

end of the blades. They may be called radially diminishing blades.

(8930) F. H. P. writes: Will you kindly explain through your inquiry department the chemical action which takes place in the manufacture of Portland cement from lime rock and shale, and why the two, when combined in a wet state and burned, will produce a cement which hardens as hard as a rock, while either element when burned and combined dry will only make a lime plaster or a substance which is not hard at all? A. A great deal of investigation has been done to determine the reason and reactions in the setting and hardening of cement. Briefly summed, the conclusion reached and apparently now fully established, is that, in the process of burning, the clay and lime combine, forming basic silicates and aluminates of lime, which then with water form crystalline hydrated silicates and aluminates respectively, thus causing hardening. If it be borne in mind that the crystalline hydrated silicates closely correspond to the zeolites of nature, and the crystalline aluminates to the spinels, the hardening is readily understood. This explains also why a mixture of burnt clay with burnt lime, does not yield a cement; in this case there is no combination between the clay and the lime, and consequently the lime simply slakes with water in the usual manner.

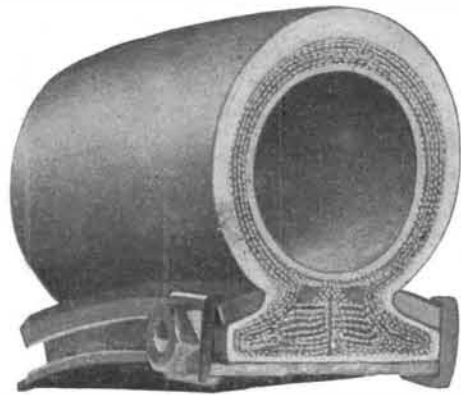
(8931) G. W. L. asks for the cost of production of chlorine gas by some process in commercial use. A. Descriptions of processes are freely found in chemical literature, but costs are rarely published. We give here a few references: Ludwig Mond, presidential address before chemical lecture at British Association meeting, 1896, gives a good description of the processes to date, but no costs. George E. Davis, Journ. Soc. Chem. Ind. xvi. 11-1868, reviews processes to date, and gives following costs for bleach, per ton, including all manufacturing and general expenses: By Deacon-Hasenclever process, £5, 6s. 9d; by nitric acid process, less than £4, 6s. 9d; by Weldon process, £5, 6s. 7d. The electrolytic processes had then not been perfected. John B. C. Kershaw, electrician, June 15, 1900, gives figures as to the actual and relative cost of electrolytic chlorine, when used in the work of bleaching goods. F. Oettel, Zeitschrift für Electrochemie, 1900, 7. (21) 315-320, and V. Engelhardt, same journal, 1901, 7 (27) 390-396, gives figures as to cost of bleaching by the Haas-Oettel and Kellner apparatus. Engelhardt takes into account the varying costs of salt and electrical energy. J. B. Swan, Jour. Soc. Chem. Ind. xx. 7, 662; B. E. F. Rhodin, same journal, xxi, 7, 449; and C. P. Townsend, Elec. World and Eng. April 5, 1902, describe modern electrolytic processes and give figures as to the output per electrical horse power, but none as to cost. Valuable data will be found in Census Bulletin No. 210, on Chemicals and Allied Products, but even here figures as to costs are not given. The Census Department might be able, however, to give such figures, or put you in the way to obtain same.

(8932) J. M. M. wants to know the best known preparation for preserving old and new shingle roofs, also tin—a preparation of coal tar or pitch, with some other ingredient in it to harden it, so it will not run when exposed to hot sun or crack in frost and winter. A. A good quality of pitch, mixed with creosote oil to the consistency of paint, is often used on iron and wood. Pitch thinned down with turpentine or carbon bisulphide gives excellent results and will dry out hard. Care must be taken when using carbon bisulphide as it is highly inflammable; also, it has a very disagreeable odor. Rosin is sometimes added and is claimed to give a better and more durable coat. We know of one concern who claim to add a small amount of rubber, stating that they obtain in this way a paint which adheres well to tin roofs and will outwear the usual linseed-oil paint. If care be taken to secure a good, rather hard pitch, which has not been burned in the distillation, it should not soften to any considerable extent under the usual heat of the sun.

(8933) G. S. K. asks how to compute the width of the brushes for a six-pole armature intended for a current output of 420 amperes. The armature, he says, is provided with a multiple-circuit winding. Each brush stud will have four brushes 3/4-inch thick. A. The data for calculation of copper and carbon brushes, as to pressure, contact resistance, and friction, are given in an article in the Electric Engineer, New York, August 7, 1895. As this journal is no longer published, you may not find it except in a library. We have not access to it ourselves, and cannot give you any result attained by the authors. The carrying capacity of copper is from 2,000 to 4,000 ohms per square inch cross section. From this the bearing surface can be easily found, with a liberal factor of safety.

(8934) G. W. T. asks for the name of an article that when added to glue will keep it in liquid form; if so, the quantity per pound of glue before dissolved, also proportion of water to one pound of glue. A. 1. Boil together for several hours, 10 parts of good strong glue, 26 parts of water and 1 1/2 parts of nitric acid. 2. Soak good glue with water, then melt in the usual way, and stir in strong vinegar or acetic acid until a solution is obtained which will be of the right consistency when cold.

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