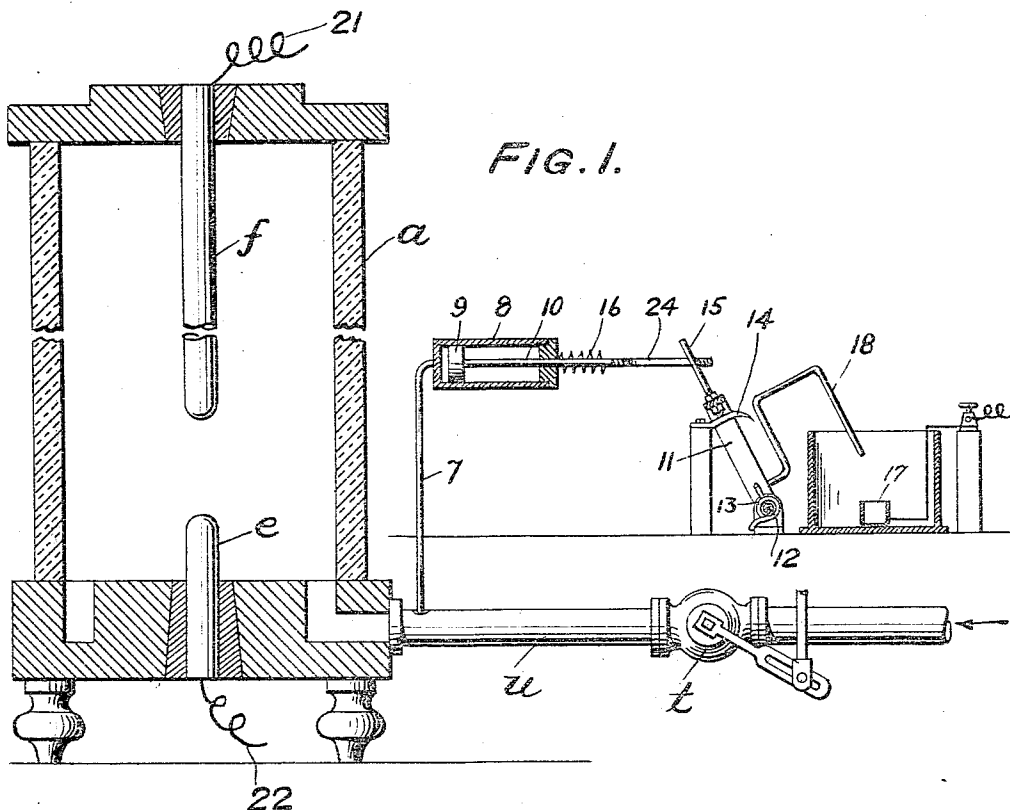


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METHOD OF AND APPARATUS FOR CARRYING OUT GAS REACTIONS BY THE USE OF AN
ELECTRIC ARC.

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1,039,852.

Patented Oct. 1, 1912.



WITNESSES:

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METHOD OF AND APPARATUS FOR CARRYING OUT GAS REACTIONS BY THE USE OF AN ELECTRIC ARC.

1,039,852.

Specification of Letters Patent.

Patented Oct. 1, 1912.

Application filed November 22, 1911. Serial No. 661,762.

To all whom it may concern:

Be it known that I, GUSTAV WAGENER, a subject of the Emperor of Germany, residing at Schlebusch-Manfort, Germany, have invented a new and useful Improvement in Methods of and Apparatus for Carrying Out Gas Reactions by the Use of an Electric Arc, 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.

My invention relates to an improved method and apparatus for carrying out gas reactions by the use of an electric arc. In carrying out such reactions, there has been invented (see my application Serial No. 661,761, filed November 22, 1911) a method which consists in compressing the gas to be heated in the reaction receptacle, under an air tight seal, by means of an electric arc until the maximum pressure is reached and, at this precise point, suddenly expanding the reaction mixture in an explosive-like manner, in such a manner that the same is suddenly cooled.

The subject matter of my invention relates to certain improvements in this method, and in apparatus for carrying out my improved method. Its purpose is to prevent an excessive heating of the reaction receptacle, and to reduce the amount of current used. This I accomplish by introducing the compressed gases slowly into the reaction receptacle and producing the arc only when the receptacle is entirely filled with the compressed gas. The resultant is that the cold compressed gases, being introduced slowly, into the reaction receptacle, are preheated, by means of the hot walls of the receptacle, which are present in the receptacle from the last reaction, before the arc is formed. In this manner also the receptacle is correspondingly cooled after each reaction, and a considerable economy of current is effected. The closing of the circuit to form the arc can be effected automatically by means of a switch operated by a pressure device rendered active by the gradually increasing pressure of the compressed gases and moved so as to close the switch when the receptacle is completely filled with compressed gases.

In fine, my method comprises gradually admitting the gases into the receptacle and forming the arc when the gases in the receptacle reach the desired pressure, and cutting off said arc when the pressure falls below that point. Further, in regulating the formation and disruption of said arc by the pressure or lack of pressure of the gases in the receptacle.

I will now describe the apparatus for carrying out my invention, which apparatus is illustrated in the accompanying drawings, in which—

Figure 1 is an elevation, partly in section of an apparatus embodying my invention. Fig. 2 is a plan view of same.

a is the receptacle, *e* and *f* the electrodes between which the arc is formed in the receptacle.

u is a pipe forming the inlet for the gases to the receptacle *a*. 7 is a branch pipe from said pipe *u* leading to the cylinder 8 in which is the piston 9.

t is a valve in the pipe *u* between the source of gas supply and the branch pipe 7.

22 is a wire leading from one pole of current supply to electrode *e*, and 21 is a wire leading from the other pole of current supply to the electrode *f*. On these circuits between the source of electricity and the electrodes, is a switch apparatus, as follows: 10 is a piston rod of piston 9, draw springs 16 at the forward end of the cylinder bearing against the stops 20 tend to hold the rod and piston to the left. The outer end of this rod 10 has the slot 24 in which rests the pin 15 of the switch arm 11. A spring 14 normally holds the arm 11 in the position shown in the drawing, and the switch opens. This spring bears against a pin 15 on the switch arm 11. The switch arm is pivoted on the pin 12, and a spring or springs 13 tend to move the switch arm to the right and close the switch, but are overcome by the strength of spring 14 which is free to act except when the piston and rod are at the outer end of their stroke. 18, 18 are bars connected to the arm 11 and, in the closed position of the switch, enter the mercury receptacles, connected to the line wires, and close the circuit.

The operation is as follows: The valve *t*

being opened, the desired amount, the gas passes to the receptacle *a*. At the same time it passes through pipe 7 to cylinder 8, moving piston and rod to the right. This does not affect the arm 11 until the length of slot 24 has been traversed, after which a further movement releases spring 14 and springs 13 act quickly to move bars 18 to cause them to enter the mercury cups 17 and close the circuit. The arrangement is so adjusted that this takes place when the gases in the receptacle are of the desired quantity and pressure. In like manner, when the pressure is relieved in receptacle *a*, the piston and rod move to the left, the spring 14 becomes active, and at once opens the switch.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas comparatively slowly into the receptacle to permit the same to be pre-heated before the arc is formed, and when the desired volume and pressure are reached, forming the electric arc.

2. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas into the receptacle, and when the desired volume and pressure are reached, forming the electric arc.

3. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas comparatively slowly into the receptacle to permit the same to be pre-heated before the arc is formed, and when the desired volume and pressure are reached, forming the electric arc, and extinguishing the arc as soon as the pressure and volume fall below said last mentioned volume and pressure.

4. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas into the receptacle and when the desired volume and pressure are reached, forming the electric arc and extinguishing the arc as soon as the pressure and volume fall below said last mentioned volume and pressure.

5. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas comparatively slowly into the receptacle to permit the same to be pre-heated before the arc is formed, and when the desired pressure is reached, forming the electric arc.

6. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas comparatively slowly into the receptacle to permit the same to be pre-heated before the arc is formed, and when the desired pressure is reached, forming the electric arc, and extinguishing the arc as soon as the pressure falls below said last mentioned pressure.

7. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas into the receptacle and when the desired pressure is reached, forming the electric arc.

8. The method of carrying out gas reactions by the electric arc, which consists in admitting the gas into the receptacle and when the desired pressure is reached, forming the electric arc, and extinguishing the arc as soon as the pressure falls below said last mentioned pressure.

9. In an apparatus for carrying out gas reactions by means of an electric arc, in combination, a receptacle, a pipe for admitting the gas to the receptacle, electrodes in said receptacle, a normally open electric circuit, a switch in said circuit, a pressure device for closing said circuit and connection between said pressure device and the interior of the receptacle.

10. In an apparatus for carrying out gas reactions by means of an electric arc, in combination, a receptacle, a pipe for admitting the gas to the receptacle, electrodes in said receptacle, a normally open electric circuit, a switch in said circuit, a pressure device for closing said circuit, and connection between said pressure device and said pipe.

11. In an apparatus for carrying out gas reactions, by means of an electric arc, in combination, a receptacle, a pipe for admitting the gas to the receptacle, electrodes in said receptacle, an electric circuit, a switch in said circuit, a pressure device for controlling said circuit, and connection between said pressure device and said pipe, a valve on said pipe between the gas supply and the connection to the pressure device.

12. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, a normally open electric circuit, a switch in said circuit, said switch being operated by said piston to close the circuit.

13. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, said switch being operated by said piston, a valve in said gas conveying pipe between the source of gas supply and the branch pipe leading to the cylinder.

14. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle,

an electric circuit, a switch in said circuit, a slotted connection between said switch and the stem of said piston.

15. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, a slotted connection between said switch and the stem of said piston, a valve in said gas conveying pipe between the source of gas supply and the branch pipe leading to the cylinder.

16. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, a spring acting to close said switch, a locking spring adapted to hold said switch open against the action of the closing spring, connection between said switch and the rod of said piston adapted in one direction of movement of the piston to release said switch from said locking spring and, in the other direction, to bring it into connection with said locking spring.

17. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, a spring acting to close said switch, a locking spring adapted to hold said switch open against the action of the closing spring, connection between said switch and the rod of said piston adapted in one direction of movement of the piston to release said switch from said locking spring and, in the other direction, to bring it into connection

with said locking spring, a valve in said gas conveying pipe between the source of gas supply and the branch pipe leading to the cylinder.

18. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, a spring acting to close said switch, a locking spring adapted to hold said switch open against the action of the closing spring, a slotted connection between said switch and the rod of said piston adapted in one direction of movement of the piston to release said switch from said locking spring, and, in the other direction, to bring it into connection with said locking spring.

19. In an apparatus for carrying out gas reactions, in combination, a pipe for admitting gas to the receptacle, a cylinder, a spring acted piston in said cylinder, a pipe connection between said cylinder and the gas conveying pipe, electrodes in said receptacle, an electric circuit, a switch in said circuit, a spring acting to close said switch, a locking spring adapted to hold said switch open against the action of the closing spring, a slotted connection between said switch and the rod of said piston adapted in one direction of movement of the piston to release said switch from said locking spring, and, in the other direction, to bring it into connection with said locking spring, a valve in said gas conveying pipe between the source of gas supply and the branch pipe leading to the cylinder.

In testimony of which invention, I have hereunto set my hand, at Cologne, Germany, on this 3d day of November, 1911.

GUSTAV WAGENER.

Witnesses:

ELISE SCHWARZ,
HANS DUMONT.