

CLAY AND CLAY PRODUCTS.

By JEFFERSON MIDDLETON.

CLAY.

The clay resources of the United States are almost illimitable and have hardly been touched, though billions of dollars' worth of wares have been made from them. Nor have the clays of the United States been put to many uses to which they are adapted. Except for kaolin or china clay and some of the most highly refractory clays, we are now practically independent of foreign supplies. The principal indictment against domestic white-burning clays has been the lack of purity and uniformity in the marketed raw material. Laboratory studies by the Bureau of Mines and the Bureau of Standards have shown that by proper treatment or by blending the American clays may be used for many purposes for which they have heretofore been thought unsuitable and they can be profitably used as a substitute for the imported clays.

The principal recent concern of the American manufacturers has been to find a substitute for the high-grade fire clays formerly imported from Germany and used in the manufacture of glasshouse supplies, crucibles, lead pencils, emery wheels, etc. At the beginning of the war the users of these clays were apparently well supplied with them. As stocks became depleted, with no prospects for a resumption of imports, the manufacturers of high-grade refractory products turned to the United States Geological Survey and other Government bureaus for information as to sources of domestic clays suitable for these uses. Such clays have been reported to the Geological Survey from Arkansas, California, Delaware, Illinois, Kentucky, Mississippi, Missouri, North Dakota, Ohio, and Pennsylvania, and lists of miners of these clays have been supplied to many inquirers. Bleining and Schurecht,¹ of the Bureau of Standards, have shown the feasibility of substituting domestic for foreign clays and comment as follows on the situation:

The question of replacing the plastic clays imported from Europe in considerable quantities up to the outbreak of the European war has been of importance to the industries concerned. The materials which are chiefly concerned are the Gross Almerode clay for the glass and the Klingenberg clay for the graphite crucible and allied industries.

¹ Bleining, A. V., and Schurecht, H. G., Properties of some European plastic fire clays: Bur. Standards Tech. Paper 79, 1916.

Some of the users of such materials have sought to replace these clays by individual American clays. There is no reason to believe that such clays can not be found in the United States; in fact, materials have been tested in this laboratory which approach the foreign clays in quality. It would be far better, however, to depend upon a mixture of two or more clays, representing both clays of the open and more refractory and of the dense and vitrifying variety, to secure the desired condition. Since such clays as those from the St. Louis, Mo., district have been used for years with good success in glass-pot mixtures, in conjunction with the European clays, it would not be difficult to supplement their qualities by means of materials vitrifying at lower temperatures and not subject to overburning within a considerable temperature range. Such clays, it is true, are not common, but may be found among the ball clays or semi-ball clays of Tennessee and Kentucky and in some of the plastic No. 2 fire clays, as those from Pennsylvania and Ohio.

The demand for clays to be used in the place of the English china and ball clays has not been so sharp, because the supply has not been so greatly curtailed as that of the German fire clays. Nevertheless there has been some falling off in the imports of kaolin or china clay and more or less demand for a substitute for the imported kaolin. Sproat,¹ of the Bureau of Mines, has shown that if the Georgia and South Carolina clays are treated with caustic soda and sulphuric acid, at a cost of less than 50 cents a ton, they can be substituted for the ball clay and 50 per cent of the English china clay, and that whiter and stronger tile can be made from these clays in their purified form with domestic feldspar than can be made from imported china clay and Cornwall stone. From these results, and the possibility of the successful treatment of other clays heretofore deemed unsuitable for use in the white-ware industries, together with the fact that large deposits of white-burning clays in this country are at present undeveloped, it seems probable that the United States will become entirely independent of foreign clays.

CLAY PRODUCTS.

The direct use of clay products in war is of minor importance compared with the use of refractory products in the iron and steel and glassmaking industries and the use of clay wares in the chemical industries, which are of vital importance to military operations.

The clays of the United States form the basis of great industries. In value of annual output these products stand next to the two metals and two fuels that rank highest—iron and copper, coal and petroleum. Every State has its workable deposits of clay, and every variety of ware, from the commonest product—common brick—to the highest grade of china or porcelain, is made from domestic clay within our borders. The imports of these wares are now exceedingly small compared with domestic production, being valued in 1915 at only 4 per cent of the total output. Of the imports, 97 per cent consisted of pottery and 3 per cent of brick, firebrick, and tile.

¹ Sproat, I. E., *Refining and utilization of Georgia kaolins*, with a preface by C. L. Parsons: Bur. Mines Bull. 128, 1916.

The value at the point of shipment of the pottery consumed annually in the United States is about \$50,000,000. The proportion of domestic production to consumption has been gradually increasing since 1907, reaching its maximum—over 90 per cent—in 1916. This increasing market for domestic pottery is due no doubt to the improvement in the texture, finish, color, and decoration of the American product and in prevention of crazing, some of the higher grades of American pottery equaling if not surpassing some of the best imported wares. The value of the pottery produced in 1916 was the greatest ever recorded, the potteries during most of the year having been rushed to the limit. The output was somewhat curtailed, however, by the inability to procure raw materials on account of the transportation and labor conditions and the shortage of fuel.

The imports of pottery, which were in general declining even before the war began, have since shown even greater decrease, the value of pottery imported in 1916 being considerably less than one-half of that in 1907, the year of maximum value.

