

but I will show you when I come to treat of the organic manures, that if such was the case, it is fully remedied by the new powers which it has acquired by calcination. Gypsum or sulphate of lime is also used as a manure in different countries, with various success; in some cases its fertilizing qualities have been so striking that in former times such effects would have been attributed to magic. The causes of the fructifying powers of this substance are but partially understood. Sir Humphrey Davy has thrown some light on this subject. He analysed a portion of clover and found it to contain a proportion of Gypsum, equal to three bushels to the acre: this proves that gypsum is a constituent of clover, but does not prove that it must previously be in the soil in the form of sulphate of lime, as it is well known that calcined lime will combine with the sulphuric acid which is always in clay soils, or soils that contain it. Leibig in his Agricultural Chemistry of the present day, when chemical science has much improved since Sir Humphrey Davy's time, has shown that powdered gypsum in its raw state has a strong affinity for ammonia.* This latter substance, as I have before informed you, is one of the most indispensable to all plants that are cultivated for the sustenance of man and all his domesticated animals, and if it did not enter into the bread plants and grasses, animals could not exist although plentifully fed with them: This substance is the most volatile of all the constituents of organic bodies, and will fly off in the gaseous state whenever these bodies are decomposed either by natural decay, fermentation, or artificial heat. No small loss is sustained by the farmer in the evaporation of this article, not only from dung of every kind, but also from the offal of slaughtered cattle and the bodies of cattle that may occasionally die; and this richest of all his manures is not only continually escaping, but giving offence to our senses, and also rendering the atmosphere less healthy. Leibig's discovery of the attraction of Gypsum for ammonia† grasses points out to us a principle by which all these losses and offences may be remedied. Leibig also shows that this gas which has escaped may yet be caught and retained. This, no doubt will appear to you a paradox, but a few words will unfold the mystery. This ingenious chemist has discovered that the carbonate of ammonia which is continually ascending from the surface of the earth, as has been shown, rises high into the atmosphere, combines with the clouds and watery vapour, and descends with the rain;—this he has proved by repeated analysis of rain water, and shows that the substance in question was always present in a greater or less proportion; snow water contains it in an equal degree. This principle has been tested last summer in various parts of the United States and found to be correct. The carbonate of ammonia which is in the rain water is volatile, and will evaporate and escape with that water. In this way Leibig accounts for the useful effects of Gypsum; the sulphuric acid of the Gypsum having a stronger affinity for the ammonia than carbonic acid, combines with it and forms sulphate of ammonia,‡ which is a salt that is not volatile but soluble in water, and would remain in the soil, although the water were evaporated; the carbonic acid being thus set free from the ammonia combines with the lime of the Gypsum, and forms carbonate of lime—the use of which is well known. It is evident that the strong affinity that Gypsum has for ammonia would retain that substance in all these places if I stated it to be lost to the farmer. If in all those places in

and about the farmer's yard, gypsum were applied, either by covering, mixing, or scattering, as circumstances would permit, and the judgement of the farmer dictate, all this waste and loss would be at an end, and the value of the manure more than doubled. This last expression may require to be explained;—the urine which falls from the stock, generally, is never thought of being retained, but is allowed to pass off with the water which falls from the buildings, or perhaps into some brook or stream; in the latter case, the result is obvious, and in the former, the carbonate of ammonia will evaporate and of course the greater part is lost, even in the very field which it has run over. It may be proper to state, that men of the best information on this subject, are of opinion that the urine contains full one half of the nutritive principle which falls from the stock; and in this is included all the ammonia that comes from that race. I will now refer to an exhausted field, that formerly produced luxuriant crops, but continued cropping for many years has reduced, and in some cases, exhausted altogether, the various mineral constituents that formed parts of the plants which had been produced, there in perfection, although regularly manured with barn manure during the whole of this time. These cases are very frequently met with even in this vicinity. The cause of this barrenness may be easily described;—the mineral constituents which had formerly abounded in the original soil, had now become exhausted, and although manured as before stated, from the barn, yet this manure did not contain the chemical salts mentioned in the former part of this lecture, but in very small quantities; therefore, this part of the food being absent or scanty, the plant could not be produced, or if produced, it would be in a very imperfect and sickly condition.—Lime or calcareous marl in such cases, I believe, is the only artificial remedy: but nature will also furnish a remedy by giving her time. We all know that by letting an exhausted field remain in fallow two or three years, it gradually recovers the powers which the extraction of the mineral salts had deprived it of. In order to exhibit the causes of this, I must inform you that all soils are partially, or wholly, composed of the detritus or matter produced by the wearing down of the various rocks which form the crust of this globe. From what I have previously stated, you will perceive that, with a few exceptions, if any, the bases of all the salts that enter into the food of plants, are lime or potash. Salts of alkalies form, in various proportions, parts of many of these rocks, and of course, remain in the soil until exhausted by repeated cropping: But the sand, gravel, and stones, are undecomposed portions of it, and yet contain the original amount of the salts in question. The gradual decomposition of these materials is still progressing by the action of the atmosphere, and annually supplying the fields with those salts, but not to the amount required by the annual cropping: This explains why fallow will restore exhausted lands to fertility. Leibig says that the country around Naples—a country famed for its corn land, is farmed on this principle:—A field is cultivated once every three years, and is in the intervals, allowed to serve as a spring pasture for cattle. The soil experiences no change in the two years which it lies fallow, further than it is exposed to the influence of the weather, by which a fresh portion of the alkalies contained in it are set free or rendered soluble. The animals fed in these fields yield nothing to these soils which they did not formerly possess. The weeds upon which they live, spring from the soil, and that which they return to it as excrements must always be less than that which they extract. The fields therefore can have gained nothing from the mere feeding of the cattle upon them, on the contrary, the soil must have lost some of its constituents.

You all, no doubt, have observed in the spring of the year,

* This is a doctrine advanced by Leibig, but we cannot see that it has been demonstrated its truth.—ED. COL. FARMER.]

† This fact is contradicted by Mr. Partridge's practical chemistry.—ED. COL. FARMER.]