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METHOD FOR THE PRODUCTION OF A RIGID MASS FOR ACETYLENE GAS ACCUMULATORS

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5 Claims. (Cl. 106—86)

Acetylene gas accumulators, due to the high explosivity of the acetylene gas and its inclination, under pressure to split up, are formed by steel containers, which are filled with a porous mass, in the capillary channels of which acetone is received. It is known, that acetone has a very high power of dissolving acetylene gas. Instead of acetone it is also possible to use some other solution means. All of these solutions means are in the following comprised under denomination "acetone." The porous masses, used for the purpose, are formed partly by loose masses, where the different particles are not combined into a rigid body, partly also of rigid masses, where the particles are combined to a rather stonelike, rigid body.

In order that an acetylene gas accumulator shall have a high power of accumulating acetylene gas it is required, that the relation between cavities receiving acetone and the particles of the loose or rigid mass, as to the volume, is very high. The greater the participation in the total volume, received by acetone is, the more acetylene can be accumulated in an acetylene gas accumulator of given weight and/or volume. One has therefore proposed different methods of increasing the volume relation.

Nowadays one is of the opinion, that in different respects rigid masses are to be preferred before loose masses. The respect, which is perhaps the most important one, in which the rigid masses are better than the loose masses is, that one can by means of rigid masses achieve an essentially more favorable acetone relation. The matrix of the rigid masses is practically without exception formed by a grid of calcium-silicate of substantially the same chemical character as concrete, although it has usually been provided in a different way, which does not prevent, that there is contained cement in several rigid masses as a constituent in the production of said mass.

In order of getting a good acetone relation in a gas accumulator of the said kind one has already proposed to make the stone-like mass, existing in the gas accumulator, from a water-content mixture of a material, consisting of lime or containing a surplus over stoichiometric of lime, and a material, consisting in siliceous acid or containing a surplus over stoichiometric of siliceous acid, whereby the porosity in the built-up rigid mass is obtained by the presence of an essential surplus by stoichiometric of water. This water has been evaporated.

Tests made with acetylene gas accumulators of this kind, however, have proved that they suffer under certain other disadvantages. In first place it should be mentioned, that the grid of porosity channels formed at the evaporation of the water during the production of the porous mass in the above mentioned way contains an enormous number of small channels, but each separate channel, instead, is utterly fine. As a matter of fact these channels have a cross-section, which could sooner be measured as one or some Angströms, than in fractions of a millimetre. In spite of the high degree of porosity obtained in this way the accumulator is, however, not suitable for delivery of great momentary quantities of

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acetylene, because the combined resistance against movement of the acetylene in these many small channels will be so big, that there is formed a limit for the maximum acetylene gas delivery per unit of time, which is often too small to correspond to the need.

For preventing this disadvantage thus there is required in addition to the fine porosity, obtained due to the surplus of water, also a given quantity of pores in the mass, which are of an essentially higher order of magnitude, preferably in the order of magnitude of 1 mm. diameter or less. It is not suitable, that the last mentioned pores have a greater diameter than 1 mm., because in such a case free acetylene would collect in them to a too great quantity, and at eventually occuring splitting an explosion would be the consequence.

A gas accumulator, which contains in this way two different systems of pores, the one of essentially finer capillarity than the other one, may be regarded as being composed by a main system, consisting in the fine porous system, and in addition thereto a reserve system, consisting in the coarse porous system. At very high momentary discharges thus the coarse porous system has to give off the major part of the acetylene gas, whereas, during a smaller acetylene delivery following thereafter, or even, if the gas accumulator is in stand-still, without delivery of any acetylene, an equalization will rather quickly take place between the two porous systems thus communicating with each other.

Another disadvantage, which has been observed in such gas accumulators, the porous system of which did only consist in fine porous channels, has been, that at strong deliveries of acetylene a given spray of acetone emanated. This phenomenon can be explained thereby, that the speed of the gas in the fine channels will be so high, that it collects microdrops of acetone, so that an aerosol of acetone and acetylene is formed. Acetone, however, is dangerous to most burners, and especially for given purposes a sooting effect may occur in the burner, which will essentially disturb its work. Further it is important, that the acetone, which was certainly not intended to be used but belongs to the accumulator, because it should serve at the next filling of acetylene as acetylene-accumulating means, should not be removed from the accumulator but remain in it.

It has now proved, that if one has a coarse porous system according to the above together with a fine porous system in an accumulator, then the inclination for acetone spraying is practically fully removed.

One has further found, that an accumulator, which contains in the above indicated way a coarse porous and a fine porous system in combination with each other, causes an essentially higher mechanical strength of the proper porous mass.

It is now obvious, that one has to create the fine porous system and the coarse porous system in essentially different ways, in order that a clear distinction between these two porous systems shall be created. The fine porous system is created in the known manner thereby, that one has an essential surplus of water in the mass forming the rigid mass of the accumulator, said water being later on evaporated.

The coarse porous system, which should exist in addition to the fine porous system, is created according to the present invention thereby, that one mixes into the initial mass, from which the rigid mass body is formed, so called fluid pearls. With fluid pearls shall thereby be understood small pearl-formed bodies, which have an extremely thin shell, however non-penetrable for fluid, and which contains inside of this shell the fluid. The fluid preferably may consist in water.

Since these fluid pearls are provided in their interior with a load of water, which is practically not compressible, the fluid pearls are practically not damaged at the production of the gas accumulator until the moment, when an evacuation takes place, preferably under high temperature. Then, as a matter of fact, the fluid will get into cooking, under formation of gas with a super-pressure, simultaneously as there will exist a sub-pressure outside of the pearls, and the brittle shell around the fluid pearls will then crack. At its cracking the shell will leave the fluid existing inside of the pearl free possibility to enter out into the outside parts of the mass body in the gas accumulator, from which it is evaporated in the same way as the water was evaporated, which formed the fine porous system.

Fluid pearls preferably are produced in the way, that a soluble salt is solved in the fluid, which should form the core of the pearls. Thereafter this fluid is sprayed together with the salt solved therein into a second salt solution of such a kind, that by reaction between the two solutions a dissoluble salt is formed. This will then be precipitated on the surface of the fluid drop and it will there form the above mentioned shell around the pearl.

It has proved especially suitable to use as the soluble salt sodium alginate, which is thus added to the water in an amount of for instance from ½% to 2 or 3%, the sodium alginate solution in water thereafter being sprayed into a vessel, containing calcium chloride solution. Suitably, also this fluid can consist in a water solution of calcium chloride with a content of between ½% and 2 or 3%. Due to the reaction between the sodium alginate and the calcium chloride then immediately calcium alginate is formed, which is completely non-soluble. This calcium alginate will enclose the remaining part of the sodium alginate solution in a spherical shell, and in this way the pearls are formed, simultaneously as, by exchange of ions successively the initially existing solution of calcium chloride will contain a given quantity of sodium chloride.

The nozzle, by means of which the sodium alginate solution is sprayed into the calcium chloride solution thus should be of such a kind, that a suitable fine division is obtained. By controlling this nozzle or by suitable choice of a nozzle one can thus obtain fluid pearls of practically any magnitude within reasonable limits, and it has also proved, that with a good such nozzle the pearls will obtain practically constant magnitude.

Such pearls are now intermingled into the wet mass, which is poured into a container to form the accumulator mass contained in said container, which, in the above indicated way, contains a siliceous acid materal, eventually pure siliceous acid, and a lime containing material, eventually pure lime, or a material, which gives off its surplus of lime under reaction, as for instance cement. During the hardening of this mass, so that it will assume rigid form, the fluid pearls remain complete, because the outer pressure can be received by the shell, which obtains sufficient counter pressure from the fluid quantity enclosed in the pearl. During the evacuation following thereafter, preferably under addition of heat, however, an evaporation of the fluid will take place, which is enclosed in the pearls, and under influence of the interior super pressure, the pearl shell of calcium alginate will be exploded, so that the alginate solution will penetrate into the formed rigid mass leaving cavities in same. The last mentioned cavities thereby form the coarse porous system, whereas the fine porous system is formed by the evaporation of water.

It will be evident from the above, that one can control the proportion between the volume of coarse porous and fine porous channel systems, in a gas accumulator mass of the kind concerned by regulating the surplus of water and regulating the quantity of fluid pearls, respectively, which

are fed to the mass before the preparation of the accumulator. Tests, which have been made, have proved, that an extremely good fine porous system is obtained, if the raw mixture for the production of the rigid mass in the acetylene gas accumulator consists in between 16 and 60 parts of diatomaceous earth, eventually with a smaller addition of siliceous acid of other origin, further between 16 and 30 parts of carbide lime, eventually with a smaller addition of lime of other origin, and between 90 and 480 parts of water. All of the above mentioned quantities thereby are calculated as quantities of weight. In such a mass one will obtain a rather well dimensioned coarse porous system, if one adds 5 or 6 liters gross measure of fluid pearls to such a quantity of the mass, which is consumed for an acetylene gas container for 40 liters volume.

A gas accumulator, produced in the above mentioned way, proves to afford also very strong momentaneous acetylene deliveries, without any choking action occuring, and without any acetone spray being observed. When gas accumulators of this kind were sawed through, and at tests to crush the formed mass by pressure, it further proved, that this mass had up to 30 or 40% higher rigidity against crushing than a mass, to which no fluid pearls had been added.

What we claim is:

1. A method of producing a rigid porous mass for acetylene gas accumulators comprising forming a mixture comprising a siliceous acid material and a lime containing material in approximately stoichiometric quantities, water in excess of the stoichiometric amount, and a plurality of small pearl-shaped bodies constituted by a frangible thin shell and a fluid entrained therein, said shell being non-penetrable by said entrained fluid, and thereafter heating the whole to cure said mixture, to evaporate the surplus of water, and to burst said frangible shells whereby the rigid mass thus obtained comprises a fine porosity due to evaporation of surplus water from said mixture and a coarse porosity due to the evaporation of fluid from the frangible pearl-shaped bodies.

2. A method according to claim **1** wherein said fluid is aqueous.

3. A method according to claim **2** wherein said fluid is a water solution of sodium alginate and said frangible shell is calcium alginate.

4. A product made according to the process of claim **1.**

5. A method of producing a rigid porous mass for acetylene gas accumulators comprising forming a mixture comprising from 16 to 60 parts by weight of diatomaceous earth, between 16 and 30 parts by weight of carbide lime, and between 90 and 480 parts by weight of water and from 5 to 6 liters per 40 liters of rigid porous mass producted of small pearl-shaped bodies constituted by a frangible thin shell and a fluid entrained therein, said shell being non-penetrable by said entrained fluid, and thereafter heating the whole to cure said mixture, to evaporate the surplus of water and to burst said frangible shells whereby the rigid mass thus obtained comprises a fine porosity due to evaporation of surplus water from said mixture and a coarse porosity due to the evaporation of fluid from the pearl-shaped bodies.

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