long as the United States adhere to a "protective policy, they must expect that traders in other nations will try to take care of themselves. If our British agricultural implement makers had sent specimens of their best work to Philadelphia, shrewd Yankees would have speedily copied their latest "inventions," and being "protected," might undersell the exhibitors. Such being the case, we need not wonder at the "almost entirely vacant space assigned us for our farming implements and machinery.

Poisons in the Air

Pasteur, in his recent experiments on [illegible] generation, has demonstrated that the germs of low organisms, bacteria, micrococci, etc., are everywhere present in the air, they settle on the skin, in the air passages etc., and are ready to become developed in all cases where there is no individual vitality, which prevents the growth of the inferior organisms, of which they are the seeds. Healthy people, therefore, will resist their ravages, but weak sickly, and especially dead bodies, will soon be the victims of their destructive action. The air in hospitals contains myriads of them, and besides dried pus globules, spores of epithelial parasites emanating from diseased parts, and which are so volatile or light, by reason of their almost infinitesimalism, that they hover continually in the air. After some time the walls become invested with them, and this makes old sick-rooms so unfavourable for restoration of health. To prove this, Pasteur had a square yard of wall in the surgical ward of the Hospital la Pitie, Paris, which intentionally had not been whitewashed or cleaned for two years, washed with a wet sponge, and the liquid of the sponge expressed; one ounce of a black liquid was thus obtained, which, on examination by the microscope, showed large numbers of bacteria, micrococci, epithelial cells, pus globules, red globules, and irregular blackish masses of unknown nature.

Next comes Dr. Esbeth, of Zurich, and examines in the same way the sweat from the face, axilla, breast, and thigh, and finds great numbers of bacteria, which appear to originate from minute bodies attached to the hairs in those regions, forming little nodules like accumulations of micrococci.

The lesson conveyed by all this is. Practice cleanliness about every part of the body; it is not in vain that combing, washing, bathing, and rubbing gives a feeling of comfort—this feeling is a hint of nature that the human system needs it.—*M. and Builder.*

Typhoid Fever and Polluted Water.

"Typhoid," or "enteric" fever, is the common fever of this country, which spares neither age, sex, nor social condition, which destroyed the life of the Prince Consort, and nearly destroyed that of the Prince of Wales, which destroys an average of about 10,000 or 12,000 people annually and which sickens and endangers about 100,000 more. It is essentially an eruptive disease of the lining membrane of the intestines; a sort of small pox, which affects the bowels instead of the skin; and, like some other eruptive diseases, its destiny is to run a definite course over a stated period of time. It is spread abroad chiefly, and probably exclusively, by the discharges from its specific eruption—that is to say, by the discharges from the intestine. These, in the natural course of things, find their way into cesspools and sewers, and when they do so they render poisonous the solid or liquid contents of the receptacles, and also the gas which is evolved from them. The fever is reproduced mainly in three ways—first, by the poisoned sewage obtaining direct access to drinking water, by leakage or soaking, and so being swallowed, secondly, by the poisoned gas escaping from sewers into water mains or cisterns, so that it is absorbed or dissolved by the water, and so swallowed; thirdly, by the poisoned gas making its way through badly-trapped drains or other channels, into dwelling or sleeping-rooms, and so being breathed by the occupants. To one or other of these methods of diffusion every outbreak of typhoid fever may be referred, and nearly every single case, the tendency of modern research, by increasing our knowledge of the outlets for sewer poison, and of the distances which it may travel unchanged, being constantly to bring apparent exceptions within the general rule. Hence two things are manifest—first, that typhoid fever is very little infectious in the ordinary sense, or through the atmosphere which surrounds the patient, secondly, that it is very actively infectious through concealed channels of indefinite length or tortuousness, so that B may derive his fever directly from A, of whose very existence he is ignorant. The connections which constantly exist between sewers or cesspools and the water or air supply of dwellings, however, disagreeable or disgusting, are harmless, as far as the production of typhoid is concerned, until the sewers or cesspools have themselves received the typhoid poison. In towns which have an intermittent water supply, and in which mains and sewers lie in close proximity in the streets, as soon as the mains are empty of water they become filled by the sewage gas, which makes its way through chinks; and in the many houses in which an untrapped overflow pipe descends from the cistern to the sewer, the gas ascends by this pipe, and the water contained in the cistern is always more or less contaminated. In both cases the water may be made to stink, or it may be rendered more or less unpalatable or unwholesome, but it does not become a source of typhoid until typhoid poison has been cast into the sewer. There are few villages in which there is not continued soaking from cesspools to wells, but this soakage is likewise—*quâ* typhoid—harmless until the specific material is supplied. The danger of such structural defects is that they leave an open door for the entrance of the typhoid poison whenever it does get into the sewers, and the typhoid poison is so widely diffused in this country that it is never safe to speculate upon its absence. When the fever appears, the only question is, practically speaking, 'How and when does the sufferer drink water which was contaminated by typhoid-tainted sewage, or breathe air with which typhoid-tainted sewer gas was mingled? All the popular talk about 'exposed to cold, or about 'bad smells, or 'over fatigue, or other vague speculations of like kind are entirely erroneous and misleading. Typhoid may be assumed, for all practical purposes, to spring only from antecedent typhoid, and to come only by the path of sewage pollution. If it ever does arrive *de novo*, the cases are entirely exceptional, and we have no certain evidence of their occurrence. —*London Times.*

The Wild Duck's Pretence.

The Duke of Argyle, in a recent article, claims something more than instinct for the duck described in the following extract. "In walking along the side of a river with overhanging banks, I came suddenly on a common wild duck, whose young were just out. Springing from under the bank she fluttered out into the stream with loud cries, and with all the struggles to escape of a helplessly wounded bird. . . . The labored and half convulsive flapping of the wings, the wriggling of the body, the straining of the neck, and the whole expression of painful and abortive effort, were really admirable. When her struggles had carried her a considerable distance, and she saw that they produced no effect in tempting us to follow, she made resounding flaps upon the surface of the water, to secure that attention to herself which it was the great object of the manœuvre to attract. Then, rising suddenly in the air, she made a great circle round us, and returning to the spot, renewed her endeavors as before. If we now examine, in the light of our own reason, all the elements of knowledge or intellectual perception upon which the instinct of the wild duck is based, and all of which, as existing somewhere, he undoubtedly reflects, we shall soon see how varied and extensive these elements of knowledge are. First, there is the knowledge that the cause of the alarm is a carnivorous animal. On this fundamental point no creature is ever deceived. The youngest chick knows a hawk, and the dreadful form fills it with instant terror. Next, there is the knowledge that dogs and other carnivorous quadrupeds have the sense of smell, as an additional element of danger to the creatures on which they prey. Next, there is the knowledge that the dog, not being itself a flying animal, has sense enough not to attempt the pursuit of prey which can avail itself of this sure and easy method of escape. Next, there is the conclusion from all this knowledge, that if the dog is to be induced to chase it, it must be led to suppose that the power of flight has been somehow lost. And then there is the farther conclusion that this can only be done by such an accurate imitation of a disabled bird as shall deceive the enemy into a belief in the possibility of capture. And lastly, there are all the powers of memory, and the qualities of imagination which enable good acting to be performed. All this reasoning and all this knowledge is certainly involved in the action of the bird-mother, just as certainly as reasoning and knowledge of a much profounder kind is involved in the structure or adjustment of the organic machinery by which and through which the action is itself performed."—*Our Dumb Animals.*

Mathematical Agriculture.

The farmer who toils in the fields knows that there is nothing exactly certain in his business. While the ancient promise that seed time and harvest shall never fail is always verified, yet the character of the one and the result of the other very greatly, and are subjected to serious disturbing influences. Droughts, frosts, or floods of rain mar his prospects, prevent the germination of his seed, kill the tender shoot, or shrivel and beat down the promising ears. No one knows better than the farmer that the variable soil, than which nothing presents more inexplicable differences of action upon vegetation, and the successful manuring of which presents so many insolvable problems to him cannot be brought under the influence of the rule or the multiplication table, nor be made amenable to the exact operations of figures. When, therefore, the agriculturist whose fields of labor are in the laboratory, and whose implements are retorts, test tubes, chemical potents, and weights and measures, undertakes to dictate to him exact formulas by which he may produce precisely so many bushels of corn or potatoes, the practical farmer whose bread depends upon the favorable results of what experiments he may undertake and who may go hungry should they fail, looks with doubt and incredulity upon the figures and wisely abstains from committing his fortunes to so doubtful an alternative. Thirty years ago or thereabouts, when Prof. Liebig first developed his mineral theory of fertilizing the soil, farmers were told exactly what they are told to-day by those who are simply following his methods of reasoning upon well known facts. Formulas were then prepared which in no wise differed from the formulas which are now being widely published for the information of farmers. One suspicious feature about these formulas at least is, that they are got up by persons who have these empirical preparations to sell. This fact alone would make it advisable for a farmer to question their value before he spends his money for that which may turn out to be naught. But our chief objection to them is that they promise too much. For instance, the following formulas for fertilizing the crops named, it will be observed, pretend to carry with them a sort of engagement that the respective yields will be certainly produced by the use of these fertilizers. These formulas, which are copied from a pamphlet published by a dealer in the fertilizers, and who, we believe, sells them in the interest of the Professor who prescribes them, are as follows:

To produce 100 bushels of potatoes per acre, without any manure and their natural proportion of tops, more than the natural yield of the land, and in like proportions for other quantities, apply twenty-one pounds of nitrogen, thirty-four pounds actual potash, eleven pounds soluble phosphoric acid, obtained from 400 to 500 pounds crude materials, which are said to cost about $12, as furnished by the agents in Boston.

To produce fifty bushels of shelled corn per acre more than the natural yield, without manure, and in like proportions for other quantities, apply sixty-four pounds nitrogen, seventy-seven pounds actual potash, thirty-one pounds soluble phosphoric acid. Cost of materials already mixed, $25.

One more formula will be sufficient. To produce twenty-five bushels of wheat per acre more than the natural production would be, apply forty-one pounds of nitrogen, twenty-four pounds potash, and twenty pounds phosphoric acid, obtained from 450 to 600 pounds of crude material, costing about $15.

Now, to purchase any of the above with the expectation that the promised crop would be realized, might, and probably would, lead to disappointment. The cost of these materials, even without the freight and cost of labor of applying them, approaches so nearly the value of the crop to be produced by them that the allowance for loss through unforeseen contingencies is very small. The promised crop is to dispose of all the fertilizing matter added to the soil, so that there is no margin given for any possible gain in their use. It is clearly a game in which one side is safe to win and the other side may win if everything is favorable. But, knowing how uncertain are the contingencies which affect the farmer's crop, how is he to be insured that the effect of these will not destroy all that he hoped to realize from the use of the fertilizer? While we do not oppose the use of chemical fertilizers, but rather advocate their use by farmers who understand their nature, at the same time we would warn both this class of farmers, and especially all others, that they will probably be disappointed if they expect, when they purchase the materials for one of these formulas, that they will certainly harvest the promised return. After much personal experience with artificial fertilizers, we have found them to be most uncertain in their action and very delusive to those who build sanguine hopes upon their results.—*N. Y. Times.*

The New York Fish Hatching House.

The house is situated on Spring Creek, about one mile north of Caledonia village. At Caledonia are the large springs from which the creek is formed. The country in the vicinity is level or slightly undulating. The soil consists principally of gravel and is underlaid with limestone rock. The large pond on the north side of the village has a rock bottom in which are several large springs, but the main spring is west of the pond about twenty rods and is entirely surrounded by hard dry ground. Here, from a shallow basin about two acres in extent rushes with great velocity a stream of pure water of about fourteen feet in width and two feet in depth. This flows into the pond and from thence to the creek, but before reaching the hatching house it receives the water of many other large and beautiful springs. At the hatching-house the stream at the present time is about fifty feet in width by three or four in depth. This water never freezes, and varies in temperature but about eight degrees during the winter. In the immediate vicinity of the hatching-house are numerous ponds filled with fish of various sizes and kinds. All the inlets and outlets of those ponds have to be cleaned twice each day to prevent weeds or leaves obstructing the steady flow of water. In the hatching-house are troughs about forty feet in length and fourteen inches in width, through which flows a stream six inches in depth. In these troughs the spawn is placed to hatch, which requires from sixty-five to seventy days. This variation is caused by the temperature of the water as affected by the atmosphere. The minimum temperature of the stream is 41°, in the pond from which the hatching-house is supplied it is 43°.

When first hatched the central part of the body of the fish is enveloped in a sack, which has the appearance of a cucumber seed with a short piece of horse hair for a tail. When hatching freely and the troughs become crowded they are removed and placed in boxes of about three feet