

From the *Transactions* of the
Bristol and Gloucestershire Archaeological Society

The Gloucestershire Steam Plough Company, 1860-2

by C. Miller
1981, Vol. 99, 141-156

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The Gloucestershire Steam Plough Company, 1860–62

By CELIA MILLER

THE APPLICATION OF STEAM POWER to the cultivation of the land had taxed the minds of inventors long before the development of the first successful system by John Fowler in 1858.¹ The award of a gold medal to Fowler by the Royal Agricultural Society of England (R.A.S.E.) following the demonstration of his steam ploughing engine and tackle at their Chester trials in 1858 seemed to many agriculturists and interested onlookers to herald a dazzling new era. To them, the successful application of steam power to industry and transport implied that its extension to tillage was a logical step; if steam had worked a miracle in these areas then it must inevitably perform the same miracle for agriculture. Like the agricultural correspondent of the *Gloucester Journal*, they could 'see no limit to the potential of steam in the cultivation of the soil.'² But while steam cultivation had some spectacular successes it also had its failures, although, naturally enough, these received little publicity and sank quickly into relative obscurity. This is the story of one such failure in Gloucestershire and it casts considerable light upon the progress of steam cultivation in the early 1860s.

There had been several contenders for the prize offered in 1856, 1857 and 1858 by the R.A.S.E. for the first successful steam ploughing system and Fowler continued to vie with competitors for a share of the available market thereafter. But Fowler's system seems generally to have been technically, constructionally and operationally superior, although controversy concerning the merits and costs of the various systems was prominent in the pages of the agricultural press in the 1860s. The Fowler single engine system on the market in 1860 consisted basically of a self-propelled steam engine,³ which was positioned at one side of the field to be ploughed, and a self-moving anchor carriage which was positioned at the other side of the field. The engine provided the power which, by means of a wire rope, pulled a balance plough between the engine and the anchor carriage. One end of the plough was at work while the other was in the air, the position being reversed at the headland for the return journey. Power was transmitted to the wire rope by means of a grooved drum driving system fitted to the engine, round which the rope was coiled. Variations in the length of rope required (owing to irregularities in field headlands) were controlled, not altogether successfully, by a slack gear system, attached to the balance plough. PLATE I is a reproduction of what is probably the earliest surviving photograph of Fowler's single engine system at work *c.* 1861. Human and

1. For a resume of earlier and contemporary systems see: M.R. Lane, *The Story of the Steam Plough Works* (1980), 14–15.

2. *Gloucester Journal*, 23 June 1860.

3. These engines were made for Fowler by Kitson and Hewitson of Leeds to his specifications between 1859 and 1862. Fowler opened his own steam plough works at Hunslet near Leeds in 1862. For a history of Fowlers of Leeds see: M.R. Lane, *The Story of the Steam Plough Works* (1980), hereafter referred to as Lane.

horse labour was needed to assist the ploughing process: an engineer to drive the engine, a ploughman to steer the balance plough, an anchor man to look after the anchor and two boys to move the rope porters which had to be positioned in the field on each traverse of the plough in order to keep the wire rope completely free of the ground. A horse and a man were needed to cart water and coal to the engine and, when the steam plough had completed its work and moved on, the headland had to be ploughed by horses. To modern eyes it seems a tiresome and cumbersome process, but to the mid-Victorians it was little short of miraculous. Sir Henry Vavasour voiced the feelings of many people when he said: 'I cannot but express the deep gratitude I feel in being permitted to witness the dawn of such a revolution.'⁴

The advantages of steam cultivation over horse cultivation were proclaimed by enthusiasts at every possible opportunity in the press and at the meetings of local and national agricultural societies. Their arguments in favour of steam cultivation can briefly be summarised as follows:

- (i) Work could be done by steam cultivation at a cheaper rate per acre, even on light land.
- (ii) The work was better and more efficiently executed by steam plough because:
 - a) the treading of horses, regarded as injurious to the soil, was avoided;
 - b) a better tilth was obtained from the more thorough shaking given to the earth.
- (iii) The steam plough could cultivate at a much greater depth, thus increasing the fertility of clay soils in particular.
- (iv) Land ploughed by steam did not retain surface water, especially on clay soils, and therefore assisted thorough drainage.
- (v) The greater speed of steam ploughing enabled the farmer to complete his cultivating in a much shorter time, therefore rendering him less dependent upon a run of good weather at the right time.

Individual costings of steam cultivation also proliferated in the press. Capital costs were high: Fowler's steam plough and ancillary equipment cost around £800 in 1860, a large sum of money for the individual farmer to find. But against this, one enthusiast claimed, could be set the sale of horses worth £300 made redundant by the steam plough and £240 a year for their keep.⁵ Another claimed that the value of the increased produce alone on a 546-acre farm was £776 in one year, more than the rent of his farm.⁶ Running costs were also high, some £2 18s. per day on one estimate, which broke down as follows:

1. <i>Constant yearly expenses</i>	£
Engineman	54
Ploughman	46
1 new rope per annum	70
Maintenance	64
Interest on £800 (capital outlay) at 7%	56
	290

The plough was at work for an estimated 200 days per year, giving daily average expenses of £1 9s. per day.

4. Report of a meeting at St. James' Hall, *The Farmer's Magazine*, 3rd series, XXV (1864), 62.

5. Edward Holland, M.P., reported in *Farmer's Mag.* 3rd series, XVII (1860), 37.

6. Report of a meeting at St. James' Hall, Lord R. Montagu, M.P., *Farmer's Mag.* 3rd series, XXV (1864), 61.

2. <i>Daily running costs</i>	£	s.	d.
One man extra at 2s.		2	0
Three boys at 1s.		3	0
Oil		1	0
Coal (1 ton)		14	0
Water cart, boy and horse		5	0
Removal		4	0
		<hr/>	
		1	9 0

Added together, the average daily running costs amounted to £2 18s. per day.⁷

Estimated and actual per acre running costs could vary greatly. The Fowler engine's performance at the R.A.S.E.'s Canterbury trials in 1860, taken at the above costings, gave the following figures which, for convenience, are compared with the estimated cost of horse labour for the same work:⁸

<i>Land type</i>	<i>Depth of cultivation</i>	<i>Motive power</i>	<i>Work rate</i>	<i>Cost per acre</i>		
				£	s.	d.
Light	7 inches	steam	11 acres in 10 hours	5	0	
Light	7 inches	horse	1 acre per day	14	0	
Heavy	7 inches	steam	6¾ acres in 10 hours	8	6	
Heavy	7 inches	horse	¾–1 acre per day	1	4 0	to 1 10 0

Edward Holland, M.P. estimated his costs on heavy land at 7s. 6d. per acre in 1860.⁹ Another 1860 costing amounted to 10s. 6d. per acre on heavy land, although the costs had fallen to 8s. an acre on the same land by 1862.¹⁰ It is therefore quite clear that an unknown number of variables were at work and that estimates of per acre costs could differ according to the cost of inputs. But one fact remains indisputable: that the work rate of the steam plough was a good deal higher than that of a team of horses.

There can be little doubt that the size of the initial capital investment meant that steam cultivation was the province of the substantial farmer and the innovative landowner. In his history of Fowlers of Leeds, M.R. Lane points out that the early lists of customers read like 'an agricultural Debrett',¹¹ including as they did the Prince Consort, the Duke of Saxe-Coburg, Lord Leicester and substantial occupiers such as J.M. Read of Elkstone in Gloucestershire, who farmed well over 1,000 acres.¹² But steam cultivation did become available to the small landowner and the tenant farmer in the 1860s through the medium of steam ploughing contractors. Lane notes their emergence with interest and states that, in his opinion, they played a major role in the promotion of steam cultivation.¹³ The aim of this article is to recount the brief history of what was probably the first contract steam ploughing company to be formed in Great

7. J.T. Harrison, a speech reported in the *Glouc. Jnl.* 28 July 1860.

8. *Ibid.*

9. *Farmer's Mag.* 3rd series, XVII (1860), 36–7.

10. J.C. Morton, 'Steam Cultivation', *Journal of the Bath and West of England Society* (hereafter referred to as *J.B.W.E.S.*), XI, II (1863), 229.

11. Lane, 41.

12. R.L.S. Engine Lists, Fowler Archives, Museum of English Agricultural Life, Reading, hereafter referred to as M.E.R.L.

13. Lane, 42.

Britain, the Gloucestershire Steam Plough Company Limited, and to look critically at the reasons for the failure of the company, noting any implications concerning the viability of steam ploughing in general.

The Gloucestershire Steam Plough Company was formed in June 1860¹⁴ and was registered as a limited liability company under the Joint Stock Companies Act 1856 (19 and 20 Vict., c. 47) on 18 September 1860.¹⁵ The objects of the company were stated in the Memorandum of Association to be: 'the purchase, repair maintenance sale, hiring and letting out for hire, of Agricultural Implements and Steam Engines, Ploughs and all other apparatus used and usable for the cultivation and improvement of Land by steam or other power, and implements for draining and improving Land and for sawing and converting timber and thrashing, cleaning and grinding corn, and for performing all or any other operations in, and connected with husbandry, and the making of any such Implements and the doing of all such other things as are incidental or conducive to the attainment of the above objects.' The nominal capital was £50,000 divided into 5,000 shares of £10 each.¹⁶ A deposit of £1 was required upon the allotment of each share, the capital then being subject to be called up by instalments of £1 per share.¹⁷ Edward Bowly of Siddington, speaking to interested parties, claimed that 'the proposed Gloucestershire Steam Plough Company is calculated to confer great benefits on the Agricultural Interests of this County, and at the same time offers a safe and remunerative investment for Capital.'¹⁸ Bowly also claimed that 'this County has the honour of having established the first steam ploughing company.'¹⁹ His claim may well be genuine: if not the first, the company was certainly among the very earliest to be formed. In the event, 1,327 shares were taken up by 102 shareholders. This may seem to be a rather unenthusiastic response but amongst the shareholders were numbered most of the leading landowners of the Vale and some of the notable landowners from other parts of Gloucestershire, as well as prominent figures in local industry, trade and the professions.²⁰ Thirty of the shareholders were described as 'yeomen' (farming owner-occupiers), but the many hundreds of tenant farmers in the Vale do not seem to be represented in the list to be found in the Appendix. A total of three calls was made upon the shares which, together with prepaid calls of £455, gave a total capital of £4,423, of which £13 remained unpaid in August 1863.²¹

The company purchased five steam ploughing engines and tackle from John Fowler, four of them between August and November 1860 and one in June 1861. The cost of the ploughs was as follows:

<i>Plough number</i>	£	s.	d.				
1	809	3	10	4	801	17	9
2	723	2	8	5	804	2	4
3	782	0	6				
				Total cost	3,920	7	1

14. Prospectuses and a form of application for shares were sent out to prospective shareholders on 23 June 1860: Glos. R.O., D149/E98. The prospectus and a list of provisional directors were published in the *Glouc. Jnl.* 30 June 1860.

15. P.R.O., BT31/502/1991.

16. *Ibid.*

17. *Glouc. Jnl.* 30 June 1860.

18. *Glouc. Jnl.* 4 August 1860.

19. *Stroud Journal*, 29 September 1860.

20. P.R.O., BT31/502/1991. A list of shareholders, subscribers to the Memorandum of Association and directors can be found in the Appendix.

21. Glos. R.O., D149/E98; P.R.O., BT31/502/1991.

This expenditure on machinery quite clearly used most of the capital called up during the first year of operation, August 1860–June 1861.²² No scale of charges survives for that first year, but the range is given in a newspaper report as between 7*s.* 6*d.* and 15*s.* per acre ‘at ordinary depths and under ordinary circumstances’.²³ A more detailed scale survives from January 1862:

1. 7 inches deep in fields of not less than 15 acres:	15 <i>s.</i> per acre
2. On lighter soils of the same depth where 4 ploughs can be fairly kept at work:	12 <i>s.</i> per acre
3. The same depth on foul or extra stiff soils or where fields are small or of an awkward shape:	18 <i>s.</i> per acre
4. Greater depth without extra difficulties — 9 inches:	22 <i>s.</i> per acre
10 inches:	30 <i>s.</i> per acre ²⁴

Despite the air of optimism which surrounded its inception the company seems to have run at a loss from the beginning. The first year’s balance sheet showed an overall deficit of £148 8*s.* 5½*d.* after purchase of the machinery, preliminary and legal expenses and sundries. In addition, the working expenses of the steam ploughs (£876 12*s.* 9½*d.*) had exceeded their earnings (£845 11*s.* 10*d.*), having ploughed only 1,153 acres.²⁵ Working expenses of the steam ploughs and their receipts were as follows:

Table 1. Working expenses and receipts of steam ploughs, August 1860–June 1861.²⁶

Plough	Date commenced work	Acreage ploughed	Earnings			Working expenses		
			£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>
1	23 August 1860	414.41	293	16	3	264	9	11
2	29 September 1860	182.84	141	3	8	274	19	3
3	15 October 1860	265.40	201	14	2	169	7	1½
4	5 November 1860	278.46	199	17	9	156	0	6
5	18 June 1861	12.00	9	0	0	11	16	0
Total		1153.11	845	11	10	876	12	9½

The average earnings of the steam ploughs were 14*s.* 8*d.* per acre, while the average working expenses were 15*s.* 2*d.* per acre. Therefore the ploughs were losing 6*d.* on every acre they ploughed. A breakdown of the working expenses shows in rather more detail where the trouble lay:

Table 2. Working expenses of steam ploughs. August 1860–June 1861²⁷

Plough	Wages			Repairs and new ropes			Oil etc.			Travelling expenses			Miscellaneous			Total		
	£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>	£	<i>s.</i>	<i>d.</i>
1	153	12	2	69	12	4	16	9	4½	29	6	7½	4	9	5	264	9	11
2	118	3	8	109	8	5	10	3	8	28	4	11	8	18	7	274	19	3
3	96	16	0	42	15	4	7	16	3	17	13	4	4	6	2½	169	7	1½
4	96	8	1	34	5	3½	8	17	1	14	11	7	1	18	5½	156	0	6
5	8	11	0	-	-	-	1	18	5	-	11	10	-	14	9	11	16	0
Total	473	10	11	256	1	4½	45	4	9½	81	8	3½	20	7	5	876	12	9½

22. Glos. R.O., D149/E98.

23. *Gardener’s Chronicle and Agricultural Gazette* (hereafter referred to as *Gardener’s Chron.*), 1 September 1860.

24. *Gardener’s Chron.* 1 February 1862.

25. Glos. R.O., D149/E98.

26. *Ibid.*

Wages amounted to 54% and repairs to 29.2% of the total working expenses, together accounting for nearly three-quarters of this outlay. Some ploughs were clearly more expensive than others, as the next analysis demonstrates:

Table 3. Average working costs and average earnings per acre of each steam plough, August 1860-June 1861

Plough	Average working cost per acre		Average earnings per acre	
	s.	d.	s.	d.
1	12	9	14	2
2	30	1	15	5
3	12	9	15	2
4	11	2	14	4
5	19	8	15	0

This shows that, in fact, only two of the ploughs were working at a loss, the other three were making a modest profit. But the loss made by one of the ploughs was so great as to turn the profits into an overall loss.

No accounts are available for the year July 1861 - June 1862 and so it is impossible to say what the precise financial position of the company was. The 1861-2 season seems to have started well enough if the *Gloucester Journal's* correspondent is to be believed: 'we are glad to state that the Gloucester Steam Plough Company a week or two since commenced active operations for the season, with the most promising prospects of success.'²⁸ Yet by December 1861 there was obviously insufficient work for the company's steam tackle, as the following sentence in an advertisement placed in the *Gloucester Journal* reveals: 'The Company are also open to receive a Tender from any competent party for the rent of one of Fowler's Engines and Tackle for a year, the machinery being kept in working order by the Company.'²⁹ By February 1862 it was clear that the situation was growing steadily worse. The manager of the company, John Thornhill Harrison of Frocester Court, a retired civil engineer, admitted that the company had not 'so far' been a commercial success. The terrain of the Vale of Gloucester was, he said, unfavourable to the steam plough because the long travelling distances from farm to farm, the small fields and luxuriant hedgerows acted as positive drawbacks.³⁰ The fact that the company had failed seems to have been prematurely leaked to the press in May 1862 when the following statement appeared in *Bell's Weekly Messenger*: 'Speaking of Gloucester leads us to announce, that the Gloucestershire Steam Plough Company is in the process of being wound up, having proved an utter failure.'³¹ In fact, the decision to wind up the company was not taken by the shareholders until the annual general meeting held on 26 July 1862.³²

27. Ibid.

28. *Glouc. Jnl.* 7 September 1861.

29. *Glouc. Jnl.* 14 December 1861.

30. *Gardener's Chron.* 1 February 1862.

The decision appears to have been almost unanimous. But there were a few dissenting voices and Thomas Cadle, yeoman, of Highnam and Thomas Morris, yeoman, of Maisemore were amongst them. Cadle subsequently expressed the opinion that the dissolution of the company had been over-hasty, 'for five or six years were required before the question sought to be solved could be properly decided.'³³ Regardless of these doubts, the company went into liquidation. The final balance sheet indicates that no work was done by the steam ploughs after September 1862.³⁴ It is possible that the company's employees were released at this point in order to avoid the expense of further wage bills. The ploughs were sold back to Fowler and Co. in 1863 for £2,600, leaving a loss of £1,320 7s. 1d. on machinery alone to be borne by the shareholders.³⁵

Relations between Fowler and the directors of the company appear to have been good up to this point. But during 1863 the situation deteriorated to the point where legal action against Fowler was contemplated, since the liquidator recorded a payment of £13 17s. 6d. on 28 November 1863 to a firm of Gloucester solicitors for 'Professional Charges in the Matter of the Action against Fowler and Co., and Cross Claim.'³⁶ The subject of the proposed action is unknown. It may well have been connected with the financial loss incurred by the company on the five sets of ploughing tackle, but the small sum paid in legal fees indicates that no formal action was taken. Such a move would surely have attracted a great deal of attention in the agricultural press and Fowler's competitors would have lost no time in making capital out of it.

The company was not officially wound up until the meeting of shareholders held on 2 and 9 January 1864, when it was resolved that 'the affairs of the Gloucestershire Steam Plough Company Limited have been fairly and fully wound up and its assets distributed.' A first and final dividend of 11s. 9d. had been paid on each share. The Registrar of Joint Stock Companies was notified of this voluntary liquidation on 9 January 1864.³⁷

So ended an early experiment in steam cultivation, largely unmourned by the people who had brought it into being. Its demise passed unnoticed in the local press, probably in order to avoid embarrassment to the county notables amongst the directors. But why did the Gloucestershire Steam Plough Company fail? There are three possible areas of investigation: technical problems associated with the Fowler machinery, problems resulting from decisions taken by the management and directors and, finally, problems arising from agricultural management in the Vale area of Gloucestershire. Any one of these, or a combination of them, could have been responsible for the failure of the venture.

The machinery supplied by John Fowler to the company consisted of five sets of self-propelled single ploughing engines and tackle, delivered between August 1860 and June 1861. Relatively little is known about the engines themselves, although three of the five can be identified from material in the Fowler archives. They were Kitson and Hewitson 12 nhp slanting shaft double cylinder 7¾ x 12 ploughing engines, Kitson numbers 759, 760 and 842. Numbers 759 and 760 are listed as having been supplied to the company in 1860. Number 842

31. *Bell's Weekly Messenger*, 12 May 1862.

32. Glos. R.O., D149/E98.

33. *Mark Lane Express*, 15 November 1862.

34. Glos. R.O., D149/E98.

35. *Ibid.*

36. *Ibid.*

37. P.R.O., BT31/502/1991. This was perfectly legal under the Joint Stock Companies Act (19 and 20 Vict., c. 47).

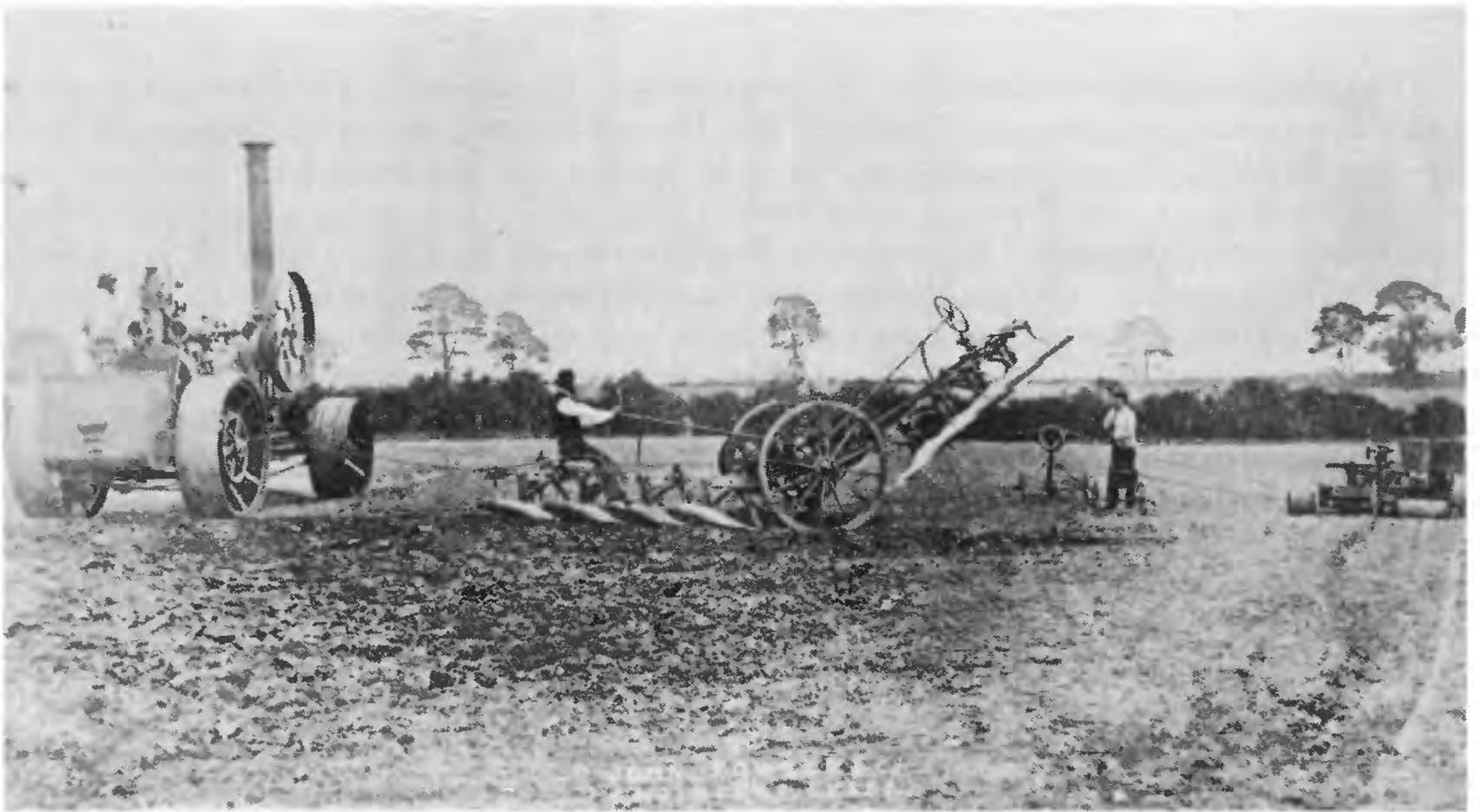


PLATE I Fowler's single engine tackle at work, c.1861

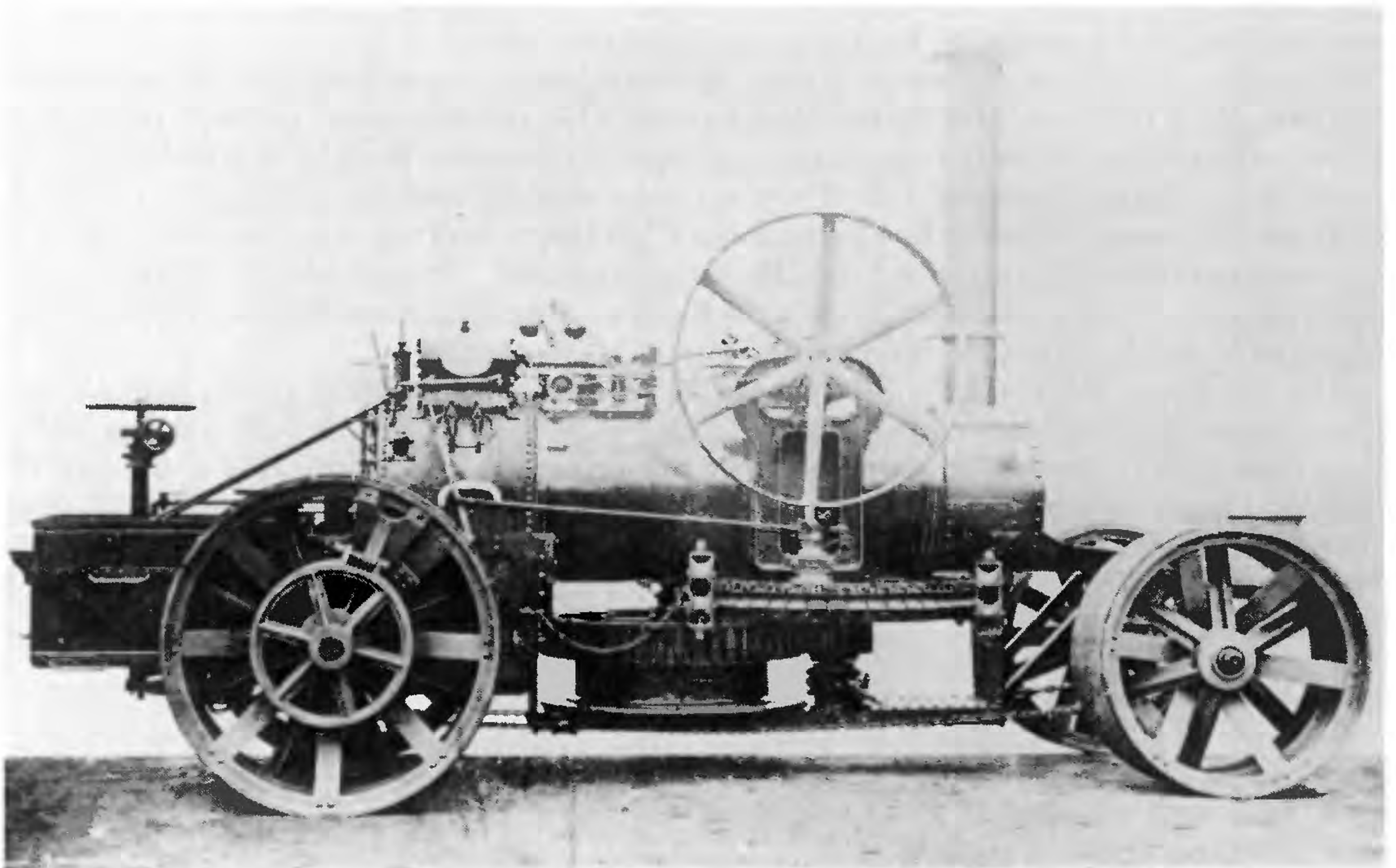


PLATE II Kitson and Hewitson's no. 24, built 1860 but with later modifications

(Photos. by permission of the Museum of English Rural Life, University of Reading)

is listed as having been supplied in 1867-8, but as the company had ceased trading in 1862 this is clearly impossible. It may well be the date at which it was resold by Fowler and Co. after being taken back by Fowler from the company during liquidation in 1863.³⁸

It is impossible to establish the precise fitments of each engine. This is unfortunate because the period was one of continual experiment on and modification of the engines made by Kitson and Hewitson for John Fowler. Some of the modifications were of a major nature and greatly improved the performance of the Fowler single engine tackle. First came Burton's clip drum which was not publicly demonstrated until the R.A.S.E. meeting at Leeds in 1861, although the patent had been filed in 1859. The early engines, amongst which the three supplied to the company in 1860 can probably be numbered, were fitted with the triple-grooved drum system for winding the wire haulage rope, the main drawbacks of this system being the uneven and fast wearing of the drum grooves and heavy wear and tear on the wire rope. The majority of these engines were later fitted with the clip drum, which gripped the rope and prevented it from slipping, thereby reducing wear and tear. PLATE II shows Kitson and Hewitson's No. 24. This engine was built in 1860 but later modified by fitment with the clip drum and a separate winding drum (for slower speed mole draining and other heavy duty work); but in all other respects it would have been very similar to the engines supplied to the Gloucestershire company. The cost of conversion from the triple-grooved drum system to the clip drum was £202 9s. 2d. in 1860.³⁹ The compensating brake, which replaced the slack gear system to prevent the trailing of rope on the ground, was developed late in 1861 and went a long way towards solving the problem of rope slack.⁴⁰ Coiling gear, for coiling the rope more evenly on the drum, was introduced in 1862.⁴¹ The versatility of the single engine system was increased by the cultivating/drainage conversion system in May 1862. The early engines were suitable for cultivating only and a different engine had to be purchased for drainage work. The conversion system enabled the purchaser to use one engine for both jobs.⁴² Finally, the introduction of the double engine system in 1863, where the implements were hauled between two engines, one on each side of the field, did away with windlasses, anchor carriages and rope porters and solved most of the problems associated with the wire rope. This was an important development and the system remained extremely successful and popular up until the beginning of the agricultural depression in the late 1870s.⁴³

The imperfection of and continual modifications to the early Fowler machinery were clearly important factors in the problems faced by the directors and management of the Gloucestershire Steam Plough Company between 1860 and 1862. Edward Holland, M.P., of Dumbleton Hall near Evesham, an ardent advocate of steam ploughing and himself the owner of a 12 nhp Fowler engine,⁴⁴ attributed the failure of the company to 'the fact of its being established at a time when the machinery was new and non-perfected.' He also pointed out that since the failure of the Gloucestershire experiment a successful company had been established in Wakefield using Fowler's double engine system, the engines being used for other agricultural

38. R.L.S. Engine Lists, Fowler Archives, M.E.R.L.

39. Lane, 33, 40, 42.

40. Ibid., 37.

41. Ibid., 48.

42. Ibid., 48-9.

43. Ibid., 53.

44. R.L.S. Engine Lists, Fowler Archives, M.E.R.L. It was a 12 nhp chain drive double cylinder $7\frac{3}{4} \times 12$, made by Kitson and Hewitson, Kitson number 747, Fowler nameplate number 40.

work when they were not ploughing.⁴⁵ Unfortunately, the cultivating/drainage conversion system, introduced in May 1862, came too late for the Gloucestershire company; the addition of this system to their engines would have been an advantage because some drainage work was in progress on the Gloucestershire clays and would have provided additional work outside the cultivating season.

There is also evidence that the Fowler engines and tackle were, initially, too light for work on the heavy clays of the Vale. The directors' report made at the first annual general meeting of shareholders in August 1861 stated that: 'the implements hitherto used, though possessing great merits, had proved very defective on the heavy lias clays, and had often become deranged or broken. These defects, in many instances, had been made good by Mr. Fowler, without charge, but had still caused much loss and disappointment.'⁴⁶ Trouble of this nature may well have had an effect on the attitude of potential customers towards steam cultivation.

But the fact remains that the Fowler engines owned by the company could have been modified to incorporate some, if not all of the improvements outlined above. It is also possible that they could have been modified to work in pairs as two double engine systems although, in fairness, this system was not introduced until 1863, when liquidation of the company was in progress. It seems that in August 1861 the directors did intend to incorporate the modifications available at that time, as the directors' report stated that 'there were good grounds for believing that by adopting the latest improvements in Mr. Fowler's implements, the next season would be commenced under more favourable circumstances.'⁴⁷ This action does not appear to have been taken. The only conclusion which can fairly be reached about technical problems with the Fowler machinery is that they may have made life very awkward and expensive for the company in the first year or so, but that they were by no means insurmountable. It therefore looks as though the real reason for the failure of the company must lie elsewhere.

There seems to be more scope for explanation of the failure in the management decisions made, presumably, by the directors in consultation with the manager, J.T. Harrison. Certainly the decision to invest the bulk of the capital called up in the first year (£3,920 out of £4,423) in five sets of steam tackle is mystifying. It would have been much more logical to purchase two sets of tackle initially, whilst canvassing customers and researching demand during the first year of operation. As it was, operating costs exceeded earnings and the remaining capital had been spent on legal expenses and stores, so that the company showed an excess of expenditure over capital and income in its first year. Edward Holland saw this over-ambitious beginning as another reason for the failure of the company: 'A great deal of the want of success at Gloucester arose from their trying to do too much at once. They had five engines, only two of which were ever in work at one time, the result being that they had a great deal of dormant capital and a quantity of expensive machinery on hand that was very liable to be broken or injured.'⁴⁸

Linked with this last point is the fact that there seems to have been insufficient work in the Vale area for five sets of ploughing tackle. Only 1,153 acres were ploughed by the company between August 1860 and June 1861, the maximum ploughed by any one engine being the 414 acres completed by Number 1, which was the first engine to commence work.⁴⁹ This indicates

45. *Farmer's Mag.* 3rd series, XXIV (1863), 189.

46. *Bells Weekly Messenger*, 12 August 1861.

47. *Ibid.*

48. *Farmer's Mag.* 3rd series, XXIV (1863), 189.

49. *Glos. R.O.*, D149/E98.

that there had been insufficient advance research on potential demand by the directors before the five engines were purchased. The directors' enthusiasm had obviously triumphed over their judgement.

Given that too much capital was tied up in machinery for which there was insufficient cultivating work, it is difficult to see why the directors and manager failed to diversify into other agricultural activities such as threshing, sawing or haulage, when this was stated to be amongst the objects of the company in the Memorandum of Association.⁵⁰ By confining itself to cultivation the company was paying out wages for the whole year when its employees were actively employed for only part of the year; Table 2 above shows that wages accounted for 54% of operating costs in 1860-61. The explanation seems to lie in the fact that the early Fowler engines were designed specifically for cultivation and had to be adapted for other purposes. By buying five engines all of the same type the company had used all of its available capital and confined itself to a single activity. It was the intention of the manager and directors to branch out in other directions, 'when the arrangements are completed by which the work will be done with engines available for threshing as well as tillage.'⁵¹ Perhaps they were contemplating modification of the existing engines or trading them in for new models. We shall never know the true story, for events seem to have been overtaken by the decision to go into voluntary liquidation.

The speed with which the decision to liquidate was taken is another questionable area for, in hindsight, it does seem that it was taken too quickly. It is clear from the summary of capital and shares submitted to the Registrar of Joint Stock Companies on 11 August 1863 that only three calls had been made upon each share⁵² and we know from the balance sheet of June 30 1861 that all these calls had been made prior to that date.⁵³ Therefore it is possible to say that enough capital would have been available in the form of further calls on shares to do all the conversion work necessary to make the engines more versatile and to improve their performance. Certainly some of the shareholders thought that the decision had been over-hasty, as we have already seen, and that more time should have been allowed for a fair test of steam ploughing in the Vale.

Doubts about the viability of steam ploughing companies arose fairly quickly in the minds of some observers and commentators during the early 1860s. For instance, the correspondent of *Bell's Weekly Messenger*, noting the failure of the Gloucestershire venture, commented: 'We have great faith in steam ploughs and cultivators in the hands of prudent, skilful and enterprising tenant farmers, but we never had any faith in steam plough companies, and are not, therefore, surprised to learn that the abovenamed has proved a failure.'⁵⁴ Most, if not all comments of this type were made with the benefit of hindsight, when the drawbacks of the scheme had become more obvious. J.C. Morton attributed the poor prospects of steam plough companies to the fact that 'the *letter* of a steam cultivator is in a very different position from the man who owns one and uses it on his own land', for his tackle had to travel long distances and was hired by farmers for the roughest jobs on difficult land not previously cultivated at any depth. Morton also pointed out that the lessor's employees had to be paid whether or not there was any employment for them.⁵⁵ This last point was echoed by Edward Holland, who thought that steam ploughing

50. P.R.O., BT31/502/1991.

51. J.T. Harrison, reported in *Gardener's Chron.* 1 February 1862.

52. P.R.O., BT31/502/1991.

53. Glos. R.O., D149/E98.

54. *Bell's Weekly Messenger*, 12 May 1862.

55. J.C. Morton, reported in *Gardener's Chron.* 30 May 1863.

companies should be connected with 'engineering establishments', where the employees connected with the steam ploughing side could be deployed in other branches of the business when the ploughs were idle.⁵⁶ J.T. Harrison, the erstwhile manager of the Gloucestershire Steam Plough Company, was reported in 1863 to have said: 'Their experience of steam ploughing in Gloucestershire clearly showed that it was not desirable for any company to undertake ploughing by hire.'⁵⁷

On balance it seems likely that the decision to go into voluntary liquidation was taken quickly for two basic reasons. Firstly, and most logically, to avoid any further losses to the shareholders and embarrassment on this count to the county notables who were directors. Secondly, to avoid prejudicing the future cause of steam cultivation in Gloucestershire by continued financial losses and possible adverse publicity. There can be little doubt that the second reason was the more valid one to the really ardent advocates of steam.

The Gloucestershire Steam Plough Company was established 'for the purpose of bringing steam power for the cultivation of land into general use in the county of Gloucester and the surrounding district'.⁵⁸ In real terms the geographical area served by the company during its short life came mainly within the area generally known as the Vale. But Vale farming itself presented some very real obstacles to the introduction of steam cultivation. The Marls and Lias clays of the area were, as we have already noted, very heavy, although extremely fertile. Because this type of soil was so expensive to cultivate by means of horse power the majority of it had come under systems of livestock management (dairying, grazing and rearing) which revolved around permanent pasture and temporary grasses, with only a small proportion of land under arable rotations. In the early 1860s the Vale seems largely to have been left behind by the changes in clayland farming that were occurring in more northerly counties, such as Cheshire.⁵⁹ The arable acreage remained relatively small despite the exhortations of eminent agriculturists like Morton and, consequently, there was not a great deal of work for steam ploughs in the Vale.

Allied to these systems of livestock management was the fact that Vale farm sizes were generally small, usually between 100 and 150 acres, rarely more than 300 acres.⁶⁰ The arable acreage on a Vale farm was unlikely to exceed 50 acres. H.C. Clifford of Frampton-on-Severn was a progressive landowner who farmed according to the best precepts of 'high' farming beloved of Caird and Morton, but even on his Town Field Farm there was a mere 59¼ acres of work suitable for the steam plough in 1861.⁶¹ Vale fields were also small; seven acres appears to have been the rule.⁶² Small fields created problems for the cumbersome steam ploughing tackle, which needed considerable room to manoeuvre. Fowler himself was of the opinion that 'if he had a steam plough, and a person asked him to plough a seven-acre field, he would not go near him', and regarded twenty acres as an ideal field size. Small fields, he said, raised the cost of steam cultivation by between 20 and 30 per cent.⁶³ Other advocates of steam cultivation saw Vale field sizes as a problem. Edward Holland said that fields had to be in 'steam plough order'

56. Report of a meeting at St. James' Hall, *Mark Lane Express*, 19 December 1863.

57. *Ibid.*

58. *Glouc. Jnl.* 23 June 1860.

59. J.C. Morton, 'On the Farming of Gloucestershire', *J.B.W.E.S.*, XII, I (1864), 23.

60. John Bravender, 'The Farming of Gloucestershire', *Journal of the Royal Agricultural Society*, XXV, I (1850), 146.

61. *Glos. R.O.*, D149/E98.

62. Thomas de Winton at the first annual general meeting of shareholders, *Bell's Weekly Messenger*, 12 August 1861.

63. *Ibid.*

for the venture to be a success.⁶⁴ J.T. Harrison admitted that farm and field size were crucial to the success or failure of contract steam cultivation: 'The experiment of a steam plough company is, in the Vale of Gloucester, being tried under the unfavourable condition of small fields, and the majority of them pasture. There is thus much travelling of long distances from farm to farm, and the fields on each are not generally favourable to the work.'⁶⁵

Another, seemingly insuperable barrier to the introduction of steam cultivation in the Vale was game preservation. The luxuriant, game-harboursing hedgerows which sub-divided the small Vale fields were notorious for their profusion and tenants were sometimes limited by their leases as to their pruning or removal.⁶⁶ To accommodate the steam plough, fields had to be enlarged, which meant that hedges had to be grubbed out. But the Vale was hunting country and fears that the conditions necessary for steam cultivation would damage hunting were frequently expressed by farmers and landowners alike. Edward Bowly of Siddington was a convert to steam cultivation and a shareholder in the company, but he still had doubts about its long-term effects upon the rural environment and voiced his fears publicly. He doubtless found some sympathetic ears when he 'asked if that hunting country was only to be remembered in the reminiscences of former years, and if no place would be left in which to breathe the spirit of our forefathers.'⁶⁷ Fowler viewed this sort of attitude with concern: 'If people will have game, instead of good farming', he said, 'steam ploughing must go to the wall'.⁶⁸ Other progressive landowners and farmers thought that the advantages accruing from steam cultivation outweighed any possible disadvantages and repaid the expense of reorganising their estate farms. This school of thought was represented by Sir George Jenkinson of Eastwood Park, who said that the steam-minded landlord 'would ultimately reap advantage in the improved state of his land, and in securing better tenants'.⁶⁹

It therefore appears that the success of the company depended from the outset upon the reorganisation of agricultural management systems in the Vale and upon the premise that farmers and landowners would increase the size of both their holdings and their fields as a consequence. Plainly, this was expecting the impossible. Not only was a restructuring programme of this size probably beyond the capabilities of any individual or group at this point in time, its validity was, in any case, doubtful. Many Vale farmers and landowners probably resisted change in the form of an increase in their arable acreage because the profitability of their own particular management system, whether it was dairying or grazing and rearing, was perfectly satisfactory to them. In view of the rising prices of livestock and dairy products in the middle decades of the 19th century this was not an altogether unreasonable attitude.

So, inevitably, one is forced to the conclusion that the Gloucestershire Steam Plough Company was doomed to failure from the beginning. Its success hinged upon large changes in agricultural and estate management which were viewed as either unnecessary or undesirable by many Vale landowners and farmers. The company's difficulties were further compounded by technical problems associated with the experimental stages of the machinery they were using and by rash purchasing and an initial lack of caution on the part of directors and management. Additionally, the inability or unwillingness of management and directors to diversify into other areas of agricultural activity restricted the potential profitability of the company.

64. *Glouc. Jnl.* 28 September 1861.

65. *Gardener's Chron.* 1 February 1862.

66. James Caird, *English Agriculture in 1850-51*, (2nd edition 1968), 40-41.

67. *Gardener's Chron.* 12 October 1861.

68. *Bell's Weekly Messenger*, 12 August 1861.

69. *Farmer's Mag.* 3rd series, XXV (1864), 64.

In many respects, the Gloucestershire venture paid the penalty of being first in the field. J.C. Morton recognised that this was part, at least, of the innovator's problem: 'The pioneers in any career of improvement, like the original shareholders in many a costly though ultimately profitable investment, too often pay a penalty for their enterprise by getting nothing but experience for their pains, which, though of great service to their successors, is in the mean time expensive to themselves'.⁷⁰ But this company also provides a vivid illustration of the hasty and ill-advised application of new technology. While steam cultivation may well have been a wise investment on the Cotswolds, where the emphasis was on arable farming and both farm and field sizes tended to be larger than elsewhere in Gloucestershire, in the mainly pastoral Vale its application was simply inappropriate. This last point must surely have been true of similar areas elsewhere in Britain and must therefore cast some doubt upon the wisdom of a more widespread application of steam ploughing.

February 1981

APPENDIX

Gloucestershire Steam Plough Company Limited

1. Subscribers to the Memorandum of Association, 18 September 1860

<i>Name and address</i>	<i>Occupation</i>	<i>Number of shares</i>
J. Curtis Hayward, Quedgeley House	Esquire	25
Anthony Bubb, Witcombe Court	Esquire	25
Joseph Yorke, Forthampton Court	Esquire	25
Richard Potter, Standish House	Esquire	25
Josiah Castree, College Green, Gloucester	Land agent	10
Thomas de Winton, Wallsworth Hall	Esquire	10
Thomas Morris, Maisemore	Farmer	10
Samuel Priday, Linton	Farmer	10

Source: P.R.O., BT31/502/1991

2. Directors

John Curtis Hayward Esq., Quedgeley House (Chairman)
 The Right Hon. Earl Ducie, Lord Lieutenant of the County
 T.B. Lloyd Baker Esq., Hardwicke Court
 Edward Bowly Esq., Siddington
 Anthony Bubb Esq., Little Witcombe
 Thomas Fulljames Esq., Hasfield Court
 James Goodrich Esq., Maisemore Court
 Edmund G. Hallewell Esq., Cheltenham
 Robert Stayner Holford Esq., M.P., Westonbirt
 Sir George S. Jenkinson, Bart., Eastwood Park, Falfield
 Daniel John Niblett Esq., Haresfield Court
 Richard Potter Esq., Standish House
 W. Philip Price Esq., Tibberton Court
 Edmund Probyn Esq., Huntley

70. J.C. Morton, 'Steam Cultivation', *J.B.W.E.S.*, XI, II (1863), 221.

John Cam Thackwell Esq., Wilton Place
 Thomas de Winton Esq., Wallsworth Hall
 Joseph Yorke Esq., Forthampton Court

General Manager: John Thornhill Harrison Esq., Frocester Court

Source: *Gloucester Journal*, 30 June, 4 August 1860

3. Shareholders

<i>Name and address</i>	<i>Occupation</i>	<i>Number of shares</i>
James Ackers, Prinknash Park	Esquire	25
Anthony Bubb, Little Witcombe	Esquire	25
Edward Bowly, Siddington, Cirencester	Esquire	20
Thomas Barwick Lloyd Baker, Hardwicke Court	Esquire	25
William Henry Bloxsome, Dursley	Clerk	25
John Michael Butt, Kingsholm, Gloucester	Iron founder	10
Henry Butt, Kemerton, Tewkesbury	Yeoman	10
Edward Bretherton, Gloucester	Provision merchant	10
The Right Hon. Earl Bathurst, Cirencester	Earl	5
Joseph Bennett, Chaxhill, Westbury-on-Severn	Yeoman	10
John Bravender, Cirencester	Land agent	20
Edmund Boughton, Junior, Gloucester	Iron merchant	10
Higford Burr, Aldermaston, nr. Reading	Esquire	5
Joseph R. Bennett, Chaxhill	Yeoman	10
Henry Bruton, Gloucester	Auctioneer	10
Martin H. Crawley Boevey, Flaxley Abbey	Baronet	20
James Bretherton, Gloucester	Solicitor	10
Josiah Castree, Gloucester	Land agent	10
Christopher W. Codrington, Dodington	Baronet	10
John A. Graham Clarke, Manor House, Frocester	Esquire	10
William Clarke, Brickhampton	Yeoman	5
Thomas Cadle, Longcroft, Westbury-on-Severn	Yeoman	5
Thomas Cadle, Highnam	Yeoman	5
Henry Clifford Clifford, Frampton-on-Severn	Esquire	10
William Capel, The Grove, Stroud	Esquire	20
The Right Hon. Earl Ducie, Tortworth	Earl	10
Thomas de Winton, Wallsworth Hall	Esquire	10
Henry Drinkwater, Sandhurst, Gloucester	Yeoman	5
William Davies, Stonehouse	Esquire	10
William Tombs Dewe, Manor House, Coates	Esquire	5
John Henry Elwes, Colesbourne, Cheltenham	Esquire	5
Thomas Sotheron Estcourt, Tetbury	M.P.	10
Edmund Edmonds, Newent	Solicitor	20
Thomas Fulljames, Hasfield Court	Esquire	20
Robert Charles Fulljames, Hasfield Court	Esquire	20
James Goodrich, Haresfield Court	Esquire	10
James Gough, Rodley, Westbury-on-Severn	Yeoman	5
Arthur Goodrich, London	Solicitor	30
John Curtis Hayward, The Lyppiatts, Cheltenham	Esquire	25
Edmund G. Hallewell, The Oaklands, Dursley	Esquire	25
Richard Helps, Gloucester	Solicitor	20
John Thornhill Harrison, Frocester Court	Civil engineer	10
Thomas Hickes, Gloucester	Surgeon	10
Edmund Hopkinson, Edgeworth Manor House	Esquire	5
Edmund J.C. Hopkinson, Colebridge, Wotton	Gentleman	10
Frederick Harvey, Churcham	Yeoman	5
Nathaniel Hawkins, Standish	Maltster	10

Edward Holland, Dumbleton Hall	M.P.	5
Thomas Holbrook, the executors of		5
George Haine, Over, Gloucester	Yeoman	10
Thomas Halsey, Compton House, nr. Newent	Yeoman	5
Nathaniel Hawkins, Putloe, nr. Stonehouse	Yeoman	25
William Hall, Brockworth Court, nr. Gloucester	Yeoman	5
Charles A. Hay, London	Esquire	30
Benjamin Hill, Birmingham	Bootmaker	3
Thomas Hartland, Newton Villa, Newent	Gentleman	10
Thomas Hawkins, Bury Bar, Newent	Gentleman	10
Daniel D. Heaven, Colthrop Farm, Haresfield	Yeoman	6
Robert Stayner Holford, Westonbirt	M.P.	20
Katharine Helps, Gloucester	Spinster	10
Arthur Helps, London	Esquire	40
Giles Iles, Packthorne Farm, Whitminster	Yeoman	5
George Jenkinson, Eastwood, Berkeley	Baronet	50
John Fowell Jones, Saul	Clerk	10
Thomas James, Llanfoist, Abergavenny	Coal merchant	20
William Jordan, Charlton Kings, Cheltenham	Gentleman	10
Edward Knight Highleadon	Yeoman	10
George J. Kain, London	Accountant	5
Erskine Knollys, Ilford, London	Clerk	20
Thomas Long, Barnwood Mill, nr. Gloucester	Yeoman	10
William Long, Down Hatherley, nr. Gloucester	Yeoman	10
W. Lauriston-Lewis, Tewkesbury	Solicitor	20
Thomas Lawrence, Churchdown	Yeoman	10
Samuel Lysons, Hempstead	Clerk	5
Thomas Morris, Maisemore	Yeoman	10
Thomas Maurice, Harnhill Rectory, Cirencester	Clerk	10
William Mann, Gloucester	Jeweller	10
Daniel John Niblett, the executors of		25
Richard Potter, Standish House	Esquire	25
William Philip Price, Tibberton Court	Esquire	25
Edmund Probyn, Huntley, nr. Gloucester	Esquire	20
Samuel Priday, Linton, nr. Gloucester	Yeoman	10
Charles Priday, Longford, nr. Gloucester	Yeoman	5
Daniel Power, Gloucester	Printer	5
Thomas Pensam, Eldersfield, Worcestershire	Yeoman	5
John Rolt, Ozleworth Park, Wotton-under-Edge	M.P.	10
Thomas Ricketts, Osborne House, Frocester	Yeoman	10
James Ricketts, Frocester	Yeoman	5
Edward Parker Shute, Dursley	Solicitor	25
Hannah Sarjeant, Stratford-upon-Avon	Spinster	10
John Cam Thackwell, Dymock	Esquire	5
Walter Wilkins, Gloucester	Bank manager	20
Alfred Cummins Wheeler, Gloucester	Seed merchant	20
William White, Tewkesbury Park, Tewkesbury	Yeoman	10
Henry Somerset Whitcombe, Innsworth	Esquire	5
Joseph Woodward, Uckington, nr. Cheltenham	Yeoman	5
James Wells, Elmbridge, nr. Gloucester	Yeoman	10
Richard G. Whatley, Alpha Villa, Cheltenham	Gentleman	20
Edmund H. Webb, Hardwicke Farm, Hardwicke	Yeoman	3
Edwin White, Maisemore	Yeoman	10
John Aubrey Whitcombe, Gloucester	Solicitor	10
Joseph Yorke, Forthampton Court, Forthampton	Esquire	25