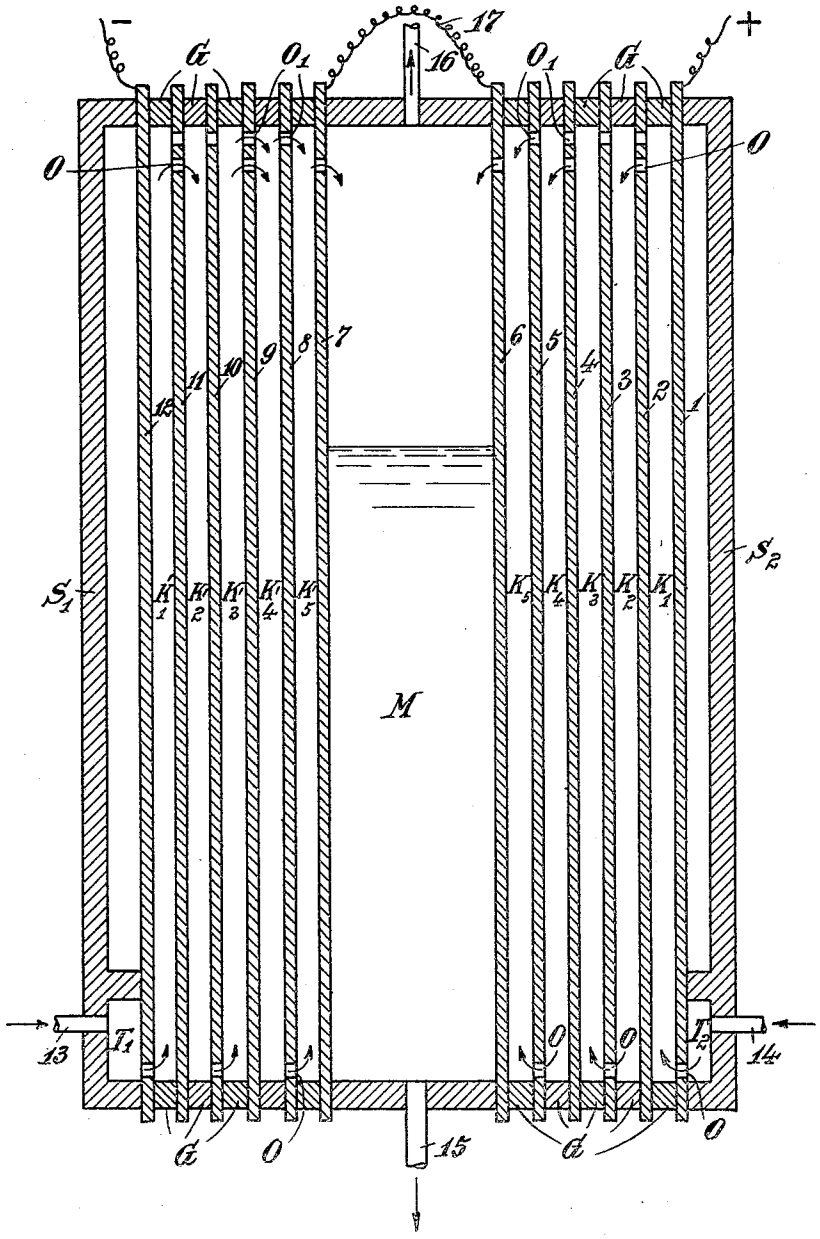
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APPARATUS FOR OXIDIZING POTASSIUM FERROCYANIDE TO POTASSIUM FERRICYANIDE

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APPARATUS FOR OXIDIZING POTASSIUM FERROCYANIDE TO POTASSIUM FERRICYANIDE

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My present invention is an improvement in or modification of that forming the subject of my prior Patent 1,732,117.

The invention forming the subject of that prior Patent 1,732,117 relates to the electrolytic revivification of the ferrocyanide of potassium formed in the purification of gases by oxidation of the hydrogen sulphide by ferricyanide of potassium to form sulphur and is characterized by the feature that in the anodic oxidation of the ferrocyanide of potassium solution, which must contain beforehand at least a small quantity of ferricyanide of potassium, in electrolytic cells without a diaphragm and preferably with electrodes of iron, the caustic potash formed in the electrolysis is converted in the nascent state by alkali metal bicarbonate into alkali metal carbonate.

My present invention relates to an improved apparatus for the electrolytic revivification of the ferrocyanide formed in the purification of gases by oxidation of the hydrogen sulphide by ferricyanide of potassium to form sulphur in electrolytic cells without a diaphragm.

The present improvement or modification resides in the feature that the battery formed after the fashion of a filter press and serving for the anodic oxidation is formed of bipolarly acting plates which consist of alloys of iron with chromium and nickel (so called V_2A metals).

It has been found that in the performance of the process according to the prior patent with gases which contain only very little hydrocyanic acid along with hydrogen sulphide etc., an electrode material consisting substantially of iron cannot be used with special advantage. If, for example, water gas, which contains only about 6 to 9 grams of hydrocyanic acid in 100 cubicmetres of gas, is to be freed from sulphur according to the prior process, then while observing the other steps of the operation characterized in the prior patent there are formed on the cathode surfaces and also on the anode surfaces of the battery more or less thick covering layers which with continuous loading of the battery lead to undesirable increase of the terminal voltages. As the cause of this there is to be considered above all the circumstance that anodically a certain action on iron (even cast iron) occurs, whereby the washing liquid is enriched with iron. If sufficient hydrocyanic acid is present in the gas, as is the case, for example, with coal distillation gases, this iron which comes anodically into solution is converted by aid of the potash contained in the washing liquid into ferrocyanide of potassium, so that no further enrichment can take place. If, however, there is a shortage of hydrocyanic acid as, for example, in the case of water gas, there occurs a certain supersaturation of the lye with anodically dissolved iron, and covering layers accumulate on the electrode surfaces, which layers gradually become thicker and occasion frequent and expensive cleaning of the battery.

The drawbacks thus experienced can be avoided if instead of pure iron electrodes there are employed electrodes consisting of alloys of iron, for example, with chromium and nickel. As practically useful there have been found, for example, the V_2A metals of commerce, containing about 70% iron, 23% chromium and 7% nickel. With the use of such iron alloys a much less anodic action is to be observed than with the use of pure iron (cast iron). So far as this action occurs to a noticeable extent minimum quantities of hydrocyanic acid in the gas to be purified suffice; for example, such quantities as are contained in water gas in order to inhibit the formation of anodic covering layers. Also in this case the directions given in the specification of the prior patent are to be strictly observed according to which the washing liquid to be revivified in the circuit must always contain some ferricyanide of potassium. Also the caustic alkali formed in the electrolysis must be converted by means of bicarbonate into carbonate and the alkali content of the washing liquid correspondingly adjusted.

The washing liquid contains advantageously along with 20% to 25% ferrocyanide of potassium about 4% to 6% of potassium carbonate and bicarbonate. Such a lye can be

continuously revivified electrolytically with V_2A electrodes even in the treatment, for example, of water gas, without an appreciable alteration of the loading capacity of the battery with uniform terminal voltage being experienced. The anode surfaces remain perfectly blank, while the cathode surfaces are covered with a covering layer which increases up to a definite thickness, which layer inhibits cathodic reduction of the anodically formed ferricyanide of potassium and thereby influences very favourably the consumption of current.

Apparatus according to the present invention is illustrated by way of example in the accompanying drawing.

Referring to the drawing there are used V_2A electrodes preferably in the form of quadrilateral sheets which may be ribbed for the purpose of increasing the surface. These sheets are assembled to form a battery after the fashion of a filter press in manner known per se. In the embodiment illustrated there are twelve sheets 1 to 12 arranged in two groups. The sheets are held together by two end plates S_1, S_2. Between the sheets are distance or packing pieces G of rubber which are located near the edges of the sheets and compressed by the plates S_1 and S_2. Fitted to the plates S_1 and S_2 are conduits 13 and 14 through which the washing liquid to be revivified flows into the apparatus. The liquid passes first to two distribution pockets T_1 and T_2 formed in or on the end plates S_1, S_2. From these pockets the electrolytic liquid flows through openings O provided in the sheet first into the outer chambers K_1 or K_1' and then in series in the direction of the arrows through the chambers K_2 or K_2', K_3 or K_3' through apertures formed alternately near the upper edges and the lower edges of the sheets to the central chamber M from which the liquid flows through the outlet conduit 15. The hydrogen evolved in the electrolysis also flows into this central chamber M from which it flows off upwardly through the tube 16 after separation from the lye. The hydrogen flows through separate holes O_1 provided in the sheets to the central chamber. These holes O_1 lie somewhat above the upper openings O serving for the passage of the lye.

The supply of current to such a battery is effected preferably at the end plates 1, 12. The two middle sheets 6 and 7 defining the central chamber M are bridged as shown at 17. They act, therefore, exactly like the end plates 1, 12 in contrast with the other sheets 3 to 5 and 8 to 11 as one-sided electrodes.

I claim:

An apparatus for oxidizing potassium ferrocyanide to potassium ferricyanide comprising a battery formed after the fashion of a filter press and serving for the anodic oxidation, said battery having bipolarly acting electrode plates consisting of alloys of iron with chromium and nickel, said electrode plates being packed at the edges by rubber packing pieces for forming chambers between said plates, said electrode plates being further provided with openings alternately at the top and bottom permitting the passage of the washing liquid, a central chamber between two innermost plates and top openings in said innermost plates permitting the passage of the hydrogen evolved into the said central chamber.

In testimony whereof I have signed my name to this specification.

RICHARD BRANDT.