sive proof that the gasses are identical *(applause.)* The same white precipitate may be obtained from the gas produced by burning paper. This is the very substance which the plants require, and the air is the great receptacle from which they derive it. Now, nine-tenths, or I might say nineteen-twentieths of the substances of your crops are derived from the atmosphere. The charcoal they derive from carbonic acid gas; the nitrogen from ammonia; the hydrogen from water.

The mineral ingredients contained in the soil are several: you see them on this diagram:—

Constituents of Soils.

Potash,	Alumina,
Soda,	Chlorine,
Lime,	Fluorine,
Magnesia,	Silica,
Iron,	Phosphoric acid,
Manganese,	Sulphuric acid.

Of these bodies *Fluorine*, *Manganese*, and *Alumina* are found in plants in only minute quantities; and it has yet to be determined whether their presence is essential or accidental. *Silica*, or soluble sand, is found in most plants, and *Phosphoric acid* (the base of bones), united with *Lime*, *Magnesia*, *Potash*, or *Soda*, is found in the seeds of all plants yet examined. *Soda* is found in the ashes of all sea-plants; and *Potash* can be produced from the ashes of most land plants. *Magnesia* is the base of Epsom salts. *Lime* everybody knows. *Iron* is also well-known; it is found in plants and the soil generally in the state of the red oxide, or rust of iron. *Sulphuric acid* is made of sulphur and oxygen, and is well-known under the name of oil of vitriol. *Chlorine*, united with hydrogen, constitutes muriatic acid, or spirit of salt. Common salt contains *Chlorine* and *Soda*. Every plant will, if possible, take something from the soil, to enable it to take something from the air. But if the roots cannot take that which is necessary out of the soil, the leaves are not in a condition to take that which is required out of the air, and accordingly the growth of the plant does not go on in a satisfactory manner. Your object is not merely to get returned to you ear for ear, the corn which the land has previously grown —you want to produce a hundredfold by the application of every scientific improvement, and every new and scientific suggestion. One of the most important of the mineral ingredients is phosphoric acid (contained in bone-dust); and I will speak of this first as being of primary importance: all animals require it to form the base of their bones; and they must derive it from the vegetables upon which they live. If you attempted to feed them upon vegetables which did not contain any phosphoric acid, they would not grow at all. If the Almighty had intended them to live without bones, they might have grown upon food not containing phosphoric acid; but as that is not the case, they must have it. You have it in many soils; but owing to the practice of mankind, which prevails, of burying bodies in places of interment separate from the land, and owing to the bones of cows, horses, and sheep never having been put back into the ground, it happens that bone-dust is generally contained in the ground in much smaller quantities than is desirable or necessary to give many plants this acid in sufficient quantity. For thousands of years the bones of animals have never been put back again into the land, and consequently there it a deficiency of this substance unless supplied by artificial means. When, however, a farm has got up to its proper pitch of cultivation in this respect, it requires very little to keep it so. Another of these important substances is potash; it is required in large quantities by most plants, and especially by turnips. It is this potash which enables the leaves to absorb the carbon or charcoal; and without a sufficient quantity of it, you will never get the carbon absorbed. Then lime and magnesia are both requisite, as both are found in the bones of animals. Iron, also, is found in the bodies of animals: you could not live without iron. By its action with the oxygen certain vital forces of the body are liberated; it is the oxide and peroxide of iron which are the principal agents in the circulation of oxygen in the system. Alumina, or clay, is found in almost all good soils; but, singular to relate, it is only found in the most minute quantities in plants. I have in one or two instances discovered a small quantity, but so very minute as to leave it doubtful whether it did not proceed from some of the impurities of the soil which had adhered to the plants when pulling them up. It has a great attraction for ammonia, and if made red hot the ammonia will immediately be smelt. I will next touch upon silicic acid, or soluble sand, as a substance of very great importance to you. Now, glass is only a composition of silica and soda or potash. The stalk of wheat, you have no doubt observed, has a glassy appearance; in point of fact, it has a perfect coating of glass over it, which is produced simply by the union of silica with potash or soda. The object of this coating is doubtless to protect the plant against the attacks of insects, and to strengthen the stem. There are two sorts of silica; one that is soluble, the other that is insoluble. It is with respect to these two kinds, something like the substance resembling coal which was found in a certain part of America. The persons who discovered it said, It looks like coal, it smells like coal, it tastes like coal—it must be coal. But the only difference they could discover between it and coal was, that the one would burn and the other would not *(laughter)*; and the only difference between these two kinds of silica is, that one is soluble and the other is not. But silica is not generally soluble unless previously combined with potash or soda. Granite rocks contain it in large quantities; and in these rocks you will see pieces of white substance, in six-sided crystals—this is feldspar. The granite rocks are the oldest rocks we have, and they contain about 17 per cent. of feldspar, and 60 or 70 of silica. The carbonic acid in the air has a great attraction for silica, and readily unites with it. All our river waters contain soluble silica; all your soils contain some silica and potash which is not quite decomposed. It is the soluble silica that becomes available for plants; and the more rain you have, the more of it becomes soluble. The straw of your wheat not only requires a great deal of potash and silica, but also a great deal of bone-dust. In a wet or damp spring you will have a large produce of straw, and a small produce of wheat; in a fine season, on the contrary you will have a small produce of straw, and a large produce of wheat (*Hear, hear*). Now, how does this arise? Why, probably in this way. Owing to the large quantity of rain falling, there is a larger quantity of silica, disintegrated and taken up, as well, as an increased quantity of bonecust You get a double quantity of straw, and you get a double quantity of phosphoric acid taken up, as well as an increased quantity of the bonedust. You get a double quantity of phosphoric acid taken up; and when the time comes for forming the ear, there is no bonedust left for the purpose. Now this is the reason why in a wet spring there is always a large supply of straw, and often a small supply of grain. This however, can be remedied by putting a larger quantity of bonedust into the land I now wish to refer you to your own farm-yards. I