steam ploughing apparatus. It consisted of two engines,—one for each headland. These were each furnished with a winding barrel, and gradually advanced along their respective ends of the field as the work proceeded. Tracing onward the course of invention, we come next to the scheme of Messrs. Fiskin, of Stamfordham, Newcastle-upon-Tyne. In this system a stationary engine was employed, a main object of Mr. Fiskin being "to dispense with wire ropes, and give off the power of the engine by means of a light, endless hempen cord, worked at a high velocity, which passed around pulleys on a self-moving anchor, and thence to winding drums placed upon the implement, the revolution of which imparted motion to the ploughs." In passing, we will just notice two important features in this system. One that the anchors were self propelling, the travelling motion being effected by the action of the rope round the pulley fixed to the anchor, the other, that the plough was on the balance principle, and was steered in either direction by means of locking the wheels This apparatus was shown at the Royal Agricultural Meeting in 1855; but although it created quite a sensation, and the judges considered it "an implement of considerable promise," no further encouragement was given to the inventor by the Society, not even by the award of a medal In the previous year Mr. Fowler, of Leeds, exhibited at the Royal Society's Meeting, held at Lincoln, his steam draining plough and apparatus. The judges were delighted with the performance of this implement, and wound up their remarks respecting it as follows. Surely this power can be applied to *more general purposes*, we earnestly commend the idea to our engineers and mechanists. "The idea" forthwith commended itself to a practical farmer, in the person of Mr. Smith, of Woolston, who ordered an apparatus of Mr Fowler, with which he proposed to work, and afterwards did work, his cultivator. "An opinion has been prevalent, says an able authority on this subject, that Mr. Smith has a claim to the invention of the whole apparatus; but in 1856, at a meeting of the Society of Arts, Mr. Smith admitted 'that his first windlass was constructed by Messrs. Ransomes, under the direction of Mr. Fowler.' I do not mention this to detract from the great merit due to Mr. Smith as a pioneer in steam cultivation, but simply that the merit should be properly divided, or given to the right party. I will, however, remark in passing that Mr. Smith has done as much or more than any other man, in arousing the country to the importance of steam culture, and to the fact that land can be economically worked by steam power."

We have now arrived at that point in our subject when we may say it was fairly launched. As yet its performances were somewhat limited, but clear heads and clever hands were at work, and hopeful men already saw the dawn of a new agricultural era.—Railways were being rapidly extended—the steam threshing machine travelled from farm to farm—and farmers began to appreciate the value of steam-driven machinery, and imbibe a taste for it We are all creatures of habit. It is therefore not surprising, when once the taste for spending money on farm machinery is acquired, to see a farmer begin by giving £5 for a patent grindstone, and, by a succession of jumps, end by investing £800 for a set of steam cultivating apparatus

Here for the present we must stop. The large and spirited illustration accompanying this article represents the Bedford apparatus.—patented by Messrs. J. and F. Howard—as at work. In this system, it will be seen, the engine is stationary, and the steel wire rope which draws the plough, or cultivator, is extended round the field on pulleys fixed on the various "rope porters,"—of which there are ten represented in the cut. The wheels fixed in the corners of the field are "anchors," with the exception of that immediately in front of the engine, which is the "Patent Snatch Block," also anchored. The top of the engraving being regarded as the north, the plough it will be remarked is represented as travelling from west to east. When the east end is reached, the motion of the engine is reversed, and the plough travels westward, and so on. The occupation of the two men, standing one at each end of the furrow, is to remove the anchorage gradually southward as the land is ploughed. As we shall have occasion to refer to this illustration again, in the further treatment of our subject, we venture to hope that our readers will acquaint themselves with its details.

The buildings in the distance are the "Britannia Iron Works," Bedford, the manufacturing establishment of the Messrs. Howard. As will be observed, they have an imposing appearance, and form altogether a fine conception of architectural genius,—adapting beauty to the home of the furnace and the anvil.

The Midge and Deep Fall Ploughing.

In our issue of Sep. 1, we published a communication on deep fall ploughing as an extirpation of the midge. The natural history of this insect has been so often discussed of late years, that we imagine very few of our readers are unacquainted with the full particulars, but it is a subject that cannot be too often discussed; each discussion tending to throw some new light on the possible remedies for the pest. Like all insect life, the existence of the midge is continued through three stages, viz: the fly, the egg and worm resulting from the egg, and the chrysalis. The fly, as we all know, pierces the outer shell or husk of the wheat, and deposits its egg close to the germ of the young grain. Whether the egg is actually in the worm state when deposited, seems somewhat doubtful, but, at all events, it gains life immediately and fastens itself to the germ of the grain, feeding on, and abstracting the juices as they flow to nourish the berry, and of course destroying it. If the midge comes late, and only deposits its egg on the full formed grain (even although it is in a soft state,) it does little or no harm, as the worm cannot pierce the skin of the grain; but, if it deposits the egg at the time of flowering, or immediately afterwards, it is fatal to the crop The worm perfects itself in time, and either remains in the ear of wheat till it is carried into the barn, or it leaves the ear and falls on the ground below, where it gradually wriggles itself into the earth, to the depth of probably an inch, and remains there till next spring.

The chrysalis is formed inside the body of the worm, and remains in a dormant state until it is hatched by the heat of the spring and summer; it then comes forth as the fly, and again runs its course as before. The midge does not, like some insects, pass through two or three transformations in the course of one year,—we have but one crop of midge each season. The midge affects some other kinds of cereals besides wheat, but the great mass of them attack the wheat. The foregoing facts can neither be disputed nor denied, the observation of every farmer has proved them over and over again. It is therefore clear that for a considerable time each year, the midge is under our control, and at our mercy, and if all could be made to think alike, and work simultaneously in its destruction, a great deal might be done to get rid of it.

From, and after harvest, until the month of May following, the midge is either in the barn, or, in the ground among the wheat stubble, where it fell at harvest. In the worm state, it has no means of locomotion further than just wriggling itself into the ground, and wriggles out of it at fly time. Any farmer who does not destroy, by burning or otherwise, all that come within his reach, in the barn, is a stupid blockhead, and deserves to lose his future crop. For those on the ground, there is but one cure,—and that is deep ploughing with the double Michigan plough, or one that operates in a similar manner. The stubbles ought to be ploughed to nine inches deep, if possible. The skim coulter, or small mould board, of the Michigan plough, skims off the surface of the furrow slice, and deposits it at the bottom of the previous furrow, the plough proper follows and buries the former surface at least six inches deep, and then the midge is safe for the time. It has been repeatedly proved, by the most accurate American entomologists, that the midge-worm chrysalis cannot raise itself out of the earth more than two or three inches. The worm and chrysalis have been buried in great numbers by those persons who have made the pursuit their study, at one, two, three, four, five, and six inches deep, and the surface of the ground covered with gauze frames, so that none could escape as they emerged. Those buried at one, and two inches, all came forth in due season; those at three inches in less numbers; at four, less still; at five inches, scarcely any; and at six inches, none. It is therefore clear that, if we can bury them at and below six inches, we have them safely out of the way. As soon as the ground gets warm enough to hatch the chrysalis into the fly, they come forth in the earth and are destroyed. But, to carry out this mode of destruction effectually, all must act alike, and at once. Individual effort is comparatively useless. The deep ploughing may be done either in fall or spring before the fly comes out, one is as well as the other; but the ground must not be disturbed till the following fall, after the wheat is safe. The ground may be cultivated and cropped with the harrow, but it must not be ploughed, or the insect will be released,—a good smothering crop may be sown on it to keep the weeds down, or, it may be cultivated with the hoe, but no deep cultivation, of any kind, must take place, or the good attained will be lost. In Rainham and Walpole, where the soil is stiff clay, the farmers, on ploughing for the second time, in spring and summer (after fall ploughing,) used to find the turned up furrow alive with the moving chrysalides of the midge; but it does not seem to have struck them that if they had not ploughed the second time the midge would have been destroyed.

Now, there are objections to this plan. In the first place, half the people do not know, and cannot be made to believe in, the importance of it. In the second place, the only sure mode of growing clover, in this climate, is with wheat, and, in the present state of Canadian agriculture, we cannot afford to lose the clover; but we must either lose the clover or the wheat. We believe that it would be an excellent course to harrow such deep ploughed land in the spring, sow it plentifully with timothy and clover, or clover alone, (of the latter some twelve or fifteen pounds to the acre) and trust to it for the clover crop, either to stand for two years, or to be ploughed under in the fall as manure; but the ploughing must not take place till the midge is hatched into the fly and destroyed.

Unfortunately this system could only be carried out effectually by legal compulsion, and in a perfectly cleared country,—no one could hope by means of moral suasion to prevail on every one to act in the same manner and at the same time, or the midge might be so greatly reduced in the course of one season, as to be comparatively harmless,—but the system is impossible with newly cleared land, or with land that cannot be deeply and evenly ploughed. So long as new land is to be cleared in old settlements, or land encumbered with roots and stumps is to be cultivated with wheat, the evil must continue to exist in a greater or less degree. The midge does not appear to be generated in any particular locality,—its generation is gradual, and at first almost unobserved, but it travels each year from nine to ten miles distance. It came into Upper Canada from the Eastward, gradually, but surely, along the lake shore, at the rate above mentioned, each year. It also crossed into the Niagara District from the United States; and again it crossed the Detroit and St. Clair rivers into the Western section of the province, making a complete sweep, and general havoc, wherever it went. By a most merciful dispensation of an allwise Providence, however, all insect plagues bring with them the seeds of their own destruction. After flourishing a few years, there is generated from amongst themselves, a parasite of the ichneumon species. This insect is also a piercer, and deposits its eggs in the holes it makes with its ovipositer; but instead of attacking the grain it attacks the worm of the midge, and having pierced its body, deposits one or more eggs. These eggs turn into maggots, which feed, not on the vitals of the midge worm, but on its fat. The midge worm grows, and the ichneumon maggots grow with it, until at last they come to perfection. They then quit the midge worm, and undergo their own transformations,—leaving the midge worm in so bad a state that it cannot pass through its necessary changes, and it consequently perishes. These changes cannot of course be seen with the naked eye, but they have been traced microscopically by most reliable naturalists, and the facts are beyond dispute.

Nowhere are these changes more easily observed than in the English currant caterpillar. This is not the same insect as the currant and gooseberry worm so troublesome here the last season. In England the red and white currant trees are always more or less under the influence of the caterpillar. The first year there are a few, the second they are in myriads, all of which go through their regular transformations,