

*Superphosphate of Lime.*—This is an artificial compound which was originally designed to present to the farmer the constituents of bones in a form ready for assimilation by plants. Bones, as we know, require from their peculiar organic structure, a very long time of exposure before their constituent parts yield to the solvent action of water, and be of direct use as manure; moreover, the difficulty in grinding bones throws another obstacle on their practical application, and generally induces farmers to burn them at the expense of their valuable organic part, in order to secure the more ready action of the remaining phosphate of lime. These evils are, to a large extent, removed by the transformation of bones into superphosphate of lime, and the immense success which this compound has met with from its first introduction till the present day, has opened for it a large field for competition, and has more recently increased the original use of bones over all the natural phosphates of commerce.

Superphosphate of lime is made by adding, under some precautions, sulphuric acid to phosphate of lime (a combination of phosphoric and lime, as contained in bones, Mexican guano, mineral phosphorite, &c., and hence the different materials employed.) As soon as the above ingredients are brought in contact with each other, a brisk chemical action ensues: sulphuric acid, being a very strong acid, and having a greater affinity to lime than phosphoric acid, lays hold at once of a portion of the lime, which exists in combination with phosphoric acid, and forms with it the hydrate of the sulphate of lime, our common plaster of Paris, whilst on the other side the common phosphate of lime, thus deprived of a portion of its lime, is converted into a new compound, called bi-phosphate of lime, which relatively contains more of phosphoric acid and less of lime than the former. Superphosphate of lime is therefore an intimate mixture of plaster of Paris, and bi-phosphate of lime; its valuable properties, however, depend exclusively on the latter constituent, from the chemical character of which we have also to judge of its mode of action as a manure.

Bi-phosphate of lime is easily soluble in water, it contains phosphoric acid in a soluble form; but its most important feature is that, whenever it meets a strong base, e. g. lime, either in its caustic or carbonated state, it becomes reconverted into common phosphate of lime, by uniting again with that portion of lime from which it was formerly separated by means of sulphuric acid. On account of its solubility in water, it will therefore penetrate the soil intimately to which it is applied as a manure; but whilst doing this, it meets almost everywhere on its way with lime, which in the form of minute and invisible particles is present in, and uniformly diffused through all cultivated soils. The immediate con-