notice of farmers as justly deserving their attention, and the principle itself was, that the exercise of their intellectual faculties upon the objects with which they are conversant would, in time, convey to them a practical reward. An extract from the pamphlet, taken from Loudon's Encyclopædia of Plants, will show the design of the writer; but it was at that period productive of no great effect. "Botanists," he says, "have long known that the blight in corn is occasioned by the growth of a minute parasitic fungus, or mushroom, on the leaves, stems, and glumes of the living plant." In this observation sufficient distinction is not made between the different forms of these fungi. The fungus alluded to here is only the *puccinia*, which is by no means the sole fungal blight to which the corn-grower's attention ought to be urgently called, as will abundantly appear in the course of this treatise. Mr. Bauer's drawings in the British Museum contain nearly all the fungi referred to, elaborately and beautifully figured. The pamphlet continues, "Felice Fontana published, in the year 1567, an elaborate account of this mischievous weed, with microscopic figures which give a tolerable idea of its form; more modern botanists have given figures both of corn and grass affected by it, but have not used high magnifying powers in their researches. Agriculturists do not appear to have paid, on this head, sufficient attention to the discoveries of their fellow-labourers in the field of nature; for though scarcely any English writer of note on the subject of rural economy has failed to state his opinion of the origin of this evil, no one of them has yet attributed it to the real cause, unless Mr. Kirby's excellent papers on the diseases of corn, published in the Transactions of the Linnæan Society, are considered as agricultural essays. On this account, it has been deemed expedient to offer to the consideration of farmers, engravings of this destructive plant, made from the drawings of the accurate and ingenious Mr. Bauer, botanical painter to His Majesty, Geo. III., accompanied with his explanation, from which it is presumed an attentive reader will be able to form a correct idea of the facts intended to be represented, and a just opinion whether or not they are, as is presumed to be the case, correct and satisfactory. In order, however, to render Mr. Bauer's explanation more easy to be understood, it is necessary to premise that the striped appearance of the surface of a straw, which may be seen with a common magnifying glass, is caused by alternate longitudinal partitions of the bark, the one imperforate and the other furnished with one or two rows of pores or mouths, shut in dry, open in wet weather, and each calculated to imbibe fluid whenever the straw is damp. Pores, or mouths, similar to these, are placed by nature on the surface of leaves, branches, and stems of all perfect plants; a provision, indeed, intended no doubt to compensate in some measure the want of locomotion in vegetables. A plant cannot, when thirsty, go to the brook and drink; but it can open innumerable orifices for the reception of every degree of moisture which either falls in the shape of rain and of dew, or is separated from the mass of fluid always held in solution in the atmosphere. It seldom happens in the driest season that the night does not afford some refreshment of this kind, to restore the moisture that has been exhausted by the heat of the preceding day." The writer then proceeds to say that it is by these pores, or *stomata*, as we have called them, the seeds of the fungus gain admission; and with respect to the one now before us he is right, according to our supposition. So exceedingly small is each individual spore of the mildew, that Sir Joseph Banks was persuaded that any single *stoma* on the stem would produce from twenty to forty germinating in the hollow beneath it. In such positions, where they are invariably found, they intercept the sap originally destined for the nourishment of the grain, while they prey also on the tissues; so that the grain, by these means, failing to receive its proper nutriment, becomes shrivelled and defective, in proportion to the number of the fungi which thus rob it of its sustenance. The corn sample is accordingly bad to the eye and deficient in flour, yielding, at the same time, a quantity of superabundant and inferior bran.

In all cases where such a little pest as this becomes multiplied to a great extent, it gives rise to fearful consequences. We find it frequently mentioned in the Old Testament, that the "mildew" was one of the Divine judgments for the sins of the people, who, even under that infliction, still failed to return to the Lord their God. Solomon, in his prayer for Israel's prosperity and safety, intreated the Lord that when under the pressure of this particular affliction they might be heard and forgiven. To Omnipotence, number has no limits, and the smallest thing God has made can be so augmented in quantity as to accomplish vast designs.

All the tribes of *gramineæ* seem more or less subject to puccinia, and it is frequently found on the leaves of different kinds of reed, presenting unmagnified the precise appearance represented in the sketch, and which is indeed much the same as on the straw of wheat. The shape of the spores are, however, somewhat different. It does not generally break out into patches till the autumn has considerably advanced; hence rye, which ripens earlier than the other corn-plants, is seldom much attacked by this parasite. It is common to almost all countries; and when the eye of the observer has once become accustomed to it, the true *puccinia* is instantly detected, as well as the dark-coloured spots under the cuticle, which precede its rupture by the spores. Moist seasons, damp situations, over-manured lands, and lateness in the crops, are peculiarly favourable to mildew, which almost always appears in a chance plant of wheat that may have vegetated on a manure-heap. Some say this is invariably the case, but it is far too loose an assertion. The rapidity with which it sometimes spreads is astonishing; only let the circumstance be favourable, and millions upon millions of sporules seem ready to enter the stomata, and germinate beneath them.

Mildew on a Leaf of common Reed.

Puccinia Arundinacea.

The atmosphere is charged to an inconceivable extent with such invisible organs of reproduction. Fries declares the sporules to be so infinite that they rise like thin smoke into the air by evaporation, and are dispersed in innumerable ways; as for instance, by the attraction of the sun, by insects, by wind, by elasticity, or by adhesion. He asserts that in one individual he calculated on good grounds, that there were at least ten millions, if not more. Thus a stoma can scarcely ever perform the function of inhalation without taking in more or less of these sporules; and it is a happy circumstance that they refuse to grow except in certain places, and under peculiar conditions; for if their vegetation were general, the produce of the earth would be almost entirely consumed by them. There is no subject on which grosser mistakes are made, even by writers well-informed on other topics, connected with these fungi. The cause is, that attention has not been properly paid to it, from its apparently recondite nature. But it is hopeless to expect a systematic adoption of remedies while the veil of ignorance invests the cause of disease. It was curious to see, in the speculations on the potato disease of 1845, how vague the ideas of their authors were respecting the fungi. But the great improvements in modern microscopes will be attended, it is hoped, with the increase of much important knowledge. Under the able management of Mr. Berkeley and others, these instruments have already done wonders; and what a number of otherwise listless winter hours might an agriculturist pass, with the aid of a good Argand lamp, in acquainting himself with these little pests which constantly attend his labours. Farmers' clubs have multiplied throughout our rural districts, and every one ought to possess a microscope. There would be always found one or more members able to exhibit this instrument, and others would soon learn its use. Ministers might sometimes attend at such meetings, and would find revealing the secrets of nature no unworthy or ineffectual step towards awakening attention to the more weighty objects of their sacred calling. The author has more than once shown these corn diseases to the members of a farmers' club, who viewed them with extreme interest. Nothing can be more simple. To show the *puccinia graminus*, or mildew of the wheat, the exhibitor should first strip off lengthwise a little bit of the affected straw, and let it be viewed as an opaque object. The thick clustering of the spores, as delineated in the first drawing of this chapter, might be easily pointed out, as well as the way in which they