

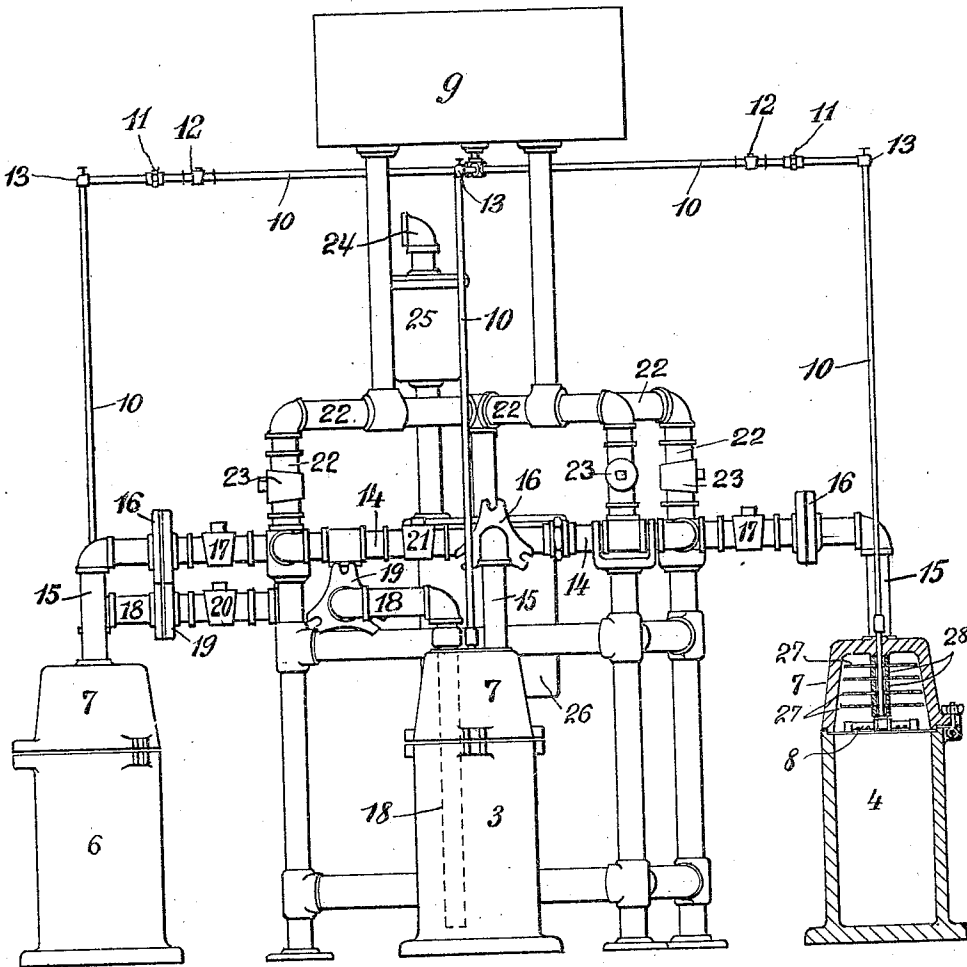
H. PHILIPP.
METHOD OF GENERATING GAS.
APPLICATION FILED NOV. 28, 1910.

1,041,865.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

E. P. La Gay
John Kerr

INVENTOR

Herrmann Philipp
Attorney
by Sealing Co. Wash.

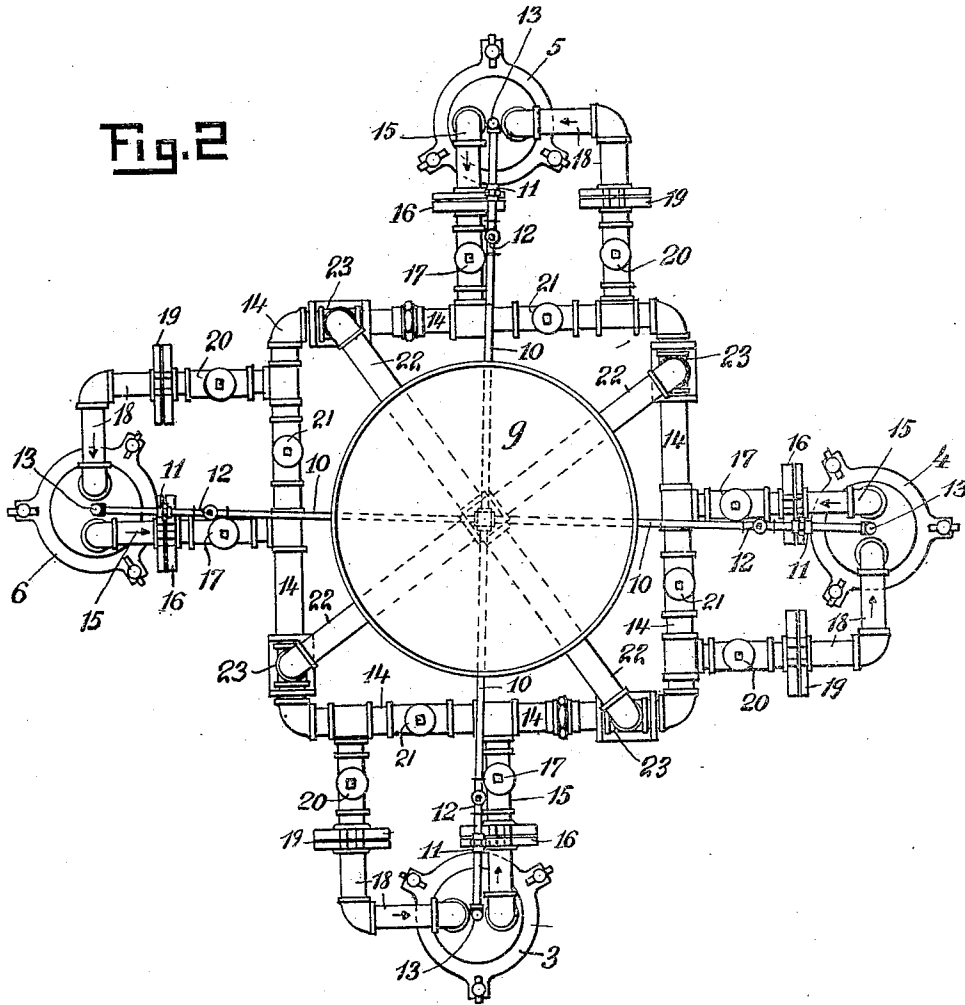
H. PHILIPP.
METHOD OF GENERATING GAS.
APPLICATION FILED NOV. 26, 1910.

1,041,865.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 2.

Fig. 2



WITNESSES:

E. P. La Hay
John Herr.

INVENTOR

Herbert Philipp
Benny Westick
Attorney
by Benjamin C. Westick

UNITED STATES PATENT OFFICE.

HERBERT PHILIPP, OF PERTH AMBOY, NEW JERSEY, ASSIGNOR TO THE ROESSLER & HASSLACHER CHEMICAL CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD OF GENERATING GAS.

1,041,865.

Specification of Letters Patent.

Patented Oct. 22, 1912.

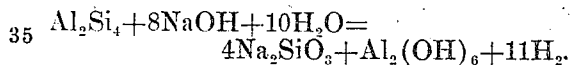
Application filed November 26, 1910. Serial No. 594,347.

To all whom it may concern:

Be it known that I, HERBERT PHILIPP, a subject of the King of Great Britain, residing at Perth Amboy, Middlesex county, New Jersey, have invented certain new and useful Improvements in Methods of Generating Gas, of which the following is a specification.

This invention relates to an improved method of generating hydrogen gas from a certain composition of matter consisting of an alkali metal, such as sodium, and a silicid, such as aluminium silicid, described in Letters Patent of the United States, No. 977,442 dated December 6, 1910, whereby the yield of hydrogen is largely increased.

In generating hydrogen gas from the composition of matter mentioned, in the manner described in said patent, 700 liters of hydrogen are obtained from 1 kilo of the mixture, although theoretically about 900 liters of hydrogen should be obtained. This loss is due to the fact that a portion of the metal silicid, which forms one element of the mixture, remains undecomposed, and on account of lack of heat and agitation, remains at the bottom of the gas generator. If the metal silicid should be agitated at this stage of the process, and steam passed through, then more hydrogen gas would be generated by the action of the free alkali on the metal silicid, as shown by the following equation, for instance:—



When water is dropped on said composition of matter enough heat is developed to pass some of the water off as steam with the gas evolved, and if this hydrogen gas and steam is passed through a second generator which contains a charge of said composition of matter already partially decomposed with water as described, then from the metal silicid still undecomposed in this second generator and the free alkali present therein, more hydrogen gas is evolved and a substantially complete reaction obtained as already set forth.

This invention comprises a process for increasing the yield of hydrogen gas from said composition of matter, by passing the gas evolved from one generator through the par-

tially decomposed medium in another generator, and I shall describe an apparatus for accomplishing these results.

Broadly speaking the apparatus comprises two or more generators suitably connected so that the gases from one generator can be passed through any of the other ones, the generators being connected to one or more suitable outlet pipes preferably in common to all the generators, although in case a very large number of generators were coupled together, the outlet pipes might be common to a certain number in the group rather than to all. The gas evolved from one generator may be passed into any other generator of the group but preferably into that one in which the composition of matter has just been partially decomposed so as to have the full benefit of the heat contained in the second generator. Of course the second generator need not be adjacent to the first one, but may be any other of the group.

In the accompanying drawings I have illustrated one form of an apparatus for generating hydrogen gas according to this invention.

Figure 1 is an elevation of said apparatus and Fig. 2 is a plan view.

The apparatus illustrated is provided with four generators by way of example.

The four generators are indicated by reference numerals 3, 4, 5 and 6 respectively, and may be provided with removable tops or covers 7 in which are contained suitable sprinkling devices 8 here shown in the form of pipes, perforated at the bottom, and arranged at right angles to and in communication with supply pipes 10 connected to a common reservoir 9. Unions 11 are placed in pipes 10 between the generator and the reservoir 9 for the purpose hereinafter set forth. Plug valves 12 are provided in pipes 10 to cut off the water supply when the generator is to be removed for cleaning and charging. The water supply to the generators is regulated by needle valves 13 in the pipes 10.

14 is common main gas conductor to which all the generators are connected by the outlet pipes 15, provided with unions or joints 16. Between these latter and the gas conductor 14 are valves 17. Interposed between conductor 14 and each of the gener-

ators is also an inlet pipe 18 which reaches to the bottom of the generator as shown in dotted lines in Fig. 1. The inlet pipes 18 are provided with unions or joints 19 and valves 20. Valves 21 are interposed in the conductor 14 between the outlet pipes 15 and the inlet pipes 18.

22 represents interconnected cross branch pipes which connect the opposite corners of the conductor 14, the vertical portions of the pipes 22 being provided with valves 23.

27, 27, represent perforated baffle plates held in place by slipping them over pipe 10 and separated from each other by collars 28. The plates 27 are to prevent any solid material from passing upward into outlet pipe 15 should the mass in the generator splash too much during the reaction.

From the above it will be seen that a generator, 3, for instance, may be removed from the system by disconnecting the unions 11, 16 and 19 in the pipes 10, 15 and 18 respectively, the valves 12, 17, and 20 nearest the generator 3 being first closed also, that by properly operating the valves 21 and 23 in the conductor 14 and branch connections 22, these latter may be cut in on or out from the system, thus permitting cooperation between any two generators, not adjacent, if desired.

The operation is as follows. Briquets of the described composition of matter are placed in the generators and water is allowed to enter slowly by way of the pipes 10, the valves 12 in the latter being opened and the needle valves 13 properly adjusted. The water is broken up by the sprinkler devices 8 and falls in sprays on the composition of matter in the generators, say for instance generator 3. Assume further that gas has previously been evolved from generator 4. Gas is now immediately evolved in generator 3 and passes into its outlet pipe 15, the adjacent valves 20, 21, 23 and 21, the latter two to the right of generator 3 in Fig. 2, being closed, while the valve 17 of generator 3 and the valve 20 of generator 4 are opened, thus forming a connection to generator 4. The gas evolved in generator 3 must therefore pass through pipes 15, 14 and 18 into generator 4 which contains a partially decomposed charge. This latter is stirred up by the gas bubbling through and the steam with the gas heats up the waste liquid and generates more hydrogen gas from the partially decomposed charge in generator 4.

When enough water has been put into generator 3 to act on the composition of matter therein until the generation of gas apparently ceases generator 6 for instance may be started up and the gas evolved therein is allowed to pass into generator 3, as described in connection with generator 4, the residual charge in generator 3 being thus

agitated to evolve additional hydrogen gas as described. In the meantime the generator 4 may be removed by disconnecting unions 11, 16 and 19 as above explained, for the purpose of being cleaned, dried and if desired, recharged and connected up again to the system. Similarly when the reaction in generator 6 is finished, generator 5 is started and generator 3 removed.

The hydrogen gas evolved from the generators, in the apparatus shown, passes off through an outlet 24, whence it may pass through a suitable filter or drier (not shown) to a storage or other reservoir as desired. The system may be further provided with the usual safety device 25 and flash back 26.

It will be observed that the evolved hydrogen gas may pass from generator 3 through the pipe 14 to the generator 5 or from generator 4 to generator 6 when the valves are properly operated as explained and as is obvious from the drawings, as well as from one generator to the adjacent one.

An apparatus as above described may of course comprise any number of generators and the detailed construction need not be followed strictly. The apparatus and method are of course applicable to the production of other gas than hydrogen, whenever it is advantageous to pass the gas through an already partially decomposed mass of the gas producing mixture.

What I claim as my invention is:

1. The method of making gas from a chemical mixture which only partially reacts with water in the evolution of the gas, consisting in partially reacting upon the mixture with water with production of the gas desired and steam and bringing the resulting hot moist gas and steam in contact with a similar, previously partially reacted upon, mixture.

2. The method of making hydrogen from a mixture comprising an alkali metal and a silicid, consisting in partially reacting upon the mixture with water with production of the gas desired and steam and bringing the resulting hot moist gas and steam in contact with a similar, partially decomposed mixture already reacted upon by water.

3. The method of making hydrogen from a mixture comprising a sodium metal and a silicid, consisting in partially reacting upon the mixture with water with production of the gas desired and steam and bringing the resulting hot moist gas and steam in contact with a similar, partially decomposed mixture already reacted upon by water.

4. The method of making hydrogen from a mixture comprising an alkali metal and aluminum silicid consisting in partially reacting upon the mixture with water with production of the gas desired and steam

and bringing the resulting hot moist gas and steam in contact with a similar, partially decomposed mixture already reacted upon by water.

- 5 5. The method of making hydrogen from a mixture comprising sodium metal and aluminum silicid, consisting in partially reacting upon the mixture with water with
10 production of the gas desired and steam and bringing the hot moist gas and steam in con-

tact with a similar, partially decomposed mixture already reacted upon by water.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HERBERT PHILIPP.

Witnesses:

A. HANS FOURIER,

ARNOLD NONNENBERG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."