

The Progress of the Early Threshing Machine¹

By STUART MACDONALD

THRASHING was as basic to agriculture as agriculture was to the national economy. New crop rotations, better manuring, and increased potential arable acreage may have produced more grain to be sold at greater profit in the buoyant grain market of the late eighteenth and early nineteenth centuries, but the importance of the essential linking process—threshing—seems to have escaped comparable attention. Before the 1780's, the most efficient way of separating grain from straw was to employ teams of men throughout the winter months to hit the corn with flails. The work was hard, it was dirty, inefficient, slow, and at a time of rapid agricultural change and some agricultural progress, primitive. Not until 1786 was a machine invented capable of relieving arable agriculture from its annual epic drudgery.² The statement made in 1799 that "In Britain, till within these twelve years, the flail may be said to have been the only instrument employed for thrashing corn . . ."³ seems to lend some perspective to simplistic views of earlier revolutionary progress in agriculture. The machine was immensely popular and readily accepted in some parts of the country: "These machines have now spread over all the corn counties of Scotland, and have lately been successfully introduced into the northern counties of England"; but not in others, "though, strange to tell, they are scarcely known in the southern and best cultivated parts!"⁴ Nor was this merely a question of slow

diffusion from Scottish origins; in many parts of England the flail remained the dominant—sometimes the only—means of threshing for the next half-century. "The thrashing of corn is performed in two ways; by manual labour, as with the flail, and by mechanical means, as the thrashing machine. The flail . . . is still used in a great part of England to separate the corn from its straw."⁵ The machine was revolutionary in function compared with the flail and in scale compared with the size and cost of other farm implements.⁶ That such a keystone of revolution should prove invaluable to some and valueless to others seems a matter of some interest and importance and has provoked this enquiry.

I

Whilst it would be eminently satisfying to compare the actual costs and efficiency of one threshing machine with those of another and, of course, with the flail, and while the conclusion could be made to appear pleasingly convincing, to do so would necessitate the use of statistics provided by contemporaries. What seem to be identical machines were made to appear radically different in performance, depending on the writer's opinions of threshing machines. As far as the evidence is concerned, performance is a function of opinion rather than the more logical reverse. "It is an easy affair to make such statements prove anything that is wanted . . . if the mountain will not come to Mahomet, there is no

¹ I am deeply grateful to D. J. Rowe for his criticism of and interest in this paper.

² "This may be considered as the most valuable discovery, in machines of agriculture, which has been made for centuries past. Not merely as lessening human labour, but as relieving farm workmen from their most unhealthy employment."—W. Marshall, *Landed Property*, 1804, pp. 163–4. Arthur Young called it "by far the most capital mechanized invention in husbandry that has appeared this century."—*Annals of Agriculture*, xx, 1793, p. 248; but he later modified his opinion after encountering the southern threshing machine while compiling his county reports for the Board of Agriculture.

³ Robert Brown, *Agriculture of the West Riding of Yorkshire*, 1799, p. 57. ⁴ *Ibid.*, p. 59.

⁵ Essay on 'Barn Management', *Quarterly Journal of Architecture*, III, 1831–2, p. 893.

⁶ Exact comparison of expense is not possible, but while a plough, a winnowing machine, or a cart would have been exorbitant at more than £10 or £15, a threshing machine could cost £100 or £150, and sometimes very much more.

difficulty in carrying Mahomet to the mountain."¹ Three apparently comparable four-horse machines, each employing five or six labourers, threshed grain at very differing cost; one at 1½d. per quarter,² one at 7d.,³ and the third at something over 1s.⁴ This information comes from men who were keen to encourage the machine: their opponents naturally increased the performance range even more. As late as 1838, the performance of threshing machines was still regarded as incomparable: "... thrashing-machines of the same power and construction perform very different quantities of work. Whilst one machine only thrashes 24 bushels of oats in the hour, another of the same power thrashes 60 or even 72 bushels."⁵ A more rigorous mathematical treatment may well be practical for evidence from later in the century,⁶ but it could be misleading to treat in this way material that is sometimes inaccurate, often vague, and always subjective.

What attention has been afforded the threshing machine, both by contemporary writers and more modern ones, has tended to concentrate on its mechanical intricacies. Interest has been in how the threshing machine functioned, not in why it was introduced. It is, therefore, hardly necessary or rewarding to take yet another engineer's view of the machine. A brief explanation of the workings must suffice. Figure 1 gives a view of both sides of the first effective threshing machine, that of 1786. Corn was placed ears down on the sloping platform and fed be-

tween two small rollers. As it passed through these, the large drum, armed with fixed skutchers, beat it with an upward motion and presumably delivered both grain and straw, now separated from each other, to an untidy heap on the barn floor, much as flailing operations must have left them. The mechanical genius here is more evident when the alternatives are examined. The flail has only simplicity to recommend it while the other threshing machines patented at about this time have not even that.⁷ Winlaw's machine attempted to grind the grain from the straw and probably produced a sort of coarse flour;⁸ Willoughby's was literally a mechanical flailer, slow, dangerous, and very liable to disintegrate.⁹ Jubb's ostensibly worked on the same principle as figure 1, but with a beater drum too small to be effective. This was the crucial problem overcome by the 1786 machine; by fixing skutchers to a much larger revolving drum, the machine could be made to beat quickly and hard enough to thrash grain efficiently without destroying itself.¹⁰

Once the essential principle of the successful threshing machine had been discovered, the machine's development and refinement were rapid. Figure 11 shows the threshing machine of 1789 after three year's development. (The machine described in the Appendix is of 1840 and is basically the same.) It is "from a generation of threshing machines which represents the first significant attempts at the solution of problems of mechanized farming."¹¹

¹ A Scottish reviewer, criticising Arthur Young's quantitative approach and his apparent eagerness to draw sweeping conclusions from his calculations—*Farmer's Magazine*, I, 1801, p. 67.

² *Annals of Agriculture*, xx, 1793, pp. 248–51. ³ William Dickson, *Practical Agriculture*, 1814, pp. 46–7.

⁴ *Annals of Agriculture*, xxiii, 1795, p. 374. ⁵ *Quarterly Journal of Agriculture*, ix, 1838–9, p. 65.

⁶ See E. J. T. Collins, 'The Diffusion of the Threshing Machine in Britain, 1790–1880', *Tools and Tillage*, II (1), 1972, pp. 16–33. It is felt that there is a great need for a rigorous mathematical treatment of this subject, particularly of the acceptability of the threshing machine in relation to local wage rates and farm size. These are matters beyond the more general scope of this paper.

⁷ Sir William Tritton, 'The Origin of the Thrashing Machine', *The Lincolnshire Magazine*, xi, 1, 1934, pp. 7–12; 2, 1934, pp. 53–6.

⁸ For details of Winlaw's Mill see *Annals of Agriculture*, III, 1785, pp. 411–17, where the suggestion is made that it could be used for rubbing the husks from rice.

⁹ *Ibid.*, p. 413: "I am convinced that no one yet offered to the public on the plan of stampers or flails, has ever answered the purpose intended, nor even can be made to answer."

¹⁰ *The Farmer's Magazine*, IV, 1803, p. 128.

¹¹ *New Bingfield Project Report*. The Bingfield threshing machine was moved from Bingfield to West Side Farm, Newton, Stocksfield, Northumberland, at the instance of its owner, Mr J. E. Moffit, and reconstructed there in 1966–7 by the Department of Mechanical Engineering, Newcastle University, which produced this unpublished report.

The threshing machine of the period 1790-1840, with its complex gearing, could occupy two floors of a barn. It might be capable of working chaff-cutters, grinders, barley-hummellers, and turnip slicers, and of mechanizing other time- and labour-absorbing activities

as well as thrashing grain, separating it from the straw, and operating an array of winnowing machines, though hardly at the same time. Its power came occasionally from windmills, sometimes from water mills and later from steam engines,¹ but more usually from a horse

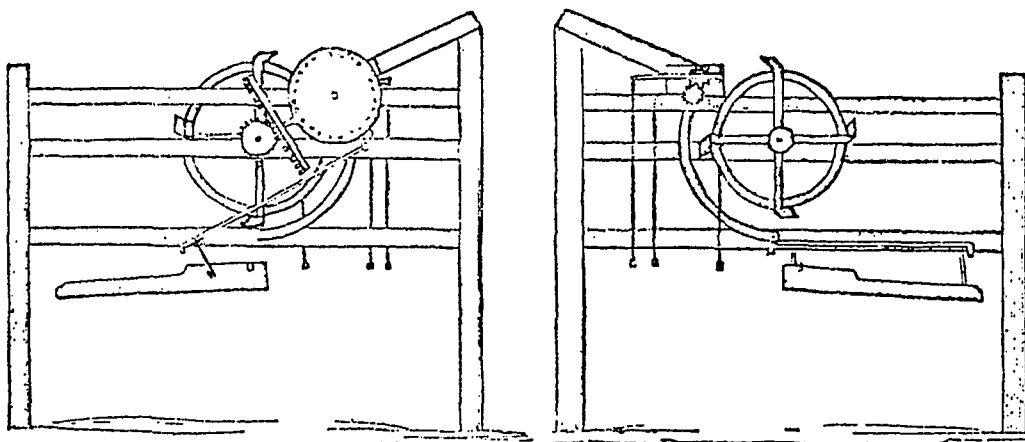


FIG. I

1786. First form of Meikle's Threshing Machine

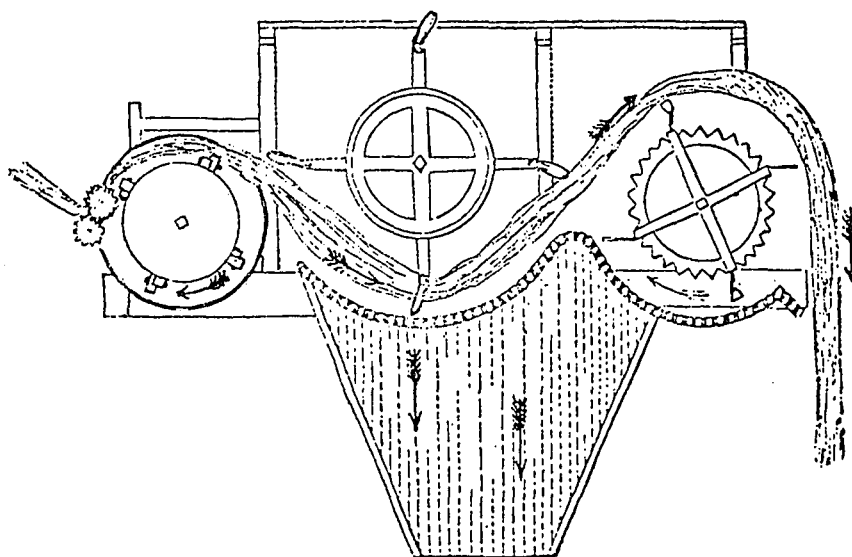


FIG. II

Section of Meikle's Threshing Machine

¹ For greater detail on the power supply of threshing machines see particularly G. B. Worgan, *Agriculture of Cornwall*, 1815, pp. 43-5; John Bailey, *Agriculture of Durham*, 1813, pp. 80-2; Rev. James Headrich, *Agriculture of Forfar*, 1813, pp. 262-6; Robert Ritchie, *The Farm Engineer*, 1849, pp. 69, 74-5.

wheel, often covered by a wheel house.¹ The threshing machine could be an exceedingly elaborate piece of equipment; the more elaborate it was, the greater its potential usefulness seems to have been and the greater the doubts expressed by some farmers. "How does your Threshing Machine succeed—is it complicated and expensive?"²

II

The basic principle of fixed skutchers on a revolving drum seems to have originated in Northumberland, where the equally basic problem of holding the machine together while it was operating fast enough to do any real work does not seem to have been solved.³ This distinction went to Andrew Meikle of East Lothian, who worked on a model of the Northumberland machine to produce his 1786 machine for which he took out an English patent in 1788.⁴ There is little evidence that Meikle personally built machines in England, but some to indicate that the work was delegated to agents,⁵ and that Meikle expected a substantial patent fee. It is hard to believe that this imposed any real barrier to the southward diffusion of the machine, especially in the light of the activities of rene-

gade builders constructing machines on Meikle lines but giving him neither acknowledgement nor fee. William Raistrick, "civil engineer" of Morpeth, claimed that by objecting on principle to paying Meikle's fee of 10 guineas for each machine he had saved the farmers of Northumberland and Durham £12,000 by 1803.⁶ In the absence of large agricultural engineering companies, which hardly became powerful centres of diffusion themselves until the 1830's, the construction of the Meikle threshing machine must have been left either to individual specialists who had acquired some sort of reputation in the field, or to local blacksmiths, millwrights, and carpenters who copied machines within their limited experience.⁷ Small works offered some assistance: "Castings, iron and brass complete, for this machine (or even the wood patterns) may be had at Mr Parker's foundry, Stourport . . . but I do not know of any particular workman who now professes making and erecting them";⁸ but the end result was the product of an individual craftsman, and was generally custom-made to suit the demands of location and farmer.⁹ Thus the threshing machine was most likely to spread by contagious contact, and presuming its invention

¹ This method is well explained in F. Atkinson, 'The Horse as a source of Rotary Power', *Trans. Newcomen Society*, xxxiii, 1960-1, pp. 31-55.

² Letter from George Boswell of Piddletown, Dorset, to George Culley in Northumberland, October 25, 1789.—Northumberland County Record Office (N.C.R.O.), ZCU/14.

³ John Bailey and George Culley, *Agriculture of Northumberland*, 1805, pp. 49-52. A good account of the early development of the threshing machine appears in *The Farmer's Magazine*, xii, 1811, p. 484, and a variation in iv, 1803, p. 128.

⁴ *The Farmer's Magazine*, xii, 1811, p. 484.

⁵ A copy of a threatening letter from one such agent, John Whinfield of Pipewellgate Foundry, Gateshead, written some time before 1803 to Thomas Walker, Millwright of Newcastle reads: "Sir, I have the orders of Mr Meikle the Proprietor of the Patent for Threshing Machines to require you to send me without delay a list of every Threshing Machine you have made and Erected . . . you are Also requested to write down . . . the names of every Millwright, Joiner or others that you know of who have Erected Threshing Machines."—N.C.R.O./2DE/44/10.

⁶ *Ibid.* The implication that there were over a thousand threshing machines in this area by 1803 can hardly be taken seriously.

⁷ This conclusion is encouraged by John Farey, *Agriculture of Derbyshire*, 1815, II, pp. 49-50, which lists twenty-one machines built in the county before 1809 where the homes of their builders are traceable. Five were made by men travelling between forty and 100 miles, sixteen by builders from between one and thirteen miles.

⁸ Letter from J. B. Turner, 26 Dec. 1807, *Agricultural Magazine*, ix, 1808, pp. 161-7. Remoteness from origins seems to have been a considerable barrier to the machine's diffusion. In 1802 "A Mr Prentiss, from Edinburgh, erected in Pennsylvania, New Jersey and Delaware, six or seven machines upon the Scotch principle, which were found to answer well. But on account of the extreme care required in feeding them and the inability of common workmen to keep them in repair, the builder being engaged in another business at a distance, prevented their general adoption." *U.S. Census Preliminary Report*, 1860, p. 96.

⁹ *Quarterly Journal of Agriculture*, ix, 1838-9, p. 66.

to have taken place in south-east Scotland, its diffusion should have occurred within that area first.

By using the Board of Agriculture Reports for the counties of Britain it is possible to glimpse this diffusion more clearly, but to use this material in such a way is a hazardous undertaking only prompted by an overwhelming temptation to apply a survey made for the whole country so soon after the introduction of the threshing machine. The weaknesses of the *Reports* are legion; counties are hardly ideal natural regions, nor were many reporters ideal agriculturalists.¹ They were underpaid, rushed in their work, and frequently out of their depth. Consequently, the standard of the reports varies greatly, and the uniformity envisaged by the Board's President in his framework of questions to be answered is generally more apparent than real. However, there is some justification for their use apart from the absence of anything remotely comparable. Sir John Sinclair asked his reporters to comment on the agricultural implements in use in their counties, a request that seems to have puzzled not a few of them. Some launch into obedient description of spades and hay forks while many see this as futile and reply that the local agricultural implements are just the ordinary ones. In their desperation to find something worthwhile to include under this heading the reporters were particularly keen to mention an implement as new and as important as the threshing machine. Several Scottish reporters even comment on the absence of them, but although their statements may be unambiguous it is rather difficult to judge the precise differences in situation between one county where threshing machines are described as "common" and another where they are said to be "general". The use of the original quarto reports of c. 1794 gives both the earliest possible date and the maximum chronological uniformity. Map 1 shows those counties

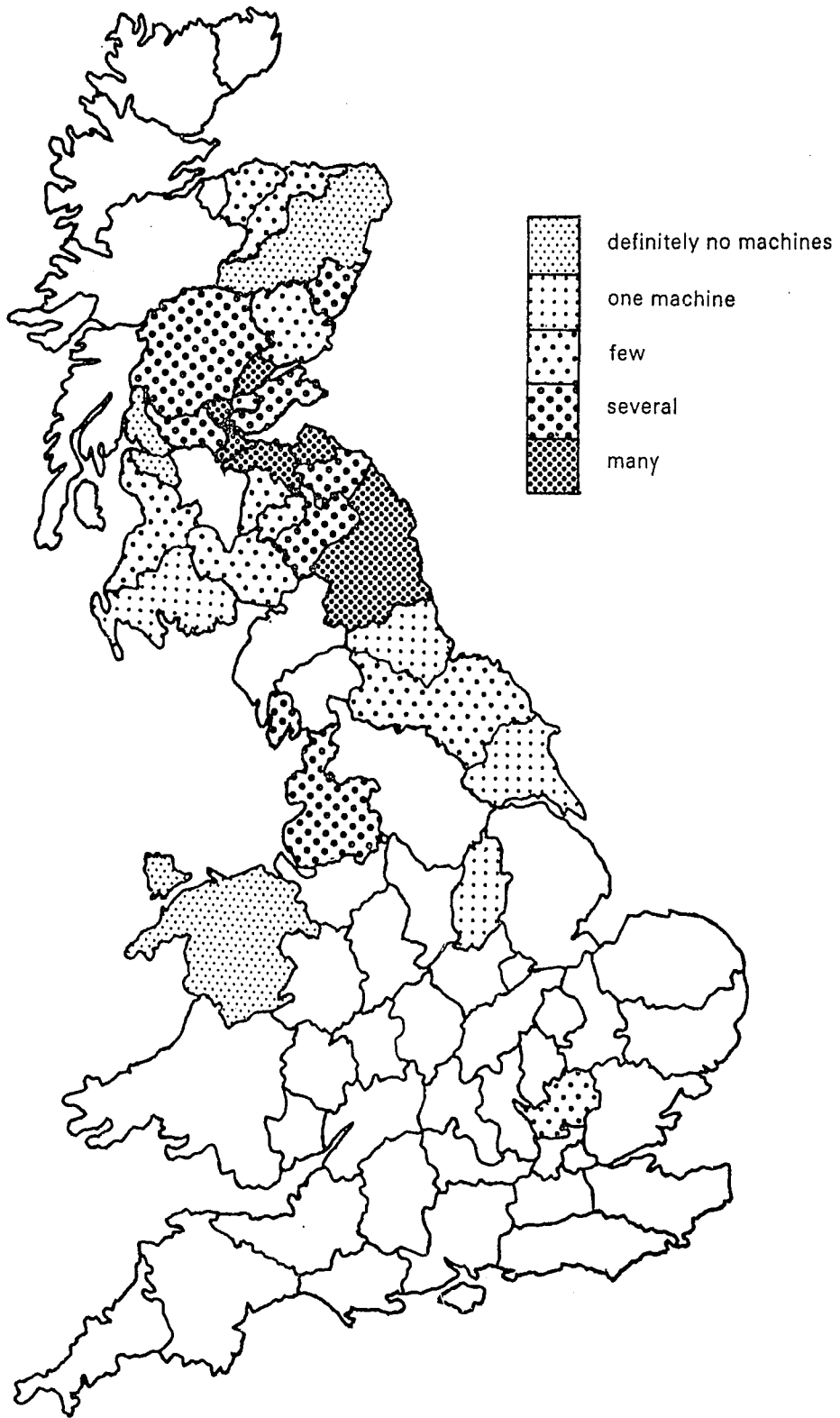
credited with threshing machines in 1794, and gives some idea of where the innovation had been acceptable earliest. The map seems to support the presumption of a diffusion centre in the Lothians and the fairly regular spread outwards from that centre, especially to the corn lands of eastern Scotland. The presence of a very few threshing machines in distant counties may well be explained more by the requirements of agricultural fashion than by those of agricultural economics. "Threshing and winnowing machines, and other implements of husbandry are introduced from time to time in this county, as well as in other counties, to gratify the whim of the moment."²

In attempting to trace later and further diffusion of the threshing machine, subsequent editions of the same *Report* were used. This was probably an even more perilous undertaking than the use of the 1794 *Reports*. Some counties produced three or four editions, one as late as 1817, while other produced fewer and earlier ones. Some later editions were identical to earlier ones, although several counties had changed both reporters and observations. Nor was it practically possible to locate the latest editions for every county. These are severe limitations to add to those already accumulated but the revolutionary nature of the machine, and the continuing eagerness of reporters to write something under the disturbing "Implements of Agriculture" heading, prompted nearly all the later reporters to amend the 1794 entry, and seemed to make an attempt to use their later reports worthwhile. The average date of the editions used to devise map 2 is 1808, but a few are necessarily considerably earlier or later. The map again reveals the strength of the centre of diffusion in south-east Scotland and the spread to eastern Scotland and north-east England.³ The corn counties of south-east England seem slow to accept the threshing machine while Wales and the south-west

¹ For one opinion see William Marshall, *The Review and Abstract to the County Reports to the Board of Agriculture*, 1, 1808, pp. vii-xxxix.

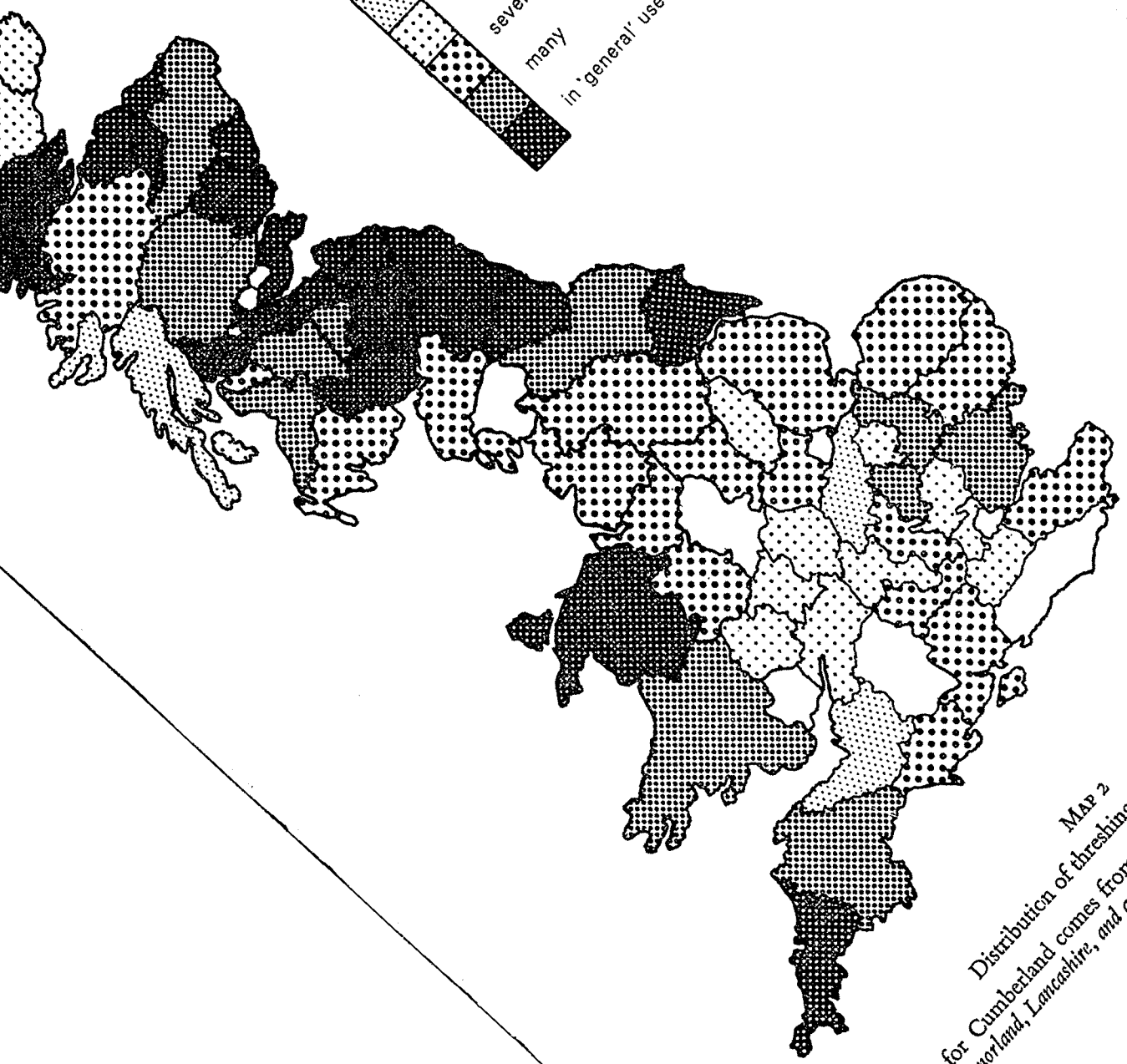
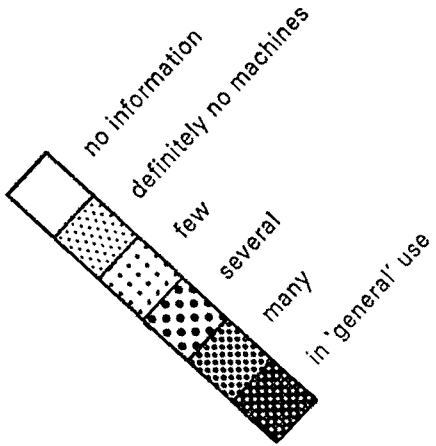
² D. Walker, *Agriculture of Hertfordshire*, 1795, p. 47.

³ John Dudgeon, 'Account of the Improvements which have taken place in the Agriculture of Scotland since the formation of the Highland Society', *J.R.A.S.E.*, 1, 1840, pp. 59-112. Dudgeon makes the suggestion that the main diffusion of threshing machines took place in the period 1795-1814.



MAP I
Distribution of threshing machines, c. 1794

Y THRESHING MACHINE



MAP 2
 Distribution of threshing machines, c. 1808
 Information for Cumberland comes from John Housman, *A History of Cumberland, Westmorland, Lancashire, and a part of the West Riding*

peninsula appear surprisingly eager. The map no longer reveals simple contagious diffusion, but rather suggests that real obstacles have interrupted the spread of the threshing machine.

III

There are two other means of throwing light on the early diffusion of the threshing machine. Information may be gleaned from the mass of printed agricultural correspondence of the period, or from the present landscape with assistance from early Ordnance Survey maps. The latter method presents certain difficulties; it reveals little about the date of the machine, and is dependent upon associated structures such as dams and sluices or wheel-houses. Where these have evolved no new function they may well have disappeared with their threshing machine. The artificial ponds of northern Northumberland still exist but no longer supply the threshing machines that were generally powered by water in that area.¹ The wheel-house is now often used for additional farmyard storage, and numbers of them can still be seen in eastern Scotland, north-east England, and in the south-west peninsula. Yet it would be dangerous to assume from this evidence that threshing machines were much less numerous elsewhere. The value of any farm building in harsher climates, and its greater permanence when made of stone rather than wood or brick, might well be sufficient to explain the present distribution of wheel-houses. The method reveals only that there remain considerable numbers of wheel-houses in those areas where the early dissemination of the threshing machine seems to have been most successful.

The agricultural periodicals of the Napole-

¹ H. Beavis of the Hancock Museum, Newcastle upon Tyne, mapped many of these in 1967. A *Report as to the Coverings of the Horseways to Thrashing Machines* for Chatton Bailiwick, Nov. 1852, exists in the Duke of Northumberland's archives, and lends support to Beavis' map. Of twenty-one farms, four have no tillage land, five have little tillage land and still use the flail, four have horse-wheels, and eight use water power.—Left-hand window sill, Middle Room, Record Tower, Alnwick Castle.

² A Novice, *The Agricultural Magazine*, 1805, p. 328.

³ *Annals of Agriculture*, xvii, 1792, p. 169.

⁴ Arator, *The Farmer's Magazine*, iv, 1803, p. 499.

⁵ William Raistrick, millwright of Morpeth, Northumberland, in a letter to Hexham magistrates, 1813.—N.C.R.O., Morpeth Collectanea, vol. II. Violent criticism tends to concentrate on a particular attribute of the machine; for example, Mr Tweddell's opinion of, "These abominable gin-horse thrashing machines, which seemed purposefully constructed to rid the world of 'surplus population'," in A. and J. K. Harrison, *Bulletin of the Cleveland and Teesside Local History Society*, viii, 1970, p. 14.

onic War period are perhaps a more reliable way of tracing this interrupted diffusion. They depended largely on the contributions of farmers from all over the country for their contents. The sheer bulk of their contributions is daunting and their individual accuracy cannot be assumed, but their candid, amateurish nature gives a rather different view of British agriculture from that presented by the more polished publications of the 1840's. Not surprisingly, the revolutionary nature of the threshing machine excites not a little comment from these enthusiasts. Their evidence would seem to confirm that the early and successful diffusion of the threshing machine in the north was not matched by any such development further south. "I should suppose that your correspondent would obtain the best information, upon this subject, from Scotland or Northumberland, where the farmers are said to be most knowing with respect to mills for thrashing corn."² "How many [threshing machines] are among the great corn farmers of Norfolk? NOT ONE."³ Why was it then that these men could talk of "England, where, except in the northern and eastern districts, the thrashing machine is hardly known"?⁴

The wild claims made by some contemporaries to justify their threshing machines do little to encourage confidence in the usefulness of the machine. "I have added millstones to the Thrashing Machines oftener than once and had Corn Reap'd, Thrashed, Drest, and Ground into Meal, and from that Bread baked all done in the same forenoon the bread produced for Dinner."⁵ Such extravagant assertions seem only to suggest that greater reliance might be placed on more moderate comment. It is for this reason that no attempt has been made to examine the perplexing and

highly contradictory calculations of contemporaries originally designed to show how fast or slow, efficient or wasteful, cheap or expensive, the threshing machine really was. However, it was frequently claimed that the machine thrashed more grain from the same quantity of corn, and that more cleanly than the flail. Another advantage was "in thrashing damp corn, not capable of being fully accomplished in any other way, and with smutty wheat, which is thrashed by it without any mischief being done to the sound grain, the smut not being crushed comes out whole, and is blown away with the chaff."¹ The machine permitted earlier marketing of grain, "We have sold wheat as fast as we could get it threshed. Why? we think the Prices are likely to be lower; Seed time and good weather prevent Threshing."² "How prudent it is to sell as much grain as we conveniently can, at this Season before the Genl. Threshing comes on."³ Economy of labour too was claimed in that fewer men were required for a much shorter period, and that these need only be used when other farming operations permitted. "Since the introduction of these mills, the grain is thrashed by the ordinary servants on the farm, and without in any material degree obstructing the operations in the field; farmers in general employing their men and forces in this business in bad weather when other operations cannot be carried on."⁴ Rapid threshing also meant that closer supervision was possible and that grain did not lie around the barn long enough to be removed by labourers or vermin.⁵

The disadvantages of the machine seem at least as numerous. The threshing machine was supposedly too expensive to be economic, and too complex to be reliable. Smaller, cheaper machines, although initially attractive, rarely seemed to satisfy for long. "I shall here take the liberty of advising every person about to erect a thrashing machine, to beware of economy. I set out on that plan; and, what with the alterations and amendments, the machine has cost me as much as a powerful, well-constructed one would have done at first and, after all, is not the thing."⁶ It was argued that only the largest of farms could afford to support one, and that what money might be saved on labour costs would only be spent on increased poor rates. "On farms of size, in a district where flail men are few, they [threshing machines] become a positive and great good. On the contrary, in a country which is fully supplied with farm workmen, they are parochial evils; tho' they may be convenient and profitable to large occupiers."⁷ Other complaints were that machine threshing was less thorough and that it damaged the straw. "In situations near great market towns, where straw is an object, I find that it breaks too much, where it is intended for sale."⁸ Both humans and horses were said to be potential victims. "All the Machinery, so soon as you can, should be covered for fear of Misfortunes, and the People should have no laps to their Cloaths as many Misfortunes happen from Womin's long loose Cloaths or Mens Coat Laps."⁹ "The Value of a horse-power machine is problematical; an invention, added

¹ R. W. Dickson, *Practical Agriculture*, 1810, pp. 28-30.

² Matthew Culley of Wark in letter to John Welch of Denton, Co. Durham, 1 Dec. 1801. N.C.R.O./ZCU/6.

³ George Culley to John Welch, 3 Oct. 1801. N.C.R.O./ZCU/6. ⁴ Dickson, *op. cit.*, p. 47.

⁵ For a summary of current opinion of the advantages of mechanical thrashing see Sir John Sinclair, *Husbandry of Scotland*, 1812, p. 83.

⁶ Letter from T—t, *The Farmer's Magazine*, vi, 1805, p. 443. Similar feelings are expressed by R.r.r. in v, 1804, p. 19, and by William Tennant, 'On Scots Agriculture', xi, 1810, p. 177.

⁷ William Marshall, *Review and Abstract to the County Reports to the Board of Agriculture*, iv, Midland Department, 1815, p. 637. Similar sentiments are expressed in a quotation from the *Irish Farmer's Journal* of 1814 concerning the introduction of the Hainault scythe and given by E. J. T. Collins, 'Harvest Technology', *Econ. Hist. Rev.*, 2nd ser., xxii, 1969, p. 464; "We would not, in this country where the population is great and without resource except in agriculture, for employment, recommend the too great abridgement of manual labour. What is gained in money is often lost in sustaining those who are thrown into distress from poverty, the result of inoccupation."

⁸ John Tuke, *The Agriculture of the North Riding of Yorkshire*, 1800, p. 83.

⁹ George Culley to John Welch 23 Nov. 1789. N.C.R.O./ZCU/6. Such accidents may not have been rare: an account of one may be found in N.C.R.O./ZCU/IX/1.

to others, for killing horses."¹ This wide range of criticism is nearly all post-1800, and seems to issue largely from southern counties; but then most agricultural correspondence is post-1800, and where it is possible to locate a source, a great deal comes from the south. However, the later reports of the Board of Agriculture also deliver some criticism. Map 3 shows those counties where reporters find general and serious fault with threshing machines. Its most significant revelation is that no northern county records a complaint.

IV

Given then that the objections at least balanced the advantages of a threshing machine, why was it that the advantages should be peculiar to some areas, particularly the north, while the objections reigned supreme throughout most of England? Perhaps the average southern farm was too small to support a threshing machine. Contemporary opinion regarded small farms as a barrier to the innovation rather than large farms an incentive. "It will not be found to answer except on larger farms than are to be met with in this county."² Where threshold acreages are suggested, they are for farm size below which adoption was thought not to be profitable rather than for farm size above which adoption was thought likely.³ Perhaps landlord policy was neither enlightened nor generous enough in the south. In the north it was early felt that the threshing machine would "become a fixture which the landlord will originally erect, and it will then pass, like

other fixtures, from tenant to tenant, under the covenant of being left by the out-going one, as our leases generally express it, 'in a sufficient tenenable condition'."⁴ "Meikle's threshing machine . . . is a powerful but costly erection. On large corn farms, however, it will answer to erect such machines; and there are frequent instances in Berwickshire and Northumberland, of farmers incurring that expense on the security of twenty-one years' leases."⁵ Perhaps the straw argument is crucial. In Hertfordshire one machine was, "used constantly, except for the wheat, the straw of which he carries to London,"⁶ while in the north even "small machines may be used with some degree of success, particularly if barley and oats are only cultivated, or where the straw is short and soft."⁷ "It is probable that the straw of the northern counties does not break under the operation of the threshing machine so much as that of the south, because the custom does not prevail here of allowing the corn to stand uncut until it becomes dead ripe and sunburnt."⁸ Or even if the straw were damaged, it may have mattered less in pastoral districts for "the more straw is beaten and broken in threshing, the better it is, and the further it will go for cattle."⁹ Perhaps the general mowing of corn with the scythe in the south and cutting with the sickle in the north was important. "The sickle is almost the only instrument used in reaping. Several mowing instruments have been introduced, but soon given up; and now that thrashing mills are coming much into use, it is probable the use of the sickle will be still

¹ Walter Davies, *The Agriculture of South Wales*, 1815, p. 440.

² John Dubourdieu, *Statistical Survey of the County of Down*, 1802, p. 54.

³ The importance of farm size is discussed in Rev. James Headrich, *Agriculture of Forfar*, 1813, where 100 acres is said to be the smallest practical size. Rev. W. Gooch, *Agriculture of Cambridgeshire*, 1811, suggests 150 acres. See also Hamm's figures in E. J. Hobsbawm and George Rudé, *Captain Swing*, 1969, pp. 361-2 and the *Quarterly Journal of Agriculture*, III, 1831-2, p. 998. The average size of the eighteen Northumberland farms belonging to Greenwich Hospital which are said to have threshing machines in 1805 was 488 acres.—N.C.R.O./N.R.O./467/42/2.

⁴ Robert Somerville, *Agriculture of East Lothian*, 1794, p. 36.

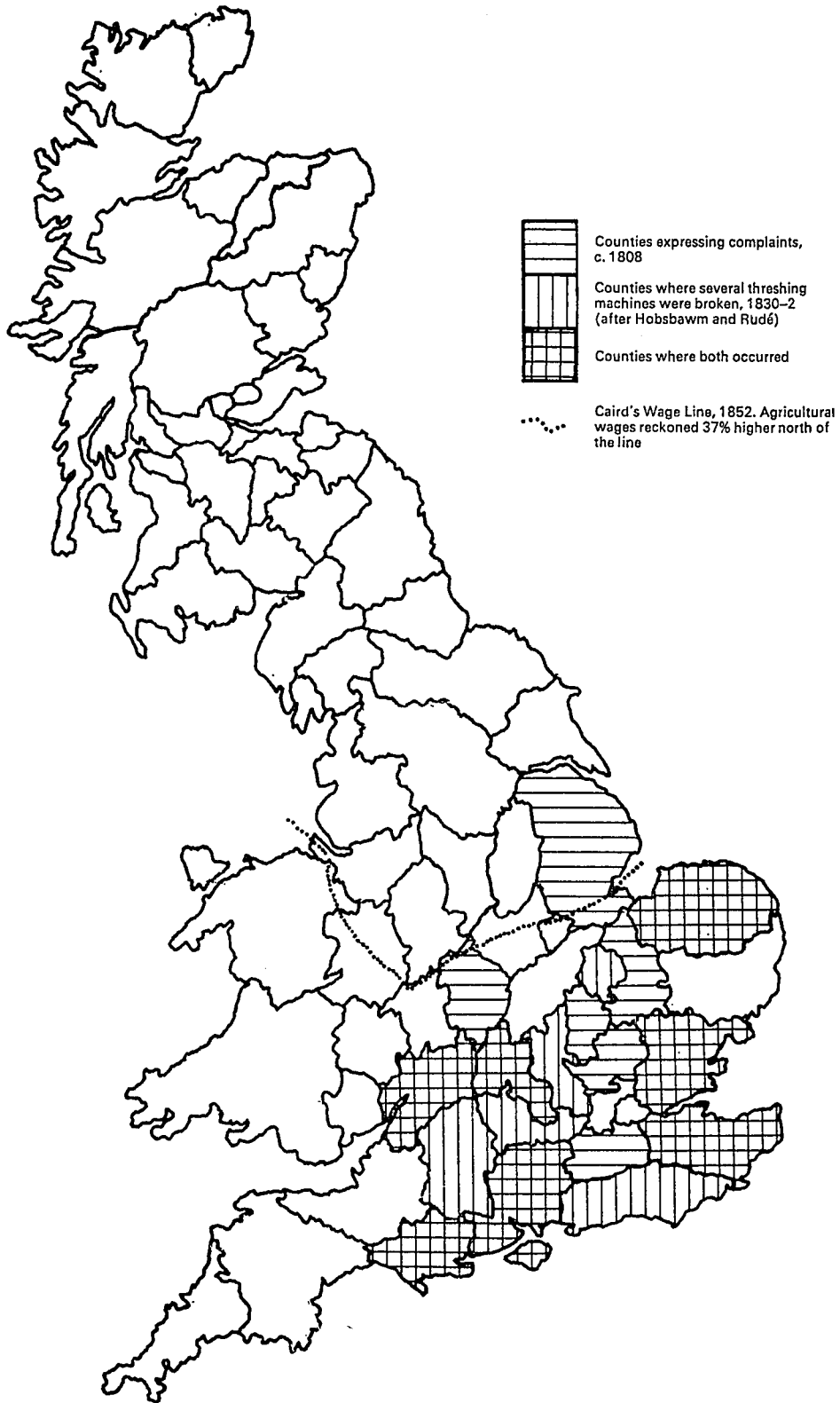
⁵ C. J. Loudon, *Encyclopaedia of Agriculture*, 1869, p. 436. Of the eighteen machines mentioned in the Greenwich Hospital's Report on its Northumberland farms in 1805, nine had definitely been bought by the tenant and only three definitely by the landlord. N.C.R.O./NRO/467/42/2. The *Parliamentary Report of the Select Committee on Agricultural Customs*, 1848, seems to indicate that considerable doubt still existed as to whether the machine was a fixture or movable, the responsibility of landlord or tenant. See especially pp. 23, 42, 122.

⁶ Arthur Young, *Agriculture of Hertfordshire*, 1804, p. 42, referring to a Mr Doo of Bygrave.

⁷ Letter from A. G., *The Farmer's Magazine*, v, 1804, p. 419.

⁸ John Grey, 'On Farm Buildings', *J.R.A.S.E.*, IV, 1843, p. 3.

⁹ Arthur Young, *Annals of Agriculture*, xx, 1793, p. 250.



MAP 3

Distribution of complaints expressed about threshing machines and breaking of machines

more confirmed, as corn thus reaped is in best order for thrashing in the mill."¹ "There is, however, one difficulty in the introduction of thrashing-mills into the southern parts of the kingdom which arises from the manner of harvesting all kinds of grain . . . if the unthrashed corn goes in sideways or irregularly, the thrasher can have but little power upon it. This would no doubt frequently happen in thrashing corn which has been mowed with the scythe."² Yet these are surely quibbles and, although supported by many contemporaries, could hardly, even in conjunction, have been totally responsible for the massive suspicion and virtual rejection of the threshing machine by most of England.

A much more convincing explanation is that which suggests the threshing machine was welcome only where labour was scarce and costly. It is difficult to believe that the end product of the threshing machine varied markedly from that of the flail or that the machine had a function more important than compensating for absent or expensive labour.³ In the north, this argument is clearly and forcefully presented. "This is not a corn country, yet labour being dear, there are several thrashing machines already introduced."⁴ "I am situated in the centre, betwixt two navigable rivers, and it is with great difficulty I can get a man to turn his hand to husbandry, as they can make so much greater wages, in a few hours, at either of the ports, by casting of

coals into ships and the ballast out."⁵ "In this country where hands are scarce, it is particularly useful, there being full employment in the fields for those who used to thresh."⁶ In the south, unskilled labour was neither scarce nor dear except under unusual circumstances. "A considerable number of thrashing machines have been erected in this county, and nearly all of them within the present century: the principal inducement for using them is a scarcity of labourers, which, in a state of warfare, may be expected to be felt most in the maritime districts."⁷ When the war did end there is abundant evidence that the cost of labourers dropped, but it would seem in the absence of contrary evidence and in the light of sample prices that the cost of threshing machines and even of horses maintained much of the level reached during wartime inflation.⁸ Where the threshing machine was already well established it remained as a valuable capital asset: where it had not spread there was even less incentive for its introduction. By 1816, the balmy days of wartime agricultural prosperity were over, to be replaced by some years of rent abatements, arrears, and short leases, and the sort of discontent expressed in the south by the labourers' disturbances of 1816 and 1830-1.⁹ No doubt some machines were built in the south during the first post-war decade—they certainly were in the north¹⁰—but it is interesting that the Swing Rioters could find but 390 threshing

¹ John Naismith, *Agriculture of Clydesdale*, 1806, p. 98.

² Dickson, *op. cit.*, pp. 28-30.

³ One county—Midlothian—is even able to report a general decrease in the local labour rate for threshing wheat and barley between 1790 and 1804 despite wartime inflation. A footnote reads, "Fallowing to thrashing mills."—*Communications to the Board of Agriculture*, v (1), 1806, p. 34.

⁴ John Holt, *Agriculture of Lancashire*, 1795, p. 34.

⁵ Stephen Watson of Oleadon, near Sunderland, in a letter of 22 Jan. 1791 to the *Annals of Agriculture*, concerning his new threshing machine.—xv, 1791, pp. 490-2.

⁶ John Wilkie of Hetton, Co. Durham, *Annals of Agriculture*, xv, 1791, pp. 487-9.

⁷ William Stevenson, *Agriculture of Dorset*, 1812, p. 144. This localized and temporary labour shortage may well explain the popularity of the threshing machine in the south-west.

⁸ Robert Kerr, *Agriculture of Berwickshire*, 1813, p. 73, suggests the average price of a horse rose from £12 in 1792 to £20 in 1808. See also John Bailey, *Agriculture of Durham*, 1813, p. 81. Similar increases in machine costs are claimed by Patrick Graham, *Agriculture of Stirling*, 1812, p. 115, and J. Bailey and G. Culley, *Agriculture of Northumberland*, 1805, p. 57.

⁹ "The conjunction of a growing population with little alternative to agricultural work and the introduction of the threshing machine—much the earliest machine of any importance in English farming—resulted in chronic winter unemployment and distress in southern England during the early nineteenth century."—E. L. Jones, *Seasons and Prices*, 1964, p. 64. This rather overemphasizes the role of the threshing machine, which was more important as a focal point for dissatisfaction rather than a major cause of it.

¹⁰ Greenwich Hospital erected several on its Northumberland estate between 1816 and 1818, including at least one steam thresher at a cost of £550. The expense of a water driven machine at £1,180 planned in 1815

machines in twenty-one counties upon which to vent their rage.¹ There were no riots in the north. While many southern farmers hardly seemed sorry to see the last of their machinery in 1831,² there is some evidence which suggests that for farmers to dismantle their own threshing machines was not an entirely new phenomenon. "A prejudice has arisen among many farmers, from having seen or heard of thrashing machines which, from being ill-constructed or ill-managed, did their work ill and after having occasioned much trouble and expense, were at last obliged to be taken down as useless."³

The southern threshing machine had always been of marginal economic benefit. While the north had generally been satisfied with a machine along Meikle lines, expensive but efficient, the south had needed a much cheaper machine to be certain of profit. The eagerness to produce such a machine is best illustrated by the 21 patents taken out for threshing machines between 1789 and 1817, nearly all for smaller, cheaper versions of the Meikle machine, and nearly all made by southern builders.⁴ "In general, reduction of bulk, and of expense, appear to actuate all the later claimants to originality in the construction of this highly useful contrivance."⁵ The Board of Agriculture Reports for southern counties mention scores of builders, including many of these patentees—"almost every mechanical knave has been tempted to set up the trade of making them, there are swarms of them, therefore, not worth a shilling"⁶—but only one builder is mentioned in all the reports for all the northern counties. In short, it is misleading to talk

of the early threshing machines in the south for there seems to have been a massive variety of machines, a variety which goes some way towards explaining the incredible divergence of prices and performances quoted in the agricultural correspondence. It also seems to explain the early influx of threshing machines in Wales, for many of these appear to have been very small⁷ and even hand operated. Where the advantages of the threshing machine were even slightly reduced, as in the south, a less expensive machine was imperative. "A variety of threshing machines have been made in England, both on the rubbing and beating, or skutching, principle, and some combining both modes; but none have been found to answer the purpose of separating the grain from the straw so well as those of Meikle, which is the kind exclusively used in Scotland and the north of England."⁸ The situation is summarized by Murray, "Thrashing-machines are to be met with in different parts of the county, but in general on a small scale; and in the manner they are constructed, can do very little work. Mills of two-horse power will never answer; four-horse power is found little enough to thrash, shake the straw, and winnow the grain; and without they are constructed so as to perform all these operations, they are not worth having. There are no thrashing mills that have yet been made, equal to those constructed by the late George Muckle. . . It is impossible to erect a good substantial four-horse mill, with every appendage for less than from £250 to £300."⁹ And that sort of sum made what had been only a possible economy for the south during

was not thought prohibitive, the Hospital considering that "no Farmer of any consequence can thrash his Crop within the Year without the Aid of Machinery of some kind."—N.C.R.O./NRO/467/42/3, 4.

¹ Hobsbawm and Rudé, *op. cit.* J. A. Hellen, 'Agricultural Innovation and Detectable Landscape Margins: The Case of Wheelhouses in Northumberland', *Ag. Hist. Rev.*, xx, 1972, pp. 140-54 has traced the past or present existence of over 500 wheelhouses in Northumberland alone.

² For an idea of the southern labourers' earlier resentment of the threshing machine see a letter from S. Taylor of Norfolk, *Farmer's Magazine*, xviii, 1817, p. 286, or another from Mr Patterson of Wimbledon, *Annals of Agriculture*, xvii, 1792, p. 170.

³ William Stevenson, *Agriculture of Surrey*, 1809, pp. 134-5.

⁴ J. Allen Ransome, *Implements of Agriculture*, 1843, pp. 263-4.

⁵ Capt. Thomas Williamson, *Agricultural Mechanism*, 1810, p. 301.

⁶ Thomas Stone, *A Review of the Corrected Agricultural Survey of Lincolnshire by Arthur Young*, 1800, in Tritton, *op. cit.*, p. 11.

⁷ The price of the machine generally used in North Wales was only from £20 to £26. Water Davies, *Agriculture of North Wales*, 1813, p. 122.

⁸ Loudon, *op. cit.*, p. 463. ⁹ Adam Murray, *Agriculture of Warwickshire*, 1815, pp. 59-60.

the war a definite extravagance after it. Even the cheaper machines seem to have become too dear or notorious, for not one patent was taken out between 1818 and 1840.¹

The reluctance of the south to accept the early threshing machine would be unremarkable were it not for the extremely rapid diffusion of the innovation which had taken place in the north. It seems certain that southern agricultural conditions, particularly the cost and availability of labour, made the northern threshing machines only marginally beneficial even at the best of times, and encouraged the abortive development of cheaper, smaller, and very inferior machines which themselves brought the idea of a threshing machine into further disrepute. The solution for the south was the portable machine, big enough to thresh efficiently, but with its cost shared among many farmers. In a few areas such portable machines had long been known, and may have been the result of builders, unable to sell their best machines, being forced to load them on carts and hire them around local farms. "In some parts of this county [Essex] and Suffolk, it is the custom for implement makers to rent about itinerant machines, to thresh from one farm to another on hire . . . the old objection in the south, is now done away, that none of them could be useful, but in the large scale, and at a high price."² Certainly the portable machine with its limited capabilities grew in popularity in the south.

"The machines now in general use throughout the eastern counties of England are, with few exceptions, portable; they are frequently the property of individuals who, itinerating from farm to farm, thrash at a certain price per quarter, the farmer finding horses, and, with the exception of the proprietor, who feeds the machine, the necessary complement of men. They are simply thrashing instruments, having neither circular rakes nor fanners attached."³ The agricultural engineering firms began to cater for the demand, Ransome's producing the first portable steam thresher in 1841. "The advantages of steam power for working fixed thrashing-mills have long been acknowledged in the northern parts of England and in Scotland; but we believe this is the first attempt to render it portable."⁴ Certainly until this date and possibly for some time after it, the flail remained an important method of threshing in the south, fifty years after the north had found the means of supplanting it.⁵ There the threshing machine continued in use, and it is likely that many more were built after 1815 than before. "In 1967 it was still possible to meet a Northumberland farmer who, as a young man, had trained horses for driving a thrashing mill in the circular gin-gan which are such a feature of that county."⁶ The north had produced the first major revolution in mechanized farming and had greedily accepted it: in the south, that revolution had failed miserably.

APPENDIX

Fig. 3 is a diagrammatic representation of the workings of the New Bingfield threshing machine,⁷ which although built about 1840 is very similar to eighteenth-century ma-

chines. Corn was placed on the feeding board (A) and fed, ears first, through the rollers (B) to come in contact with the fixed skutchers (D) on the revolving drum (C). The grain was

¹ Ransome, *op. cit.*, pp. 263-4.

² Letter from R. R., *The Agricultural Magazine*, April 1809, p. 243.

³ Ransome, *op. cit.*, p. 151.

⁴ 'Report on the Implements shown at the Liverpool Show', *J.R.A.S.E.*, II, 1841, p. cvii.

⁵ The surprise shown by even educated visitors to the north is illustrative of the southern situation. "There are no barns such as we have in the south. All the farm buildings are of stone; each has a place sufficiently large for beating out the corn by a thrashing machine; and there appears to be no such thing as a barn's floor or a flail in the whole of these counties [Durham and Northumberland]."—William Cobbett, *Rural Rides*, 1832, G. and M. Cole edn, 1930, p. 714. But the Chatton Survey mentioned above would seem to indicate that the flail was still occasionally used in Northumberland twenty years later.

⁶ Nigel Harvey, *A History of Farm Buildings in England and Wales*, 1970, p. 153.

⁷ By courtesy of the Department of Mechanical Engineering, University of Newcastle upon Tyne, *New Bingfield Project Report*, 1966-7.

knocked out, and with the straw, was swept upwards between drum and concave (E), and deflected by the board (F) to meet with the circular rake (G). The function of this addition was to restore some order to the straw and to allow the grain to pass through the straw, through the concave screen (H) to the shute (J) below. The straw, devoid of most of its grain, passed over the secondary separating drum (K), dropping any remaining grain through the slots in the drum as it went. The grain fell on to the concave (L), from whence it was swept by the brushes (N) through the screen (M). Beneath the shute lurked a winnowing machine, almost as frightening in its complexity, which separated the good grain

from both chaff and lighter grain. The chaff was sent flying to a distant container, the good grain to a nearby one, and the lighter grain, containing unthreshed ears, to an intermediate one from whence it was carried via the bucket elevator (P) to suffer the whole process again. The machine is 20 feet long, 10 feet 6 inches wide, and 19 feet high; and its design and construction are such that it had to be installed permanently into the building used to house it, making it necessary for the machine to be custom-built to suit the conditions imposed upon its installation by the nature of the farm as well as any other special requirements of the original owner.

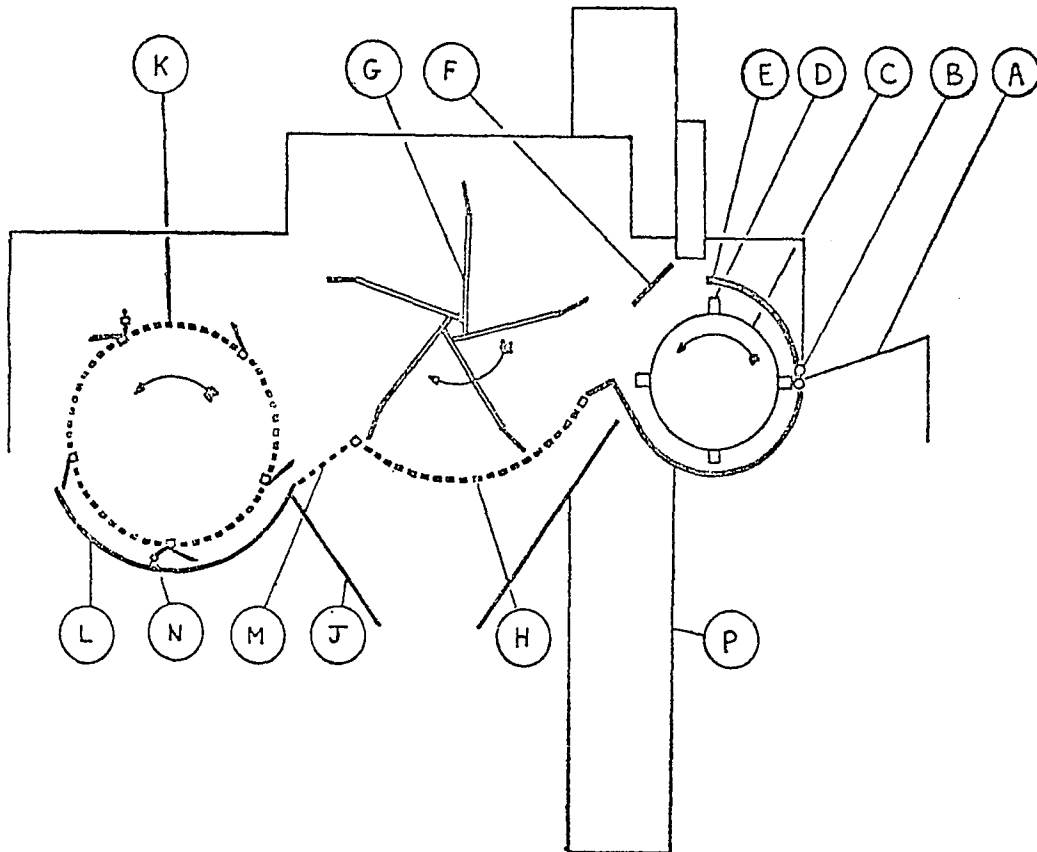


FIG. III