

Mr. H. Hannam, of Bureote, near Abingdon, a well-known agriculturist, in connection with Messrs. Barrett & Exall, constructed an apparatus for steam ploughing, which may be regarded as the first attempt to work ploughs or cultivators by the ordinary portable engine, and also to be the first attempt to plough the land by an engine stationed at one corner or outside the field." All these various inventions have, however, been superseded by the three contrivances that now take the lead—Smith's, Fowler's, and Howard's. In England these are now in full operation, and have each produced extraordinary results. The main features in these systems are— "1st, Smith's is essentially a grubber or cultivator, and is worked by an ordinary stationary engine at any part of a field, generally placed as conveniently as possible for water, and then snatch-blocks or anchors are placed at different angles of the field, and a steel wire rope is passed round or across the field round these anchors, and is wound or unwound on two separate drums of a windlass placed near the engine, and turned in the ordinary way by a strap round the driving wheels of both engine and windlass. The main difficulty Mr. Smith had to encounter was to know what to do with the slack rope, so as to pull the grubber back again after it had first crossed the field, and he at last succeeded in inventing a very simple plan, which he called a "turnbow." This plan of Smith's was called the roundabout system. Mr. Fowler's may be described as the direct system, as he places his engine, a very expensive one and not an ordinary farm engine, on the headland of a field, and a travelling anchor on the opposite headland, a wire rope being attached to the plough, which is generally one of four or five furrows, and hangs on the balance principle. The rope passes round a most ingeniously constructed apparatus, called a clip-drum, affixed under the boiler of the engine, and winds up the rope, drawing the balance-plough after it; the furrow-plough, which has been up in the air as it comes to the engine, being on its return to the windlass on the opposite side of the field placed in work by a simple movement of the driver, and the furrow-plough, which has been in the ground, takes its place in the air back again; the windlass also, in a most singular manner, being attached to an anchor at one corner of the field, moves itself along simultaneously with the engine. Mr. Howard's plan is like Mr. Smith's, viz., the roundabout system, but he has a frame for his implement carrying four or five coulters, with points and shares both in front and behind, so that this grubber or cultivator simply is moved backwards and forwards across the field, without the necessity of using Mr. Smith's turnbow. Mr. Howard has made several most important improvements in his windlass, snatch-blocks and anchors; and the perfection to which he has brought the manufacture of the steel wire rope has been to a great extent the cause of the successful adaptation of steam to the cultivation of the land. Amongst others is that of a steam-engine with the boiler placed transverse or across the carriage, which enables the engine to travel up and down hills with great facility. One of the great advantages of Smith's and Howard's plans over Fowler's is that it matters not if the field be triangular, five-cornered, or ever so oddly shaped, or whether it be up hill, down hill, or with high ridges across the field, this roundabout system accomplishes its work thoroughly, and by crossing every bit of the land can be moved; but with Fowler's system, moving on the headlands, the fields must be square, and the water-cart must follow the engine; and on strong clay lands, where steam cultivation is of such vast importance, the kneading and treading of the headlands is a matter of great detriment. The advantages which the supporters of Fowler's system claim are—that the traction being direct, the power of the engine to be exerted is less, and that only about one-half the rope is required."

We have taken the foregoing account from the report in the "Gardener's Chronicle and Agricultural Gazette" of a lecture recently delivered by Mr J. K. Fowler, Aylesbury, England. From the same source we now proceed to give some observations on the cost of steam cultivation. This is, after all, the great practical question, and in this country especially, where capital is even more difficult to obtain than labour for agricultural purposes, we cannot expect or advocate the adoption of any scheme respecting which an affirmative answer cannot be given to the important enquiry—"will it pay?" But in estimating the cost of steam cultivation, we must bear in mind that the work is by this means done much more thoroughly and efficiently; and if the profits in the crop should outweigh additional expense, the wise

economist will not grudge the required cost. As the steam plough has hitherto been very little employed in the neighbouring States, and not at all, so far as we are aware, in this country, we must deduce our estimate of the cost of this plan from its practical working in England.

The following examples were cited in a paper read by Mr. Charles Morton before a Farmers' club as far back as 1863:

"Messrs. Druce, of Eynsham, farm about 900 acres of arable land and 300 of pasture. They used to work 27 horses and 22 oxen; they now work the same land with 19 horses—8 horses and 22 oxen have been put down since the purchase of Smith's tackle three years ago. They get over about 700 acres of grubbing on the two farms each year."

The whole cost of wages and fuel was 23s. 6d. (or \$5. 61) a day. 140 acres done in 20 days were at the rate of 7 acres a day, or about 3s. 6d. (81 cents) an acre. In the same paper were given other examples in which the estimate of the cost per acre with Mr. Smith's apparatus was the same. In reference to Mr. Howard's apparatus, we are informed that

"Mr. Pike, of Sterington, Bedford, also on a heavy soil, has grubbed 157 acres once, and 107 a second time—264 acres altogether—5 to 8 inches deep, in 42 days, or about 6 acres a day, spending about £25 in coals, £1 15s. in oil, £30 in wages, and very little on repairs—£57 in all, or very little more than 4s. an acre."

This reduced to Canadian currency amounts to 96 cents per acre. Various other instances were adduced with similar results. Corresponding reports were also given of work done with Fowler's apparatus. This is more costly than either Smith's or Howard's. A larger capital is invested; and it ought, therefore, according to a very general rule, to accomplish more and cheaper work than its rivals. So costly is it, they say, that it is not preferred by tenant-farmers. In the examples mentioned it is said, "the depth of the work varied from 6 to 9 inches, the tilth of the soil could not be better, and the produce was much improved. The cost, including the purchase of rope and repairs, was after the rate of 5s. (or \$1 20) per acre in one case, and in another 4s. 6d. (1 08)." Mr. J. K. Fowler next gives his own experience as follows,— "about five years ago, having seen and fully made up my mind that deep tillage was in future to be the sheet-anchor of good farming, and autumn cultivation to be the means of thorough cleansing the land, and having torn to pieces two teams of horses, and broken lots of harness and implements in this attempt, I went to see Mr. Smith's stiff land at Woolston smashed up, and I came away determined to use it as soon as I had an opportunity; but as my occupation at that time was only 200 acres, about 105 being arable, I did not feel justified in purchasing my own set of tackle, and I hired of Mr. Moore, whose implements and rope were very weak, and he broke up about 40 acres each year. The following year, Mr. Lewis Taylor having purchased a new set of Messrs. Howard, I engaged him to break up all my land that required it, and he did most excellent work; this convinced me, from the splendid crops of the next year, how thoroughly efficacious the plan was. The next year I took another farm of the same size, and at once bought a set of Smith's tackle, and set to work in earnest, and the first year—that is in 1864—I smashed up 160 acres twice over, at a depth of from 8 to 9 inches. The land was generally very tenacious clay, and being a very dry, hot year, it was as hard as iron; pieces of clay came up weighing some cwt., and the dry autumn killed nearly all the couch-grass and weeds of the farm. The year 1865 I did the same, doing about the same amount of work, but this year (1866) much more easily, and breaking it up one inch deeper; and I will now give you the result of my operations as regards expenses. I must tell you that I hire my steam engine, not having as yet a threshing machine, and that is a heavy item. I will give it per diem:—

Hire of engine—12 horse power	0	14	0
Engine-driver	0	3	0
Windlass men	0	2	6
Two anchor men	0	4	6
Two lads with rope porters	0	2	0
Oil and waste	0	1	6
Seven cwt. of coal	0	6	0
Beer 10 pints per day (plus malt tax)	0	1	8
Interest on cost of apparatus, £220, and wear and tear, at 12½ per cent., on 40 days when used	0	14	0
Water-cart, horse, and boy	0	4	0
	£2	12	2

Average 7 acres per day, or about 7s. 6d. per acre." This is equivalent in Canadian currency to \$1 80. Mr. Fowler considers price a secondary consideration in comparison with the excellence of the work done, respecting which he says, "the great point was that I had smashed up and made useful thousands of tons of soil that had never been disintegrated before, and never seen daylight. I had broken the pan of the earth that had been trodden and puddled for perhaps centuries by heavy horses year after year, and by means of this smashing up had rendered drainage on these stiff clays perfect. The water which formerly stood up the furrows and all over the land is now never seen; and above all I had broken up all my land and completed everything in the way of autumn cultivation by the middle of October. I am convinced that subsoils are often poor because they are not properly cultivated, and they are in an unfit state to receive manure; but this system will alter all that, and these poor clay subsoils will be found rich in the best constituents of useful land."

The question of cost is thus summed up by Mr. Fowler—

"Looking at the comparison in a pecuniary light, it is immeasurably in favour of steam over horse-labour. It was absolutely impossible that all the horses in England could do what the steam engine could do. There was no invented implement that could go deep enough. There was no invented harness that could move the masses of earth that steam could; and the very method by which the steam plough drove like a sledge-hammer into the soil—not like the dead pull of horses, but the banging of the engine itself on the soil—disintegrated it in a way that no horse labour could effect. He was for smashing up. Mr. Mechi once said at a dinner that he had never seen furrows made by horse-power, deeper than a wineglass; and he afterwards took a wineglass and placed it in the furrow in the ploughing field; and in no case was the furrow deeper. He had heard of people ploughing by horse-power 10 inches deep; but he would be glad to go any distance to see it. What he would say was, 'Let us stick to this principle: whatever is to be obtained, go to steam and have deep cultivation, especially on your heavy clay lands.'"

Such is the opinion of practical agriculturists in England; and although in this country the difference in the cost of labour and the price of produce, must ever modify the conclusions we draw with regard to the application of the same force to farm operations among ourselves, yet we believe that progressive improvement in steam apparatus, the cheapening of its use, and its adaptation to the circumstances of the country, will ere long introduce here also this great power as a labourer in the field; and that the time is not far distant when the might of this untiring worker shall wonderfully enlarge the capabilities of the Canadian farmer, and while mitigating the sweat of man's brow and the labour of his hands, will relieve in no small measure the strained muscles of his faithful and too often over-taxed servants, the ox and the horse.

Small Farms and Thorough Cultivation.

The celebrated Robert Bakewell, of Dishley, Leicestershire, and the founder of the new Leicestershire sheep, used to tell an anecdote with exceeding glee, of a farmer not only of the olden school but of the olden times.

This farmer, who owned and occupied 1000 acres of land, had 3 daughters. When his eldest daughter married, he gave her ¼ of his land for her portion, but no money; and he found, by a little more speed, and a little better management, the produce of his farm did not decrease. When his second daughter married, he gave her ¼ of the remaining land for her portion, but no money. He then set to work, and began to grub up his furze and fern, and ploughed up what he called his poor, dry furze, covering in some places nearly half the land. After giving half his land away to two of his daughters, to his great surprise he found that the product increased; he made more money, because his new broken up furze land brought excessive crops, and at the same time he farmed the whole of his land better, for he employed three times more labourers upon it; he rose two hours sooner in the morning, had no more dead fallows once in 3 years; instead of which he got two green crops in one year, and ate them upon the land. A garden never requires a dead fallow. But the great advantage was, that he had got the same money to manage 500 acres as he had to manage 1000 acres; therefore he laid out double the money upon the land. When the third and last daughter married, he gave her 250 acres, or half of what remained, for her portion, and no money. He then found that he had the same money to farm ¼ of the land as he had at first to farm the whole.