

UNITED STATES PATENT OFFICE.

ARTHUR EICHENGRÜM, OF DÜSSELDORF, GERMANY, ASSIGNOR TO FARBENFABRIKEN VORM. FRIEDR. BAYER & CO., OF ELBERFELD, GERMANY, A CORPORATION OF GERMANY.

PROCESS OF GENERATING FORMALDEHYDE.

No. 875,415.

Specification of Letters Patent.

Patented Dec. 31, 1907.

Application filed March 6, 1907. Serial No. 360,906.

To all whom it may concern:

Be it known that I, ARTHUR EICHENGRÜM doctor of philosophy, chemist, citizen of the German Empire, residing at Düsseldorf, Germany, Kingdom of Prussia, have invented new and useful Improvements in Processes of Generating Formaldehyde, of which the following is a specification.

I have found a new process of generating gaseous formaldehyde, which process consists in treating an aqueous formaldehyde solution with salts of those peracids which are derived from metallic peroxids, having an alkaline reaction.

For my purpose I can use salts of perboric acids, such as the perborate of sodium $\text{Na}_2\text{B}_4\text{O}_8 \cdot 10\text{H}_2\text{O}$, salts of percarbonic acid, for example the percarbonate of sodium Na_2CO_4 , salts of pertitanic acid, such as the pertitanate of potassium $\text{K}_4\text{TiO}_6 \cdot 10\text{H}_2\text{O}$, salts of pervanadic acid; for example the pervanadate of sodium, NaVO_4 , salts of peruranic acid, such as the peruranate of potassium, K_2UO_5 , salts of perzirconic acid, for example the perzirconate of sodium,



the salts of permolybdic acid such as the permolybdate of potassium KMoO_4 ; etc. Salts of alkaline earths etc. may also be used. The reaction can be accelerated by the addition of fixed alkaline compounds, such as sodium carbonate, sodium hydroxid or the like. Instead of one salt of those peracids which are derived from metallic peroxids, having an alkaline reaction, mixtures of such salts of different acids may be used.

On using for instance the commercial formaldehyde solution 200 parts of a 40 per cent. formaldehyde solution are poured upon 50 parts of sodium perborate mixed with 50 parts of sodium hydroxid. A lively evolu-

tion of gas takes place with generation of heat and the liquid begins to boil, gaseous formaldehyde and steam being given off which may be used for disinfecting purposes. The same reaction takes place if 200 parts of a 40 per cent. solution of formaldehyde are mixed with 100 parts of perborate of sodium. This reaction is probably due to catalysis.

Having now described my invention and in what manner the same is to be performed, what I claim as new and desire to secure by Letters Patent is:—

1. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with salts of those peracids which are derived from metallic peroxids, having an alkaline reaction, substantially as described.

2. The process of generating gaseous formaldehyde which consists in treating an aqueous formaldehyde solution with a mixture of salts of those peracids, which are derived from metallic peroxids, having an alkaline reaction, and fixed alkaline compounds, substantially as described.

3. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with sodium perborate, substantially as described.

4. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with a mixture of sodium perborate and a fixed alkaline compound, substantially as described.

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

ARTHUR EICHENGRÜM. [L. s.]

Witnesses:

OTTO KÖNIG,

J. A. RITTERSHAUS.

It is hereby certified that the name of the patentee in Letters Patent No. 875,415, granted December 31, 1907, for an improvement in "Processes of Generating Formaldehyde," was erroneously written and printed "Arthur Eichengrüm," whereas said name should have been written and printed *Arthur Eichengrün*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of February, A. D., 1908.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

Correction in Letters Patent No. 875,415.

UNITED STATES PATENT OFFICE.

ARTHUR EICHENGRÜM, OF DÜSSELDORF, GERMANY, ASSIGNOR TO FARBENFABRIKEN VORM. FRIEDR. BAYER & CO., OF ELBERFELD, GERMANY, A CORPORATION OF GERMANY.

PROCESS OF GENERATING FORMALDEHYDE.

No. 875,415.

Specification of Letters Patent.

Patented Dec. 31, 1907.

Application filed March 6, 1907. Serial No. 360,906.

To all whom it may concern:

Be it known that I, ARTHUR EICHENGRÜM doctor of philosophy, chemist, citizen of the German Empire, residing at Düsseldorf, Germany, Kingdom of Prussia, have invented new and useful Improvements in Processes of Generating Formaldehyde, of which the following is a specification.

I have found a new process of generating gaseous formaldehyde, which process consists in treating an aqueous formaldehyde solution with salts of those peracids which are derived from metallic peroxids, having an alkaline reaction.

For my purpose I can use salts of perboric acids, such as the perborate of sodium $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$, salts of percarbonic acid, for example the percarbonate of sodium Na_2CO_4 , salts of pertitanic acid, such as the pertitanate of potassium $\text{K}_4\text{TiO}_6 \cdot 10\text{H}_2\text{O}$, salts of pervanadic acid; for example the pervanadate of sodium, NaVO_4 , salts of peruranic acid, such as the peruranate of potassium, K_2UO_5 , salts of perzirconic acid, for example the perzirconate of sodium,



the salts of permolybdic acid such as the permolybdate of potassium KMoO_4 ; etc. Salts of alkaline earths etc. may also be used. The reaction can be accelerated by the addition of fixed alkaline compounds, such as sodium carbonate, sodium hydroxid or the like. Instead of one salt of those peracids which are derived from metallic peroxids, having an alkaline reaction, mixtures of such salts of different acids may be used.

On using for instance the commercial formaldehyde solution 200 parts of a 40 per cent. formaldehyde solution are poured upon 50 parts of sodium perborate mixed with 50 parts of sodium hydroxid. A lively evolu-

tion of gas takes place with generation of heat and the liquid begins to boil, gaseous formaldehyde and steam being given off which may be used for disinfecting purposes. The same reaction takes place if 200 parts of a 40 per cent. solution of formaldehyde are mixed with 100 parts of perborate of sodium. This reaction is probably due to catalysis.

Having now described my invention and in what manner the same is to be performed, what I claim as new and desire to secure by Letters Patent is:—

1. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with salts of those peracids which are derived from metallic peroxids, having an alkaline reaction, substantially as described.

2. The process of generating gaseous formaldehyde which consists in treating an aqueous formaldehyde solution with a mixture of salts of those peracids, which are derived from metallic peroxids, having an alkaline reaction, and fixed alkaline compounds, substantially as described.

3. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with sodium perborate, substantially as described.

4. The process of generating gaseous formaldehyde, which consists in treating an aqueous formaldehyde solution with a mixture of sodium perborate and a fixed alkaline compound, substantially as described.

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

ARTHUR EICHENGRÜM. [L. s.]

Witnesses:

OTTO KÖNIG,

J. A. RITTERSHAUS.

It is hereby certified that the name of the patentee in Letters Patent No. 875,415, granted December 31, 1907, for an improvement in "Processes of Generating Formaldehyde," was erroneously written and printed "Arthur Eichengrüm," whereas said name should have been written and printed *Arthur Eichengrün*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of February, A. D., 1908.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.

Correction in Letters Patent No. 875,415.

It is hereby certified that the name of the patentee in Letters Patent No. 875,415, granted December 31, 1907, for an improvement in "Processes of Generating Formaldehyde," was erroneously written and printed "Arthur Eichengrüm," whereas said name should have been written and printed *Arthur Eichengrün*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of February, A. D., 1908.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.