March, 1788, he tried the experiment of fitting a retort containing caustic volatile alkali to a gun-barrel filled with crushed pyrolusite (maganese dioxide), and heating the latter to redness, whilst the retort was also heated. Signs of nitrous acid and nitrous air soon made themselves manifest, and by continuing long enough nitrous gas was obtained. The experiment was repeated many times; its success depended on the nature of the pyrolusite, the temperature of the furnace, and the patience of the experimenter. Full details are given as to the best way of carrying out the experiment. It frequently happens that the ammonia passes over unchanged. Red lead was found, unexpectedly, not to be active, but green vitriol burnt white gave better results.

The changes are correctly explained by Milner as due to oxidation. With burnt alum he obtained the curious result of the evolution of a large amount of inflammable gas mixed with hepatic air (sulphuretted hydrogen) and sulphur, whilst sulphur remained in the gun-barrel. It is, therefore, not sufficient merely to bring the volatile alkali in contact with a substance containing dephlogisticated air, but another substance is also necessary which has a strong attraction for the combustible substance.

It is also noteworthy that Black in his "Lectures on Chemistry" (edited by John Robison, Edinburgh, 1803) states that "our newspapers inform us that the French chemists procured saltpetre for the Army by blowing alkaline gas, and even putrid steams, through red-hot substances which readily yield oxygen" (vol. 2, p. 245); and there is a statement that "Mr. Milner of Oxford (*sic*) published a paper in the 79th volume of the Philosophical Transactions . . . but he did not attempt to ascertain how much of the nitrous acid might be produced from a limited and known quantity of the volatile alkali" (vol. 2, p. 455). Black (*ibid.*) gives a clear explanation of the process; the ammonia "is a compound of hydrogen and azote, we need only suppose that part of it is totally decomposed and destroyed by the action of the oxygen contained in the manganese. Part of it, uniting with the hydrogen, forms water or watery vapour; and part, uniting with the azote, forms vapours of nitrous acid." I have not traced the reference to the "newspapers," but a footnote on the same page (455) reads: "*January*, 1796. There is a rumour that the French have manufactured saltpetre, during a part of the war, by obtaining nitrous acid from the vapours of volatile alkali, forced to pass through red hot manganese. Author."

Many strange names have of late been given to the process of ammonia oxidation; we have heard of the "Ostwald-Mittasch process" and others. The first use of platinum as a catalyst appears to be due to Kuhlmann, of Lille, in 1839.

J. R. PARTINGTON.
45 Kensington Gardens Square, W.2.

A Specimen of Wrought-iron Currency from the Kisi Country, Sierra Leone Protectorate, West Africa.

A SPECIMEN of iron currency from the Kisi country was obtained by one of us (E. R. M.) while on service in West Africa in 1915 through the agency of his servant, Ali Badara, the son of a chief in the adjoining Momo-Fullah country; and a description of it may be of interest to readers of NATURE.

As this form of currency ceased to be used after the establishment of the British Protectorate in 1787, the age of the specimen may be estimated at not less than 130 years, and probably more.

The "coin" (Fig. 1) is of rough workmanship, and consists of a strip of roughly forged rectangular section, one half being twisted and the ends hammered out into thin blade-like projections, the broad end serving to prevent the "coin" slipping through the belt in which it is carried.

Analysis shows the metal to be wrought-iron of good quality, probably made by the direct process of reducing an oxide ore by carbon in presence of a basic slag containing much iron oxide to prevent carburisation of the iron, most of the slag then being

FIG. 1.—Photomicrograph × 1/5.

expressed by hammering the pasty mixture of iron and slag. The percentage composition is as follows: Carbon, 0·095; silicon, 0·103; manganese, nil; sulphur, 0·024; and phosphorus, 0·046. For the analysis drillings were taken from the wider part of the specimen and fragments from the narrow end. These were washed in benzene to remove the coating of black grease from the surface of the metal.

The metal is extremely soft and easily bent, the Brinell hardness at the point A being 121 (using a

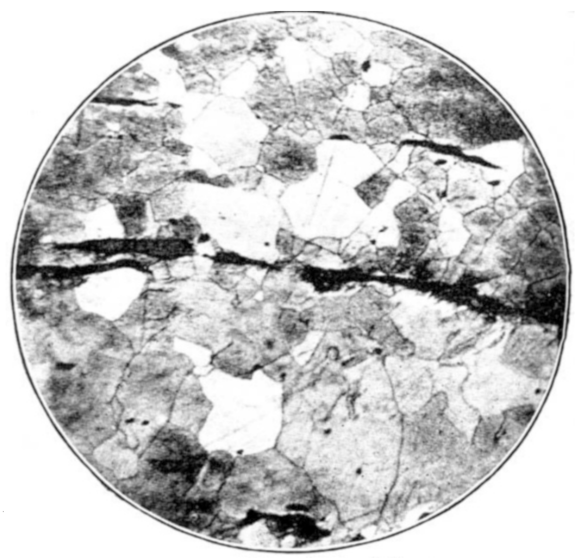

FIG. 2.—Photomicrograph × 275.

ball 1 mm. diameter and a load of 10 kilograms). A small fragment was cut from the point B, embedded in solder, polished, etched with 2 per cent. nitric acid in alcohol, and photomicrographed. The photomicrograph (Fig. 2) shows the typical crystalline structure of a pure iron, together with elongated inclusions of slag.

R. C. GALE.
E. R. MACPHERSON.
Chemistry and Metallurgy Branch,
Artillery College, Woolwich.

Molecular Structure of Amorphous Solids.

A QUESTION of fundamental importance in the theory of the solid state is the nature of the arrangement of the ultimate particles in amorphous or vitreous bodies, of which glass is the most familiar example. Is it to be supposed that the molecules are packed