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FARMER'S PROGRESS
THE FARMING LADDER

THE FARMING MANUAL

A Guide to Farm Work

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FABER AND FABER
24 Russell Square
London

Contents

Illustrations

The following plates will be found between pages 96 *and* 97

1. One of the old school, aged 91, he learned to bend his back when he was young
2. Correct way to carry heavy bale
3. Risking a dislocated shoulder
4. Contrasting styles. Young lady on left is hoeing easily and correctly
5. A well-set scythe
6. Poor material with which to start
7. A low hedge on top of a bank
8. Putting in the stakes
9. Pushing down the layers
10. A well-laid Midland hedge
11. Dry stone building. North Wales
12. A creep left for sheep
13. Dry stone walling. Southern Italy
14. A Cotswold dry stone wall
15. Small Scottish ricks
16. Starting the rick
17. A good rick
18. Stacking bales
19. Covering in
20. A thatching needle

Preface

I became an agricultural craftsman, a stockman, and a farmer very largely through the kindness, the patience and the wisdom of the men who taught me. I write to share the knowledge which was so freely given, and to which my own experience has added over the years. In my first book, *The Farming Ladder,* I described how it was possible to go all the way from farm pupil to agricultural landlord within a comparatively few years. In my second book, *Farmer's Progress,* I gave the philosophy of life which comes from living on the land and tried to show others how it might be achieved. In this, my third, and possibly last book, I will try and explain the bare mechanics of the process. Not in the sense of mechanized farming, but of the human machine on the land and its application to work.

Many farmers have written to me suggesting that I should write a book on these lines. They point out the enormous number of publications, books and periodicals on every aspect of farming, and yet so few on the actual application of the work. They suggest that I, who have enjoyed my work so much, must have mastered it, and would render a service in trying to pass on my skill and knowledge to a much wider circle than the few dozen pupils I have had the privilege to teach.

Another point raised is that recently published statistics have

shown an alarmingly high accident rate in our industry, 100,000 injured and 600 killed in the last five years. It is equal to everyone employed in the industry meeting with a serious injury within his working life. In this respect farming must be considered a dangerous occupation, although it is not an unhealthy one, for further analysis of the figures show that more time is lost through strains and broken bones than is lost from illness among agricultural workers. Vicious animals as a cause of injury come second, and are still above the illness rates, and these in the main must be due to neglect of reasonable precautions, carelessness, or sheer lack of knowledge. How easily these accidents might be avoided, and needless suffering and time saved by knowledge and the application of a few guiding principles which are easily learned under proper direction!

Apart from this, agriculture is so desperately short of manpower that any loss of labour becomes serious. A willingness to labour, and physical skill, are now at a premium. It seems incredible, but in the forty years I have spent on the land a third of a million people have left it. The number of workers directly employed in the industry has fallen by *nearly two hundred per week*. Ten thousand a year leave the land and are not replaced. Sixty-five per cent of our farms have no regular male workers employed between the age of 21 and 65 years. The work is being done by young boys, girls and old men. The percentage of men still actively engaged at over 70 years of age is ten times higher than in any other industry. Of the labour available, it is doubtful if they are 40 per cent efficient compared with the workers of a couple of generations ago in a great many of the farm tasks which still require manual labour.

The drift from the land is attributed to many causes: higher wages elsewhere, better amenities such as canteen facilities, easier work, less exacting supervision, more leisure, the five-day week, and no Sunday work. Among those who remain on the land there is inability, and for that reason a reluctance, to do

the heavier work and tasks which require manual skill. Tractor drivers are still comparatively easy to obtain, especially if there is a good house available; but a thatcher, a hurdle-maker or shepherd, in many districts will be searched for in vain, and even if found may be an elderly man with his best years behind him.

How often we see the fit young man flopping on a tractor while the heavier work is being done by a man long since past his prime, yet whose early training still makes it possible.

Management also is passing into the hands of college-trained men who have no manual skill with which to instruct those who serve under them, and to inspire them with a joy in work which makes hours, wages and conditions of secondary importance to the pleasure and interest which may be found in the work.

The tragedy of it all is that given the skill, and the high output which comes from skill, agriculture is the happiest and pleasantest of all occupations, performed under conditions of fresh air and sunshine, and with proper direction and efficiency it should be possible to find in it a reward comparable with anything which can be earned in industry.

Farm work is something to be enjoyed, in it can be found the same pleasure as in any pastime, hobby or game, and more should be derived from it because it is creative. There is so much scope for initiative, pride and interest that it becomes so great a part of one's life that we never give up or think of retiring. In all life's difficulties, in our moments of loneliness or perplexity, we can find such a comfort in the painstaking performance of our appointed tasks that even when our larger problems seem insoluble, how steadying to the nerves, how soothing to the troubled heart is the exercising of a skill and craftsmanship which makes work for its own sake worth while.

Many people work harder at their cricket, golf or tennis, yet the same zest and satisfaction should come from the more use-

ful and productive arts, which are complete in themselves, and yet give the exercise in the fresh air which is the principal aim of most games. How many thousands of man-hours are spent every year in passively standing and watching others play games while allotments and gardens go to rack and ruin—for want of the pride and interest in manual skill which can be learned by a child.

To become proficient in farm work practice is, of course, essential, but in this book I try and teach not only the gymnastics and the underlying principles which lie behind it and make it possible, but also try to give a wider understanding of what is involved and how it comes about. You may admire the ease and skill with which a man carries an eighteen-stone sack of wheat, but he cannot do so unless the sack is properly tied. There are many tricks of the trade which have a bearing on the whole. Tools must be carefully chosen to enable you to work to the best advantage. There is a historical significance, too, often going back to neolithic times, in the shape of our tools, and the things we do in our daily work. There are many points of interest arising out of manual skill worthy of recording which I trust will add to the balance of a book in which some space must be given to technical and even anatomical details.

A book must be ambitious in scope which attempts to pass on so much inarticulate knowledge which has always been instinctively possessed by our finest and best workers on the land; but I shall have achieved my ends if others start to study where I have left off and in due course give their conclusions to the world.

I take the opportunity of thanking all those who have so willingly and patiently co-operated by sharing their knowledge, permitting me to study them, or posing for the photographs. I am also indebted to Mr. Thomas Asbridge, F.R.S.A., headmaster of Charlbury Primary School, for his help with the drawings, the interest he has taken in the progress of this book, and

his work for the advancement of rural studies; and to Messrs. Edward Elwell Ltd., of Wednesbury, for the opportunities they gave me to study the manufacture, and handle, the vast range of hand tools which they make for farmers all over the world.

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Oathill Farm,
Enstone, Oxford.
April 1959.

CHAPTER I

Teaching Farm Work

Many farmers who take a pupil have no idea of teaching or instruction; they think it is sufficient for one to have the privilege of working on a farm and instinctively picking up the knowledge as he goes along. It is also significant that a Farm Institute or University only requires that an applicant, apart from certain academic standards, shall have spent twelve months on a farm, and not show acquisition of any skill or craftsmanship. While lip service is paid to the idea, farming is not recognized as a skilled occupation. If you advertise for a cabinet maker it will make little difference whether he served his apprenticeship in Bristol or in Newcastle-upon-Tyne, he will have certain standards which will be accepted anywhere; but advertise for a farm manager, and you will soon be in doubt as to what may be expected. He may hold a degree or diploma in agriculture, yet cannot answer half a dozen questions based on the first chapter of this book, and he may not be altogether to blame because he has received no instruction on the theory and practice of teaching farm work. In the field also, the skilled worker often deliberately hides his knowledge for fear others may become as clever as he regards himself.

Personally, in nearly forty years on the land, I find I learn most when I am most willing to share my knowledge, and the mere writing of this book brings to my mind many things

which had faded from my memory, and even more in the search for new ideas and methods with which to illustrate it. It is said, that the exclusive sign of a thorough knowledge is the power of teaching; recognition as a teacher must therefore be the reward for sharing knowledge, and worth more than anything which can be kept to one's self.

A thorough knowledge of a technical subject alone is not sufficient, the test is whether the student can learn from you, and if you increase your knowledge of the subject in the process of teaching him.

A farmer has one very great advantage in that he seldom has more than one or two to teach, and also he can select his students. I use the term student not only in the sense of one who is formally wishing to become a farmer, but anyone employed by the farmer and considered worth teaching—and if he is not, it is quite certain that his services are not worth retaining—for a worker who cannot acquire skill and application is a liability to be avoided at any cost.

First, to select potential workers. You set a simple, straightforward task well within the capacity of the unskilled individual; and then you go away for some unspecified time; on your return, in the split second that your eye picks up the worker, notice if he is actually working. Do this three times; and if on each occasion the person was productively engaged, you have probably first-class material on which to work. Twice out of three times, a possible; once a doubtful; and if never working, quite useless. I was told this many years ago by a very experienced and observant farmer. I thought it rather hard to be judged by three split seconds in perhaps eight hours, but I have found it a very sure indication in having over a hundred people serving a trial period; and also in testing it out on my neighbours' employees, and deciding in my own mind whether the farmer will retain them or not, presuming he will judge by other standards, and in any case will be quite uninfluenced by me in any way, the final

result is the same, but it almost invariably takes him longer to find out.

Application to work having been established, it is necessary to determine ability, or innate mental capacity and aptitude for the job. Many different tasks can be selected and used, and will be determined by the time of the year, but we may take for example hoeing, and assume that an adequate explanation and demonstration has been given, and the opportunity for a little practice. First, we look for the ability to judge space accurately—the plants are the specified distance apart. Second, the appreciation of detail, has he left the best plants, as far as space allows, and the correct plants—not confusing a somewhat similar weed for the seedling plant, charlock in place of turnip, white goosefoot in place of mangold wurzel. Third the induction factor, can he explain the reason for the operation—which is to give every plant the maximum opportunity for development in relation to the total number which must be left to ensure an adequate yield from a given acreage. The ability to judge distance, detail and object, are very important factors which can make all the difference in mastering a craft.

The approach of the individual should be closely studied, noticing how he stands, walks, and holds his tool. The physical effort involved is also important, he may be using less or more strength than is required for efficiency. If a faulty or awkward movement is eliminated before it becomes a habit a big obstacle in establishing a skill may be overcome. One of the most striking features in learning farm work is the ease with which improper work methods may be acquired and the difficulty experienced in replacing them with correct methods. Once learned, a routine task becomes so automatic that a special effort to unlearn may be necessary before a better method can be substituted.

The acquisition of skill is the important factor, and if it is found in one job it can be, with proper training, transferred

to another. A skill is a series of intricate movements which have been repeated so often that the subconscious mind appears to take charge of the greater part of them. We know, for example, that a learner on skates has no control over stability and even less power with which to set a course. He is wholly absorbed in correcting a series of movements which he causes but cannot control. A skilled skater can do what he pleases, actions which shift his centre of gravity in the most violent of extremes. Yet the skilled skater is never precisely balanced; he is continually correcting himself, no less than the beginner. The difference is simply that his balance-seeking, although equally continuous, is invisible to us and is for him unconscious. The process by which the skater maintains his balance is the same as is applied in any form of skill. The greater the control the greater the liberties which can be taken, but never for one moment ignoring the basic conditions of balance which permit the work being done to the best advantage. The skilled worker, unlike the beginner, never ignores the basic conditions of balance which permit him to work to the best advantage, he obeys them far more closely; that is why he is more free. Given stability, he has initiative to set a variety of courses; but the holding of the course, once set, is a matter of control.

To acquire any skill expert demonstration and supervision is essential right from the start, and the object should be accuracy, correctness, ease of movement and then speed. All skills need time to be assimilated, and are the better for it. A few days of good training in one season will put you far ahead in the next year.

In comparatively simple work like hoeing, two minutes' explanation, five minutes' demonstration, and twenty minutes' practice, will provide a good start. After the trial period the instructor should come back and go over the routine again emphasizing any point which appears to have been neglected, but without actually saying so. Then he should again give the

trainee the opportunity to work alone; and then on coming back for the third time, give a further demonstration and point out the faults which are developing. In more complicated work such as hedge-laying, the work can be split up in processes—which are not all taught on the first day—the cropping up of the hedge, the cutting out of unwanted material, the preparation of stakes, the laying, the binding of the headers, etc., and allowing the same time, that is to say 10 per cent in explanation, 15 per cent in demonstration, and 75 per cent practice for each process. With proper training many men can learn as much in a week, as others take years to pick up, and often perpetuate faults in technique through learning in error the wrong methods and failing to grasp the essential principles.

It is better to teach a little well than a lot badly. It is good training for any instructor to try summarizing in two or three hundred words the essential details which have to be observed in a certain piece of work. It can further be divided into 'must know', 'should know', 'could know'. The first can be given in the preliminary explanation, and the second and third each time that he comes back to check up on progress. From time to time one should check up on the trainee's knowledge, asking him to explain what he is doing and why. To think and speak clearly and to really understand what you are doing goes a long way towards the mastery of any process, and, *if the worker hasn't learnt, the instructor hasn't taught.*

The first and most important point in good work is good attention. Do you fully understand what is required, and are you limiting your attention to that? Can you successfully correlate that you know with what you do? Have you found the logical sequence of movement to get the maximum effect for the minimum of effort? Do not be discouraged, it will only come with constant application and practice, but there is a great deal more to be learned from thoughtful application than there is from blind learning based on repeated practice and nothing

else. At the same time the best of initial training does not guarantee optimum performance, constant guard is necessary to prevent the later acquisition of inefficient, unsafe or costly working methods. In acquiring a good technique it is desirable to see that the new recruit does not work with a gang too soon, or his efforts to keep up with the others, or preoccupation with their conversation, may lead him into careless habits of work and inattention to detail.

Manual dexterity varies considerably, and the physique which makes it possible even more so. Although the handicapped person, with proper training, can in a great many cases successfully compete with the natural athletic type, but without training. Co-ordination of hand and eye may be more important than physical strength. A good man with a hoe will leave fifteen plants a minute, even in a difficult crop, which may mean two thousand strokes an hour, which can leave little margin for waste of energy or misguided effort.

Adjustments to severe handicaps are possible in farm work. I have known a skilled, but blind, hedge-layer. The nature of the handicap is less important than the effort which has been made to overcome it. A person often chooses farming as a vocation in order to compensate for some inadequacy which has barred him from another profession.

In all physical work there must be a certain amount of adjustment when it is first taken up. In work which requires bending, it is quite a good plan to deliberately bend a little more than the work requires, and then ease the back to the position actually required by the task. In this case it is the strongest muscles which are being stretched; the opposite would be inadvisable, that is to say straining to lift something with a flexor muscle.

The instructor should pay special attention to the trainee who finds the work so hard that he constantly needs to rest; he is probably wasting a great deal of energy or is badly out of con-

dition. The man who tries to ease his back by standing up every few strokes should be encouraged to count his strokes between rests and see if he can gradually build up the number. The man who tries to stand upright and continue hoeing with his grasp on the tool reversed, should be told to rest, and not make an inevitably poor job through failing to be able to exact pressure on the ground, and because he will only shift the pain from one group of muscles to another.

In ordinary industry great emphasis is placed on rest periods; in my experience the best farm workers have always been men who have trained themselves to work steadily on without rest for the allotted period, even if it be four hours straight off. But the trainee can only hope to work up to that as his aim and goal.

There is ample scope for encouragement, everyone can do better if they keep on trying. Never grudge a word of praise, kindness and generosity expand the personality. Sympathy and willingness to understand the difficulty will often gain acceptance of your ruling. An instructor must be Fair, Firm, and Friendly.

The arousing of interest in the job is important, it leads to enthusiasm. We seldom perform as well as we can unless we are motivated positively. One of the best means of encouraging optimum performance is the competitive spirit. Let it be known that a good worker can hoe 250 yards an hour in mangolds or sugar-beet, leaving 300 singled plants per hundred yards, penalizing doubles as gaps and trebles as two gaps, so that the newcomer may check his progress and have an aim and object in view, and recognition when he deserves it.

Pride and interest in work go together. We all like to excel; and there are few satisfactions to equal the craftsman's contemplation of a good job well done. Once the correct stance and rhythm has been established work should be a pleasure and enjoyed as such. We should enjoy being active, most of us are more contented when we are doing something, and the

acquisition of skill makes it easy. I imagine I am as happy with a scythe or a hoe as others are with a golf club or tennis racket, simply because I was trained to get pleasure values from them. A skilled person is one who has learned the art of identifying himself intelligently with the tasks of his daily occupation, has no fear of competition, and is willing to share his knowledge. I think we will also find he is a worthy member of the community, for the enjoyment of work is a major characteristic of a well-adjusted personality.

Health is a fundamental requisite of efficiency, and ill health a prime cause of fatigue and inadequate performance. I define good health as the state of mind and body in which you can do your work without stress or strain and derive pleasure and satisfaction from it. For that reason I believe farm work, with proper instruction, can be a builder of health, mental and physical. People who blame fatigue and lack of zest on how hard they have to work, sadly misplace the blame. It may be due to lack of function in their body—which is ill health—or throwing unnecessary strain on it by awkward and unsound performance of their work. As far as benefit to health is concerned there can be no comparison between orderly, well-balanced movement, repeated many thousands of times in the day, and say ten minutes' physical jerks, on leaping out of bed in the morning, which is sometimes supposed to have such good results. A happy man is more than halfway to being healthy. Happiness is as good an indication of mental health, as a thermometer is of physical health. A happy worker has no worries, for he is far too busy to worry about problems which do not concern him directly. An unhappy worker magnifies his grievances, and their poisons settle in his muscles to add to his troubles. This is no exaggeration, every doctor must be familiar with patients who developed all sorts of rheumatic complaints which disappeared when the cause of their troubles and frustrations was removed.

Physical fitness may be defined as the development of the body to a state in which a given amount of work can be produced when required, with the minimum of physical effort. With suitable work the muscles can be developed to give more than three times the normal energy and a 100 per cent increase in size, and without increasing the weight of the body, unless the individual was under weight for his build when he started, and in which case we should expect to see an improvement. But it should be remembered that the development of muscle is not the object of farm work, it is the employment of muscle in a sustained and balanced output of work. Ideally it will produce a supple-limbed, agile being, whose chief characteristics are activity and power of endurance; in striking contrast to the ponderous muscularity which may be developed, one can only think, for exhibition purposes, by the use of special exercises, concentration of the mind on the muscles themselves, and gymnastic apparatus.

Reliability is very important in all farm work. To find the pace at which one can go steadily on, day in and day out, without stress or strain. So much in farming depends on the capacity to be ready to work at the right moment. Cows have to be milked twice a day on 365 days in the year. The loss of a day when important cultivations should be carried out may spoil the results from a field for the whole season. 'The farmer who is late in one thing is late in all things.' So Cato so wisely said in the third century B.C. Also, so much has to be done on a farm without supervision that the reliability factor becomes very important. A man may, for example, be required to close a shutter on a number of poultry houses to protect the birds at night from foxes. The routine is carefully explained, demonstrated and checked for a few nights. If, after a few days, the man misses a house, his reliability is in great doubt. You may be very firm with him. He promises never to miss one again, and does not for quite a long period, but sooner or later he does

it again. On the other hand, the individual, who on completing his round, suddenly worries, 'Did I shut No. 7?' and goes back to see, invariably finds that he had done so. The reliability factor is becoming subconscious and habitual.

Safety precautions should also be taught and enforced until they become habitual. Accidents represent a serious threat not only to the workers but to the organization of the business. Let it never be said that a man was injured because you had failed to warn him of the precautions required in his work. Always set a good example. Always investigate and analyse every accident—however slight—it may save serious injury another time. In nearly every accident it will be found that someone had failed to take reasonable precautions, and did not realize the danger involved. One need not be concerned with apportioning blame, only in making sure it will not happen again.

Within my own knowledge I have known trifling things lead to serious injury: a pitchfork lying on a field which should have been stuck upright in the ground; a shovel left where an animal could knock it down; a corn bin and a door left open so that a straying animal could gorge itself; a cartridge left in a gun; a tin of Cyanagas, for gassing rats, opened in a building and then knocked over.

I remember once standing talking to a farmer in his yard. There was a fork lying in a doorway, and two of his men came along and carefully stepped over it. The farmer remarked to me: 'My fellows would fall over it rather than pick it up.' A third man, coming along and failing to see it, did so. I felt that not only were the men taking the wrong attitude, the farmer was also to blame.

Many farmers have told me that if they have half a dozen men hard at work hay-making, harvesting, threshing, and similar busy jobs they expert somebody to hurt themselves one way or another if they continue straight on for a few days. This

should not be necessary, men can be trained to do the job with reasonable care for their personal safety, and it is in the farmer's best interest to have them fit and well.

There are minor disabilities which have to be overcome by those new to farm work, such as blisters caused by holding a tool, or stiffness of muscles through unaccustomed work. Bathing with methylated spirit is good for blisters. 'A hair from the tail of the dog that bit you', or in other words, a little more work will remove the waste matter from the muscles. Sunburn is something to be carefully avoided by taking care to only expose the skin for short periods to begin with, and preferably early and late in the day before and after the sun gets high in the sky. Diffused sunlight, the sun shining through white cloud, is very deceptive and severe burning may be experienced under those conditions.

In farm work one has to become accustomed to working under considerable variation in climatic conditions. It is not unknown to have a rise of 30 deg. in twenty-four hours in the winter-time, and even more in summer. I have seen frost on the grass at dawn in mid-June and run up into the eighties by afternoon. In the past workers bought clothes to protect them from the cold, and worked through the heat without shedding more than a coat or waistcoat—some would actually put on an extra waistcoat to protect them from the sun. It was quite common to wear a stiff collar, and in any case the shirt was kept buttoned. These men never had a bath, some never took their clothes off for six weeks during lambing, and yet when they died their skin was clean.

What a person wears seems to be a matter of habit for the body has great powers of adjustment. It is an interesting comment that looking back forty years I cannot recall a farmer or farm worker then who would work, or even venture out of the house, without his hat, yet not one wore gloves. Today many go without hats, yet regularly wear gives in winter.

I believe that washing in warm water softens the hands as far as resistance to cold weather is concerned. A man who carefully avoids doing so can continue to work under severe conditions. If one wishes to harden one's body against cold, then the best means I know is, when going out of the house in the morning, deliberately refrain from breathing for the best part of a minute. Normally breathing in the cold air warns the mechanism of the body through the lungs and the skin prepares to resist the shock. Without that warning the skin has to make its own adjustment to protect the body, and in doing so appears able to build up a resistance to cold. Within reasonable limits cold is a valuable therapeutic agent. The best protection against heat is to lower the intake of calories, in other words a lighter diet.

Diet in relation to farm work is important. Even those who make very great demands on their physical energy tend to overeat, and impose a strain on the body in its efforts to digest food while working. The best food is the product of your labour, and the cheapest and most valuable food is that which can be produced on your own farm. Young people need the proteins of meat, milk and eggs, but older people can maintain health and productive energy on not more than six foods: wholemeal bread, potatoes, fruit, vegetables, cheese and honey. While one need not rigidly restrict oneself to that, it forms the basis of a very sound diet.

The spacing of meals in relation to working hours is almost as important as what you eat. I have tried a number of variations in a fairly long working life and for maximum efficiency I would split up the day as follows. Start at five o'clock and do an hour's work until breakfast time. An hour for breakfast and start again at seven o'clock. A twenty-minute break mid-morning with a glass of milk, fruit or a scone. A good meal at midday and a rest until one o'clock. Half an hour for tea at four-thirty. Another two hours' work, followed by a light meal will com-

plete the day without any sense of exhaustion at any time. If one rests on Sundays between the mid-morning break and tea time, it gives you a seventy-two-hour week, and if every hour is properly planned and organized the output of work will justify the effort involved and will leave a sense of quiet satisfaction and achievement. The work must also be planned to give variety and interest, one would not want to hoe sugar beet for seventy-two hours. From labour health, from health contentment springs. If a man loves the labour of any trade, apart from any question of success or fame, the gods have called him.

The greatest service we can render anyone is to teach him to love his work, and to find in it contentment and happiness. The physical health and ability to do the work are first essentials, but with that alone he might become a mere automaton; there must also be real interest and satisfactions which cannot be found elsewhere. No farmer could spend time better than in devoting ten minutes a day, on his daily rounds, to stimulating each worker to the desire for knowledge by arousing his curiosity and interest in the things about him. Even with the dullest it is possible to overcome some of their inherent indifference and apathy. In the search for material the farmer will develop his powers of observation and add considerably to his knowledge. In the attempt to pass it on the gift for clear and simple explanation may be found. There are some who hate to be instructed, in which case we must learn from them in a series of carefully graduated questions. The wisdom of the ignorant may be a lesson to the wise: it resembles the instinct of animals, diffused only within a narrow sphere, but within that circle can be very profound. When a man has taught you all he knows, he may be content to learn from you. True wisdom is to know what is best worth knowing, and to do what is best worth doing. A man who has chosen his work wisely, which is that to which he is best suited, would live the same life even if he won the biggest

Football Pool—although it is improbable he would go in for them. Wisdom is to the mind what health is to the body, it permits its proper function. Wisdom permits nothing to be true which will not be so for ever, but to learn the rules without applying them is like building a rick and failing to thatch it.

Apart from the basic skill in handling tools, and the mastery of about half a dozen rules which apply to each job—which enable a man to dig a drain, lay a hedge, repair a stone wall, build a rick, drive a tractor, handle a team, milk a cow, shear a sheep, and truss a chicken—and which are dealt with elsewhere in this book—it is well to consider the essential knowledge which everyone should have, if only in his own interests, when he takes his place on a farm.

Punctuality and reliability are something the farmer must have. Unless you can be on the spot a few minutes before you are required in the morning, and can be relied upon to go steadily on whether the boss is there or not, you may find yourself the first to be redundant. In the matter of time-keeping the farmer must always be a good example to his men. Nothing is more disheartening than to be kept waiting when you are there and ready for work.

Punctuality depends on good time-keeping, and we should be conscious of the passage of time in relation to our work. It is always good practice to guess the time before looking at your watch, and after a bit you will find that you can tell the time from a glance at the sun or the progress of the work. It makes a good impression on others if you can work steadily on to the end of the afternoon; and then stand up, remark: 'Tea time, I expect,' look at your watch, and it is right on the stroke. It is so much better than having to look at your watch two or three times in the last half-hour. If the work has been particularly hard and tedious you can relieve the tension by saying: 'Oh, dear, I suppose we shall have to stop, and just when it was getting interesting.'

For those that work in the open, it adds to their interest to show how time may be calculated. The sun is always approximately due east at six o'clock in the morning, and due west at six o'clock at night, even when it is not visible above the horizon, and is therefore south-east at nine o'clock, south at midday, south-west at three o'clock. To fix the points from the field in which you are working, point the hour hand of your watch at the sun, and the south will be halfway between the hour hand and twelve o'clock on the dial. Allowance has to be made for 'Summer Time'.

To tell the time at night, we have the 'Star Clock'. Take the Pole star as the centre of the clock, and the 'Pointers of the Plough' as the hour hand. First notice the time as shown by the 'hour hand' and add it to the months that have gone since January 1st. Double the number, subtract from 40¼ (if above 24, subtract 24). Add one hour for ordinary time, and two hours for 'Summer Time'. Providing you have observed correctly, the result is correct within a quarter of an hour.

To find the age of the moon for any given date. You must know the epact, which is the excess of the solar over lunar year, or the age of the moon in days on January 1st. It can always be found in the tables near the front of the Prayer Book of the Church of England. It is also necessary to learn the month numbers, which counting from January are as follows: 1.3.1.3.3.4.5.6.7.8.9.10. We add the epact to the day of the month and the month number, and the result is the age of the moon in days. If we wish to know the age of the moon on Christmas Day 1960: the epact for that year is 2; the month number is 10, the date is the 25th, giving a total of 37; we take away 30, as the total is above 30. Christmas Day therefore falls on the seventh day of the moon. Of what value is it? If you turn your rams out on a date which will start the lambing at the beginning of a moon, it gives you moonlight for the peak period. The care of small details, the careful planning ahead,

but without over-emphasizing their importance, is always a valuable lesson to the student. From his opportunities to study, and the wide field of knowledge that farming covers, a farmer should find it easy to pass on something of value and interest every day. He has the advantage of the changing seasons, the variations in the weather, and the things which never change. To draw up a list of a thousand simple facts, which would provide one a day for nearly three years if they were carefully doled out, is not difficult. To teach three a day is as many as most students can remember, and one can always try them out at the end of the week to find how well each individual can remember. It is, of course, good training for the farmer, but I have noticed that one thing good farmers have in common—invariably they have good memories. In farming we need to know something about everything, but I doubt if we ever know everything about one thing, we can always find something to learn.

It is not sufficient to pass on knowledge, every effort must be made to develop the power of observation in the student. Few notice even ordinary things unless a special effort is made to observe. Ask, for example, what is the most common colour in the flowers of weeds. They will probably say yellow, which is the most conspicuous, but in actual fact far more species have white flowers than any other colour. Ask how many petals has a poppy, or whatever is the most conspicuous flower at the moment. The student will invariably find there are less than he thought, or two very different flowers have the same number. The poppy and the charlock both have four. From there one might lead on to how many varieties of poppies there are, or point out the four petals of the charlock form a Maltese cross, in common with all members of the Cruciferae order of plants.

There are many aids to learning, my advice is to use them all. There is the simple couplet or verse, made popular by Thomas Tusser in his *Five Hundred Pointes of Good Husbandry,* written

four hundred years ago. Many of them are still commonly quoted today.

Sow timely thy wheat, sow rye in the dust,
Let seed have his longing, let soil have her lust.
Let rye be partaker of Michaelmas spring
To bear out the hardness that winter doth bring.

It is good fun making them up. Someone has said:

The things we are passing as commonplace weeds,
May prove to be just what some sufferer needs.

Which leads us on to realize that valuable drugs are obtained from weeds. We can then use the alphabetical method, using either the names of drugs or of weeds in that order. Aconite, which comes from the Monk's Hood, Wolfe's Bane, or Blue Rocket. Belladonna, which comes from the Deadly Nightshade. Conium from Hemlock. Digitalis from Fox Glove. So one can build up quite a store of knowledge, and it is good memory training.

We all know that learning based on fundamental principles and logical reasoning which is understood, is far more valuable and easily recalled than the learning acquired by rule-of-thumb methods, rhymes and the like, but they have their uses where there is no logical principle to follow.

Visualization, especially when receiving orders, or having to carry orders for others, is invaluable. As your boss tells you what Tom, Dick or Harry have to do, you form in your own mind, a picture of the individual doing it. If you wish to especially impress it on your mind, think of it from some slightly ridiculous angle. The man who has got to take half a dozen tools with him for a certain job, think of him trying to balance them all on his head. You will not forget the man who has got to roll a field of corn, if you think of him pulling the roller and the tractor sitting down laughing at him. It may seem childish,

but it is very effective. At one time I developed it as a form of entertainment at Harvest Home Suppers and the like. Asking each member of the audience to name something, and from which I built up a series of mental pictures for each section of the audience. We might have a cow, a piano, a cigar, and so on. I would start to build my picture with the animal sitting at the piano smoking the cigar, and it might finish playing 'The Lost Chord' in St. Paul's Cathedral. In pulling the picture down again I had no difficulty in telling each person the object they had chosen, and without of course disclosing in any ways the means by which it had been memorized.

Each individual must find the means best suited to himself. Some learn easily from a good teacher, others derive more knowledge from instructive books. Observation comes later as a source of knowledge, experience fourth, and hearsay a very bad fifth.

The habit of reading, and deriving knowledge from books, is essential for any young man who wishes to go far in farming. It is worth studying how to read quickly. A practised reader will read the introduction carefully, which should describe the purpose of the book, and then flip quickly through and make brief notes on the sections which will merit closer study. In some books there are whole chapters which may be skipped altogether. The skill in quick reading lies in directing the eyes between the lines, and it will be found that whole phrases instead of individual words are being taken in at a glance.

But all you read are mere theories until we have tried them out in practice. Whatever comes to us, good or bad, is usually the result of our own action or lack of action. Learn something every day. Teach something every day. A quarter of an hour daily over twenty years is five thousand hours of study, or four hours a day for four years, more time than the average university graduate has put in in his time at college, and infinitely more valuable if it has been reinforced in the field of direct

observation and deduction. There is no substitute for time and study. Take the best from your past and build the future from it. A man's weakness is revealed by what stops him. Do what you can, with what you have, where you are.

Every student should be encouraged to make a five-year plan. It should be a target, so high, so difficult to reach, that it will require tremendous concentration, determination and energy to get anywhere near it. He should plan to reach a certain position. I described in my *Farming Ladder* how I set myself, at the age of sixteen, to become a farmer by my own efforts by the time I was twenty-one. The ambition was achieved one month before my twentieth birthday. I now know that I had learned all that is necessary to make a success of farming within the first two years, but the opportunity had still to be won. It is not only knowledge, drive and energy which must be acquired, but the personality which convinces people that you are a master of your trade.

My experience convinces me that very few boys, and even fewer girls, know their own ability. It is something you have to teach them. It surprises many of them, and with delight, to learn how capable they are. But they must be given carefully graduated responsibility at first to see they do not fall down on the job in the early stages. Later they may blame themselves bitterly for the things that go wrong, then we have to help and comfort.

Sound training imparts not only a way of doing, but a way of thinking, so that a man confronted with a situation acts wisely and quickly. A good teacher not only instructs, he trains, and that involves the acquisition of skills and facts; it involves habits of thought, reliability, initiative and leadership. Qualities are *caught* not *taught*.

But how worthwhile it all is, to earn the friendship, the affection and the respect of the young. To have the privilege of listening to the younger generation telling us how they hope

to put the world and farming right. Few will dispute it has often gone wrong. It is a tremendous thrill to share with youth their passionate desire to make the world a better place, both for themselves and those who will follow after them. They will not fail if they only pass on the message that work is something to be enjoyed, *that work is good for you.*

CHAPTER II

Farm Work

There are two schools of thought in the farming world, the positive and the negative. First, there are those to whom farming seems, and undoubtedly is, a chosen way of life. They enjoy their work, feel little conscious effort involved, and while never slackening their pace, notice with interest the activities of their neighbours in the surrounding fields, absorb the beauties of the countryside, and may even compose poetry while ploughing a field or thatching a rick. On the other hand we have those who find farm work hard and laborious, and so mentally and physically exhausting that they are fit for nothing more than going to sleep over a newspaper in front of the fire at the close of the day. The work leaves them dull and listless, to them neither recreation nor constructive thought is possible, and they look back on a grim past and forward to a sad future.

Physical strength seems to enter little into it, for it is not the strongest man or the one who does the lightest work who is least tired at the end of the day. Poor output, inefficiency, or exhaustion, come also from misdirected energy. It is a mistake to believe that only the fittest and strongest can do the heavier work; it only requires intelligent appreciation of what is being done. Fatigue can be avoided by economy of effort, and physical motions are tiring only in proportion to the distortion of the

natural pose of the body. In nearly all physical labour there is needless strain; get rid of strain and there will be more output for less effort.

Very few people understand, or know how to use their own bodies, and if left to themselves will usually work in the hardest way. Every movement of the body is worthy of study; to notice where the strain comes and to eliminate it as far as possible by swing and balance. Gravity and posture have a considerable influence upon muscular activity.

If while holding an erect posture the subject of this experiment raises and holds an arm straight out in front, the posterior spinal muscles can be seen and felt contracting, not that they are directly concerned in raising the arm but because they must keep the trunk balanced erect against the leverage exerted by the advanced arm. This may be proved by the model, with arm still outstretched, leaning slightly forward, when the muscles will at once become flaccid. On the other hand, one should beware of a mechanical calculation in assuming that a muscle is in an anatomical position to take part in a movement. There is no guarantee that the muscle belongs to the group executing the movement when the will desires it; and in farm work it is possible to rest various groups of muscles while performing the same task.

Once a few guiding principles have been mastered, there is effortless ease, which will enable you to work from morning to night without overtiring, and there is of course beauty, precision and economy of effort in the trained movement of a human being as there is in a racehorse. The untrained wastes the activities of many muscles in exaggerated and unbalanced efforts. Physical efficiency secures the best use of your time and body, and with thought and study is easily attained.

The basic principle of manual work is to do the hardest work with the strongest muscles, while maintaining balance and orderly movement. The body and legs are a stand supporting

and allowing the movement and use of the arms and legs.

If we take for illustration a simple task. The picking up of a bucket is probably the most often repeated action on a farm: we do it 365 days a year, in feeding and watering animals, in carrying milk, in picking potatoes, in filling radiators and fuel tanks, and in a dozen different ways the same movements will be gone through. Although they have done it hundreds and hundreds of times, my observation shows that seven out often workers will show a loss of efficiency and waste of muscular effort in this simple movement.

The man leans forward, putting his weight on his right foot and with his right leg straight, and supporting the weight of his extended body. He grasps the handle, with his thumb pointing forward. He lifts with his back muscles, with his weight still on his right leg. The bucket swings back and touches his leg as he assumes an erect position. He will then move the bucket away, possibly extending the other hand in an attempt to balance the weight if the bucket is very heavy, but even then it will tend to swing again against his leg as he starts to move off. Now in lifting that bucket, in addition to its contents, the man lifted three-quarters of his own weight on his back muscles and his extended leg, and imposed further strain on the sacro-iliac joints which are liable to injury if the body should be accidentally thrown out of balance while executing the movement.

For efficient action, the man would step close to the bucket with the leg on the bucket side slightly behind, bend both knees and grasp the handle with his thumb outwards and his fingers forward. He then lifts straight up by straightening his legs, and the strongest and longest muscles, shared by both legs, have been used for taking the weight. The bucket has also moved away from his legs for the simple anatomical reason that his forearm twists out by the turning of the hand, and has the addition advantage that the contents will not spill as the bucket swings free with the movement of the body. If one tries

Fig. 1. Right

Fig. 2. Wrong

both methods say twenty times straight off it will be clearly demonstrated how much extra effort is involved and the fatigue which could be avoided; to say nothing of the risk of slipping a disc if the body should be further thrown out of balance by some unforeseen circumstance, such as picking up a petrol can which was thought to be empty and was actually full, or vice versa. Unnecessary strain on the lumbar regions often leads to lumbago and fibrositis.

While it is a mistake to use the back against the strong thigh muscles, combined they are used for the very heaviest work through leverage and momentum and learning how to use them to the very best advantage. 'Putting one's back into it' means more than mere exertion, it consists in using strength and weight to achieve the object.

But while leverage and muscular exertion are necessary to

effect a movement they cannot be sustained for long, and balance and the bony framework of the body must take their place to either support the load or provide a rest for each group of muscles in turn. That is why the very experienced sack-carrier places his burden equally across his shoulders rather than down his back, and can then carry at least three times his own weight without difficulty. The world record is 1 ton 18 cwt.: the man taking the load from a ramp just below shoulder level and standing with it perfectly balanced. An outstanding example perhaps of the extent to which a human being can be developed, yet it is doubtful if one worker in five can handle an 18-stone sack of wheat today, and 15 per cent of all reported accidents are caused by lifting heavy objects, sacks amounting to a quarter of the total. In the old days, the carrying of a sack of wheat up the granary stairs was the qualifying task by which a youth was entitled to consider himself a man. I did it on my seventeenth birthday, and have been able to do so ever since, although it is by knowledge, and I doubt if it ever was by strength, for I brought but a frail body to the industry. I still remember the amusement of my fellow workers at my efforts in carrying a single hundredweight in my first week on the farm. I studied those who could, and within twelve months my master would set me to carry all the grain from the threshing machine in the standard four-bushel sacks, and which in the case of beans, peas or vetches would be 19 stone—in those days approaching two and a half times my own weight.

The bony framework is so strong that once the load is evenly balanced and rigid it makes little difference whether it be 1½ cwt. or 2½ cwt., but it must be tightly tied down to the grain. A floppy sack, loosely tied, is very difficult to handle at any time. The all-important thing is to see that the sack is evenly balanced, and the greater the weight the greater the risk if the load is thrown out of balance by slipping. Injury is also caused, in fact more often than not, by attempting to regain balance when

it has been lost. The best training is to carry even light weights in the same way as you would the heaviest, for constant practice, well within your capacity, will show exactly how the sack must be adjusted in relation to the height from which it is being taken, such as the tailboard of a lorry or from a stack of sacks. The ideal height is shoulder level, but better be below rather than above.

The strength of the bony framework of the human being is best illustrated by using an old-fashioned yoke, and notice the weight which can be carried from the chains and only steadied by the hands. Normally we do not carry loads on our heads in this country, but I have seen Portuguese women each with a 5-gallon jar of water, weighing something over 50 lb., standing and having a chat on their way home, beautifully poised but with muscles relaxed, the weight going through the main axis of the body in a vertical line from the ears, in front of the shoulders, through the hip joints and ankles.

Fig. 3. Muscles Relaxed

It is sometimes necessary to take a sack from a height from which it is not possible to take it across the shoulders, and in which case it must be carried down the back, and can be done in perfect safety providing the knees are close together and the stomach muscles are contracted before taking the weight. To have the legs wide apart and the body muscles slack is to court an injury either to the back or stomach. The disadvantage in carrying a sack

by this method is that it requires greater physical exertion, and also if the sack slips down a little one is half-strangled by the shirt collar, even if no further damage is done.

It is inadvisable to carry sacks in one's arms, even if the weight is well within your capacity, for if you should slip you fall on the base of your spine, the weight of the sack contributing to the force with which you strike the ground.

Fig. 4. Courting an Injury

In taking sacks from an elevator in loading a trailer or lorry it is customary to face the machine and let it slide the sacks past your head and not quite straight on your shoulders. You then turn round and drop it in the required position over one shoulder. It requires considerable practice, and an inexperienced

person should always try it with a few sacks of chaff first, and then work up via oats and barley to wheat and beans.

Wire-tied bales of hay and straw, which weigh from 90 to 120 lb., unlike sacks, should not be carried across the shoulders: the wide stretch of the arms, holding the corners of the bale, leaves the chest and side muscles vulnerable to strain, and a sudden gust of wind has been known to dislocate a man's shoulder when using this method

But balance still plays an important part in carrying bales, and the weight is taken high up on the shoulders and partly by the head, and when correctly placed can be carried without holding it by the hands if so desired. Apart from correct placing, it should be carried on a narrow edge (and it should be remembered that there is a hard and a soft face, the top of the bale as it comes from the machine will be found to be much easier to the back, although it necessitates turning the bale round, after rearing it up, or over-end). The bale should never be carried on the wide side, with the wires against the back, as there is a great risk of a ripped shirt, if nothing worse, from the end of a wire which has been left sticking out. I have known a man have a half-inch rip right down his back by dropping the bale when he felt the prick of the wire on his shoulder.

If a sack or bale is to be dropped from the back, it is important to see that both feet are flat on the ground. If one foot is resting on the toe, there is a great risk that the load will be dropped on the heel, and bones broken in the foot. I have seen it happen.

If it is feared that a sack will split on being dropped to the ground, it is better to let it down over the shoulder, clasping it in the arms, and bending the knees.

If a heavy sack has to be moved on the ground a short distance, as in lining it up to a stack of bags, then leverage is the most effective method. The toes are placed close against the bottom, the knees a little under halfway up, and the arms

clasped around the top. Then by leaning backwards, the bottom is pulled off the ground and easily moves forward. The longer the sack, and the tighter it has been tied, the easier it is to move.

The importance of balance in carrying anything is never more clearly illustrated than in moving a ladder. Evenly balanced in the centre, a thirty-rung ladder can be carried quite easily, but becomes impossible a few rungs either way. On a still day, it is even easier to carry it bolt upright, providing the balance can be perfectly maintained against the shoulder.

In picking up sacks from the ground agility and balance is involved. If it has to be done single handed, it is best to kneel at one side, having turned the sack on edge, roll it on to the thighs, clasp it round the top and bottom with the arms, press it tight against the stomach, swing backwards and stand up with both legs together. Then if it is to be lifted higher, contract the stomach muscles, swing the shoulders back and the arms up, and in this position the sack can be lifted if necessary on to another man's back.

Normally sacks are lifted from the ground by two people. With wheat, beans, or barley, which weight 2 cwt. and above, it is customary to first rear the sack upright, then the men clasp each other's hand, the most experienced with his knuckles upwards, not locking the fingers or the fingernails will stick in, nor grasping too tight, then they stoop with their clasped hands halfway down the sack, grasp the bottom corner on each side with their free hand and lift. They should lift exactly together, although the crafty one will be a split second quicker for it is easier for him that way! Once the sack is lifted, quite a good swing can be obtained by the arms, especially if the top is lowered a little.

If a third person is available he can assist by giving a tug on the top, as the two men lift, and then push it forward as the bottom comes to rest on the trailer or lorry.

With oats, the four-bushel sack weighs 1½ cwt., and lighter sacks, a short thick stick, about 18 inches long is often used in place of the clasped hands and is very effective. For 1 cwt. sacks two men each catch hold of the top and bottom corners on either side, and pick them straight up from the ground. Where there are a number of men available and a large number of sacks to be moved, such as potatoes, into a store, then it is quite a good plan to have two men each taking opposite ends of each sack, and lifting it on to the shoulders, placing it cross-ways, for each helper in turn.

A barrel is designed for rolling, but if one must be loaded by hand then two men stand one on each side, clasping their respective top and bottom rims, push their heads together, and lift. One is surprised to find how easily it comes up. This method is also a help to an inexperienced person when lifting for the first time a heavy sack in any of the ways described above.

In handling rolls of sheep-netting, the first essential is to see that they are tightly rolled. Each roll is then taken by the top and bottom, rolling it on to the knees if necessary, and then up. If it is to be carried on the back, then with a little practice it is possible to swing it right up, dropping the head and stepping forward at the same moment, and it comes comfortably on to the shoulders.

The carrying of sheep hurdles clearly illustrates the application of guiding principles and simple rules to save effort. As the fold is taken up, the first hurdle is left leaning on a stake against the top at the middle of the hurdle. Four or five hurdles are added to the first, and their respective stakes are stood on the other side from the supporting stake and leaning against one end of the hurdles. When all the hurdles have been got together in this manner they are ready to be carried on and placed ready for the new pen or fold. The shepherd takes the supporting stake from the set, pulling the hurdles towards him; then the

stake is inserted under the top brace in the right-hand side of the hurdle, which forms at that point a small triangle, and is pushed through the whole set. The man then turns his back to the hurdles, and while retaining his grip on the stake with his right hand, gathers up the spare stakes in his left hand and puts them under his arm. He then presses sideways to the right, against the stake which is in the hurdles, and they in turn tip up on the ground, as the stake is not quite in the centre, and when the stake is high enough, his shoulder is placed underneath it, he leans slightly forward, gaining leverage from the stake in the hurdles and the others held in his left arm, with the result that the hurdles come off the ground, and he walks easily forward with the load evenly balanced. On reaching the fresh site he reverses the process and sets the hurdles down safely with the absolute minimum of effort from start to finish. The whole process being far easier to do than to describe. All the hurdles required to set on a pen a chain square being carried in six journeys.

If a sheep or a calf has to be carried, it can be taken quite comfortably and safely across the shoulders. Grasp the fore and hind legs, putting your neck under the animal's body, and getting up with both knees together. It will sometimes struggle as you lift, but this assists you as the weight is thrown backwards and it compels you to pull a little on the legs. The animal lies quiet once you start to walk.

An interesting sidelight on this means of carrying an animal, was a bet made many years ago, in a time of fantastic wagers, by a farmer who backed himself to carry a two-year-old bull up a certain hill in the south of England. He used this method, but had been practising for two years, starting with a calf and carrying it up every day. Both the man and the bull must have got used to It, and we may assume he had not over-fed the animal.

An unconscious man can be picked up by kneeling and then

raising him against your chest until you can slide him chest downwards across your shoulders. Then grasping his right hand with your left until you get him nicely balanced, and then put your right hand and arm behind his knees, and grasp his right hand across your chest, and you get up without danger to yourself or to him. You still have your left hand free to open a door or grasp a ladder. This method would only be used if you were satisfied that the man was not suffering from a spinal injury.

We have now covered nearly all the direct heavy lifting which has to be done on a farm in the daily routine. Lifting is not done for the sake of doing it, by proper planning much of it can be eliminated, but there will always be a certain amount to do and the few guiding principles are important. It is a sound rule to remember that it is far better to pull than to push—it is easier and with less risk of injury. The higher you push above waist level the greater the danger to back and arms. Lifting from below the waist with your knees bent and together imposes the minimum strain. If something really heavy must be pushed, say a horse lying in a loosebox, then by bracing your back, with your shoulders against the animal and your feet against the wall, a tremendous weight can be moved. While it is of no practical value, except as a demonstration of the strength of a combination of muscles, I have seen a blacksmith lift a horse right off the ground by putting his shoulders under its chest.

The most important fact in all forms of weight lifting is to remember that you can rest each group of muscles in turn by using the bony framework to the best advantage. You can see this clearly illustrated in many a circus turn as the performers go through their exercise; pausing before each move, before making another muscular effort. We can learn from them also that it is better to warm up our muscles with gentle exercise before calling upon them for a special effort. If you have got cold, perhaps waiting impatiently, and then rushing to show some-

one how something should be done, the risk of a torn muscle rises considerably.

We now come to the work in which a man's strength is projected through the leverage of his tools, and is a very important aspect of skilful application because more time is devoted to this than to any other work on the farm.

Hoeing is probably the most hated of all farm work involving the use of a tool. Too many people acquire a pain in the back over what should be a pleasant exercise of skill. Many have worked all their lives and have never got over it. A few have never been troubled in this way, except perhaps when they first started, and before finding unconsciously the correct stance and position in which to hold their hoe. I studied them very closely in my early days on the farm, both those who hated it and those who enjoyed it, until some basic principles were evolved. In recent years I have taught many to hoe, and providing they are prepared to adopt what they have been taught, find it a pleasant task, and will work from one end of the field to the other without straightening their backs.

A good hoe-er can be recognized at a couple of hundred yards. I remember walking across a field with a college-trained farm manager who complained bitterly of the slow progress and poor workmanship of those at work in the roots. I looked at them for a moment, and told him that it must be because he had never taught them properly.

He said nothing until we came up to his gang, all young people, and then introduced me to them by saying I was the man who knew all about hoeing and could tell them how to make a much better job than they were doing.

This was not very tactful. One young fellow threw his hoe down and said, as far as he was concerned, I could have the job.

I said that would be very nice, because there was nothing I enjoyed more than hoeing in pleasant company. A young girl

spoke up and said that as fat as she could see, it was not very pleasant company, with all the hoeing they had in front of them I smiled and assured her that I understood only too well I

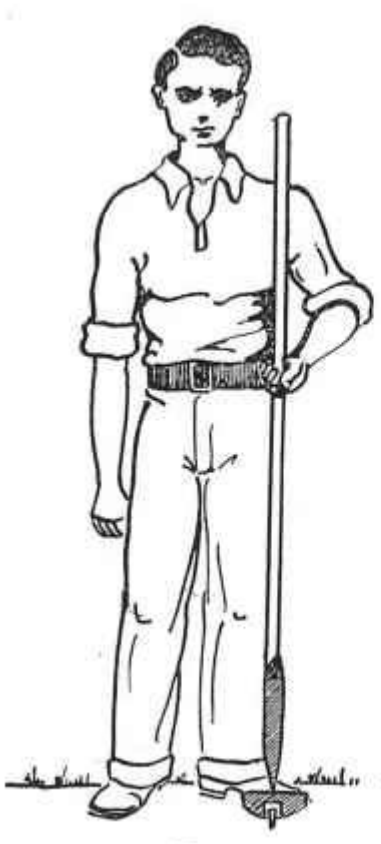


Fig. 5

Fig. 6

said: 'It used to give you a pain in the middle of your back, and now it has moved to your left shoulder.'

She looked at me in surprise. So I went on: 'You are 5 ft.

3 in. tall; 3 ft. 5 in. to the waist, and 21 in. from your armpit to your clenched fist.'

The farm manager stepped back in surprise. 'Do you go round measuring up land girls ?' he asked.

Fig. 7

I told him it was not necessary, only interesting. It is sufficient to stand your hoe head-downwards on the ground, grasp the handle at waist level with the left hand (as in Fig. 5), then raise the hoe up to the shoulder, and grasp it with the right hand at the level of the armpit (as in Fig. 6). Retain the grasp in both hands, return the hoe to the ground, and start to work (as in Fig. 7). You are then perfectly balanced, and simple laws of levers and pivots come into operation, and you work comfortably and easily, and through a series of triangles

and lines of draught. This can be easily illustrated by making a cardboard figure, with paper-fasteners at the joints. The distance from the forehead to the ground is the same as that from the head of the hoe to the left hand. The distances between the head of the hoe, the right and the left hand, are all approximately equal. But a practical trial in the field is by far the most convincing demonstration.

Choosing the tool is important, the first essential being that it should be a swan-necked and not a dub-headed hoe. It is an interesting reflection, that in districts where the former is used the standards of workmanship are much higher than they are in places where the latter is generally accepted. The handle, which should be of ash, should be as tall as the worker when stood on the ground. Not that the end of the shaft is grasped when hoeing, but to balance the tool. The shaft should be 3½ in. in circumference, or just sufficient to be able to touch the big muscle of the thumb with the second and third fingers. The hoe should balance on the edge of the hand at about one-third of the length from the head, which is also the position taken up by the right hand when hoeing, as described above. Although, of course, either hand may be used, and you can hoe left-handed or right-handed, for a change is as good as a rest.

Having mastered the tool, it only remains to keep it sharp and clean, and to remember that one hour's work tonight may be worth a day's work in a fortnight's time, and you can do it easily now that you know how!

In hoeing the major work is done by pulling, and a man is best designed for that purpose, and although there is a hoe designed for pushing (and is very useful for side-hoeing) it is much harder work, and is held at the end and one-third down the shaft to get the maximum thrust. It works in principle more like the old, so-called, breast-plough, but which was in fact pushed by the thighs.

No finer example of the balanced tool, fitted to the individual,

can surpass the scythe. To measure a scythe you put the heel into your armpit, and so adjust the first handle so that you can touch it with your outstretched finger. The second handle is fixed at the distance from elbow to extended fingers from the first handle, and this will be found to be at waist height, or a little above, when the heel is stood on the ground against your foot. You next measure from where the 'gass nail' goes through in the heel to the point of the blade, you then describe an arc to the handle, and the point should be adjusted to make it an equilateral triangle from this point to the heel again. The scythe will swing like a pendulum, when balanced on one finger from the lower handle, when it has been properly set. The pitch of the scythe is adjusted to the crop you wish to cut, by heating and bending the heel, to get a flat blade horizontal with the ground for mowing a lawn, and then increasing the angle orf coarser work such as a standing field of oats. A characteristic pain is felt in the right side when using a badly set scythe, and will disappear when the correct adjustment has been made. Grass is always mown out from the standing crop, corn into the crop. An acre of grass, or two acres of oats, was considered to be a day's work in bygone days, and a man who can do that today, on a small acreage, would earn good money against a contractor's charges for bringing and using modern machinery. With a scythe you can be reasonably certain of finishing your day's work, the most expensive combine-harvester may be held up by the failure of one inaccessible nut and bolt.

While the scythe is still a familiar tool, the flail has gone almost entirely out of use, yet it can be easily made from home-grown materials, and is invaluable for preparing thatching straw of the finest quality, often making as much as £40 a ton, and against which machine-threshed straw, at any price, is a very poor substitute.

The flail is also a joy to use, and is another finer example of fitting a tool to the individual. The handle is of ash, and of

Fig. 8. The Flail

elbow height when stood on the ground. The links are of willow, the length of an extended finger, and are joined with a strap. The arm is of cherry, the length of a man's arm and extended fingers.

Two sheaves are opened on the barn floor, with the heads of the corn just overlapping, and you work up each sheaf in turn striking flat with the arm of the tool. On completion the straw is easily bundled up and tied. You can knock out a load a day, or about 2 qr. of corn and ½ ton of straw, and the real value lies in this straight, clean, and unbroken material for thatching. With it I have covered in sixteen squares a day, compared with the normally accepted four squares of machine-threshed straw which has to be yealmed and a bigger percentage wasted. The old test for a thresher who applied for work, was to require him to drive a pin into the wooden threshing floor with a single stroke of his flail. Such is the precision of this simple combination of the human frame and three pieces of wood, that it is not difficult. Although of course you have to learn by hitting yourself on the head a few times before becoming proficient.

A spade is used for digging, and a shovel for shovelling. I

stress this point because I have known university graduates, with a degree in agriculture, who did not know the difference; and when sent to the barn to fetch one, brought the other. Both tools were designed, or more probably evolved, for a specific purpose.

A spade is flat, or nearly flat, as it falls about a quarter of an inch from the corners to the centre of the cutting edge. The upper edge is thicker, it sometimes has an additional ridge added, to prevent wear on the user's boot when he presses the tool into the ground with his foot. Spades vary a little in size, those commonly used for digging have a blade 12 in. by 8 in., and one can be chosen to suit the individual. A rough guide to the most convenient length is found by standing the tool at the side of the leg, when the top of the handle should just reach the hip joint. If we wish to be very scientific the overall length of the tool should be twice as long as the thigh bone or femur. The femur is 27½ per cent of the total height, which means a 5 ft. 6 in. man will require a 3 ft. spade, and a 6-footer two inches more in total length. A well-made spade will balance on the finger at the first rivet hole.

The spade is a remarkably efficient tool. A good man can dig a chain of medium soil in a day, shifting about 50 tons at 6 in. deep in eight hours-—a ton in ten minutes.

Special sizes are made for particular jobs. A draining spade with an 18-in. blade will taper in width from 6 in. to 3 in., with an overall length of 45 in. A 16-in. blade will be a little narrower at the top and a little wider at the bottom, compared with the 18 in., but will lose about 3 in. in overall length.

A shovel has a straight edge, with the sides, and usually the top edge, turned up to form a hollow in the top surface while remaining flat on the ground side. Many shovels also have a slight taper of about half an inch from the front to the back of the blade to facilitate withdrawing it from a heap of material. As a tool it is quite unsuitable for digging. The size of a shovel

varies considerably according to the purpose for which it was designed: it will vary from 12 in. by 8 in. for shovelling gravel, to 12 in. by 15 in., or even more, for grain or snow. A suitable length is to have the handle reaching to the hip bone, making it some 5 in. longer than the spade. Allowance has to be made for the varying length of the blade, but the handle will be set at an angle of 35 deg. for a 2-ft. handle, measured from the top of the blade, this angle will fall to 30 deg. in an additional length of 5 in., but the important point is, that when the blade is flat on the ground the end of the handle will be 16 in. above it, or just below the knees of the operator, so that he has additional flexibility from his knees to assist his arms. The pivoting action is also clearly seen as the tool moves across his body; as it comes from the right the blade is tipping to pick up its load, as it goes to the left it is raised.

In shovelling from a heap, the material should always be cleared along the front of the heap at ground level, never dig into the heap. It may be harder to start, but as the material falls down from the face of the heap, it provides loose and convenient shovelfuls in which to work. A shovel can be used most effectively for spreading anything from gravel to artificial manures with a swing of the body and arms, preferably with the wind in the direction of thrust. The flat of a shovel can also be used for knocking-in of the sheaves in a rick which have slipped out a little too far in the building, or even to improve the general appearance of the rick.

I have tried a number of experiments with shovels. The importance of having the right size with which to work can be demonstrated by having three tools of the same weight but with different length handles, and inviting the subject of the experiment to try them all and find which one suits him best and to give his reasons for rejecting the others. Invariably two will be condemned on the grounds they are too heavy, while in actual fact they are the same weight but the wrong length for

the individual. With a shovel or spade a man must use the open or cross handle, he cannot adjust his hands to the tool, as with a long fork, for that reason length is of supreme importance. Providing the length of the tool is right, weight of the load is the controlling factor in determining the maximum amount which can be moved for the minimum of effort in a given time. Ideally one would select a shovel to hold just over 20 lb. when fully loaded, regardless of its size; and it matters little whether you are shovelling grain or gravel, although the cubic capacity will be doubled with the lighter material. Too heavy a shovelful wastes strength, too light a shovelful wastes time. Output can be increased two to three times by using the right tool.

Probably no tool has faded so quickly from farming practice, after serving mankind so long, as the sickle. Used now for trimming up a bit of rough grass on a bank, or cropping back a one-year growth on a hedge, it was for two thousand years the principal tool for harvesting grain. It was in two forms; the reaping hook, a lighter tool which was used for cutting off the heads of the grain, the corn being grasped in the free hand; or a fagging-hook, with which the corn and straw were cut close to the ground, with the aid of a fagging-stick, and made into sheaves.

Only last year a farmer with over a thousand acres of corn had to confess to me that neither he nor his men knew how to cut and tie, with a straw band, half a dozen conventional sheaves which the local vicar required for a Harvest Festival. Yet there are still odd corners of fields, or patches which the combined harvester misses for one reason or another, which would justify clearing up; and there are a great many more patches of weeds around too many farmyards where it would be dangerous to use a scythe for fear of damaging the blade on the implements hidden by the rubbish which has grown up. I do not know whether it would be advisable to use selective weed-killers for this purpose, for many of them are corrosive, but I have noticed

that many farmers who use them extensively in their fields still allow their machinery to be chocked up in this way—which is wasteful and untidy.

A sickle is a fine example of a balanced tool: the distance between the heel and the head of the blade being twice that of the distance, midway between a straight line drawn between those two points and the back of the blade. This means that the handle does not tend to twist when grasped in the hand.

The fagging-stick is cut from a hedge. About 18 in. long—the same overall length as the sickle—it is cut just below a fork, so that a V-shaped spur about 6 in. long can be left on the other side. With this stick the corn is pressed over against the standing corn while it is cut and left leaning, then the corn is rolled back with the stick, cutting underneath again until sufficient has been cut to make a sheaf. Then it is picked up between the stick and the sickle and laid on the prepared band of straw ready to tie. In this way, with someone else to make and tie the bands, the man who is cutting can go steadily on without letting the tools out of his hands.

Storm-beaten grain presents no difficulty to the man with a sickle, yet hundreds of acres may be lost in a bad year, such as 1950, which even a combine cannot touch. Yet in bygone ages every man, woman and child in the village would have been pressed into service, and with these very simple tools the crop saved. After all, if a crop is going to be a total loss unless it is cut with a sickle, a quarter of an acre—at £30 to *£40* an acre—is not bad money for a day's work, and the land is cleared for the next crop.

The root-knife, or leaf-knife, is a smaller edition of the sickle, but with a hook at the end; although in some districts a straight blade is still used. It is usual to pull the root with one hand, sever the leaves and cause the root to travel to the heap in one movement. If the roots are not too heavy, or liable to damage as in the case of mangolds, a root-stick can be used. This is

shorter than the fagging-stick, thicker, and has a long nail driven through at one end, at an angle of about 30 deg. The root is impaled on this, topped, cleaned if necessary, and then a swing of the stick, stopped at the correct moment with the back of the knife, causes the root to fly off, and travel quite a long way, with considerable accuracy to trailer or heap. This method has the advantage that the hands can be kept clean and dry in bad weather.

The tools still most commonly used on the farm are the forks for handling sheaves, hay, straw and manure. The pitchfork is a long-handled, two-pronged fork, made in various sizes, but always in exact proportion. A long fork, used for pitching sheaves on to a load may have an overall length of 7 ft., with tines 14 in. long and 7 in. between the points; while a fork used for loading, unloading, moving material across a rick, or for rick building, would be 5 ft. overall, with tines 7½ in. long and 5 in. apart. The long fork with wide tines enables two sheaves to be pitched together on to a load, and with a slight throw to a height of 14 ft. With a short fork it is possible to achieve the same height with single sheaves, but with very considerable effort and accurate aim, but it is not intended for that purpose. On the other hand a long fork would be very cumbersome to use on a load or rick.

In the past, very long three-tined forks were sometimes used for pitching hay from a load to the rick, but most farmers preferred to have a man on a ladder halfway up the roof to pass the hay on, or to have a 'pitch-hole' in the rick, which was afterwards filled in.

A manure fork is a heavier four-tined tool. It may have a long handle like a pitchfork, or shorter with an open handle like a shovel. The long handle offers greater leverage in freeing manure from a yard or heap, but requires a grasp on the shaft to prevent an unbalanced forkful turning over, which in actual practice means nearly every time. While a short fork, with its

open handle, is easily balanced and quickly discharged. It is significant that the long fork, with an overall length of 60 in., is usually held at 40 and 20 in.; while the short fork of 40 in., is held at the end and at 20 in. Only if the material is very light will the man be able to use it like a pitchfork. Even so the heavier tool involves the lifting of 20 per cent more weight for the given quantity removed. In fact the lighter the material the greater the proportion of weight is found in the tool. To use a 3¾-lb. tool to move a 4-lb. forkful is making heavy work of it. In a restricted area, such as a calf pen, the short-handled fork has much to recommend it.

The important factors in using a fork are, leverage bases on a good stance (the feet being no wider apart than the shoulders), and then a swing of the body with the arms at full length. In working right-handed, that is, with the left hand at the opposite end to the tines, the right hand is used very largely as a fulcrum. The movement is always across the body, from left to right or vice versa. The forkful is raised by pressing down with the left hand, and then with a swing of the body the load is discharged. Not more than four movements are involved: putting the fork into the material, levering it out, lifting and throwing. These should be counted as it is quite common to see people making five or six movements, sometimes even more, for each forkful. Manure or a sheaf can be thrown about 15 ft. on the level. It decreases in proportion: 10 ft. across and 5 ft. above the ground, as in loading a trailer. The extreme limit up will be found in pitching a sheaf on to a rick. Manure should never be carried in forkfuls, but thrown twice if necessary.

Manure loading is considered to be one of the heaviest jobs in farm work, but with a little study it is no more than a physical effort which can be enjoyed. During the war, farmers were warned that they should not expect land girls to load manure. With suitable training a woman can compete quite easily with a man of similar weight. Intelligent application, as any woman

can demonstrate, can compete with brute force in nearly all farm work.

A special word of warning to the inexperienced. Never load manure with one foot in front of the other, or you may impale your foot. If you do there is a risk of tetanus, some farms are worse than others, and from a fork wound it can develop after several weeks, then inoculation is the only reasonable safety precaution under those circumstances.

Hedge cropping involves a similar movement to forking only on a higher level, the entire movement being done above the waist, if the conventional method of always striking upwards is adopted. The reason for this being that the little branches are easier to cut in the direction of growth. One should never attempt to cut anything thicker than the shaft of the slasher, and never strike a branch with the shaft below the blade, or it may break the tool. Apart from this the risks involved come from working too close to another person, or a thorn in the eye, I have never known an accident result from this work, which does require a very sharp tool, providing it is properly done. To strike downwards is dangerous and does require special care in relation to the feet of the operator, and the risk of uncut branches springing back.

A most valuable skill which is being quickly lost is the hand-broadcasting of seeds and artificial manures, and strangely enough it is a task in which an experienced man can compete successfully with the machine either in cost, or efficiency in difficult conditions.

The generally accepted contract price for fertilizer distribution by tractor is 10s. per acre up to 3 cwt., plus 1s. 6d. per cwt. for every cwt. over. Broadcasting single-handed from a bucket, a man can distribute 3 cwt. per hour, and has the additional advantage that he can vary the quantity as the crop requires if it should be weak or rank in patches. For the best results, a smaller dressing at intervals is better than a heavy application at

one time. Therefore a farmer using 1 cwt. in three applications by hand would have a considerable economy in cost, and a better crop, than if he had 3 cwt. applied at one time by the contractor. The broadcasting of seeds, on well-set-up furrows so that it can be covered by a single stroke of the harrows, can sometimes put a farmer well ahead in a bad season while others wait for the land to be dry enough to be worked down and drilled by machines.

Broadcasting should be a pleasant rhythmical action. For light seeds a hopper can be strapped to the waist and both hands used, a breadth of 1 pole, or 5½ yds., being covered, or two 'bouts' to the chain.

With the heavier artificial fertilizers a bucket, and using one hand, is almost as fast. The bucket is rested on the hip bone, with one arm closed around it, the other hand being used for the distribution. If the bucket is held on the right side, then the right hand comes into the bucket as the right leg goes forward, then the handful of material can be distributed as the left hand comes back, and then again into the bucket as the right foot goes forward. This will give about a 2-cwt. distribution to the acre on a 4-yard breadth. For a lighter dressing a double action can be used, letting half go each time, and the hand only coming back on the second stroke. With a little practice it becomes a pleasant and enjoyable exercise. It is important to see that an even pattern is obtained, and it is a great help in this respect if you work with your head well up. Care should be taken to see that the artificial does not seep over the edge of the bucket as you set out with it full.

The most important thing is the setting out of the work; plan to work with a cross wind, otherwise it can be very unpleasant through the dust blowing in your eyes. In a field 10 chains long is to be broadcast, at the rate of 1 cwt. to the acre, the sacks or the bags should be put in a line, at 5 chains, across the middle of the field at 1 chain apart, with the first half a

chain from the hedge. Three markers are required, pitchforks do very well, to guide the broadcaster in his work. A bucket should be found that holds 20 lb. of the fertilizer. Then, taking half a bucket and one fork to the distant side of the field, stick the fork in 4 yards from the hedge as a marker for the return journey. Then starting close against the hedge, the material is distributed back to the line of sacks. Then the bucket is filled, two forks are taken, one put in 4 yards from the hedge, and the other taken on in the spare hand of the arm holding the bucket, as you continue to broadcast down the field. On reaching the end, the bucket is put 4 yards from the hedge, ready to go back to the middle marker, and the fork put in at a further 4 yards, ready for the return journey. The middle marker is always moved on 4 yards, the end markers 8 yards each time. Once a start has been made, the bucket is always filled at the centre, and used half out to the hedge, and the other half back to the centre marker. With a little practice it is soon possible to gauge the quantities required for any rate of dressing. If several people are working together, it pays to have one filling a spare set of buckets so that there is no delay on this account. Hand broadcasting has the additional merit that it frees a tractor for other work; an important point in a busy spring. Although, if a tractor is available buckets can be filled direct from it, and then moved on as required.

In farming, unlike industry, very little work is done at a table or bench. Repairing tools, grading eggs, trussing poultry, packing fruit, are probably the main tasks in which it is involved. Where a table is used, the correct height is usually considered to be that at which it is possible to lay the palms of the hands flat on the surface, and this makes the level at which it is convenient to stand or sit. For a woodworking bench, elbow height is usually accepted. If the workers vary in height, it is fitted up for the tallest and a platform is provided for the others to stand on.

Where eggs are to be graded from a bucket standing on a table, then the egg trays should be raised to the same height as the top of the bucket. If they are to be graded into 'firsts', 'seconds', and soiled, then the 'firsts' should be on the right-hand side, the 'seconds' on the left, and the soiled behind the bucket, as viewed by the grader. It sometimes helps to have the egg trays sloping up from the operator, especially if hatching trays are being filled for an incubator. An average person has a reach of about 2 ft. on each side of the bucket, but the shorter the distance they have to reach, the quicker the process. Both hands can be used in the bucket, and with a little practice the eyes need not follow each egg to its tray.

It takes some practice to use both hands equally and simultaneously, but every effort should be made to do so. Continuous circular movements in a steady rhythm is preferable to a backwards and forwards motion. By picking up a soiled egg and a clean one together it is possible to deliver the one in front and the other to the left in one circle and vice versa. One hand should not be used for holding, neither should one egg be transferred to the other hand for packing on the correct side. As in all work, a comfortable working position should be found and maintained. In all work that involves standing in one spot, avoid a concrete floor in winter-time, for the feet become quickly chilled on this material. Ideally, in all work one should have warm feet and a cool head.

Now we come to the least acceptable of all manual work, that which involves bending and stooping, as in picking potatoes, pulling turnips and the like. This is work in which women excel, and it brings out what a great difference anatomical construction can make. A woman's centre of gravity is about 4 in. lower than in a man, and this gives her a range of nearly 25 per cent more in reaching from a crouching position before toppling over. This difference can be clearly illustrated by the distance a woman can stand from a wall, and after putting her

head down to touch the wall, can recover her balance without using her hands. A woman can do this quite easily standing the distance of three times the length of one foot from the wall, a man's limit is two and a half times the length of his own foot.

Fig. 9. A Balanced Crouch

Probably the best and easiest stance for potato picking is to combine a stoop with a crouch, that is to say, the back and knees share the convolution, the feet being about 1 ft. 9 in. apart, which with a receptacle between the feet will still permit the elbows to come inside the knees. A suitable container for the potatoes adds considerably to the efficiency of the movement. A light, low, oval-shaped wire basket, which can be moved on with two hands is best. A bucket is too high, involving lifting each handful of potatoes an extra 6 in., and does not lend itself to being easily moved on with two hands; and for that reason there is a tendency for the picker to hold it with one hand, and pick with the other—a considerable loss of efficiency.

In planting out small seedlings, when the bundle of plants is held in the left hand, and each individual plant inserted with

the right, weight can be supported by the left wrist just above the left knee. This position also brings the hands reasonably close together for transferring the plants from one to the other.

The general guiding principle in all farm work is to see that the method or motion is the simplest and the most straightforward which will meet the needs of the job in hand and be best adapted to the physique of the individual concerned, by eliminating stress and strain. Beyond this, by far the most valuable piece of advice I can give on any aspect of manual work which involves bending, or even looking down, is to *lift the head upwards and forward* before starting the motion, this automatically straightens the spine, and will always make the work much easier. It is so simple that it has to be tried to be believed, and it amazes me that it is not universal knowledge. There is a whole school of medical thought based on the simple stretching of the cervical vertebrae, which may, or may not, have all the answers, but it is the most important thing I know in saving physical effort. Farm work should be pleasant and easy, practice, with knowledge, can make it so.

CHAPTER III

Studying Farm Work

When you have people who are skilled, willing and reliable, it is still necessary to organize their labour to the best advantage. In recent years quite a lot of thought and time has been given to this aspect of work under the heading of *Work Study,* or as it used to be known, *Time and Motion Study.* As in the acquisition of skill, the main object is to obtain greater output of useful labour for less time and less physical effort. There is some opposition from organized labour in this field of study, on the grounds that men may work themselves out of a job; on the other hand willing co-operation may make it possible to reward labour in proportion to its capacity to earn. Apart from that angle, there is no object in working harder or longer if a little thought and study can enable us to eliminate loss or waste of time by the adoption of more efficient methods.

Work study is not new, it is only the more scientific approach which has aroused attention. Those of us who went to plough with horses, knew that our masters expected an acre a day, that involved nine hours in the field, steadily plodding on for thirteen miles, ploughing 6 in. deep and 8 in. wide, and the number of furrows for each field according to the direction of ploughing was known and expected to be turned during the day.

Many jokes have been made at the expense of some of the

productivity teams which are either sent from America or go there to study, but which only illustrates the poor choice of people selected for the purpose. We are told with due solemnity that the elimination of tea breaks in the British building industry would result in several more hours' work a week, but we do wonder how much of real value has been missed. Those are the things we must find for ourselves.

It has often been said that work study is merely the application of common sense in an organized way. First you select the work to be studied. Record all the main facts bearing on the present and proposed method. Examine the facts critically. Plan the most practical and effective methods, having regard to all the economic and other aspects. Once it is determined, install it and try it out. If it is proved, then it should be adopted as a standard practice; and care taken to see there is no slipping back.

It has been found in industry, and for that reason often advocated in farming, that as large a section of the organization as possible should be studied. Personally I believe that the study is so involved that it should be tried out as separate units and then incorporated in the whole. For in farming there are many considerations which do not apply to ordinary industry which must have an important bearing on any proposed reorganization of labour—and it is towards the saving of labour that work study is directed. Weather has a very important influence on outside work, while with livestock something more is involved than the dumping of a certain quantity of food in the right place at the correct time.

It is possible to devise dry-mash hoppers and automatic water troughs for pigs which only need attention once a week. By their adoption it might be possible to reduce the labour charge from 365 hours to sixty-five in the feeding of 365 pigs annually. But if the system permitted each pig to waste 2 oz. of food daily, either down its throat or on the floor, the saving

would be entirely wiped out. Also if the man failed to notice a bunch of pigs which were off their food in time to isolate them and prevent an outbreak of disease it might be calamitous. On the other hand, if a little reorganization of the work did give him time in which to study the pigs no time could be better spent.

Work study is discredited only if we think it involves nothing more than the clever little man with his plan of the cow-shed or pig-house running a piece of cotton round a series of pins as a means of calculating how far a man must walk to go about his daily tasks. This may be the basis of the study in which other considerations are taken into account.

The best planning is done before the work ever starts. If, for example, we are going to put half a dozen poultry houses on to a stubble field for the birds to have free range, then they should be equally spaced at the six points of a hexagon, all equal distance from the hedge. If water was to be provided at only one spot, then it would be best placed in the centre of the circle. For egg collecting, shutting up at night, and supplementary feeding, etc., the man would walk the minimum distance with which it is possible to give the birds the maximum free range, discourages them from laying away in the hedges, and reduces the risk of the birds tending to crowd into houses at one end of a line. In this it will be seen there are several points to be considered in the management of the birds as well as making the best use of the man's time, which incidently this layout also provides.

For those of us who can plan our own set of farm buildings, the convenience and saving which might come from having everything under one roof has to be balanced against the risk of fire, and due allowance must always be made for future expansion, which might otherwise unbalance the original plans. A food store placed at one end of a building may be very convenient, which end may not be important, but if the building

is to be extended at some time, should it still be at the end of what will become a very long building, or should it become a central store to serve both wings ?

An important development in planning in recent years has been to make provision for tractors, mounted with a high-lift, to go right into the buildings for cleaning-out purposes. The utilization of existing levels to provide ramps for loading and unloading has also received more attention than in the past.

Troughs mounted on the outer walls of open yards, with or without yokes, can save a great deal of labour in opening and shutting gates and going in among stock with their food. A Dutch barn in the right place can provide a useful windbreak, apart from providing facilities for feeding and littering. With careful planning in the first place it can be used to extend the yard as the produce is consumed and the livestock grow.

A substantial capital outlay may be justified if it will save a man's labour—and especially so if a suitable man is not available. At £500 a year he represents the interest on at least £5,000; and on a great many farms that represents about the average capital invested for each person employed on the farm, apart from the freehold value of the land.

But any outlay is only justified by a long-term policy suited to the farm, and any system of farming that might be adopted there, from all grass to pure arable. We are all too familiar with the ranges of brick and tile pig-sties of an earlier generation, which seem a sin to destroy, but are quite out-moded.

As far as one can see we need general purpose buildings: very high, with wide spans, the stanchions being bolted into the foundations so that the building could be moved with the minimum of expense if necessary. The building should be high enough to take a second floor if desired, for deep-litter poultry keeping, or for storing fodder (other than for dairy cows). The building could have temporary walls bolted into the stanchions

where required, and for which suitable provision could be made at the time of erection.

In such a building it is a simple matter to plan the layout and routine work to the best advantage. The building being subdivided with iron hurdles, or for some purposes two chains hooked tightly across at 2 ft. 6 in. and 36.6 in. from the ground.

Most farmers will still have to make do with existing buildings. Then the first aim must be to reduce carrying and walking as much as possible. A man develops about 1½ horse-power carrying quite a heavy weight at 3½ miles an hour; which is very expensive transport at something over a shilling a mile. With a suitable truck or barrow on a level surface he can take five times as much, providing provision has been made for getting round corners and through doorways. Where cows are milked in long sheds and everything is mounted on a truck, from cleaning towels to milk churns, then many miles and hours will be saved in the course of the year.

The ultimate test is not the time or the mileage saved, it is the stock units which can be efficiently managed. Research at Cambridge established, from records kept on a number of well-managed farms in the Eastern Counties, the annual labour requirements in terms of Man Days. This system has now been generally accepted as a fair guide in other parts of the country; although an analysis based on the Agricultural Returns would indicate that only 219 man days per unit of labour engaged in the industry (farmers and workers) would be required to manage the stock and crops in England and Wales. Either we have too much labour, it is badly distributed, or we should be producing more, if the general average was equal to the farms in the original survey.

While the standards laid down are such that will ensure a reasonably good return for the labour employed, it is still possible to halve the time required to manage a given number of stock units, by careful planning and good organization, and at

TABLE OF MAN-WORK UNITS PER ACRE AND PER HEAD

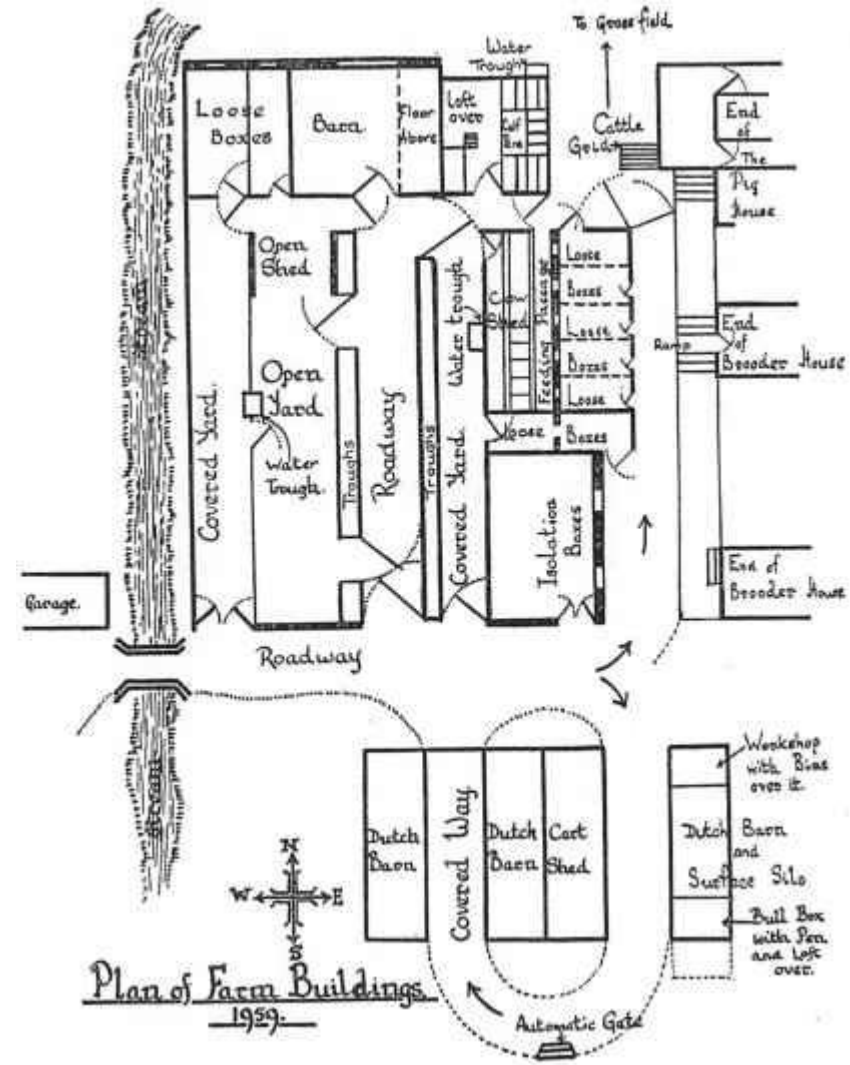
Crop		*Man-Work Units*
Wheat, Barley, Oats, Mixed Corn	Cut by Combine	2
	Binder	4
Peas, Beans	Combine	3
	Binder	5
Sugar-Beet		20
Potatoes		20
Fodder Roots		20
Kale (Folded)		7
(Cut)		14
Arable Silage		4
Temporary Grass		
Hay/Silage		2½
Second Cut		1
Grazing		½
Permanent Grass		
Hay/Silage		2
Grazing		½

Livestock	*Man-Work Units*
Dairy Cows	18
Nurse Cows	3
Cattle	
Over 2 years	2
1 to 2 years	3
Under 1 year	4½
Bulls	3
Sows	5
Boars	1½
Fat Pigs (No. sold)	¾
Laying Hens	¼
Pullets reared	1/10
Cockerels	
to 12 weeks	1/20
to 28 weeks	1/10
Ewes	1½
Store Sheep	1
Rams	1

Labour available is calculated at the following conversion rates: Stockman, 350 man-days. Tractor driver, 320 man-days. General worker, 300 man-days. 15 per cent is usually allowed for maintenance work. It has been shown that on a great many farms the work units per man are about 270.

the same time incorporate each section of a mixed farm into the whole, so that the individual worker can switch from one to another without loss of time. For on the smaller farms it is not possible to have one man solely employed in each department, and even if it is, there are times when two or more could co-operate for peak periods such as milking.

Let us consider an existing set of buildings, which have been added to over the years, but always with the intention of pro-



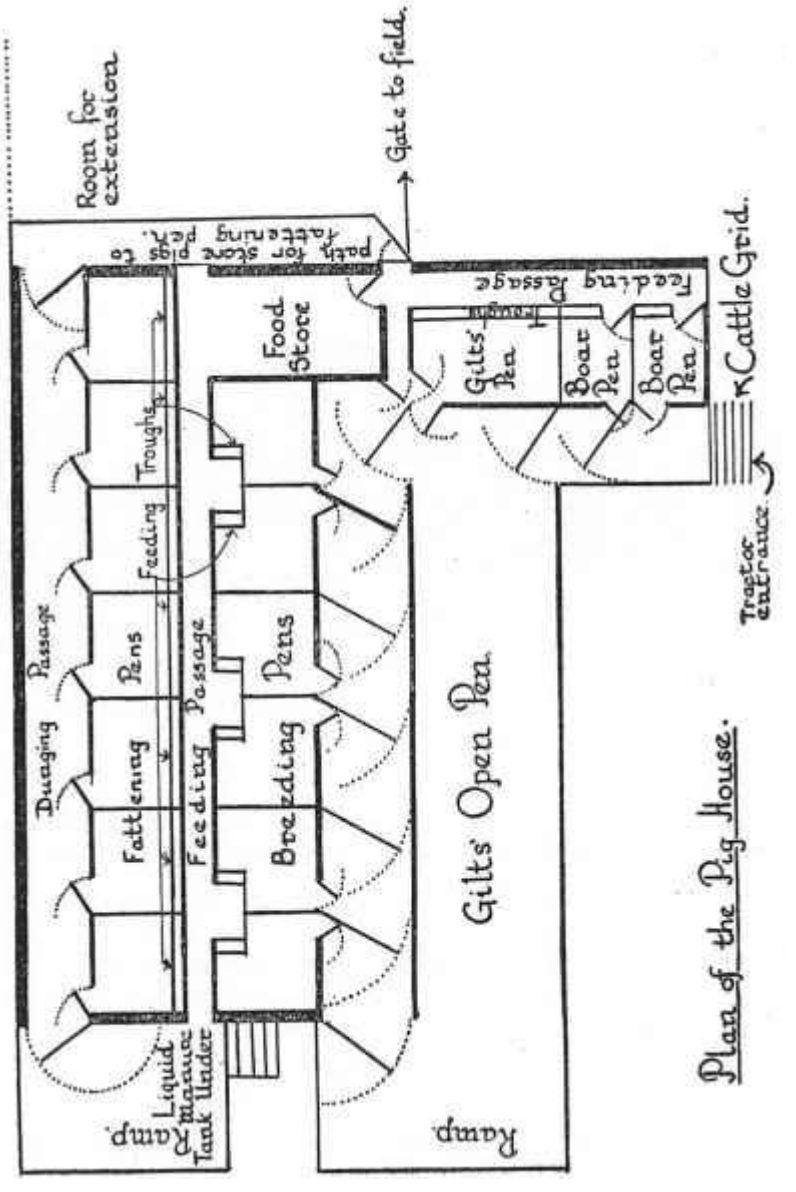
viding the best possible conditions for the stock, with the maximum convenience for those engaged in looking after it, within the limits which the site provides.

First, a hard road serves every building. A gentle rise from west to east means that loading ramps were easily provided for the Pig House, and Brooder Houses. Roots and silage stored in east Dutch Barn can be brought down to the cattle yards. It is also possible to load in central Dutch Barn from the back of the adjoining Cart Shed at trailer level—which is very convenient for loading corn threshed and stored in Dutch Barn, or loading a heavy machine on to a lorry.

The covered way between the Dutch Barns is very convenient for standing loads of sheaves overnight, or for threshing under cover in wet weather. The space could also be used for stacking corn, and then threshing it out by setting the machine across each end in turn.

In regard to the livestock; and to take the cattle first. There is direct access to each yard from the road for littering and cleaning-out purposes. Outside troughs are mounted on the walls, to give the maximum feeding space and convenience for feeding. There are water troughs in the yards, and feeding hatches and water-bowls in the loose boxes. Corn bins (to hold a week's supply of concentrates) are placed where needed. Loose boxes have removable divisions so that two or more can be thrown in together, or all cleaned out mechanically at one time.

When the buildings are fully stocked with cattle it only requires 140 man-days against the standard 240 as shown in the table. There is this saving of time in spite of the fact that roots are pulped and mixed with chaff (to make the best of the farm's resources), and silage is fed according to the needs of the animals, and not on the more recently introduced 'Self-Feeding' system. No economy can be found in wasting good food to save time, when time and expense has been involved in obtain-



Plan of the Pig House.

ing that food. One of the advantages of efficient organization is that it provides the time which is needed to do the job properly.

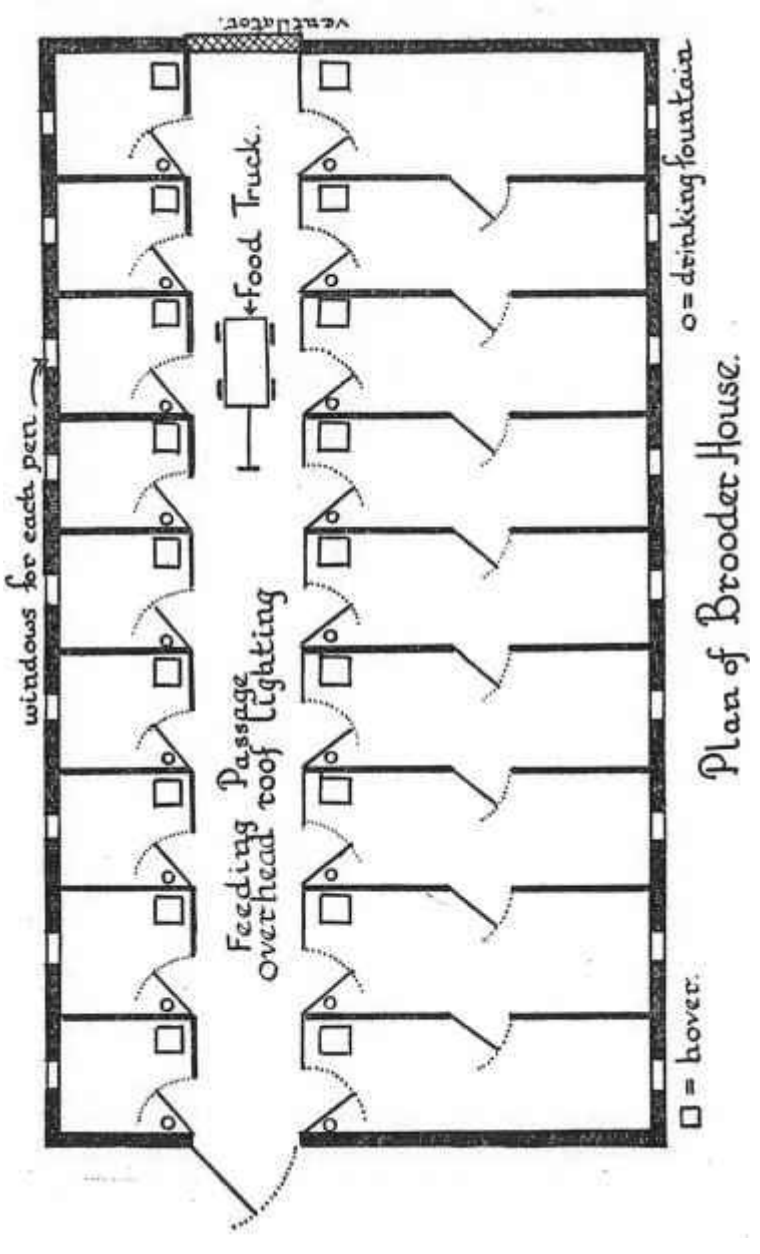
In the pig house illustrated, and built twenty-five years ago, accommodation is provided for 12 sows, a boar, and a through-put of 200 fat pigs a year, which would require 210 Man-Day Units on the Cambridge scale, can actually be done in 90 Man-Days, or two hours per day. Twenty-one Man-Days can be saved by having water tubs and taps in such a position that four pens can be watered from each—the dry meal having been put out first in the troughs. Alterations to provide for mechanical cleaning-out now provide for a further saving of time below the 90 Man-Days specified.

In the brooder house, in which over a quarter of a million chickens have been reared, the labour efficiency is four times as great as that laid down by the accepted system of calculation, although the birds are reared in smaller units than on most farms today.

Provision has also been made in the barn for storing, grinding and mixing, with bins on four levels, advantage having been taken of a high, old building. With a sack elevator for bags, and a screw elevator for loose grain, supplies can be taken in, and delivered out, either at the back or the front of the building. It can also be taken off at two levels—to a tractor trailer behind the building, or at ground level in front.

Cattle grids, and automatic gates, which enable a tractor to be driven straight on and over, can represent a considerable saving. It takes between two and three minutes per gate. It can be shown that no less than thirteen movements are involved. If this is done four times a day, it represents from 50 to 75 man-hours in the year. To have a tractor running idle for that time is also expensive.

This set of buildings, fully stocked, would enable an active man to deliver some 1,100 Man-Work Units per annum, or



Plan of Brooder House.

nearly four times that which would be normally expected. This shows the possibilities of sound planning, good organization, and without any great outlay. For the most part the buildings have been cheaply erected or adapted by farm labour. They have long since paid for themselves, and could be scrapped if necessary and replaced if a new plan or reorganization of the farm was thought necessary.

The main essential in farm building planning, is to have good access to every building, but with the minimum of running about; sunlight and fresh air, without draughts; water taps, troughs, and corn bins at the most convenient points.

In the use of farm buildings, the planning of routine is of the first importance, arranging an even flow from one job to another, elimination of unnecessary walking and carrying. Cleanliness has a place, slippery concrete is dangerous to man and beast. Littered straw or hay is not only wasteful, it can lead to fire. When carrying has to be done, it is better to have gates opening from you, and towards the stock they restrain. Not only is it easier to get through, but there is less risk of the stock getting out. Full loads reduce the number of trips. Double handling should be avoided. Definite places should be provided for tools. It is worth keeping a shovel or a fork at a point where it will be needed, rather than fetching and carrying it back two or three times a day. But a tool must never be left where an animal can knock it down. All paths and gangways must be left clear at night. Serious injury might result from falling over a wheelbarrow if in an emergency you have to run in the dark.

Electric power should be used wherever it is possible to save human effort, and grinding, mixing, pumping are the most common purposes for which it is installed.

Good lighting, and the placing of the lights, which at key points should be wired for two-way switches, can make an important contribution to more efficient working. Electricity, which travels at 186,000 miles a second, is very cheap com-

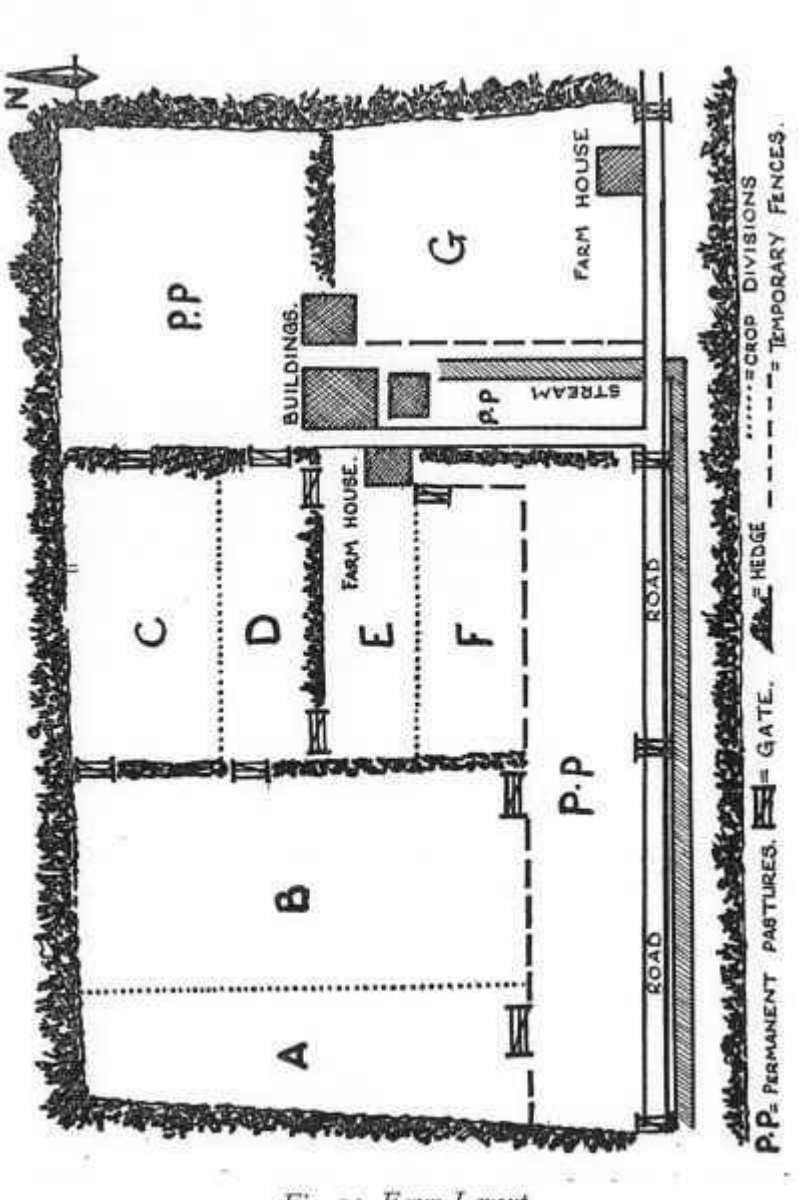


Fig. 13. Farm Layout

pared with a man's walking time; especially if it otherwise involves carrying a lamp or torch in one hand. An inspection lamp on a long flex can be very useful in places where light is only very occasionally required.

While most workers prefer to have their own tools for hand work, and it is a good plan to make them responsible for them, there is some equipment which has to be used in common, and which all should know how to use. It is a mistake to have only one man who can put on the milking units, or back a loaded trailer into a shed.

On many farms more than half the man-hours are spent round the buildings, but there is still ample scope for work study in the fields. It may involve changes in the rotation of crops, the putting in of extra gates, as well as in the organization of routine and the individual processes involved.

At Oathill Farm, for example, as originally laid out and cropped when we took it over, there was no access to sections A, B, C, D, E, F, had we wished to strip graze then while the other land was in crops. But with reorganization as follows, it is possible to arrange strip grazing with a run-back to water and permanent grass, but by also retaining the original gateways it is possible to haul direct across the fields, should they be clear at harvest time. Both systems give alternate routes for the drawing-out of manure, and also in going to plough. If section D is in stubble awaiting the plough, but A or B is being ploughed first, then furrows can be drawn in D as the tractor is running to and from its work—saving idle running, and getting a start in the next field.

It is an aid to efficiency to know how many drills are required for an acre in each field, and the total number required to cover the whole field. I know that in section A there will be 20 rows of roots to an acre, or 4 runs with the corn drill—an aid to setting hoeing piece work, or the exact quantity of seed can be put in and checked.

Where all the necessary equipment is supplied, the next step is Work Simplification, which is the finding of quicker, easier and more economical ways of doing the farm jobs. The method is to make a detailed list showing what is done by each man, what is done by each machine, and what happens to any products or materials used in the process.

A careful analysis is then made on the basis of: Why is it necessary? Where should it be done? When should it be done? Who should do it? and What is the best way to do it? All this is done in relation to the layout of the buildings, equipment, flow of work, and any other factors which have to be taken into consideration.

The next stage is to eliminate unnecessary elements, combine elements where possible. Rearrange for better sequence, and simplify where possible.

Then try out new methods under actual working conditions. Make sure the workers understand the details and the reasons for the new method, and get their opinion, and suggestions for improvement on the reorganization.

Then the new methods are followed until you are sure it is fully accepted and cannot be further improved. Where full co-operation has been obtained, there always seems to be a quickening-up, not always due to an improvement in the organization, but to the general tempo of interest.

When the last graph has been drawn, the stop-watch put away, and the cotton wound up, the most important factor in work study will be the character and personality of the farmer. The man who is master of the job, who can show others how it should be done, and winning the co-operation of all concerned, can plan and organize the work in such a way that the extra man-hours which become available can be profitably used and adequately rewarded, not only in terms of money, but in job satisfaction—which is found in the elimination of strain, the relief of monotony, and a renewal of interest.

CHAPTER IV

Farm Tools

The selection of hand tools, in relation to the work which has to be done with them, is an important consideration which is apt to be neglected. There is a tendency to make do with whatever may come to hand, or the local ironmonger has to offer. We cannot blame the toolmakers, they offer us such a wide variety that it should always be possible to select the right tool for the job. Nearly a hundred years ago Richard Jeffries wrote: 'The billhook is the national weapon of the English labourer.' Today one manufacturer offers no less than thirty-six different billhooks, each in four different sizes. We have a choice of a straight or curved blade with a single or double edge; and a round, oval, caulked or pistol handle.

The variation in the vast array of tools is very intriguing to the student in pondering on the reasons for the many shapes and sizes, and the factors which may have brought them about. Man devises tools for a certain purpose, and they depend on the nature of the material on which they are to be used, and if the material remains unchanged so does the tool. If we draw a straight line from Beachy Head to Solway Firth we will find to the east of that line a tool designed, but still in great variety, for dealing with tough thorn; to the west of it, in even greater variety, a tool more suited to hazel, bramble and briar. In the

central districts we have a tool which shares the principal features of both. How far back that choice may go is difficult to say; the Celt, Saxon and Teuton, all seem to have had their preferences which have some bearing on the shape of the tool. But it is from these that each district develops something best suited to its needs, which are in turn reflected in soil and climate. A broad band of stone-walled country, on which hedges will not grow, such as Dartmoor, the Cotswolds, or Pennine Chain causes no sharp demarcation, the culture will spread round the edge. But you may find a sudden change within a mile between two villages. The men of the Oxford Plain and the Wychwood Forest, until at least a very few years ago, had very definite views on the most suitable tools. It may be influenced by the materials on which they have to work, but some observers in other spheres believe the people to be of different racial stock, which may account for it. The tools would suggest the Forest people are of Celtic origin, a little community which survived when the Saxon, Dane, or Norman, took the better land all round them.

The same demand occurs in slashers, staff hooks, brushing hooks and switching bills; as you travel west so the tendency to choose a tool with a greater curve increases. The Hexham slasher is straight, likewise the Pennine, but the Derbyshire has a slight curve, in the Lancashire and the Monmouth it is more pronounced. While the staff hook does not appear to be used in the Eastern Counties, the West Country pattern has a greater curve than the Midland or Wiltshire. Where brushing hooks are used we see the same co-ordination in demand, although they are curved in all districts, the Ledbury, Monmouth, Tenbury, and Welsh, all show a greater curve than the Midland, and even more than the Lincolnshire. A feature which depends on the manufacturer shows greater uniformity, with a strapped ferrule, tanged, or oval socket, but the countryman still insists on the familiar tool of his district, unless he has migrated, and

will be duly gratified if you recognize him as a Lincolnshire man in Pembroke, or a Lancashire man in Essex, by his tools.

Unlike the foregoing tools, the axe seems to have been more or less standardized. We know that apart from the material from which it is made, and the skill in making it, it has remained almost unchanged from neolithic times. From the Greek 'ax', the Latin 'Ascia', the French 'Hache', where they do not pronounce the 'H', the German 'Axt' and nearly all the other countries of Europe show it has a common origin and use. It is the tool we must use to clear the land in the first place for cultivation. Although the principle is the same, there is still a wide choice from a 1¼-lb. head and a 14-in. handle in the Household Hatchet to a Wedge Axe with 36 in. handle and a 7-lb. head. The Hedging Axe will go up in quarter pounds from 2 to 3 lb. in weight and from 24 to 32 in. On a neglected hedge it is sometimes necessary to use a 4½-lb. axe to cut some of the bigger material out. With axes there is also a choice of either ash or hickory handles. With the larger axes there is a range of length of handle from 32 in. to 36 in., which may be 'Fawn Foot' or straight. They can also be bought without a handle if desired.

An axe is an expensive tool to buy, but it is worth having a good one, it becomes fitted to one's hand, is a joy to use, and with proper care will last a lifetime. It can even be passed on from generation to generation, if we are like the old countryman who claimed his axe was three hundred years old and had only had three new heads and four new handles!

The very best axes are today forged from high-grade manganese chrome steel, they are precision ground, and have perfectly balanced handles for the weight of the tool. One leading manufacturer offers the following instructions to enable their customers to make the very best use of their tools.

Use a wet wheel or file for grinding the cutting edge; grinding on dry wheels will soften the edge, and reduce the life of the axe.

After filing rub strongly with a piece of leather or whetstone to remove roughness.

After use wipe the edge dry and clean and put a smear of grease on the edge itself. An axe loses its keenness if the edge becomes flecked with rust.

Do not use the head of the axe for striking hammer blows. Do not use it as a wedge.

If the axe sticks, ease it out gently by raising the handle up and down—pump-handle fashion. Do not force the handle out sideways; you may break it or twist it out of alignment. Striking the axe with a sledge hammer is not recommended.

If by misuse the handle is broken do not burn out the eye. This might cause the eye to warp and will certainly soften the cutting edge. Factory fitted handles are selected, inserted and wedged with scientific care, and should only be changed if absolutely necessary. Reasonable care and protection of the handle should avoid the necessity of changing it.

If handled tools are stored in a very dry shed for any length of time there may be a tendency for the moisture content to dry out of the handle and this may lead to loosening the handle in the head. Immersion of the head and handle of the axe in a bucket of water for a few hours will usually rectify any tendency to loosness through this cause.

Do not let frost get into the axe. In cold weather, when not in use, keep it in a place protected from frost. The very best axes are provided with an appropriate gauge and protective leather sheath for the cutting edge. *Use them.*

Another tool in common use all over Europe, for use on common material, is the scythe. The essentials in design are the same, although a shorter blade has been accepted for use among the rocks and stones of Scandinavia and other mountainous parts of the Continent.

The Romans introduced it into Britain, and the name is derived through many forms from the Latin to cut. The word

sickle obviously comes from the same source. The swath, left lying after being cut, is still low German for a scythe. Where the common name for the sickle, bagging-hook, badging-hook, fagging-hook, is derived from is doubtful. It may come from flag, an old name for coarse grass, the 'l' being dropped as in a number of English words like Malmesbury, Alnwick. Or it could come from fag, meaning weary toil. The modern Italian for fag means work. Also in Italian, French, Spanish and Portuguese, they share a word of common origin for the scythe, all meaning to cut. A mowing machine is literally a cutting machine. Our word mow comes from northern Europe. But where grass or corn is to be cut by hand, nowhere have they devised a better tool.

While the axe, the scythe and the sickle, for common use on a common substance tend to be standardized, the spade will vary with the nature of the soil on which it is to be used. A Jersey spade measuring 9¼ in. by 12½ in. gives a surface area 25 per cent greater than a Guernsey spade of 8½ in. by 12½ in. The Guernsey spade will also be square-mouthed and treaded, while the Jersey tool will be round-mouthed, and will not need a tread for the lighter soil of that island. Although whether a tread is fitted or not depends in many districts on personal choice. It saves cutting the soles of the user's boots, but makes the tool a little harder to clean. On a light soil which does not stick we may find the tread in favour, and on a sticky clay it may be disposed with. At the same time we can have a combination of the two types in one spade; a London treaded spade has a round mouth and a heavy tread, while a Scottish treaded spade has a tapered blade and a square mouth, with a lighter tread. A Cheshire spade has a round mouth, but no tread, while a Yorkshire spade has a square mouth and no tread, they are otherwise identical in size. One can also get a Boy's or Ladies' spade which has just over two-thirds of the surface area of the others in its blade, and is about the right size for anyone up to

eight or nine stone. At ten stone one should be able to handle a man-size tool.

There are also special spades made for rabbiting and mole catching. The rabbiting tool will have a blade twice as long as it is wide, with a rounded mouth, and a choice of straight or tapering edges, varying in size from 12 by 6 by 5 in. to 10 by 6¼ tapering to 4-7/8 in. The Mole Paddle is the smallest spade of all, 6 by 4-3/8 by 4 in.

When we come to shovels we have a truly amazing range of tools from which to choose; one manufacturer alone lists 110 different shapes and sizes, with a surface blade area varying from 208 square inches to 84. We can have them tapered, round or square, with an open neck, solid neck, open socket, or solid socket.

It is in the shovel that we see the racial choice most strongly marked, the so-called Devon or Welsh socket shovel is used wherever you find the Celtic people, in Cornwall, Wales, the west of Ireland, up the west coast of Scotland, and of course in the Western Isles. Tools which the majority of Midland and Eastern Counties farmers have never seen. Although while insisting on the shape and design of a tool which is so different from the conventional shovel in design, there is nevertheless considerable variation within a county. The Cornish shovel will vary in weight from 2¾ lb. to 5¾ lb., and is almost as wide as it is long from 11 by 11½ to 14 by 14½ in., in seven sizes. The Penzance shovel will vary in weight from 2½ to 5 lb., and from 9 by 10½ to 11½ by 13 in. in eleven different sizes. The Truro with a range of six sizes from 3 to 4½ lb. and from 10 by 11 in. to 13 by 14 in.: yet in no size or weight corresponds with either of the other two. There is not more than forty miles between Penzance and Truro and they are both within Cornwall. No one can explain the preference so strongly marked in local demand. One must feel that the manufacturer and stockist would like standardization in this long-handled tool, which to

the Saxon and Teuton seems so awkward, and yet the Celt uses with effortless ease for many different jobs, and knows exactly the size and weight he requires.

While a farmer may manage with a general-purpose shovel, he must have a range of forks.

A manure fork has four long, slightly curved and rounded tines, with a choice of a long or short handle. Taking a line from Dorset to Northumberland it would appear that east of the line they favour a long handle, and to the west of it a short handle. In other words, in the arable districts where there is a lot of long straw to tread down into manure they find a long handle more convenient, and where the manure is shorter, the corresponding tool is selected.

Potato forks have long flat tines and are designed for lifting potatoes, to use a manure fork for this purpose is to bend the tines and ruin it. But a potato fork can be used as a garden fork if care is taken, and it is used for loosening soil that has already been dug over. When lifting potatoes, the fork is used from the side of the ridge, driven right under the plant and then levered down. With care none of the potatoes are speared on to the tines. While a potato fork is suitable also for carrot lifting, a spade should be used for celery, leeks, and similar crops.

A garden fork has four or five straight tines, which may be square or rounded. They are made in several sizes. It does not take the place of a spade, except in a very light, loose soil. Its main purpose is to loosen up soil, which has already been dug, and we hope well frosted, before raking it down to make a seed bed.

With the advent of the pick-up baler for hay and the combine-harvester for corn the traditional two-tined fork may disappear; but the farmer who is not so far advanced will still have to provide a long fork for every man he has pitching sheaves on to a load, and short forks for pitching into an elevator and for rick building whether it be of hay or corn. The tool is stan-

dardized everywhere, but care should be taken in selecting long-grained handles, free from knots and other blemishes.

Where wooden hay rakes are used, we do not look for high quality materials, but if they are well made and carefully used they last quite a long time, and are easily repaired on the farm if a tine or two is knocked out.

In selecting a hoe we do not go far wrong if we bear in mind the purpose for which it is to be used, which is to single plants in a row and to kill weeds. The tool which gives us the greatest visibility is the Swan Neck, it may cost a little more, but the best craftsmen I have known have always preferred it, at least for mangolds and beet. Where turnips are planted on a ridge, as in Scotland, there is some good work done with the Short Neck. Hoes are made in many sizes, but you can have one with interchangeable blades, and use it for anything from cutting thistles in corn to singling mangolds 10 in. apart.

It is a tribute to the soils of Britain that a mattock is seldom used, except for grubbing out tree roots; but over vast areas of the world it is the principal tool for cultivation, and our manufacturers export them by the hundred thousand in many shapes and sizes. There are a number of jobs where it can be used to advantage, and will be found 50 per cent quicker than a spade: in digging up root vegetables, loosening the soil in the bottom of a ditch ready for shovelling out, earthing up potatoes in the garden, and breaking up subsoils which a spade cannot touch, as in digging a grave. The usual size in this country has a 4-in. blade and a 48-in. handle. In Wales the Neath mattock has a 2½-lb. head and a 42-in. handle—catering for the short, sturdy Celt. There is also an Axe Eye hoe, as it is sometimes called, but is really a mattock with a choice of a 5, 6, 7, 8, or 9-in. blade and a 48-in. straight handle.

For the whole range of farm tools there is a wide choice of handles. We can have the riveted eye or 'D' handle; the split 'D' or wooden 'Y-D' handle; metal-top handle; shaped crutched

or 'T' handle; oval or barrel crutch handle, 28, 30 or 32 in. for the former, and 32 and 34 for the latter. We can have a long straight handle with knob for any tool, length 39, 48, 54 and 60 in., or any other size to order. The manufacturers endeavour to cater for every need.

In catering for a very conservative industry the manufacturers make progress where possible. Hay knives are being used to a lesser extent on hay, but they are not really suitable for silage, and so a special silage knife has been put on the market. It is hollow ground, the handle is offset to allow cutting at an angle, and is cranked to avoid bruising the knuckles. This tool involves about 20 per cent of the effort required by a conventional hay knife, and can compete very successfully with the more expensive mechanized tool that is also offered for that purpose. This tool can still be used for cutting hay, straw or bales if required, but greater care is necessary to keep it bright and sharp, and to protect it from accidental damage, than was ever meted out to the old-fashioned hay knife.

With a full range, and a tool for every job, a good set will last a lifetime. They should never be left out at night, protected from rain and frost, and cleaned immediately after use. All soil or manure should be removed with a wire brush, and then, when clean wiped over with an oily rag. Soil from the handle should be removed with hot water and a scrubbing brush if necessary, and occasionally given a little linseed oil to preserve the wood.

Tools with a cutting edge should be kept sharp with a smooth file or stone, rubbing from the shoulder to the point. A dry grindstone will destroy the temper of the steel. Tools should be hung with the handles down: with a place for everything and everything in its place, so that if any tool is missing the loss will be apparent. A broken or missing tool should always be reported, so that it can be replaced or traced immediately. A tool left out is a loss to the farmer and a possible danger to man or beast. A tool not available for work when required may cost

a lot more in lost time or making do than its replacement. Farmers and gardeners spend over £1,000,000 a year on hand tools. Greater care of what we have enables us to have a greater range for future use, for the same outlay.

Apart from the usual range of tools associated with the land and crops, a farmer may need a cross-cut saw, iron bars, wedges, a sledge-hammer, and if he makes hurdles, a paling froe or cleaving axe.

A good range of woodworking tools, for repairs and the building of poultry houses and the like, could even save their cost on the first big job. The bare necessity is a good general-purpose saw, a steel jointer plane, a spokeshave, a set of chisels (ordinary 1 in. and ½ in. and a mortise ¾ in.), a brace (preferably with a ratchet for use in awkward places), with a range of bits. A screwdriver, mallet, a light and heavy hammer. An oilstone will be needed to keep the plane blade and chisels sharp.

For the repair of machinery another range of tools is required. It is usual to have a few general-purpose tools with which to start, and to add to them as the need arises. A set of spanners, a wrench, a hacksaw, pliers, a cold-chisel, a drill, tinman's shears for cutting sheet metal, and a good stock of washers, nuts and bolts, are the minimum requirements. For fixed equipment, a solid bench and a good vice are essential.

Whether buckets, ropes, lanterns, creosote and paint, come under the heading of farm tools I do not know, but I like to see them in the farm workshop or store. In fact a well-equipped workshop is not only necessary for the efficient management of a farm, but it can keep people happily employed in the worst weather.

There are some tools, or at least aids to work, which we can make for ourselves. A typical example is an old oil barrel with the bottom knocked out to be fitted into a potato sack—to hold it upright and open for filling—and then easily withdrawn, leaving the sack full.

CHAPTER V

Hedging, Ditching, Dry Stone Wall Building and Fencing

The most conspicuous feature of the English countryside are the hedges which surround our fields. It has been estimated that there are at least 500,000 miles of them—sufficient to encircle the globe twenty times at the Equator—and assuming the average width to be only one yard these hedgerows occupy a quarter of a million acres. To sacrifice one hundredth part of the land to provide a stockproof barrier may be well justified where there already exists a well-managed hedge; for considering its very long life it is still the cheapest form of fencing which can be provided.

Most of our hedges date from the time of the enclosures, when every landowner was required to fence the land allotted to him (and marked with a ditch) within twelve months. This must have denuded the whole countryside of timber, and brought home to the occupiers the importance of providing a living fence and the possibilities of hedgerow timber. Even after the heavy demands of two wars the Forestry Commission found in 1951 that 33 per cent of the standing hardwood trees were to be found in hedgerows and parkland. If anyone required proof of the age of the hedges (apart from counting the annual growth rings in a cross-section of an old tree) notice how

railway lines and canals cut through what must originally have been square or oblong fields, while our roads do not; more often they wind round the boundaries of our old open fields. On the Roman roads we still find the landmarks which divided up the estates, and within them we see how a later generation planted the hedges.

The main object of a hedge is to present a living barrier against livestock, and this is best effected by a well-laid hedge. Laying does not benefit the hedge plants as such, it serves a purpose in restraining livestock while the hedge is growing up again from the bottom, so that in due course when the old hedge laying dies out, the process may be repeated. Hedge cropping, the mere cutting back of growth, is not so effective, as the hedge tends to get thin at the bottom and gaps appear through which stock may escape, while a really well-laid hedge is hen proof. But laying or cropping does preserve the life of the hedge in preventing the individual plants growing into trees.

On many farms the management of hedges is open to severe adverse criticism. A couple of generations of neglect is not being remedied by the mechanical means at the farmers' disposal. A hedge-cropping machine can be a very great help in preparing an overgrown hedge for laying by cropping it straight up, but it can also mutilate it by cutting it off 3 ft. from the ground. If in doubt, it is better to cut it off at ground level, and let someone else have a fresh start at making a good hedge in six or seven years' time. Good fences are essential in the economy of farming and will well repay the care and attention devoted to them. If a hedge is cropped up every second year and laid every eighth year it should not cost more than £2 a chain, or 5s. a year, and with an average of 2 chains of hedges to the acre, which is about the average for the country, it is not a very heavy charge on the farm.

In laying a hedge the initial operation is to cut out any superfluous growth at the sides and to clear the bottom of the hedge

of brambles, weeds and rubbish, and cut out the old, decayed and useless stumps. The main part of the hedge should not be thinned too drastically to begin with, but only as the laying proceeds. In cutting the layers, it should be done as close to the ground as possible to encourage young growth to sprout from the bottom of the hedge. The cuts should be clean and long, but no deeper than is necessary to bring the layer down. Too often nothing more than the bark is left, while a little more wood would enable the sap to rise. If the layers are not cut close to the ground, it spoils the hedge and finally results in thick clumps which are a nuisance for future layings.

In some districts the aim is an all-living hedge. The layers, stakes and headers are all alive. The system depends on an abundance of material from which to work and which is only found in a few favoured localities for growing hedge-laying material. The more common practice is to have live layers, and to cut the stakes and headers from the waste material, or to import them on to the site. Where the headers and stakes are supplied by coppice owners it is usual to tie them up in bundles each in sufficient quantities to do a chain of hedging. With the bought material it is possible to make a very fair job of a very thin hedge. The longer the layers, the farther apart are the stakes, from about 18 in. up to a yard. Where live stakes are used a greater distance is usually allowed between stakes, as they are naturally a little more rigid. The disadvantage of live stakes is that they tend to throw out a bunch of growth at the top, and the stake has to be cut right out of the hedge the next time it is laid as it tends to get thicker and thicker as the years go by.

In laying a hedge it is desirable to have it a little out of the perpendicular, leaning away from the ditch, and with the brush put through on the opposite side, in this way the hedge is protected by the brush from the livestock in the next field, and fresh growth can spring up on the ditch side for future laying.

The stakes can either be set first and the layers pulled down

Farmer & Stock-Breeder photograph

1. One of the old school, aged 91, he learned to bend his back when he was young

2. Correct way to carry heavy bale

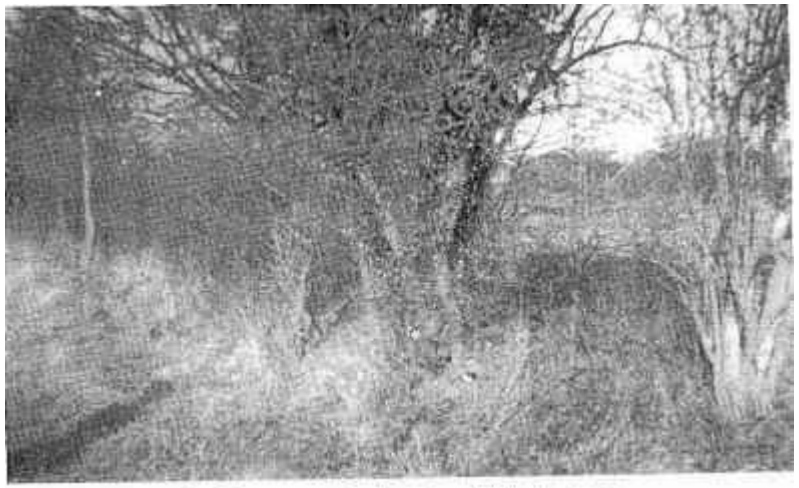
3. Risking a dislocated shoulder

Farmer & Stock-Breeder photograph

4. Contrasting styles. Young lady on left is hoeing easily and correctly

Farmer & Stock-Breeder photograph

5. A well-set scythe



6. Poor material with which to start

7. A low hedge on top of a bank

Farmer & Stock-Breeder photograph

8. Putting in the stakes

Farmer & Stock-Breeder photograph

9. Pushing down the layers

Farmer & Stock-Breeder photograph

10. A well-laid Midland hedge

11. Dry stone building, North Wales

12. A creep left for sheep

13. Dry stone walling, Southern Italy

14. A Cotswold dry stone wall

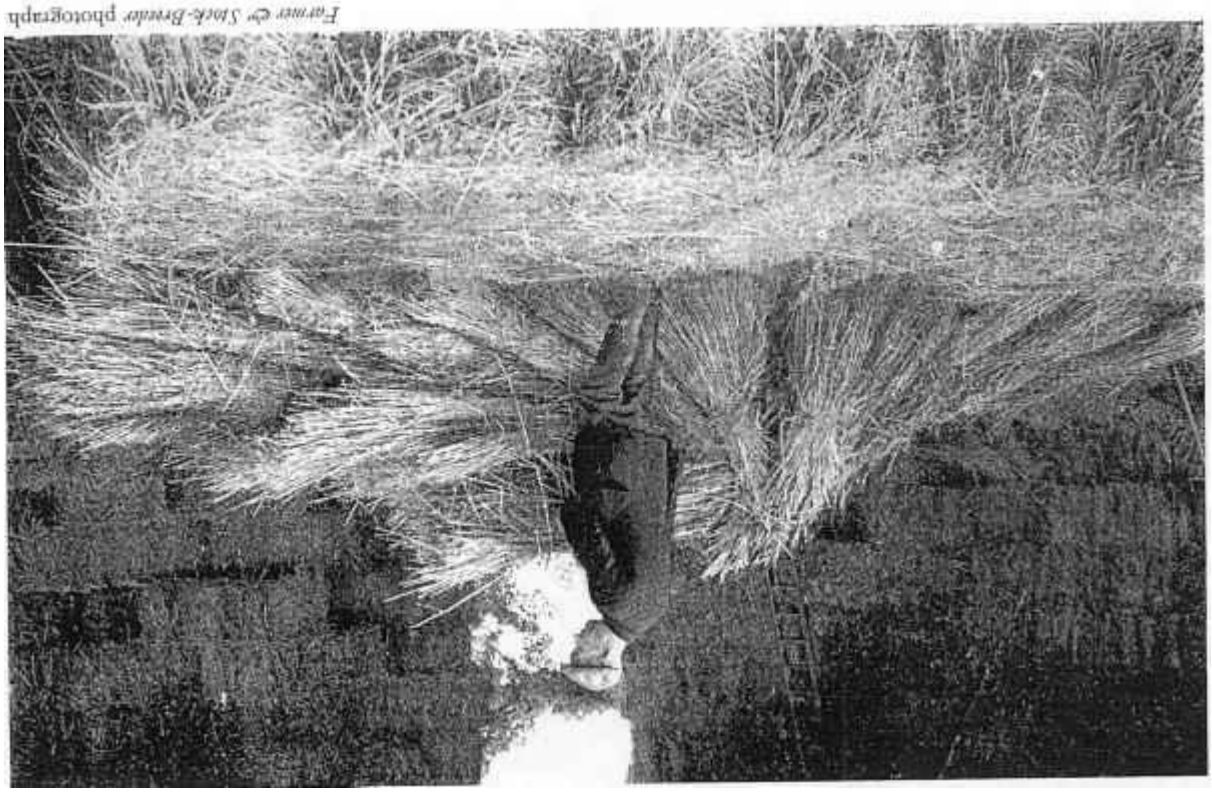
Farmer & Stock-Breeder photograph

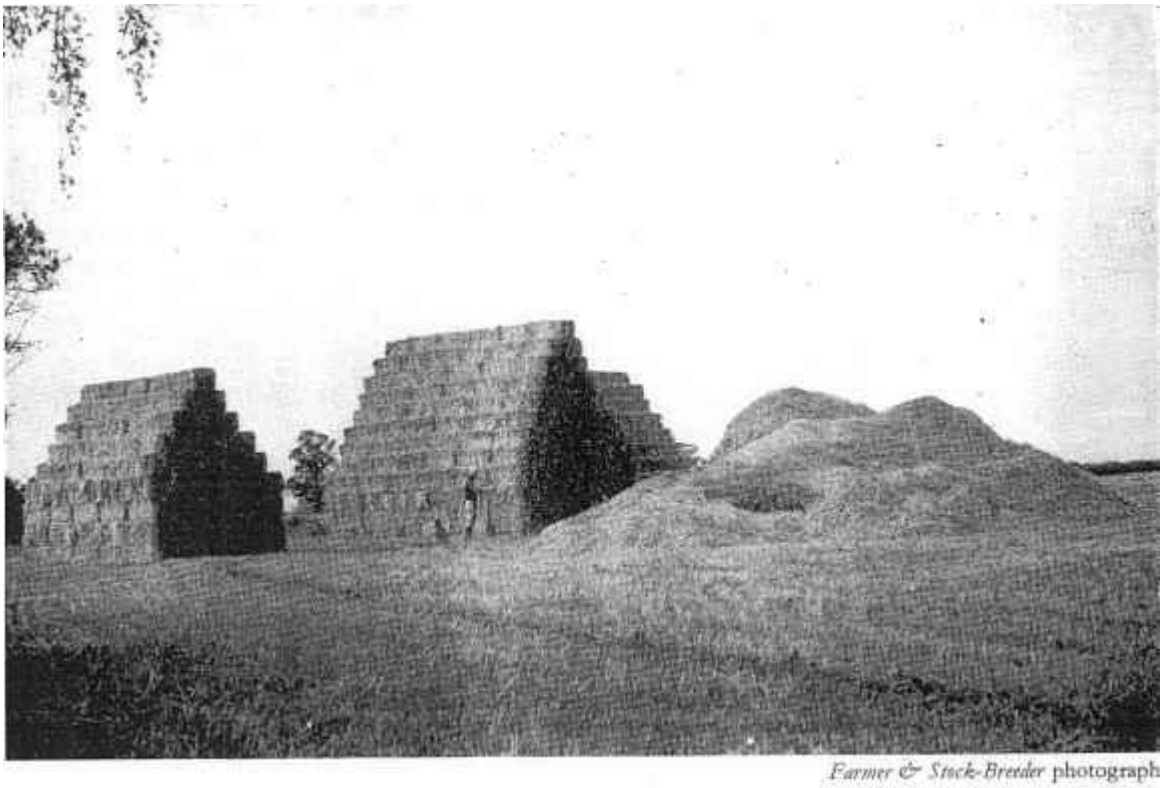
Farmer & Stock-Breeder photograph

15. Small Scottish ricks

16. Starting the rick

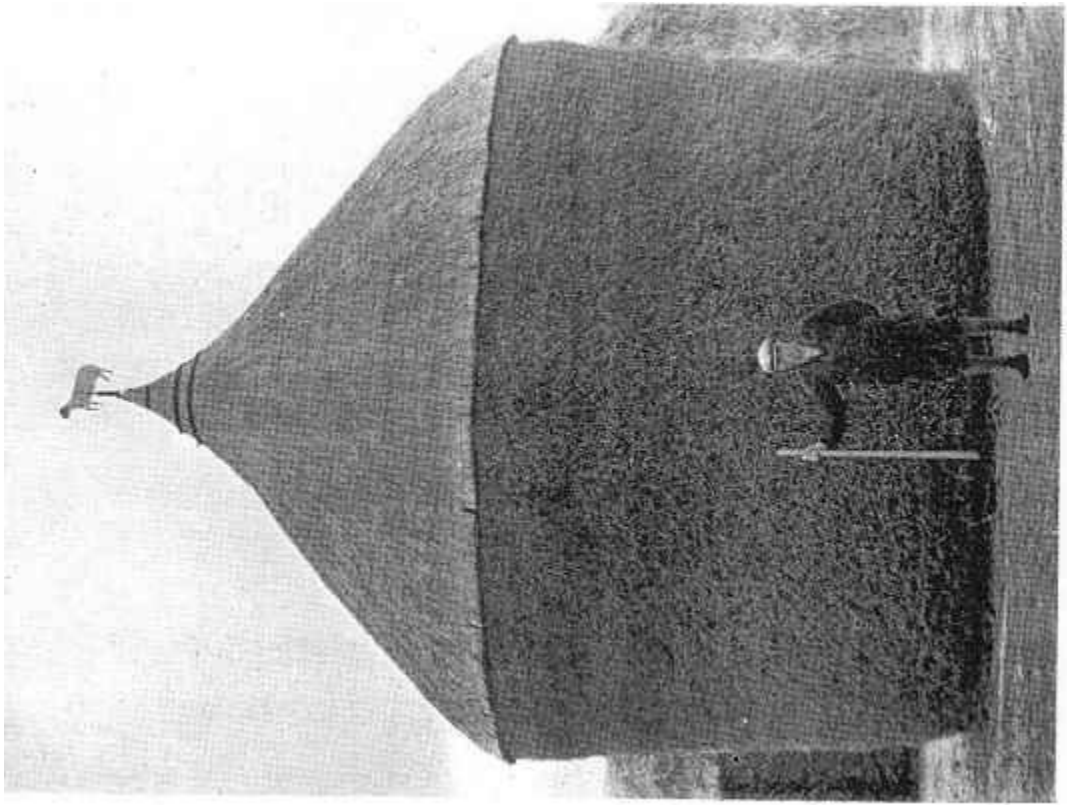
Farmer & Stock-Breeder photograph





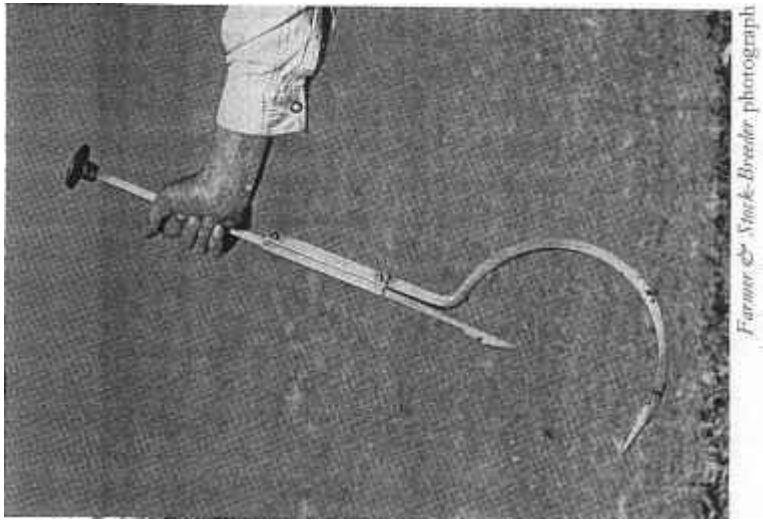
Farmer & Stock-Breeder photograph

18. Stacking bales



Farmer & Stock-Breeder photograph

17. A good rick



Farmer & Stock-Breeder photograph

20. A thatching needle

Farmer & Stock-Breeder photograph

19. Covering in

and twisted between them, like making a basket, or the layers can be pulled down first and the stakes put in afterwards, this is the more usual practice when laying very thick material. The headers are then plaited in and out along the stakes and above the layers, to prevent them springing up or being blown up by a strong wind; and for that reason a section of hedge should never be left overnight without its headers, once it is finished it is safe. Finally, any surplus stake extending above the header is cut off.

If possible use headers about 12 ft. long and ½ to ¾ in. in diameter. Stakes 4 ft. 6 in. long and 1½ in. in diameter. Layers we have to take as they come, ideally they are long and thin and about 2 in. thick.

If live headers are to be used, long, straight and thin growths are left on the ditch side every few yards, and when a section of laying is finished these headers are cut nearly through at the bottom, in the same way as a layer, but are then bent in the reverse direction to the layers and interlaced between the stakes along the top of the hedge.

On completion of the hedge laying the ditch should be cleaned and the surplus soil put along the bottom of the hedge. If there is no ditch and the young growth of the hedge may be damaged by livestock, the surplus thorn from the hedge can be laid along against the bottom on the vulnerable side away from the brush which was put through. In a few cases it is necessary to protect a freshly laid hedge with a strand of barbed-wire, but too often only as the result of putting the brush through on the wrong side.

Where a boundary has an earth bank a very low hedge on the top will prove an effective barrier for stock. Only three or four layers are necessary, and these are usually tied down to each other by staples of hazel, which are easily twisted up, and the conventional stakes are not used.

In hedge laying every effort should be made to preserve the

hawthorn, which is the hedging material *par excellence,* it gets its name from the Anglo-Saxon 'hedge thorn'. If there is any choice, the hazel, elder, maple, privet, spindlewood, wayfarer, guelder, and briar should be cut out, a rapid-growing, large-leafed species is the enemy of the thorn.

The most important factor in a hedge is thickness at the bottom. To get growth from the bottom is comparatively easy if all the layers are cut close to the ground. In cropping a hedge the aim should be to get it wide at the bottom and narrow at the top. If a farmer is not prepared to let his hedges grow up to be laid, then they should be cropped in an 'A' shape, coming right down to the ground. To get it into the required shape it must be slashed upwards. Once that is obtained then it is always cropped downwards. Growth will follow the stroke, and the more often it is repeated the greater the tendency for downward growth. The cut being oblique and from above means there will be more terminal buds on the underside and these will tend to be preserved while those on the upper side are destroyed.

After a few years a drastic cutting back may be necessary, as a cropped hedge tends to get bigger and bigger. If this is necessary then alternate sides should be done at an interval of two years.

Hundreds of farmers no longer keep sheep because their hedges will no longer confine them. On many farms all the stock roam over too wide an area for want of efficient hedging. On such farms it is difficult to think of a more profitable investment for time, money, and effort, than in putting all the hedges in order. No great outlay of capital is needed; all the tools required are a slasher for hedge cropping; an axe, billhook and hedging gloves for laying; a fork and a box of matches for clearing up; and a spade for cleaning out the ditches. If any mechanical aid is desired, or available, the hedge cropper, intelligently used, can be a great help. A high-lift on the tractor can make a very quick job of clearing up the rubbish for burning.

Ditching is usually associated with hedging and general maintenance. The rules are simple: get an even flow; always start from the outfall and work up; keep the bottom even; the ditch at an equal width, and cut the banks at an angle at which the earth will not fall down or be undermined by the flow of water; try and scour them out every year, preferably when the ditch is dry.

Over large areas of Britain, where hedges will not grow, an all-wise Providence has provided us with stones with which to build walls—a form of enclosure which has much to recommend it. Well built it is stockproof, long lasting, and provides shelter from wind, rain and sun.

I have travelled through the 120 counties of England, Scotland, Ireland and Wales, and in more than three-quarters of them stone walls are used to a greater or lesser extent, and although there is a great variation in the material available, the same guiding principles are observed from the Shetlands to the Scilly Isles in dry stone wall building. Indicating that here is a craft older than cultivation itself that has survived through all the changes that have gone on round about it.

Very few people will build a new wall today, but there are many in need of rebuilding or repairing. The materials are on the spot, although they may be buried if the wall has been down for a number of years, but they will not be very far down as the soil is shallow in stone-wall country.

It takes about three times as long to build a wall as it does to lay a hedge, but if the work is well done it may not need further attention for a century. I have recently seen a wall built in 1820, and as far as it is known no repairs have been done to it in 138 years, and none are necessary now.

Skill and speed in dry stone-wall building comes from the ability to select the right piece of stone for a particular spot and to lay it correctly.

The basic principles of dry stone-wall building are easily

Fig. 14. End Section of Wall

summarized. A foundation trench is dug and filled in with stones a little wider than the width of the wall at ground level. The wall is built to slope inwards on each side at an angle of 10 deg. A wall 34 in. at the base would finish at 20 in. wide at 3 ft. 9 in. high, or at 14 in. wide at 6 ft. This means that the lower wall could be added to at any time if desired and without rebuilding the whole wall.

It is sometimes desirable to sort the material before starting, putting the bigger stones nearest to the wall, and those required for topping it farther out.

The tools required: a 4-lb. mason's hammer, a foot rule, two strings for lining up with existing work, and if heavy stones are to be levered into position an iron bar and a good plank about 6 ft. long.

The wall is built with two parallel rows of closely fitting stones, each *laid lengthways* into the wall, and at the correct distance to form the width of the wall, any space between them in the middle being carefully filled in and levelled up with small hard stones. Each succeeding layer is drawn in a little, only one-third of an inch if building with 2-in. stones, and is placed to cover the joints below, any space in the middle being filled in as before. At about 21 in. from the ground, long stones are laid right across the wall, and allowed to project a little on each side, at about 30-in. centres. It is filled in between with the ordinary stone, and continued as before. If the wall is to be completed at 3 ft. 9 in., then at 3 ft. the wall is covered by single stones, touching and laid flat, and finally it is headed by closely fitted stones placed on edge. If the wall is to be 6 ft. in all, then at two-thirds of the total height through pieces would be placed in the same way as was done at 21 in., slightly shorter stones being required, about 22 inches in length, and the wall is finally topped at a width of 14 in.

It is not always possible to have the material we require, some improvisation is often necessary. Sometimes boulders can be incorporated in the foundation, filling in the spaces between with the ordinary double row of stones. Sometimes suitable stones can be levered up and used at higher levels. If extra material is needed, the original source is usually close at hand. You can see where some outcrop has been quarried. It is always better to bring stone downhill than up, and a sledge is the best tool.

Where boundaries run uphill, the wall should be built horizontally, and not up the slope. Heading stones should be supported by a large block occasionally, or made to lean uphill, so that if a lower stone is removed accidentally the others do not fall like a pack of cards.

Where there is suitable material available, the dry stone-waller's art can be extended to the erection of quite substantial

buildings. There are many cowsheds and barns in North Wales which have stood for several hundred years, whose method of construction follows all the rules laid down for wall building. If we go farther afield we will see the Scottish brochs, the Sardinian nuraghi, or the talayots in the Balearic Isles, and note that over a period of twenty centuries the technique is faithfully observed. Ruined villages, built of other materials, may surround them, but they stand four-square to all the destructive forces of weather and man. With the modern high-lift on a tractor to assist in putting up the material a substantial building could be put up at moderate cost, where there are old ruins to use as a quarry, and the farmer will have something in the traditional style of which he can be proud.

It is a mistake to think of dry stone walling as something which was only done in the past, or is an exclusively British craft. I have seen as good walls being constructed in Italy as was ever done in Yorkshire or Galloway in the last two hundred years. It is an art which is well worth keeping alive. Taking the long view, it must be by far the cheapest form of boundary on any farm where the suitable material is obtainable.

Compared with hedges and stone walls any form of permanent fencing is very expensive, both in first cost and maintenance, in view of its comparatively short life. While there is still scope for skill even in erecting a post-and-wire fence, in setting the stakes and straining the wire, there is never quite the same satisfaction as in using natural materials. For post-hole boring, on suitable soils, a tractor can be a very great help if fitted with the necessary tool; and a tractor winch for straining the wires can make all the difference between a good and a bad job.

For temporary fencing there is still a limited use for sheep-netting and hurdles, especially in the lambing pen, and for close folding on roots or kale where the lambs are permitted a creep hurdle to get ahead into the next pen. Where both netting and

hurdles are used wire is used to form the sides of the pen, and the hurdles for moving on daily.

The setting of hurdles, quickly and well with the minimum of damage to stakes and hurdles, is a skilled job. It is simple in itself but difficult to describe. The stakes are always put on the side away from the sheep, or they may rub them down. Each hurdle has a loop of string on one upright at the end, made from old binder sheaf strings, about 2 ft. long. In delivering the hurdles ready for setting, the strings are always on the end opposite to the direction in which the range of hurdles are to be set. That is to say, if the shepherd is working from right to left across the field, the loop of string is on the right-hand end of the hurdle.

Then, putting the first hurdle in the right direction, the shepherd takes his fold bar in his left hand, and marks a point 10 in. from the end and close against the bottom rail. Then he moves the hurdles a few inches out of his way, makes a hole, drives in a stake, and then pulls the hurdle back against it. Then, taking the next hurdle, he places the loop of string over the top rail and round the stake, inserts the foot of the second hurdle exactly opposite the foot of the first, and pulls it down, tightening the string. It is sometimes necessary to make a hole for the points of the hurdles, but it is not considered good practice to hammer in the hurdles with the fold bar, except on very soft ground, owing to the risk of splitting them. The shepherd then proceeds as before, the second hurdle is lined up with the first, the point marked for the stake and so on. It was always considered a good man could set a hurdle a minute, and in an absolutely straight line whether or not he had a row of roots to guide him. Straight setting is important, as a yard out in a couple of chains might mean he was unable to close the gap for want of an extra hurdle in completing his pen. A very important aspect is in planning the number of daily pens in a given field in such a way as to give the sheep the food they require, and at

the same time ensure the minimum of effort for the land covered, and to never finish at the week-end with all the additional labour of moving to the next field. The old shepherds were always very cunning in having it all worked out. Many of them never set a hurdle after midday, but spent their spare time 'looking at the sheep', while lesser men would strive all day to catch up. In the old days it was reckoned one man could set for 400 sheep grazing roots, or half that number if he was grinding (pulping) the roots by hand. It was equivalent to having 1,000 sheep on each acre per day, no wonder the Golden Age of British farming was based upon them. Many farmers only gave up for want of shepherds, and there are still some making money from the sheep with this old traditional system—*where they are prepared to do the work themselves.*

As far as containing stock within smaller areas than existing units is concerned the electric fence has been the greatest innovation. It has made possible the folding of cattle and pigs to an extent that before was only possible for sheep, and with an extra wire is very effective for sheep. Practically the only drawback is the ease with which it can be put out of action by mischievous boys, or driven snow settling on the insulators.

CHAPTER VI

Rick Building and Thatching

In spite of the great advances which have been made in the mechanized harvesting of grain, a good corn rick is still the cheapest store that can be provided, and the sale of straw will pay for all the expenses of threshing, providing the labour is available.

To the smaller farmer who can manage with a second-hand binder the old-fashioned methods may still appeal compared with having a contractor charging *£4.* an acre for combining, often leaving a lot of grain behind on the ground (one grain to the square foot is 4 lb. to the acre), and then a further charge for baling the straw—if the weather permits.

Even the bigger farmers who use combine-harvesters may still feel justified in cutting some in the sheaf, and are compelled to do so if they want thatching straw for any purpose, or oat straw in good condition for fodder. In the autumn of 1958 there was an unsatisfied demand for machine-threshed straw at £12 a ton, and for good bright oat straw, hay prices were being offered.

While more than half our farmers still use a binder there will be a need for rick-builders and thatchers, and it is one of the most satisfying of all the farm crafts.

In rick-building and thatching, as in all agricultural crafts, there is sometimes a confusion of terms in use for something

meaning the same thing. In the north and east we have a stack and a stack-yard. In the Midlands a rick and a rick-yard, and the terms are roughly divided by the River Trent. But in some places they insist on a hay stack and a corn rick. Our word rick may come from the Old English *breac,* or the Dutch *rook,* or the Norwegian *rauk.* If we favour stack, then the Old Norse (or the modern Swedish) *stakkr,* indicates the source from which it was derived.

When it comes to thatching, many of our terms are far older than our conquerors of the last fifteen hundred years, many are of Celtic origin, or may be older. Thatch pegs, for example, have a name in each district and language which is descriptive for what it is—a split piece of wood. This is true not only in our country, but in other places as well. Splitting wood may be older than language itself. As in every country in Europe there is a three- or four-letter single-syllable word meaning God, so they have a three- or four-letter single-syllable word meaning a split stick. In this chapter I propose to explain the terms when they are not self-explanatory. The reader may be interested to find the local terms for his own district.

Good rick-building starts with the binding of the corn: good tight sheaves, well butted by the machine, and then systematically stooked in pairs, with the knots of the string on the outside, provides good material with which to work.

The siting of the rick is the first consideration, to have it in a suitable place for threshing and the getting away of the produce. The fire risk should also be allowed for in not having too many ricks close together, or near to chimneys from which sparks might be emitted. Overhead electricity wires present another danger when elevators and ladders are used in the vicinity.

A level site ensures a good start. It is possible to make some allowance with extra layers of sheaves on one side, but it takes a great deal of experience to achieve a really good rick on such a foundation.

On a damp site a trench should be dug round the base and the soil thrown into the middle. A rick stand of the traditional staddle stones would be ideal, but a very good substitute can be made from old oil drums filled with concrete and old steel girders laid across. This is not only vermin proof, but the air rising through the rick helps to dry the grain. In a permanent rick-yard, suitable concrete bases can be built with a mould that bolts together. On such bases, artificial manure can be safely stacked and sheeted up, when not required for corn.

Failing stones or concrete, a layer of faggots or hedge trimmings are often used. They do keep the rick dry, but also tend to provide easy access for vermin. On a dry site a good layer of straw is sufficient to keep the corn dry, and does not make it quite so easy for the rats and mice to begin with, but eventually they will get in.

Ricks may be round, square, oval or oblong. As a general guide, where the rainfall is above 30 in. the ricks tend to be circular, and below 30 in. they are usually oblong. In the west the round rick is favoured, in the south and east we will find them oblong. But on little islands of high ground, such as the Chiltern Hills where they have 5 in. more rain than the Oxford Plain, it will be noticed that the ricks are round. The farmers cannot explain it, beyond it is a custom. But as a round rick dries better, it shows the value of a tradition which must have been founded on trial and error.

The size of the rick is determined by the material that is to be put into it, and local weather conditions. A Scottish farmer, with his little round ricks, built around a tripod, will confidently stack after three fine days in the field after cutting, if there is a threat of rain to come. But a Cotswold farmer, with a rick big enough to hold a day's threshing, will like his oats to 'Hear the church bells twice' in the field, in other words a minimum of ten days—if they were cut on a Saturday they should not be carried before the following Monday week. With

wheat or barley, if the grain was hard and the straw dry, and the butts free from greenery, three or four days would suffice.

Heating in the rick must be avoided at all costs, which causes serious loss of feeding value, and is liable to cause digestive troubles as well. The bigger the rick the greater the risk. A slight tendency to heat may be averted by stuffing one or more sacks with straw, and drawing them up through the centre, as the rick is built, thus leaving 'chimneys' out of which the warm air will escape.

In a bad season it is better to build smaller ricks and get on with the harvest rather than wait until the crop can be safely put together in a larger rick.

Large ricks are easier to build than smaller ones. They require less thatching, and save moving the threshing machine so frequently. Farmers in the arable districts have always favoured a day's threshing, about 10 acres, in one rick, as it keeps their staff busy all day, and two men alone can reset in the evening ready for another day.

Round ricks may be 9 to 21 ft. in diameter at the base, and 12 to 20 ft. high at the eaves. A rick 12 ft. in diameter and 15 ft. in the walls, will take about five cartloads of sheaves, and another load for the roof.

An oblong rick, 15 ft. wide and 27 ft. long at the foundation, and 18 ft. in the walls, will hold a day's threshing, and provide about 10 cubic yards for each load of grain. It will naturally vary with the season and whether long- or short-strawed varieties of grain are grown.

To start building four sheaves are placed head together to form a stook in the centre of the rick, then a circle of sheaves are laid with their heads resting on the original four and with their butts on the ground; then further layers, each assuming a more horizontal position until the outside is reached. Every sheaf should be tightly packed to the next and with the knot uppermost. A foundation built in this way ensures that only the butts

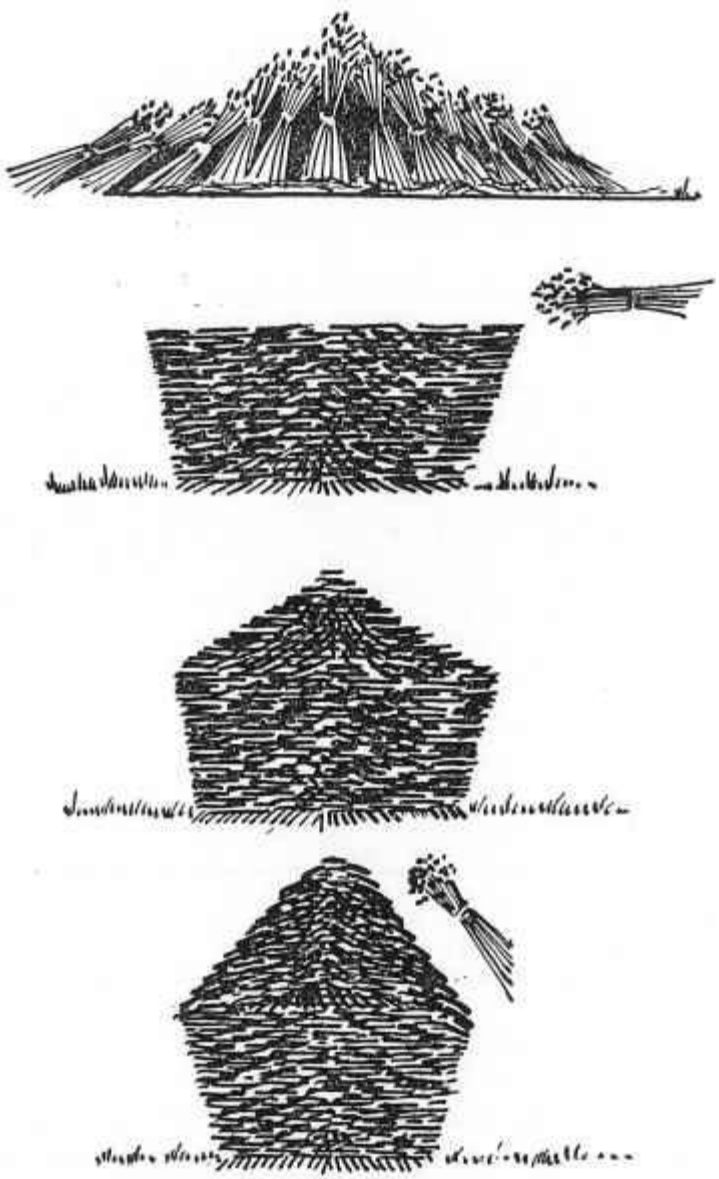


Fig. 15. Right

and no grain touches the ground even when compressed by the rick settling down.

Then a ring of sheaves are carefully laid on the outside with the butts exactly out to the bottom layer of the foundation on the base. This is followed by another layer with the butts just out to the strings of the first to bind them on. This process is continued until the layer is completed to the centre of the rick —every butt pointing outwards, every head inwards—and in complete circles to facilitate pitching in a regular order when threshing the rick. Then the next layer of sheaves is started on the outside again. While the sheaves can be laid with a fork, many builders prefer to lay them by hand, kneeling on each sheaf as it is laid, and feeling with their hand to make sure it is exactly above the preceding layer. A good helper is required on the rick to put the sheaves as conveniently as possible to the builder's hand, and when the two outer rings are well started it is permissible for the assistant to lay the third sheaf in its place if he has time to spare between passing on each sheaf for the outer and second layers.

Up to the level of the eaves every sheaf should be laid with the knot upwards. As the sheaf is longer on the knot side the rick-builder can use this difference to gradually increase the width of the rick from foundation to eaves, which enables the roof to drip clear of the walls. The effect must not be too pronounced, 6 in. in all is sufficient. Some prefer to run the wall straight up, and then put out the last three layers in the walls, each a little further than the last, to get the same effect as far as draining from the roof is concerned.

As each layer in the rick is completed, the centre should be a little higher than the outside, but if the effect becomes too pronounced an extra layer can be put on the outside; but the aim is to have a gentle slope outwards on every sheaf in the rick. Every sheaf must be correctly laid in the right place. A single sheaf has been known to let a rick slip right over when left in

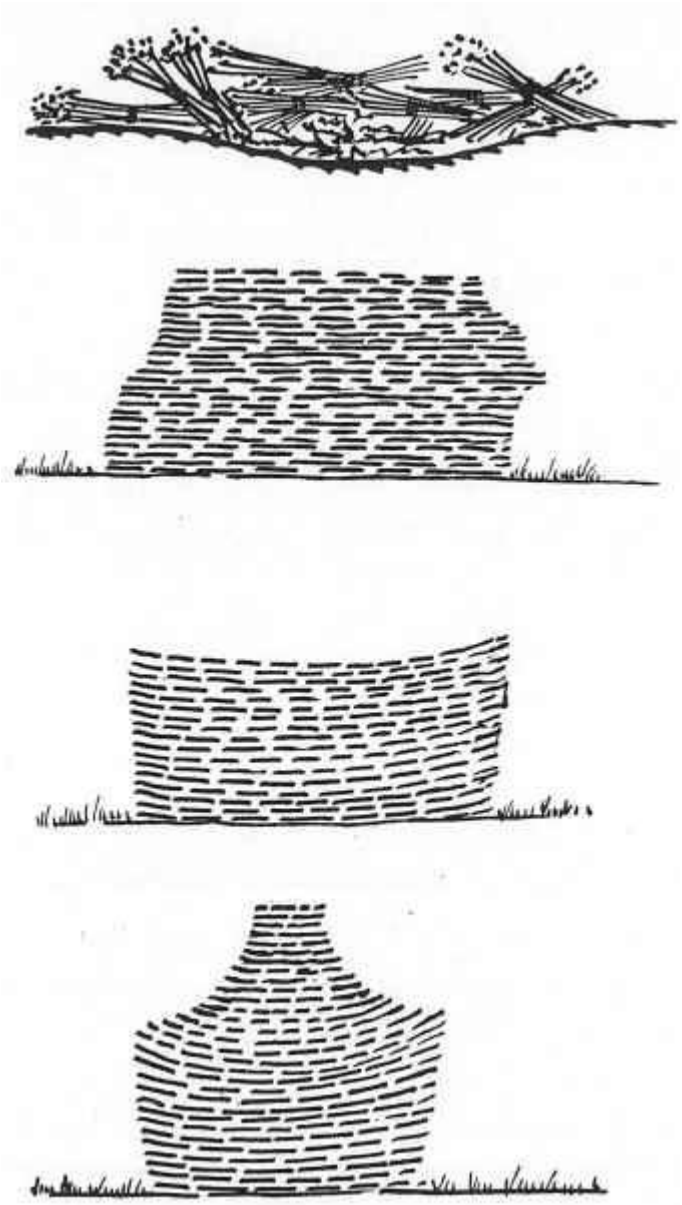


Fig. 16. Wrong

the wrong place. Any loose straws falling from the sheaves should either be pulled into the centre, or scraped off and used in the foundation of the next rick.

At no time should a load of sheaves be allowed to brush against the rick in drawing up to it. Nor should a ladder be left against a rick, unless it is desired to make the rick settle the other way. A badly built rick may have to be propped up if it settles too far in the wrong direction. If an elevator is not being used, it is an advantage to pitch the sheaves in alternate loads from opposite sides, or the constant dropping of the sheaves may beat down one side.

Before starting the roof the middle of the rick should be well filled. If there has been a slope of 10 deg. in each sheaf on the outside, an effort should be made to double it in the roof.

In the roof the sheaves should be laid with the knots downwards, and the natural taper of the butts can be used to form the slope of the roof if required.

The wider the roof the greater the slope required, for more water has to travel farther. Where the sheaves are tightly packed and every one well sloped, an angle of 30 deg. is sufficient, but except in exposed places most farmers prefer an angle of 45 degs., although it does involve 25 per cent more thatch.

A round rick is the easiest to build, but not to finish. An oval rick holds a little more and saves the necessity of building good square corners. A square rick stands well, but involves more work in passing the sheaves across in building and threshing. A rectangular rick holds the most stuff for the effort involved, and the thatch required to cover it. An oblong rick can be gable ended, or 'barn ended'. Either involves the same quantity of thatch, but the latter holds a little more corn, but does not hold its thatch quite so well in rough weather.

In any form of rick building the faults to avoid are: a rick bottom in a hollow, or carelessly laid sheaves to give the same

effect. Damp and sprouted grain in the base can spoil the whole sample. The roof may dry out if you wait for March winds, but the base never will. A careful check should be kept for irregular or receding sides or ends, which may trap a lot of water and run it into the rick. A hollow middle may result in every sheaf in the rick being wet by draining in, if a really wet day, say 2 in., is experienced in a day, before thatching; and the best of thatching will not safeguard a badly built rick in a really wet time. Never judge a rick by outward appearances. We all like to see a symmetrical rick, and a good one usually is, but it is possible to build a very tidy, but vulnerable, rick by cocking all the outside sheaves up a little, and the fault is emphasized as the rick settles. A potentially good rick can be spoiled by going too high in the walls in proportion to the width. No hard-and-fast rule can be laid down, but the wider the rick the higher you can go in proportion. The longer the sheaves the higher you can go. There is a big difference between building with 6-ft. wheat sheaves, and little, short, round barley sheaves.

Two ladders are necessary. A short one for getting on to the loads of corn ready to pitch them, and for getting on to the rick while it is still low. Never permit anyone to jump from rick to load, or load to rick, and never let them slide off the rick; it is dangerous, and may spoil the rick. A long ladder is necessary for getting off the rick when it is finished (although it is permissible to climb down the elevator where one is used), and a long ladder is also required for thatching. With a rick 15 ft. in the walls and a further 10 ft. in the roof, a 35-ft. ladder is necessary to stand on the ground and lay up the slope of the roof at an angle of 45 degs. A thatcher's ladder is usually 42 to 48 rungs. It is possible to use a shorter ladder by placing the foot in a trailer. The ladder will not slip out at the foot if laid up the slope of the rick. An important point to remember, for it is very disconcerting to find the ladder slipping away when climbing up with a large bundle of thatch. If it does, hold tight and it

will stop when flat on the roof. When raising a ladder, the foot should be placed at a distance from the rick equal to the height of the walls. One man stands with both feet on the bottom rung and holds on to the fourth or fifth rung, and leans back. The other man lifts the top of the ladder and works down on the under-side, until it is upright, and then he stands on the bottom rung and lowers it on to the rick. A very heavy ladder may require more than one assistant, although once on the roof it is easily managed by rolling it over. It should never be dragged across the roof, although a thatcher will sometimes put one foot on the rick and lift the top a little towards himself. Care should also be taken in lowering a ladder, as they are easily cracked. Recent legislation now makes the worker responsible if he has an accident through using an unsafe ladder; although the farmer has always had an obligation to provide a sound one.

The thatcher's tools are simple, and apart from crank-handled shears for cutting along the ridge and eaves, can be home made.

The thatcher's hod, dog or jack is made from a forked branch cut from the hedge, or can be made from a piece of wood 2 in. by 2 in. about 1 ft. 6 in. long, and two holes drilled at a slight angle from each other to take two stakes about 4 ft. long. A strong piece of thin cord is tied to one side at the top, and has a hook or peg on the free end, which will hold the bundles of thatch in place, when hooked on to the other arm of the hod.

The thatcher's rake can be made from an old fork handle, by driving a few nails through it, or from an old wooden hay rake, cutting off the teeth which are not required to make the handle. Some thatchers prefer to use a heavier piece of wood, which is also used as a mallet for driving in the thatch pegs, instead of a leather pad strapped on the right hand for the same purpose. It is desired to keep the number of tools to a minimum, to save time in moving on and in changing from hand to tool work.

Knee-pads are essential, preferably of leather, to protect the knees as so much time is spent on the ladder, but if there is only a little thatching to do, strips of sacking will prevent rubbing the knees, which can get very sore even in a single day's thatching.

The thatcher's shears are cranked to allow for cutting along the eaves without rubbing the knuckles. A long pair, well pointed, with a good clearance should be chosen.

A supply of thatching pegs, or 'rick-sprays', is necessary. They are cut usually from ash or hazel, usually 2 to 3 ft. long, and sharpened at one end; they will grip better if a 'fish-hook' is made near the sharp end. Four can be split from rods of green hazel, about 2½ in. in diameter, and if split directly through the centre each time, will show two white sides and one with bark. About twenty-five are needed for each 'Square' of thatching. A square is always 10 ft. by 10 ft. In some districts the thatch pegs can be bought in bundles of 250, which is sufficient for a rick 10 yds. by 8 yds.

If desired, thatch pegs can be dispensed with and a thatching needle used; with it pieces of string are tied into the rick and tied to the strings which run along the thatch.

About 2 cwt. of straw is required for each square of thatching. A ton should be kept back for every day's threshing anticipated. Ideally, it should be hand-threshed with a flail, and grown without the aid of artificial fertilizers—although the farmer who can supply that today can sell every handful at a high price for house thatching. Straw that has been combine-harvested, baled, or threshed with a fast-moving peg drum, is useless for thatching. In the West of England there are a few special threshing machines designed for the preparation of thatching straw, but require about five men to take the straw off. The ordinary old-fashioned machine produces fairly good thatching material from a suitable variety of corn. Wheat or rye straw is best. In some western and northern districts oat straw is used, but only

for lack of good wheat or rye straw, which is superior. New-season's straw is best, but if straw is to be prepared in advance for thatching corn ricks, old straw must be used in most cases.

To prepare the straw for thatching, about half a ton is well shaken up in a heap; the man standing behind it as each layer is spread. Water is thrown on by spraying it from a bucket. With a quick jerk and inverting the bucket at the same time, the whole surface of the heap can be damped down. Finally, a heavy baulk of wood is laid on the heap to weigh it down. Then the straw is drawn out in double handfuls from the bottom of the other side from which the heap has been made. Each handful is called a 'yelm', and usually weighs about 4 lb. It is laid on the ground, and all short pieces of straw is combed out with the fingers, and then the yelm laid in the jack. The next yelm is laid above it, at a slightly different angle, so that each yelm is easily distinguished when taking them out on the rick. The process is continued until the jack is filled, and then the cord is hooked across the top to hold them in place when being carried up the ladder. Five to seven yelms usually make a jackful. Two sheep hurdles, set in a 'T', make a very convenient stand to support the jacks while being filled. It is usual to have at least two, to provide for one man filling, and another thatching. In some districts a jack is not used, the yelms being tied in a bundle, and this method has an advantage if a lot of thatching straw is being prepared in advance. If hand-threshed or machine-prepared straw is being used, the yelms can be placed alternately butt or ears and easily separated again, but has the disadvantage that half of them have to be turned round on the rick to have them all the same way in the thatch with the butts down.

For very quick 'covering in' straw need not be yelmed. 'Boltens', 'Batterns', 'Bunches', as they come from the double-string straw tier behind the threshing machine, can be opened out along the rick and tied down, extra long pegs are required.

It makes a rough-looking, fairly wasteful, but satisfactory cover for a well-built rick, at least for a few weeks.

Balls of twine are twisted round spare pegs, one more than the number of yelms required to cover from the eaves to the ridge, and each ball should be long enough to go right round the rick, and sufficiently high on the peg to leave a good point for sticking in the rick when not in use, although it is better to insert it behind the string at the last peg fixed in the roof. Twisted straw ropes can be used if desired, but cannot be tied to thatch pegs, and are stapled with twisted spars of hazel instead.

A still, misty day provides ideal conditions for thatching. It cannot be done in strong winds, heavy rain or frost. But thatching straw can be prepared under cover in stormy weather to speed the work when the opportunity occurs. While it is desirable to cover in ricks as soon as possible most thatchers prefer to leave the rick for a week to settle first, otherwise you may have to go round again and tighten up the thatch pegs.

To make a start the ladder is placed about 3 ft. from the right-hand end of one side of the roof.

The thatcher takes up a jack of yelms, a fork and his rake. The jack is comfortably anchored to the left-hand side of the ladder by sticking in the fork below it. A decision must be made as to the thickness of thatch; about 3 in. is deemed sufficient for a well-built rick. This is important because an extra inch runs away with a lot of straw—but if it is poor material it may be necessary to use more.

The jack is opened, the first yelm taken, and laid to project well over the eaves, while the top end is squeezed together and tucked into the roof to hold it in place until the string is fixed later. The first layer is usually made a little thicker and two yelms are laid to cover perhaps 2 ft. 6 in., when the yelms above cover 1 ft. 6 in. to 2 ft. After the first two yelms are laid together, the others are slid one above the other, right up to the ridge. The

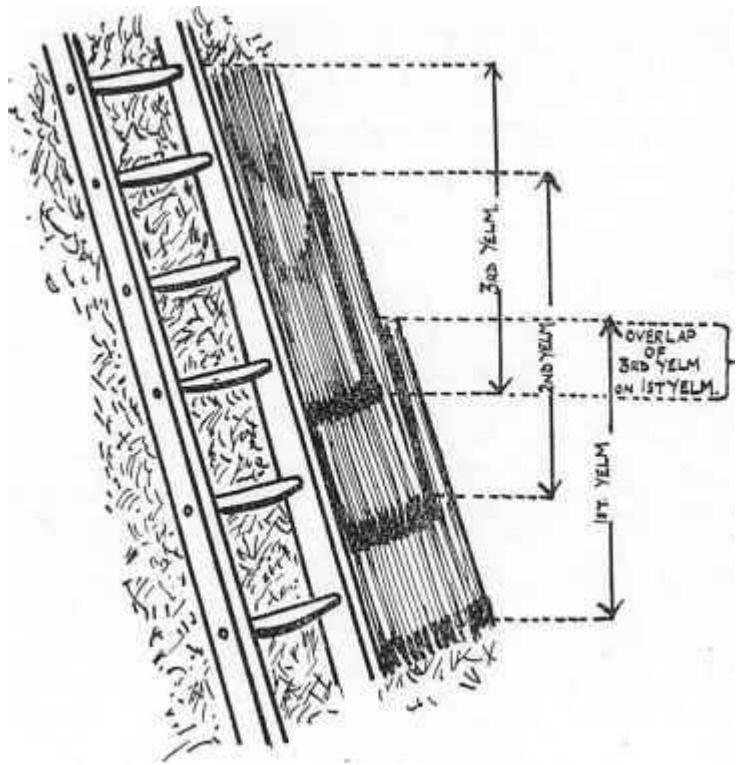


Fig. 17. Laying the Yelms

second layer is placed to cover two-thirds of the first, and further yelms only one-third of the one below. If the roof has been well-topped at the ridge with a long batten of straw, the last yelm is put well above it at the top to make sure it will meet the yelm on the other side as the rick is finished and can be neatly trimmed off together with the shears.

When the first strip is completed, the thatcher carefully rakes it down, steadying each yelm with his left hand as he does so. Then the thatch-pegs are driven in, with the point above the

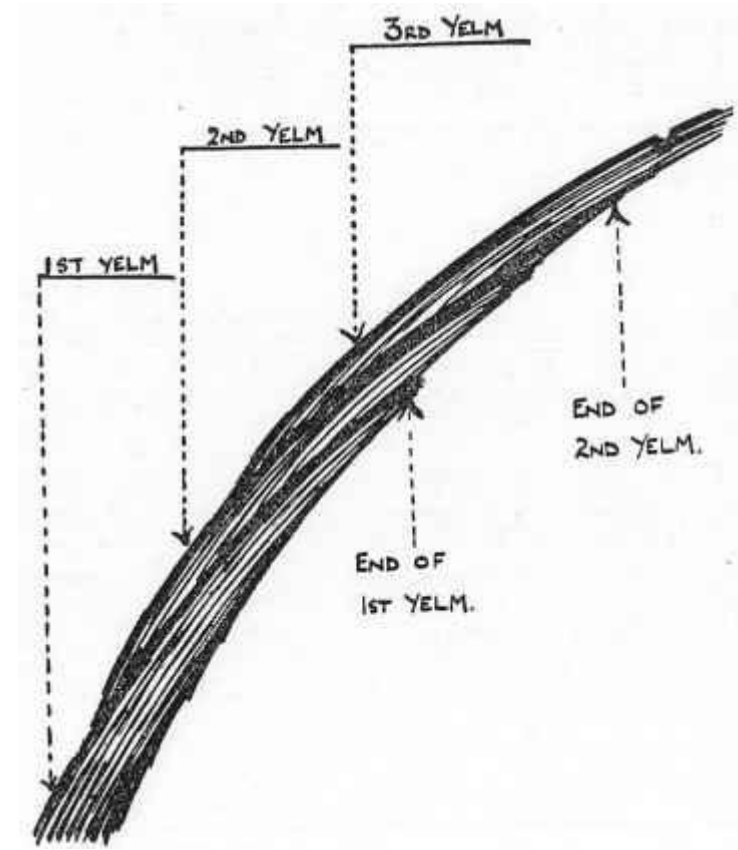


Fig. 18. Check the Overlap

horizontal, so that they slope downwards to the outside, and will not drain water into the rick. The pegs should not be placed one below the other in the thatch, but slightly staggered, this is to prevent making a division in the thatch where water would also drain in. The string is attached to the pegs, and the balls of twine placed conveniently in reach for when the next strip of thatching is completed.

The ladder is rolled over, another jack of yelms taken up and the process repeated, carefully laying the yelms against the first strip, raking down, putting in the pegs and tying across. A clove-hitch is best, and is made with two simple loops over the peg, although some thatchers use a double wrapping round the peg and then make a loop by passing the string first over and then under the connecting string from the last peg, and then making another loop to go over the top of the peg before drawing it tight. It is, for all intents and purposes, a clove-hitch with an extra loop round the peg.

As the work continues the lines along the thatch must be kept quite straight and parallel; special care being taken at the corners. Sometimes, extra strings are considered desirable on the corners in an exposed position.

The eaves are clipped with the shears as the thatching proceeds, making the best possible provision for shooting the rain water off as far as possible, but not leaving any straws that can be teased out by the wind. The ridge is clipped while proceeding along the second side of the rick. If the yelms have been put well up, about 9 in. above the ridge, a very tidy finish can be given.

Most of the skill in thatching comes from practice, well-prepared straw, carefully drawn yelms, and good organization of the work—the correct number of yelms in a jack to do one strip of the roof, the ladder in just the right place, and so on.

When thatching round stacks, the method is similar but greater care is necessary in joining the yelms, and provision has to be made for more yelms at the eaves, overlaying with less as the work proceeds, and every yelm pointing to the top.

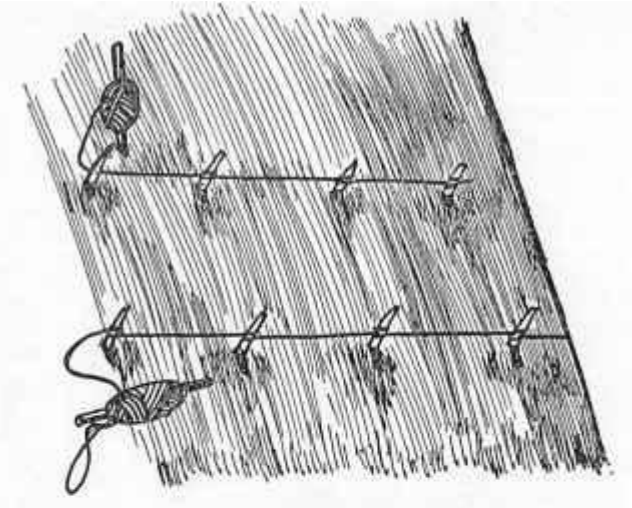


Fig. 19. The Finished Effect

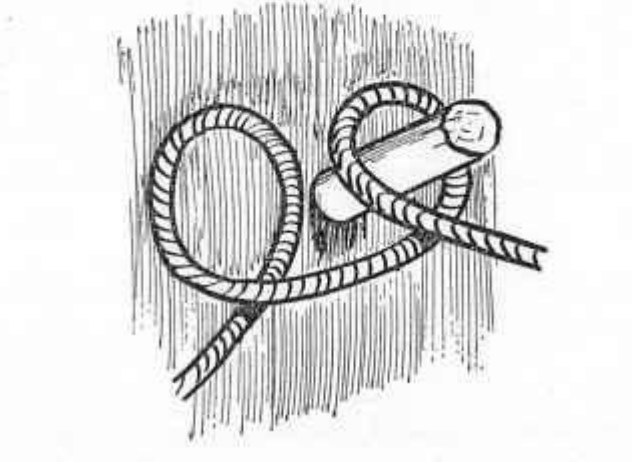


Fig. 20. Two Simple Loops, the left being placed over the right

CHAPTER VII

The Handling of Animals

Success or failure in farming depends in the vast majority of cases on the management of animals. Nine-tenths of the crops we grow are cashed in through animals. Science can tell us a great deal about the breeding and feeding of livestock, but that will avail little unless there is intelligent observation combined with a genuine love, knowledge and understanding of the stock in our charge.

In nearly fifty years of daily contact with animals I have come to the conclusion that they can in a certain degree, which naturally varies with the individual, read our thoughts, or at least respond to our feelings. Both the dog and the horse know when we are afraid of them. And they know with equal certainty when we decide that their age and infirmity is such that they must be destroyed.

As far as I know very little research has been made on telepathic communication between man and animals. Twenty-odd years ago, when I used to plough with horses, I would sometimes hook up my reins and let the horses plod on along the furrow, they could not see me behind the plough as they were wearing blinkers, then I would concentrate my mind on telling them to stop. First one would turn back his ears, as if listening for the command, then the other would do the same, then one would hesitate, and finally they would both stop, and without

me having uttered a sound or made any physical contact through the plough or reins. Then by further concentration, and some hesitation on their part, the horses could be put into motion again. I still frequently demonstrate that I can summon my sheep dog when he is asleep somewhere around the buildings from a distance of 200 yards. The results were quite as good as that achieved by the schoolboy who fixes his gaze on the boy sitting in front of him in class and mentally commands him to look round. In other words, it does not always work, but it usually does.

I have mentioned elsewhere in this book, how the physical culturist can develop a muscle by concentrating his mind upon it as he goes through his exercises. In the same way, by concentrating our mind on the subject we seem to be able to help or influence a sick animal to get better, and most certainly can overcome the fears of a nervous one. Whether the soothing voice has as great an influence, or a greater influence, I have not yet been able to determine. Attitude of mind seems to be all important.

Physical contact is important also, we all know how animals like to be rubbed, stroked or patted, and it would appear our thoughts can be conveyed through our hands. Every good hand-milker is familiar with the ready let-down of milk which can be obtained by a sympathetic state of mind. The same applies to physical massage. The response is always greatest in animals we know well.

I do not wish to over-emphasize this aspect of animal management, in the vast majority of cases technical knowledge will achieve far more definite results. If, for example, a strange dog comes rushing at you with his bristles up, and you extend your open hand towards him, there is a very good chance he will bite your fingers. But if you offer him the back of your hand, with the fingers slightly closed, he will not attack. There is nothing psychological about this: extended fingers, about

half an inch thick present something he can bite, while the curved knuckles sloping away from him do not offer anything on which he can get a hold, and he feels at a disadvantage.

All animals have strong instincts. If you put your hand on a calf's head, he draws back, from the primitive impulse to fight. But if you put your hand under his jaw, then he is delighted to be petted.

All domestic animals have to learn that we are their masters. If a bull calf, or a ram lamb, has been allowed to attack human beings, then we must get right under his guard and hit him hard on the forelegs with a whip. They very quickly learn. If a stock cockerel attacks, and they can be a great nuisance to children, the thing is to let him attack you, catch him, put his head under his wing and swing him round three times, and then release him. He appears to be very giddy for a few moments, and then apparently decides that he has had the worst of the fight and very rarely attempts it again.

In driving animals, very few people know, and some who have worked with animals all their life do not know, that a hiss is as effective as a shout. Horses and dogs have exceptionally good hearing, and it is seldom necessary to shout at them. But if you always shout at them, in due course they always expect it.

Animals have long memories. If a calf is tied up for only a short period daily in the first few weeks of its life it will take quite quietly to a yoke in the cowshed when it is brought in at three years old. A colt which is haltered and led at ten days old, will take quite easily to the same restraint when it comes into work, where another, without that early training, may throw itself down and suffer serious injury.

Animals, like children, are always trying out the discipline we impose. We should never give an order which we are not prepared to enforce. In due course obedience becomes habitual, and it is seldom necessary to remind them that you are master.

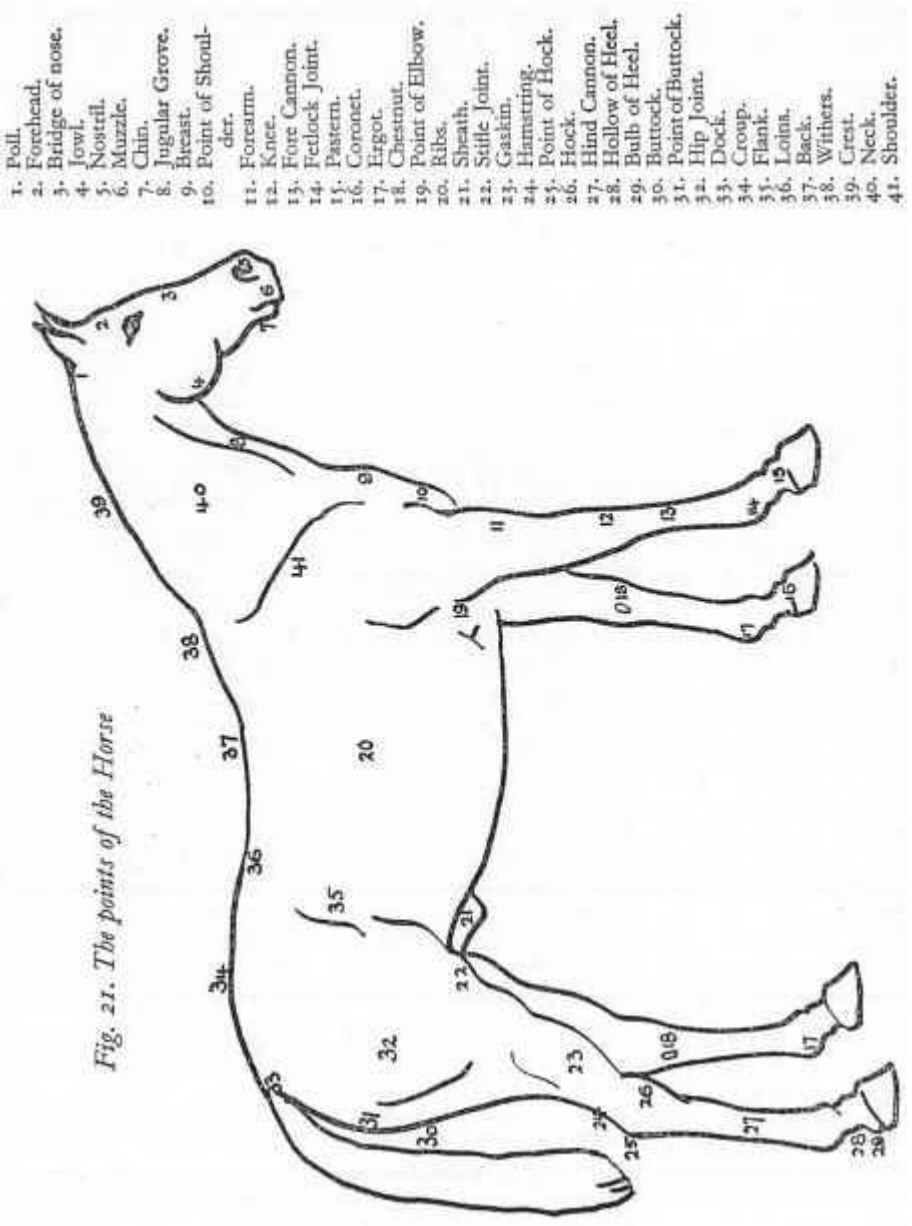


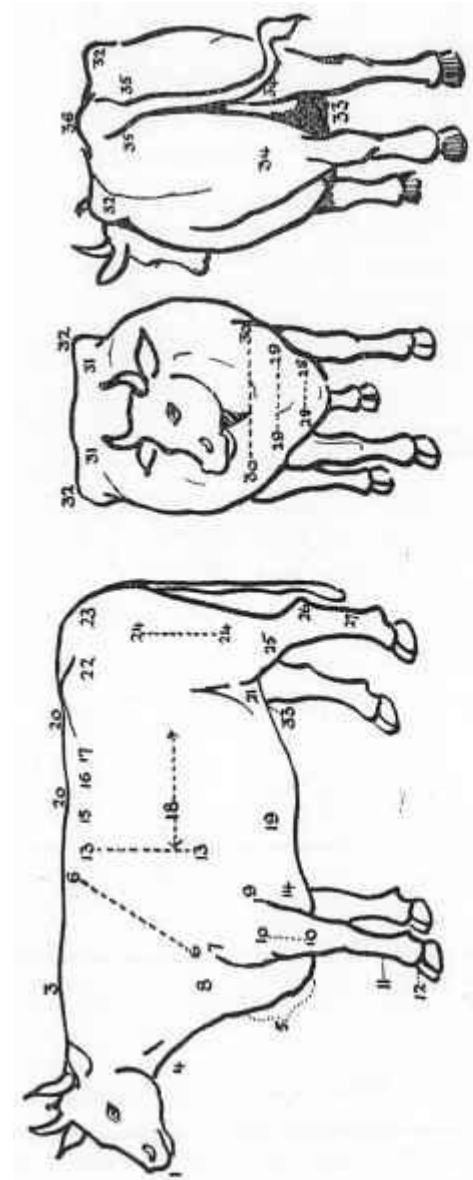
Fig. 21. The points of the Horse

Human temper is something animals cannot understand, and a man who has not sufficient patience to control himself at all times in dealing with them, would probably make a very good tractor driver, or something else, at least we hope so.

I think it very important that the student should learn the points of the animals. It compels observation in the first place, and secondly other people may know what we are talking about. We would form a very poor opinion of a garage assistant, who on being told there was something wrong with the carburettor started to jack up the back axle of the car. Yet I have frequently asked a farm pupil, with a couple of years' experience: 'If a farmer said, "One of the cows has a cut on its brisket", Where would you look?' Almost invariably I have got the reply: 'Somewhere round the back end.' The brisket is between the forelegs. Which means that for sheer lack of knowledge, the cut might go untreated.

To inquire 'Where are a cow's horns in relation to its ears ?' has brought a great variety of replies, which show a complete lack of observation, or inability to visualize what should be a familiar object. And for that reason even a serious fault in conformation may go unnoticed. Although even very experienced judges often slip up unless they are constantly on their guard, especially when a very clever exhibitor always manages to put himself between the fault and the judge's eye!

A moment's reflection will show that the most important faculty the stockman can possess is observation. On it depends the greater part of 'stock sense': that quality the school psychologists who advise young people on their choice of a career have yet to discover. Yet the boy or girl who loves looking at animals, can pick out the differences between them, and remember the individuals, is with proper training, in the majority of cases, well suited to their care. Genius has been defined as the ability to perceive relationships; no truer observation could have been made, if it has been intended only to apply to the



1. Muzzle.
2. Poll.
3. Crest.
4. Throat.
5. Dewlap.
6. Shoulder.
7. Point of Shoulder.
8. Neck.
9. Elbow.
10. Arm.
11. Shank.
12. Hoof.
13. Crop.
14. Fore Flank.
15. Fore Ribs.
16. Mid Ribs.
17. Back Ribs.
18. Barrel.
19. Belly.
20. Back.
21. Lower Flank.
22. Plate, } Croup
23. Rump. }
24. Upper Thigh.
25. Lower Thigh.
26. Hock.
27. Shin.
28. Brisket.
29. Bosom.
30. Chest.
31. Loins.
32. Hook Bones.
33. Udder.
34. Twist.
35. Pin Bones.
36. Tail Head.

Fig. 22. The Points of a Beast

great stockbreeders of the past, although of course knowledge and judgment must be added to it.

When I speak of observation it does not only apply to visual perception, mellowness of touch is something to which many breeders attach importance, and the blind can sometimes put the sighted to shame in selecting stock. The quality of a cow's udder, of the condition of a fully fleeced sheep can only be determined by touch.

On observation must depend the selection of stock we are to manage or breed from. We must notice their response to the environment we provide, the progress they make, and their value in comparison with other animals when we come to sell them.

What are we looking for? Any deviation from the normal which can be regarded as an unsoundness. An unsoundness is anything which interferes with the usefulness of the individual. It may be the result of inherent weakness, strain of work, from disease, parasitic infection, or lack of proper care, feeding and sanitation.

It has been said that a stockman spends his life looking for trouble—and nearly always finds it. I think it would be more correct to say that he spends his time avoiding trouble by recognizing it, and doing something about it whenever it may appear. The twitch of a 'fly-struck' lamb, the slight tenderness which indicates mastitis in a cow's quarter, the pig with a drooping tail, the hen with a slight cold, and the horse with a loose shoe, may indicate action which may save a journey to the blacksmith, prevent an epidemic in the poultry yard, enable the pig to be turned into good bacon before it is too late, save the cow's udder, and the lamb's life. A good stockman probably saves more than his wages every week in preventing trouble developing, and if he does not is a liability few farms can afford.

Apart from the temporary troubles and infections to which all stock are to a greater or lesser extent heir, observation is

essential to detect those disabilities which are inherent in certain strains and breeds, or are due to the conformation of the individual, and should be avoided in selecting breeding stock. There is the type of udder which seems predisposed to mastitis; there is the sickle-hocked and cow-hocked animal whose legs will not support it for the normal span of life; there is the narrow chest and flat ribs which indicate a lack of vital capacity. In fact more than fifty common faults can be listed, and they can only be detected by habitual observation of all the animals with which we come in touch and spotting deviations from the normal.

If we take the cow as being the most familiar animal on the farm, the first essential is a good digestion. A cow must have great capacity to deal with roughages and good depth and width through the heart region, combined with well-sprung ribs, and a broad muzzle, and this is the best indication of digestive capacity. To get its food a cow has to travel and eat on her feet, and for that reason a cow's feet and legs must be good. An easy gait and the ability to avoid stumbling are essential, and come from good hocks and pasterns. Bad walking leads to lameness, falls and other injuries. The texture of the hoofs must be good. Often the foot is blamed for the fault of the leg, and sometimes of the back, for whenever a cow walks badly, sooner or later its hoofs are affected.

Next comes good confirmation of the pelvic region, this is essential for the necessary attachment of a well-proportioned udder. Length of rump, as shown by the croup, and width between the hook bones and pin bones is also needed, for without you cannot have good attachment and capacity in the udder. Narrow thighs or close hocks tend to compress the udder, which therefore drops, causing pain to the cow in full milk, increases risk of injury and renders it more susceptible to mastitis. The greater the yield of milk the more important the udder, the shorter the legs the better-hung must be the udder. A long-legged cow almost invariably has a poor, compressed udder.

Hair and skin are important. A good milk producer needs all the protection she can get and nature provides. Hair that drains off rain easily—notice the provision that nature has made for this purpose on a cow's neck when grazing—and flexible skin that will give three or more ridges on the crop is a feature to look for.

Now in this simple description I have used a number of terms, croup and crop, hook and pin, hock and pastern, yet unless the student is already familiar with them, or studies the diagram, the information is useless to him. I believe it is worth going farther; and getting a good book on veterinary science and learning the names of the bones, muscles and organs, and their location in the living animal, if only to compel observation. If then, as a cow walks past you, you can visualize the moving skeleton, or the muscles putting themselves into action, many faults and weaknesses will become apparent. You will see the sloping croup which means the udder will be pitched forward; the slack back which means the feet have to be put a little too far forward to carry the weight, and they in due course will grow unevenly and cause further trouble. Yet there have been critics who ridicule the farmer's insistence on a level top line. Trust science when it explains the ancient wisdom and proves its efficiency.

It is observation, not old age, which brings wisdom. Samuel Smiles, a favourite author of my youth, wrote:

'It is the close observation of little things which is the secret of success in business, in art, in science, and in every pursuit in life. Human knowledge is but an accumulation of small facts sifted by successive generations of men. The little bits of knowledge and experience carefully treasured up and passed on.'

I had been farming for some years before an accumulation of observation and knowledge showed me that the female in every species from mouse to man is a little bigger on the left side than on the right, and the male a little bigger on the right than the

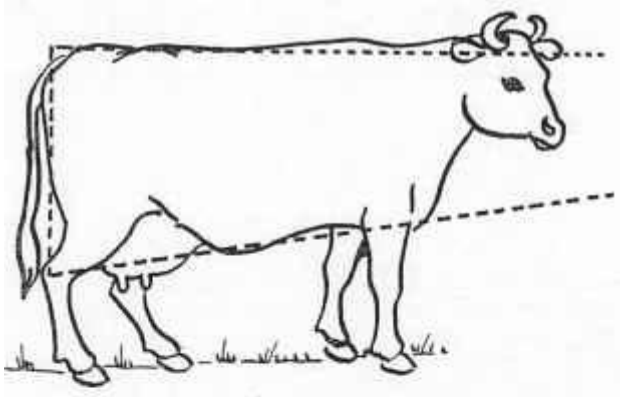


Fig. 23. Milk

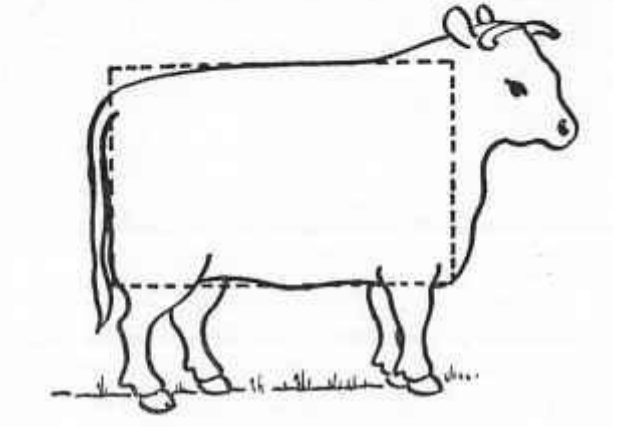


Fig. 24. Beef

left. Why do we traditionally always milk a cow on the right-hand side ? It is because people have found from experience that the left-hand side of the udder being a little lower than the right, it is easier to reach under the right-hand side. Yet if you asked the cowman, he could only say: 'We always do. Grandfather did it.' I have never worn a sword, yet I mount my horse from the left, because generations ago the practice of wearing a sword made it necessary.

Shakespeare said, we look before and after. Carlyle added, the more surprising we do not look round a little, and see what is passing under our very eyes.

With stock we must always stand back first and take a general view, and then see if our detailed examination confirms our general impression.

There are broad differences of type which are taken in at a glance. A dairy cow should be lean, angular and wedge-shaped; while a beef animal is square with rounded corners. Both types may be found to a greater or lesser extent within a breed, although generally speaking type has been fixed by selection over many years, and what appears to be a throw-back may be the result of cross-breeding in recent generations.

Straight lines can also be used in checking soundness in animals. The main purpose being to see that the weight of the body is supported by the bony framework and not by muscular tension, as we know it should be in the human being. When a horse is viewed from the front, a plumb line dropped from the point of the shoulder should bisect the knee, cannon, fetlock, pastern and foot. From the rear, a line from the buttock should bisect the hock, cannon and foot. From the side, a line from the centre of the shoulder blade should bisect the elbow joint and foot. On the hind leg, when the cannon is perpendicular a line from the point of the hip joint should bisect the foot.

If the structure is sound then movement will bring out muscular weakness. A tired horse swings his head from side to side.

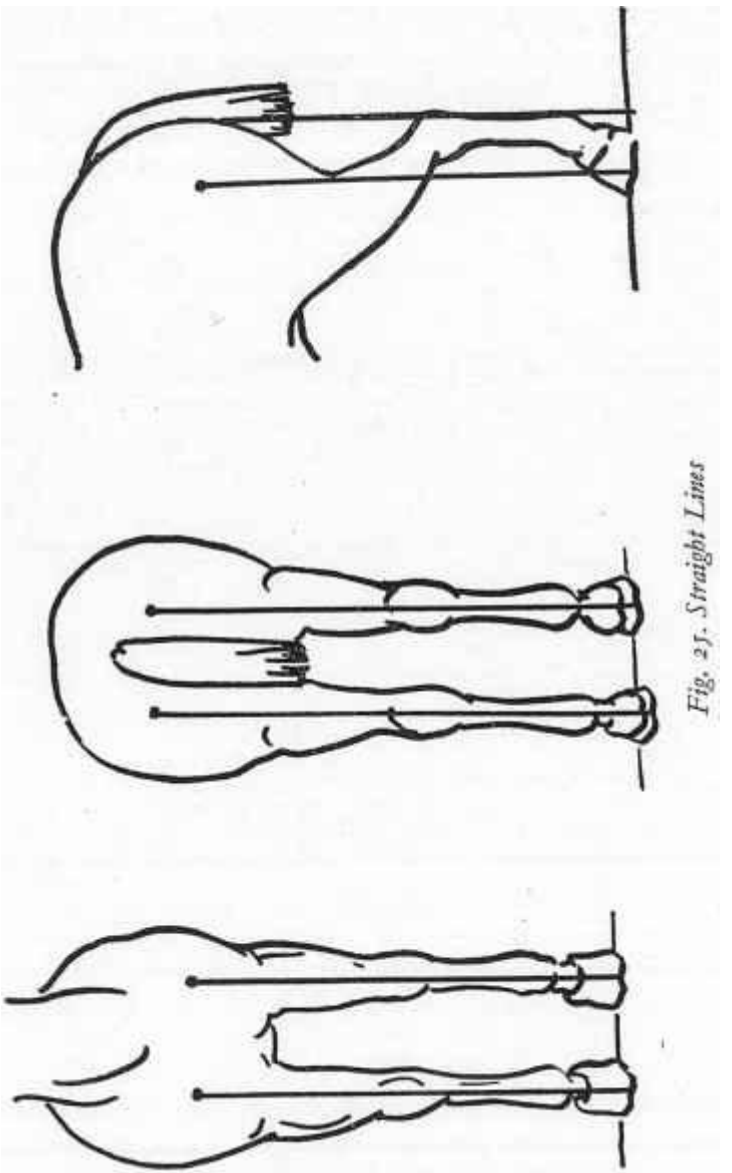


Fig. 25. Straight Lines

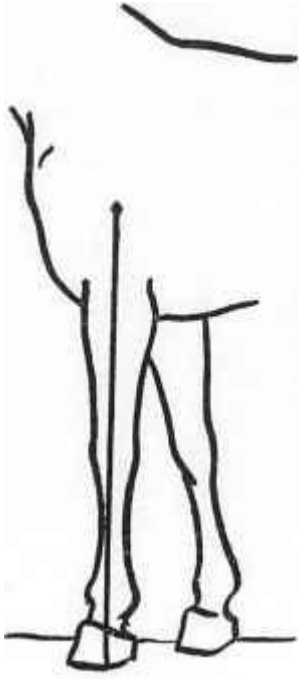


Fig. 26. Straight Lines

Lameness on the front feet will cause the horse to nod his head on the sound side. The movement of the hips will display lameness behind.

How acute and accurate observation may be is demonstrated by the fact that many horsemen believed that there is a moment of time when a trotting horse is completely off the ground-but was only proved by the coming of the slow-motion film.

Many indications of the temperament of animals are also available to the trained observer, as in human beings it is not always possible to judge by appearances, but as the short ears, laid back, in a horse indicate temper, so will it be seen that big

ears, well forward, be associated with a pleasant-natured animal. There are some cows which even look mischievous and can be very playful. But it must always be remembered that any animal can be taught to misbehave by bad management quite apart from any inherent tendency. Nevertheless, there are some cows which are equipped by nature and temperament to be hedge breakers, and the farmer who can recognize one at sight in the market may save himself a lot of trouble by leaving it there. On the other hand the naturally wild type of animal is, with kindness and patience, easier to train and manage than the sullen, phlegmatic brute. An animal that rushes on the halter can be steadied, while the beast that hangs back can only be beaten on—it may even lie down and refuse to get up.

The most important observation of all is that of health. The dewy nose, the lick marks on its coat, and stretching itself when it gets up, are the signs of health in a cow. The moist nose, silky hair and curly tail of the pig. The compact fleece and active movement of the sheep. The bright eye, the alert appearance of the horse, which stands firmly on all four feet.

The first sign of any departure from health, in winter, is a chill; and the signs are: ears back, dry nose, shivering, staring coat and high temperature—and the most effective remedies are either ½ to 1 oz. of ammonium carbonate in a pint of gruel as a drench, or a well-known proprietary drench based on the same drug.

As far as respiration is concerned it is better to stand and observe the animal rather than handle it. Notice the rise and fall of the flanks—on respiration. In cold weather count the respirations of the condensed breath. Eight to 12 in the horse, 12 to 16 in the cow, 20 to 30 in either the pig or sheep.

There are approximately four heart beats to the breath. Faster in pain, apprehension, or fright (a horse's temperature and heart beats can be increased by swearing at it), in very hot or very cold weather, in fever and after exercise. A test of fitness in the

horse is to see how soon the pulse returns to normal after violent exercise.

Apart from chills, which may be associated with it, and for which every stockman must be on his guard, is bloat, hoven, or tympany, which is a serious condition in which the rumen becomes distended with gas. It is usually due to the animal eating large quantities of frosted roots, kale, or rape in winter, or lucerne and clover leys in a rapid state of growth in summer. A farmer may not have a case in years, and then a dozen animals may be lost within half an hour of turning them out. The symptoms are unmistakable, the animal is uneasy, standing with its head down a little, then it may get up and down two or three times. On closer inspection it will be seen the flank is distended right up above the backbone on the left side, and instead of the familiar hollow in that region it is drum like. Rapid, distressed breathing is also apparent. Immediate attention is vital. A drench should always be kept ready mixed, consisting of 1 oz. of medicinal oil of turpentine to the pint of linseed oil. The dose is 1 to 2 pints according to the size and breed of the animal. Turpentine in milk can be used if linseed oil is not available.

With no drench available, and the animal's life is obviously in danger, a knife can be plunged in at the highest point of the swelling on the left side, but at a cost of less than a £1 a farmer should have a trocar and canula, which is a sharp-pointed stiletto inside a metal tube, the point projecting a little beyond the tube. It is plunged in midway between the last rib and the haunch bone, and the backbone, the trocar withdrawn, leaving the canula in place.

There are two types of bloat. Where it consists of gas alone, a very prompt response to treatment is observed—the animal may be back to normal in twenty minutes. But where a mass of foam is formed in the stomach the best of treatment may not prevail.

In extensive experience of folding lucerne, I have found that

no trouble may be experienced for days and weeks, and then comes a blustery day with strong winds, the trouble starts and goes on regardless of the weather, one or more animals being affected daily, and not always the same animals. The provision of oat straw for the animals to eat seems to provide relief in some cases.

On clover leys, the S.100 White Clover seems particularly liable to cause trouble. A wet night followed by a hot day, seems to stimulate growth, and in later afternoon of the following day trouble starts.

A distressing aspect is that it is nearly always the heavy milkers which go first, as they are the greediest grazers.

Where bloat is a serious problem, it has been found desirable to plant all grass mixtures, consisting of fescues and timothy, on at least one part of a field so that animals liable to this disorder can be folded on it when required.

Foaling, calving, lambing and farrowing, are all part of the stockman's work: and here observation is all important because the golden rule is to leave an animal alone unless something is abnormal, and if it is something beyond a simple misrepresentation, to recognize it and to obtain skilled assistance before it is too late. How often in the past have valuable animals been lost, or rendered sterile, by the mistaken belief that the offspring must be dragged into the world as quickly as possible after parturition starts. Some men, after a lifetime among stock, make the little mistakes which make the difference between life and death. Some, who have calved hundreds of cows, cannot give a clear and simple explanation of the stages through which a normal calving passes.

Parturition is a normal physiological process which seldom requires human interference to bring it to a successful conclusion, but nevertheless, a little assistance, intelligently applied at the right moment, can do no harm, and sometimes saves the mother reaching a point of exhaustion. The most important

thing is to know the stages through which the process passes, and to know what stage the animal has reached.

The first indications usually appear some days before the event, especially in a young animal, although the whole process may be passed through in a few hours. First, the udder swells, and becomes hard and tender, and sometimes a clear, or sticky substance can be drawn from the teats. In the case of the mare the teats are sealed with a wax-like substance. At the same time the external organs become enlarged, flabby and swollen. There is usually some slight discharge which sticks to the tail. The pin bones and the base of the tail appear to drop away as the ligaments slacken, and which usually coincides with a drop in the abdomen. The process is continuous, but individual animals progress at a different rate, but from experience the stockman can usually estimate whether or not an animal will calve within twelve hours or so. There are some cows which show no immediate signs of calving yet when left for half an hour will produce a large, strong calf.

Normally the animal becomes uneasy and, if at pasture, leaves the herd. If in a building, the final sign is usually a drop in the hollow of the flank, and a twitching of the vulva. Then when calving is about to start, the animal becomes restless, gets up and down, and mild labour pains, or straining, begin. Then they become more and more powerful, with less time between them. The animal rests between spasms, but the breathing and pulse quickens with each recurring pain. After a variable time from a few minutes to several hours the 'water bladder' appears, and should in no way be interfered with. It is quite firm during a pain, but becomes flaccid in the intervals. It is empty at first, apart from the water, but after two or more pains the fore feet of the calf can be seen or felt in it. At this stage the severity of the pains is at its greatest. The animal may stand up or lie down alternately. The back is arched, the chest is blown out and the muscles of the abdomen become harder with each strain. Finally

the 'water bladder' bursts, there is a rush of fluid, and the animal gets some relief for a few minutes, and the fore feet which had appeared with the 'water bladder' are often withdrawn a little. Then in a short time they appear again, with the muzzle lying above them, and these appear to dilate still farther the walls through which they must pass. The most common mistake is then made by dragging the calf out. The animal needs a rest before making the final effort. Then when labour starts again steady traction on the fore feet, downwards towards the hocks, can help the cow, but it should only be given when the animal strains, and taking special care when the shoulders and hips are passing through the mouth of the womb and the vulva, for it is then that tearing may take place.

When a cow has calved there is no necessity to beat her to her feet immediately for fear of prolapse. Prolapse may be the result of the rough treatment she has received—straining continuing when the calf has been dragged out may result in the loss of the womb, with all its risks of infection before it can be put back, and little chance of breeding again.

Having all the points of a natural calving quite clear in his mind the attendant is quite justified in exploring to find the cause of some abnormal presentation.

Before touching the cow, first wash the hands thoroughly, and trim your nails back, then get a bucket of warm water to which a good non-irritant antiseptic has been added, soap, and a nailbrush. Then thoroughly scrub your nails, hands and arms (right up to the shoulder). Wash the cow's vulva. Then wash your hands again, and soap the hand and arm you are going to use, filling the nails with soap. Be careful not to burst the 'water bladder'. It is very important to be able to visualize a calf by touch. If there are two hoofs sloping away from the top, it is in all probability a normal presentation, and by feeling on a little farther the nose can be touched. If a finger is inserted in the mouth, a live calf will give a suck. Then all is well, and is

probably a big calf, which requires a little more time. A breech presentation, hind legs and tail coming first, will be indicated by the hoofs being the other way up, sloping upwards, and feeling past the hock will find the tail. The cow always seems more uneasy with this form of presentation. There can be many complications, two feet and no head, because it is down between the legs or turned back on one side. There can be a breech presentation in which the hocks are down. There can also be a fore-and-hind-foot of the same calf. One hind foot of two different calves. A hind foot and a fore foot of two different calves. If necessary each leg can be roped, with a carefully washed cord (nylon for preference), the calf or calves pushed forward, and then brought out in the right order. If a foot has to be turned against the wall of the womb it is always cupped in the hand to save damage. There is plenty of room forward in a cow. When one calf has been born, it is possible to put your arm in right up to your shoulder and be unable to touch another calf, yet it may be there and delivered in due course. In all but the simplest complications skilled assistance should be obtained, for a veterinary surgeon calves dozens of difficult cases in a year, but if he is not available, then it must be done. In the case of lambing ewes, with a fair-sized flock, the farmer usually gets sufficient experience to deal with all but the most difficult cases, as when, for example, a Caesarean section has to be made, although the cost of the operation is often more than the value of the animal.

Within a few hours of calving the 'afterbirth' is delivered. On farms where the retention is common it is usual to put in two or three pessaries. If it has not been delivered within three days it must be removed. Sometimes a cow will eat it undetected within a short time of calving. In which case if there is no discharge from the vulva one can usually assume it has cleansed.

As soon as a young animal is born it is absolutely essential to see that the membranes in which it has been enclosed do not

obstruct the mouth or nose. As soon as it is born it usually gives one or two spasmodic gasps and starts to breath. In a very few moments the first shallow breaths become normal. If they do not start then it is necessary to stimulate respiration. A splash of cold water will sometimes do it. Pressure on the lower ribs and stomach with both hands, and then a sudden release, will often draw the air into the lungs. Vigorous rubbing will assist circulation in a young animal that appears to be failing. On some farms it is necessary to tie the umbilical cord for fear of infection. In any case it is a simple precaution to dress it with a good antiseptic. A calf, lamb, or foal should always be pulled out in front of its dam to be licked. Both seem to benefit.

Within half an hour most young animals can stand on their feet, and should be assisted if possible to find a teat.

For the revival of a weakly animal that cannot suck there is nothing to equal glucose and warm water. It is worth infinitely more than all the brandy, whisky, and sweet spirit of nitre that was prescribed in the past. They would buck anything up for twenty minutes, but did not confer any lasting benefit, and left it weaker than before.

We now come to the restraint of farm stock, for in dealing with individual farm animals the first essential, like that of the proverbial hare in the cookery book, is that it shall be caught. If this can be done without frightening the animal a lesson has been learned which will remain with it throughout its whole life.

The foal is the most nervous of all the farm animals but has the advantage of being reared by its mother, which means we have a trained animal to assist us to catch it. A foal always tries to hide behind its mother, and by placing the mare across the corner of a loose-box, and by letting the foal go in behind her, it is penned up. The man then gently reaches round the mare's quarters and strokes the foal, and then gradually works up between them. The mare showing no fear gives her offspring

confidence. The man can then slip a soft cord round the foal's neck, hold it in his left hand, and still have his right hand free to fondle, or to control it by pressing on its off side. Then, another day, it is an easy matter to put his arm over the foal's neck, and taking an open headstall in both hands slip it over the head. From then on the foal can be led with the halter rope passing round in front of the mare's chest. This method can be used at any age while the foal is still with its mother, but the best results are achieved in the first month of its life, starting about ten days old.

The calf is much more easily restrained with a hand round its neck and another round its quarters. Although a rope round its neck and a hand on its off side, when it is backed up into a corner, gives complete control. A halter is easily slipped on, but no dairy farmer could make a better investment than in a set of small headstalls for his calves to wear at an early age. Once they have got used to something on their head they are more than half trained for leading. The lesson can be completed when they are being turned out into a field, if each can be led in turn as they follow the bunch. To have an animal which will lead quietly for the rest of its life is worth a great deal in convenience, whether it be to bring it into the cowshed, take it to the bull, or load it up into a lorry. What is more, they associate being led with kindly human beings, and that may mean an extra hundred gallons a year. It has been noticed that a change of farm can reduce the yield by 10 per cent in the first year, and the same again by a change of cowmen. What then must be the influence of consistent gentleness. I noticed many years ago that it is not only the cow which is beaten up whose yield is affected, but the unoffending one beside her. A rough dog helping to bring in the cows reduced the herd yield of sixty cows by four gallons, only half a pint each, but it was twelve shillings out of the farmer's pocket twice a day.

Apart from showing rams, sheep are seldom led in this

country, although they will tether and lead as easily as any other stock if required. The usual method of catching a sheep is to grasp it just above the hock. Then by lifting the legs slightly and pulling back the animal is easily moved. If a crook is used, it is hooked just above the hock and twisted slightly. No attempt should be made to catch a running sheep with this tool, or you are almost certain to lame it. Generally speaking, if a man is not sufficiently active to handle a sheep without a crook he had better leave it alone. The mountain shepherd's cromac, which is mostly used as a walking stick, is a more humane tool when used to catch a sheep round the neck.

Once a sheep has been caught, then one hand round its neck and the other on the off side of its tail enable us to move it where we will. A sheep should never be grasped by its fleece. If the animal is in poor condition the wool will pull out, if the animal is fat a nasty bruise will appear in the flesh and the butcher has to cut it out. If you get in the habit of handling a sheep by its wool, you are helpless when it is shorn.

To sit up a sheep to pare its feet or to shear it there are two methods available. The more usual, but does require a little more strength, is to place one arm as far as possible under its neck, and the other as far as possible over its back to the lower flank, grasp the skin, and pull up, and the animal turns neatly on to its back. The other method is to stand on the near side, with one hand on the jaw and another on the off quarter, turn the sheep's head back on its off shoulder, and step sharply back, and the animal falls on its side, and is then easily pulled up into the sitting position. One of the agricultural colleges has developed a cradle which can be used for this purpose. Whether it would be worth buying, storing and carting about, can only be decided by the individual farmer. I can imagine the comments of an older generation of shepherds had anyone tried to introduce it in bygone days.

The pig is the most difficult of all the farm animals to handle.

It is best to arrange their pens so as to involve the least possible handling. Young pigs are usually caught by one hind leg in one hand and their weight taken under their chest by the other arm, for ear marking, inoculation, etc. For castration they are suspended by the back legs, and their head held between the assistant's knees. Older pigs are usually roped with a running hitch over their nose and behind the canine teeth of the upper jaw. This method is used for ringing, drenching, or castrating an older animal. Many pigs will learn to tether well, and special harness can be bought for the purpose. Breeding stock should be rubbed and handled to get them tame. To be able to get a sow to lie down on the word of command, expecting her udder to be rubbed, can be of the very greatest help, if any farrowing trouble is experience. I have put back a sow's uterus with no more control than this, and what is more, fixed it there with large safety-pins inserted through the lips of the vulva.

Poultry are probably the most mishandled of all farm stock. If a bird flutters it is out of balance. A bird should be caught by one, or if possible two, legs from behind, and by the left hand, and then taken into the right hand, which should be under its breast, and the legs taken through the fingers. In this position the bird is quite comfortable, can be easily inspected, and will not soil the clothes by its droppings. If it is to be placed in a crate, it can be taken again by the left hand, the right hand opens the lid, and the bird is inserted head first on to the floor, and will get up immediately it is released. If the bird is to be handed to another person, then the legs are retained in one hand, with the other under the breast, until it is taken. If an attempt is made to hand it over by the wings, the other person's hands will be ripped by its claws. In handing over birds for culling it is very important that each one should be presented in exactly the same way. It is very tiring to have to turn each bird round before you can look at it if there is a large number to be done.

Ducks are best caught by the neck, and picked up with one

hand under the body. But ducks, geese and turkeys are easily driven in a flock, which presents a great advantage in moving them compared with hens.

Where the larger animals have to be driven on the road, droving seems to have become a lost art. All too often we see two men behind the herd or flock urging them on, and the cattle scraping round cars which have come to a standstill. Whereas one man should be ahead, and just behind the leading animals, so that the followers thin out as they follow through. Motorists have become very inconsiderate also, but it is in the interests of the animals that they should be properly driven. When cattle are taken daily from a field it should be possible to train them to keep to one side. Forty years ago, when there were still professional drovers on the road, they could meet and pass another herd without getting them mixed up, or interfering to any great extent with the flow of traffic. Once cattle are well on one side a reasonable flow of traffic helps to keep them there, when a motorist does stop to let stock go by he should be thanked by the drover.

Now that such a large proportion of stock are carried by cattle truck, the most important point in loading is to see that everything is arranged and organized so that the animals go in at the first attempt; each time they manage to break back they become more difficult. If force has to be used, the electric goad would appear to be more humane than a stick, and this applies especially so to pigs. Although with well-arranged ramps it should be seldom necessary. If a suitable place can be found it is better to load animals on the level rather than up the slope of the tailboard.

Normally the minimum of restraint needed for the larger farm animals is a halter. A stockman should train himself to put on a halter with the minimum of effort and movement, and with no unnecessary adjustment afterwards. He should also be able to pick up a halter in the dark and know instantly by touch

the component parts. If the end of the rope and the first loop is taken in the left hand, the right hand is free to put the small loop over the animal's nose, and the large loop over its ears. An adjustable halter should always be made a little larger than required to slip it on easily before pulling tight.

An emergency halter can be made by tying a bowline on the end of a rope, tying another at a distance equal to the width of the required nose band, then the loose end is run through the first and second knots. When putting on the halter the first knot is on the off side of the animal's head. An extra knot can then be made on the near side, if the halter is to be made secure. If temporary extra control is required for a few minutes with a horse, the free end of the shank is passed over the head, down the off side, through the mouth, or under the lower lip, and then turned round the first part. To be used in this way a fairly long halter cord is required. With a cow an extra turn of the halter round the nose below the nose band of the halter may be used.

For greater control of a horse, a twitch, in addition to a halter, is usually used. It consists of a strong piece of wood about **2** ft. 6 in. long, with a ½-in. hole drilled through one end, to take a strong piece of thin rope about **1**8 in. long to make into a loop. To apply the twitch, the left hand is put through the loop and a firm grip taken on the upper lip. The loop is raised above the fingers with the right hand, and the stick twisted to get sufficient tension for the purpose without being too severe, and finally held with the free end of the stick back towards the horse's near shoulder. In an emergency, anything which can be used to twist, a leather boot-lace, or a piece of rope will do, such as a crooked walking stick, or a 'D' spade or shovel handle. Do not use a fork—the tines are too dangerous.

For a cow, a firm grip in the nostrils with thumb and first finger is usually sufficient, although a metal clip called a Bull-dog, can be bought if desired.

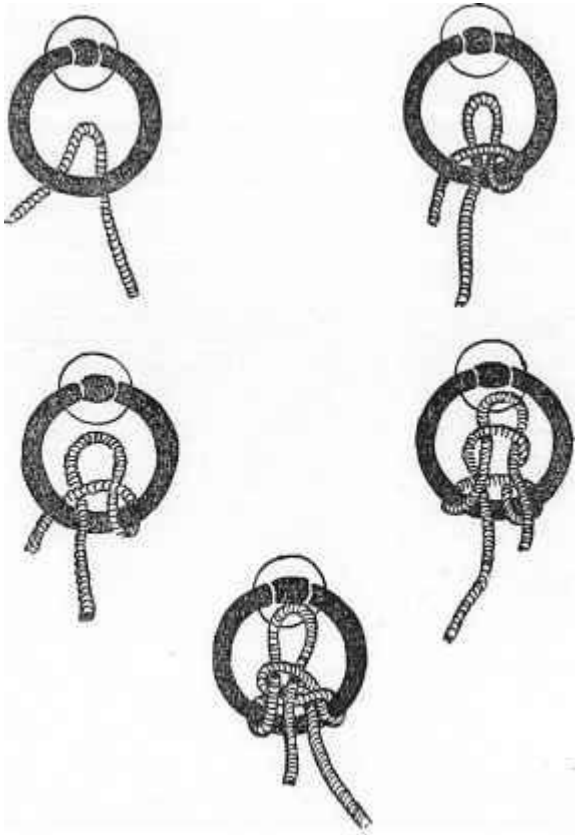


Fig. 27. The Manger Ring Knot

In tying an animal up, with a halter, to a post or tree a clove-hitch is usually used, as it has the advantage that it will not slip up or down. It can be secured if necessary with a half-hitch. When an animal is being secured to a manger, and there is a ring, the shank of the rope can be passed through the ring and then through a small block of wood, and tied with a transport hitch. With this method the animal cannot get a foot over the

rope. If a halter is to be tied direct to the manger ring, double the shank and put it under the ring. Make a loop in the rope leading to the animal and insert it through the doubled end. Make a loop in the short end and insert it through the last loop, and pull the knot tight. Both methods are designed for quick release in an emergency. A pull on the short end, and the animal is free.

When a plough-line is used for driving or lunging a horse,

Fig. 28. Wrong

a bowline with a bite, is the correct knot to use. The 'bite' being the end of the shank turned back in the last loop for instant release if necessary. The knot is often known as the Horseman's knot, as the clove-hitch is known as the Thatcher's knot. It is interesting that it is used in all European countries and was known in Eastern countries for centuries before. To be able to tie this knot without any apparent thought or effort is to be recognized as a horseman from Norway to the toe of Italy.

When an animal has been trapped in a pond or bog, a bow-

line round the base of the horns, or round the neck with the knot underneath the jaw, is the knot to use. An animal can stand a tremendous pull if the strain is gently taken up, and steady traction given in a straight line with the body. If an extra rope can be put round the hindquarters extra help can be given. Given a good foothold a strong horse can pull more than a rubber-tyred tractor under these circumstances, but cannot compete with a tractor winch if one is available.

Fig. 29. Right

If a horse has to be cast it is usually for something sufficiently serious to require the attention of a veterinary surgeon and he will bring the necessary tackle with him. If it is merely necessary to restrain a horse from kicking while an examination is made of the back legs, one fore-foot held up by the toe against the horse's arm by one hand is the best method. This is more effective than holding with two hands on the fetlock, for it also prevents the animal putting its weight on the attendant.

To prevent a cow kicking, put a soft rope round the body

over the loins and in front of the udder. Tie the ends with a reef knot, put a stick through the rope and twist until the rope is sufficiently tight. It must not be kept on too long as the restraint is due to pressure on the nerves in the spine.

To examine a fore-foot a rope can be tied round the fetlock, passed over the cow's back and held by an assistant on the other side. For a hind-foot a stick passed in front of the hock to be lifted, and a little above and behind the other hock, by two men, who also steady the animal with their shoulders, one man on each side.

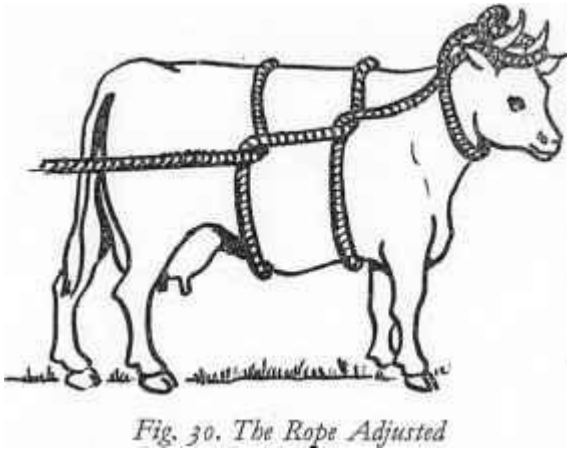


Fig. 30. The Rope Adjusted

To cast a cow: a running loop is made at the end of a 30-ft. rope, and put round the base of the horns. If the animal is polled, or has been dehorned, the rope can be attached to the top of a strong halter. A half-hitch is made round the neck, a second round the girth immediately behind the shoulder, a third in front of the udder. The knots being made on the side desired to be uppermost when the animal lies on the ground. Then while one man holds the halter, two more pull on the rope, and the animal quietly sinks down. The legs can afterwards be secured if desired.

To cast a heavy pig: the jaws are first secured with a running noose. Then, using strong, thin cord, the front and hind legs are each secured with a short rope, using clove-hitches each fixed with a half-hitch, as separate pairs. Then another rope is run from the front pair through the back legs, and from the back pair through the front legs. Both ropes are then pulled, all four legs are brought together and the animals falls, or can be gently pushed over.

Where there are many sheep to trim up, or to compel a ewe to suckle a foster lamb, a yoke is sometimes made, although a loop of rope attached to the side of the pen, at the right height, can be very effective.

The most important handling of a sheep is in shearing. By the older method, probably based on hand shearing, the sheep was kept sitting up as much as possible; by modern techniques the sheep is never fully sat up at all. What I believe is more important is to be able to shear with either hand, and this applies to either hand or machine shearing. If by hand, the change is as good as a rest; if by machine, the cable driving it is more easily manoeuvred.

While methods of handling change, all shearers agree that the skin should be stretched taut, preferably by the position in which the sheep is held, or by the free hand. As a general rule the free hand should be behind the shearing head and on the bare skin. In shearing the comb should be practically full all the time, and especially so on the long strokes. The comb must be close to the skin, flat on the animal, or ridges will be left. Avoid second cuts, and at the end of a stroke do not run the shearing head out through the wool. Wool is wasted and time is lost by cutting twice. Never pull the wool ahead from the cutter, or the sheep will be cut.

Whether the sheep is sat up, or laid on the ground with its head pulled up, it is customary to start by shearing around the right ear and cheek, and then down the neck to the brisket. The

wool is then opened, and shearing from the backbone to the right leg, the neck and shoulder is cleared. At this stage some people clear all the belly wool. Others prefer to take the sheep's head between their legs, and shear right round from just behind the backbone and including the belly wool. Finally, he clears the tail, before sitting up or twisting round the sheep to start on the left side, and if he wishes with his left hand. Having sheared a little farther beyond the backbone on the right side makes the sheep a lot easier to handle when shearing the left side.

Fleeces should be kept clean, tightly rolled and carefully packed into the bales. For sewing up the bale strong string is usually provided by the merchant. A special stitch is used which can be drawn tighter, but will not loosen as the bale is closed. The needle is driven through one side, pulled tight, and a double turn taken in the string, then the needle is put through the other side of the bale, and the string back through the top loop of the double turn and pulled tight.

CHAPTER VIII

How a Man Works

For those who would be proficient in farm work, and also to instruct others in the actual doing of the task, nothing could be of greater help than an elementary knowledge of anatomy and physiology. Anatomy is concerned with structure and physiology with the normal function of living things.

It is commonly held that an artist cannot illustrate the human form intelligently without an appreciation of the proportions of the body, its framework and arrangements of muscles; so will the students of any form of manual dexterity have a better understanding of cause and effect by knowing something more of how the human machine works.

How often a good judge of cattle can detect the slightest weakness in the confirmation of a beast, but cannot select a potentially good hand-milker by looking at his hands, or pick a man who can keep up with a fast-stepping stallion by his walk.

On the other hand, there are men with acute powers of observation who can and do detect the slight variations which make all the difference, but would be better qualified to judge, and would have their opinions confirmed, if they knew the underlying principles of structure and function which makes certain things possible. We all know for example that the average boy can throw a ball much farther than the average girl, but few can explain the comparatively slight anatomical dif-

ference in the respective lengths of the upper and lower arms and the way in which they are joined at the elbow that makes such a great variation in the result achieved for a similar effort.

Further knowledge is gained when we look for the reason underlying such a difference in conformation, and we see that the greater angle is necessary to ensure that the girl's arms may clear her wider hips as she walks. We know that the necessity for wider hips in the female is connected with her special function in life to reproduce the race, but again, the wider hip girdle and the shorter thighs give her an advantage in some forms of work such as cabbage planting or potato picking.

The search for knowledge becomes a fascinating study which more than repays the effort involved. Furthermore, the time spent in gaining an elementary knowledge of human anatomy will be more than justified in its application in the study of the animals which come under the farmer's care: many of the names of bones and muscles will become familiar in all species, and it will be seen how they have become adapted for a special purpose.

Man is superior to all the farm animals in the great variety of movements he can make. He is hinged at the shoulders, elbows, wrists and fingers, which flex and can be combined together to give powerful actions combined with leverage and weight out of all proportion to his comparatively frail body. There is also linked action between the arms which can be combined with body swing and twist, as in using an axe, scythe or flail. There is up and down motion as in pumping, using the arms, as well as pulling and pushing with them, either together, alternatively, or in opposition. All these movements can be reinforced or combined with similar hinged action in the lower limbs at hip joint, knee and ankle, as in riding a bicycle, and where co-ordination is so fine that an unstable machine can be controlled without conscious effort. There is practically no action he cannot perform from threading a needle to picking up 5 cwts. of hay by turning a somersault on a steep hillside over a carefully

prepared and tied bundle, as is commonly done in the more mountainous parts of the world, and in which the hay starting to roll forward swings him on to his feet.

Man is able to do all this intricate work because of his ability to make many complex movements. The human body is built around, or moulded upon, a bony framework which provides attachment for the muscles and tendons which make movement possible, and also protects the vital organs on which life depends. To the bony framework is attached a wonderful and infinitely complicated arrangements of joints, each joint controlled by a group of muscles, one opposing the other. These muscles, whether we wake or sleep, are never completely relaxed. They are always under greater or lesser tension, helping the ligaments, which are strong, tough bands of fibrous tissue, to hold the joints in their natural position. When a movement is being made one set of muscles contract and another group relax, and by this arrangement the joints are kept under complete control while a movement is being made. We are conscious of the movement, but not the forces which bring it about, although we can see the muscles inside our forearm contracting as the limb is flexed, and on the outside when it is extended. In the same way we can feel with a finger the muscles on the back of our thigh contract when we bend our knee, and relax when we straighten it. The extensor muscles tend to be stronger then the flexors, that is to say the muscles pulling backwards are stronger than those pulling forward. If a man faints his head and body fall forward, safeguarding his skull and back, but as his knees collapse he will tend to roll backwards. Also muscles which lift away from the body, which is called abduction, are stronger than those which return the limb, adduction, chiefly because these are helped by gravity and are seldom called upon to make the same effort.

The bony framework is bound together by ligaments. A joint is a very remarkable structure, and is formed where bones

meet. The bones have ends made to fit into each other and are covered by cartilage to lessen friction. The main joints are freely movable, those between the vertebrae have some movement in the upper sections, but are fused together in the lower back, and like those in the skull are immovable.

Movable joints are enclosed in strong fibrous tissue. The inside of the joint is lined with synovial membrane which secretes a fluid to lubricate the joint and allow the bones to glide freely as required. There are four kinds of movable joints. Ball and socket joints, as in the shoulder and hip, which can be moved in any direction. Hinged joints as in the elbow, knee, wrist and fingers, where movement is allowed in two directions. Pivot joints, as where the backbone meets the skull in the atlas and axis bones. Gliding joints which permit only slight movement in the bones of the hand and feet.

The spine or vertebral column, upon which the whole frame is supported, is a flexible structure about 28 in. long, varying little as height is determined very largely by the length of the lower limbs. There are thirty-three separate segments of the backbone, although in adult life the lower nine fuse into two sections of five and four, to form the sacrum and coccyx, reducing the number of separate bones in the spinal column to twenty-six. These bones provide considerable flexibility with great strength, and permit bending forward, to either side, and to a limited extent backwards, while a certain degree of rotation is possible in the neck and back. A distinctive feature of the spinal column is four distinct curves. The cervical, or neck, vertebrae are arranged with a curve looking backwards. In the dorsal area, to which the ribs are attached, the curve looks forward. In the lumbar region, or small of the back, it is again back. In the lower section of the sacrum and coccyx, forward. The dorsal and sacral curves greatly increase the capacity of chest and pelvis, while the compensating curves help the general axis in a vertical line.

The vertebrae move upon each other and are kept separate by means of thick pads of cartilage or gristle, called intervertebral discs, which act as buffers in counteracting shocks, and provide for the suppleness of the backbone. The discs comprise one-quarter of the length of the spinal column. These pads of cartilage do not seem to derive much nourishment from the bloodstream, in which they differ from all other living tissues in the body, although they seem liable to contract when the subject is reduced in health, mental or physical, and 'slipped disc' results in considerable suffering and disability.

To the spinal column is attached the bony case of the chest by the dorsal vertebrae which pass forward twelve pairs of ribs to the front of the body. The upper seven are joined to the breast bone; the next three have no independent connection with it but merge into the seventh rib; while the last two are attached only to the spine. The cavity provided by the ribs and backbone contains the vital organs, heart, lungs, liver, stomach, etc.

The collar bones, or clavicles, which run from the upper end of the breast bone to the highest point of the shoulder blades, and across the root of the neck, are not straight, as they sometimes appear when viewed at the same level from the front, but have two curves, backwards and forwards, which give increased strength. Nevertheless, they are the most frequently fractured bones in the body.

The shoulder blades, or scapula, are flat bones, each about as large as the flat of the hand and fingers, placed on the upper and back part of the chest. They are only directly attached to the main trunk through the joint provided by the collar bones, but are held in place by the powerful muscles which suspend it from the backbone and ribs.

The upper-arm bone has a rounded head which fits into the shoulder blade just below the juncture with the collar bone. At the lower end is a rounded process which presents a wide

pulley-like surface for union with the two bones of the forearm.

In the forearm are two bones. The ulna, or inner bone, forms at the upper end the point of the elbow, and fits into the bone above. The radius, or outer bone, is not fixed at the elbow but articulates with the bone in the upper arm. Of the two, the ulna is more liable to fracture. The radius, as its name implies, can be rotated, changing the relative position of the two bones as the hand is turned, from being parallel when the palm is upwards, to crossing the lower end of the ulna in the reverse position.

There are eight bones in the wrist, arranged in two rows of four, which permit some flexibility, and in combination with the bones above allow further freedom of movement.

In the hand proper there are five bones, the ends being prominent at the knuckles. From the joints of the knuckles each finger has three phalanges, the thumb has only two.

Few people realize how large the hand is. From the wrist to the tips of the fingers it is as long as the face, and a little longer than the radius. The full span of the fingers is wider than the head.

The pelvis is the largest group of bones in the body, the pivot on which the body turns, and the pose is nearly always based upon it. It is made up of the two conspicuous haunch-bones on either side and the sacrum and coccyx behind. The pelvis supports the spine and the lower limbs on which it rests. The female pelvis is wider, broader and shallower, than in the male. This gives greater width to the loins and affects the whole conformation.

Into a deep socket of the pelvis fits the thigh bone, or femur, which is the longest and strongest bone in the skeleton and takes the whole weight of the body. At the lower end it articulates with the tibia, or shin bone of the lower leg. At the knee is the patella, a small but important bone, not attached to the other bones, but lying in front, secured by strong ligaments, and is the junction of muscles from the upper and lower leg.

The bones of the leg are the shin bone or tibia, and the brooch bone or fibula. The shin bone is the strong bone extending from the knee to ankle on the inside of the lower leg, and plays an important part in both joints above and below. The brooch bone, which provides additional support for the lower leg, is long and narrow, with enlarged ends. It is parallel with the shin bone on its outer side, and articulates with it at both extremities. It does not enter into the formation of the knee joint, but at its lower end forms the outer part of the ankle joint.

There are twenty-six bones in the foot. Seven form the instep, of which the heel bone is the largest and strongest, it joins the astragalus, which articulates with the tibia and fibula, and with a bone on the inner side of the foot. This joins with another, the cuboid, on the outer side of the foot, between the heel-bone, and the two outer metatarsal bones, while three more metatarsals, on the inner side, go to carry with them all the phalanges, fourteen in number, two in each toe.

The strength of the 200-odd bones which support the body, and the leverage which can be expected and exerted from them through the joints and muscles will be appreciated when it is realized that the whole bony structure weighs about 20 lb., and enables 50 to 60 lb. of muscle to do an immense amount of work.

The fleshy covering of the skeleton is called muscle, and by means of it the bones are moved. A muscle consists of a large number of fibres, covered and bound together by connective tissue, the whole being enclosed within a sheath. There are two kinds of muscle—voluntary and involuntary. The former are on the outside of the skeleton, and are under the control of the will. Involuntary muscles control the functions, over which we have no control, as in the process of digestion and the dilation of the pupil. There is a third type of muscle which is similar in formation to the voluntary muscles, but are not under the direct control of the will, and are found in the heart.

Muscles act by contraction: they cannot push. When a muscle contracts it broadens and shortens, thus bringing a movable bone to one that is fixed. The stable part to which a muscle is attached is called the origin, and insertion is the end attached to the movable bone. The fleshy part between is known as the body of the muscle.

To work a muscle requires energy. Energy is derived from food that has been digested and stored in various parts of the body, to be released when required. The energy is ultimately supplied by turning sugar and oxygen into carbon dioxide and water, but it is a very complicated process accompanied by the generation of heat, and the carrying away of the waste products of the chemical processes within the muscle by the blood. Seventy-five per cent of muscle consists of water in addition to a plentiful supply of nerves and blood vessels.

There are said to be over 300 voluntary muscles on each side of the body which can be brought under the control of the will, but for our purpose it is sufficient to be familiar with the main muscles responsible for the fundamental movements of the body used in farm work.

Starting from the neck, the most conspicuous muscle is the sterno-mastoid. It is in two parts, one attached to the temporal bone and the other to the occipital; at the lower end to the clavicle and sternum. If either muscle functions singly, on one side of the neck only, the head is pulled round in the opposite direction. If both sides contract together the head is pulled forward and down. It is also possible to pull the head forward, sideways and down by means of them. Other muscles assist in the movement but we are only concerned with those which are visible for the purpose of this study.

The large muscle covering the back of the neck and shoulders is the trapezius, it is attached to the spine, extending down to the last dorsal vertebrae and up to the occiput of the skull, via the characteristic depression down the centre of the neck.

It goes to the outer third of the collar bone and along the top to the highest point of the shoulder blade. It braces the shoulders up and back, elevates the arm, and bends the neck backwards. The trapezius covers other muscles which only become apparent in certain positions.

The latissimus dorsi is the large muscle of the back which extends from the middle of the back to the sacrum, and covers in places up to five layers of muscles, and is very important in most muscular efforts involving the arms and back.

The large and conspicuous muscle of the chest is the pectoralis major. It extends from the collar bones to the seventh rib, out towards the armpit, and out under the deltoid muscle of the shoulder to the arm, which it pulls forward and inward, it is also engaged in drawing the arm back and lowering it to the side.

The most important and powerful muscle in the abdominal region is the rectus abdominus, which bends the body forward, and covers the whole length in the front of the abdomen from the fifth and seventh rib to the pubic crest.

The serratus magnus and the external oblique are closely associated in the side. Serratus attached to the eight upper ribs, and the oblique to the eight lower ribs, thus sharing four.

The large muscle on the top of the shoulder is the deltoid, it caps the top of the arm, covers one-third of the clavicle, and extends nearly halfway down the upper arm. It raises the arm, draws it back and forward by means of posterior and anterior action, in which it differs from most muscles which only work in one direction.

The very prominent muscle in front of the arm is the biceps. It is connected by tendons with the shoulder blade and forearm, and assists in raising the arm forward, bends the elbow, and turns the forearm outwards. The biceps closely overlies another large flat muscle, which raises the arm obliquely and draws it to the side, this is the brachialis anticus. On the back of the upper

arm is the triceps muscle, and this is an extensor which acts in opposition to the biceps, and straightens the arm.

In the forearm there are two main groups, the flexors and the extensors, the former in the front to raise the arm, the latter on the back to extend it. These flexors and extensors are carried on by means of tendons to bend and straighten the fingers. More than twenty movements of the fingers can be listed separately, which means in combination probably many hundreds. A careful study of the hands will explain a great deal of the general principles on which bones, muscles and tendons work.

The lower limb is considered to begin at the pelvis as no less than thirteen muscles are attached to it. On the back of the pelvis is the largest muscle in the whole body, the gluteus maximus, which with two others forms the buttocks.

On the front of the thigh is the long, broad, rectus femoris, the strongest muscle in the body. Starting at the same point and crossing the thigh is the sartorius, the longest of all the muscles. Both these large muscles act as flexors of the thigh; the sartorius pulling it inwards to give the characteristic cross-legged position of the tailor, and from which it gets its name; while the rectus femoris also acts as a flexor of the lower leg. The gracilis muscle, which lies on the inner side of the thigh, adducts thigh and flexes leg. It is this muscle, in common with the sartorius, which is most frequently strained in riding; and through its over-development and then wasting away which gives the awkward walk of the horseman, and often even more marked in the horsewoman.

On either side of the rectus femoris lie the vastus internus and the vastus externus, the former being attached to the back of the thigh bone, and the latter to the outer extremity of the pelvis, or great trochanter. Both are attached to the patella and act as extensors of the lower leg.

The biceps femoris, or outer hamstring, on the back of the thigh is the powerful muscle which flexes the leg and rotates it

outwards. On the inner side lies the semi-tendinosus, overlying the semi-membranosus, both these muscles help to flex the lower leg and rotate it inwards.

In the lower leg the most conspicuous muscle is the gastrocnemius, which forms the calf. Unlike the forearm, to which the bones of the lower leg may be compared, the extensor muscles are on the front, and their tendons joining to the toes on the upper surface; while the flexors are extended to the toes on the under-side. In this the feet differ from the hands, where the extensor tendons terminate at the back, and the flexors on the front of the hand.

To know the name of a bone or muscle is in itself of no special value, although it serves to locate and help us to remember it. In many cases the full name suggests the position and function—extensor digitorum obviously extends the digits or fingers; while flexor carpi ulnaris is associated with the ulna in the forearm.

A knowledge of the function of the body can be of real value in learning to use it to the best advantage. If we are aware of the established habits of the body, we can detect where weakness, or even lack of function, may exist and by persistent effort, deliberate training, or readjustment, overcome it so that there is a greater ease of movement and a corresponding increase in energy.

The best form of exercise is to learn to use the body properly in ordinary activities. It is most important to remember that the voluntary muscles are under control of the will, and the will can actually develop a muscle if the mind is concentrated upon it while performing an exercise; but by just trying to develop muscles very little good is achieved—far more important is the balance of the body and precision of movement. A man cannot hope to retain the agility and supple limbs of youth, but he can retain his activity over his whole working life and develop considerable powers of endurance. The well-balanced person of any

age is one who has learned the art of identifying himself intelligently with the tasks of his daily occupation.

It has been shown that the bones, joints and muscles are governed by mechanical principles; it is also necessary to understand the forces which make them work. Every worker will have noticed the effect that muscular activity has on the body; the breathing quickens and becomes deeper, the heart beats faster, there is a feeling of warmth and perspiration starts. This shows that energy is being mobilized to be expressed in work, and to make good the losses involved in it. The fitter, and better-trained the man is, the less noticeable are the effects. He can do quite strenuous work and only feel a sense of personal well-being. One reason being that his actual output of energy is lower owing to the skilled direction of his efforts, which require the minimum of effort to achieve a given object; the other being that his body has learned to anticipate the effort required of it and by harmonious correlation quickly adjusts itself to the rhythm required.

If for a certain task it was required to travel ten yards and climb a ten-foot flight of stairs, a man who walked on the level and ran up the stairs would use ten times the energy of the man who ran on the level and walked up the stairs, both taking the same time.

The nervous system controls movement. The nerve tissue is composed of both fibrous and cellular structure, the cells generate and receive impulses, while the fibres transmit them. The cells are highly specialized, and unlike other cells cannot reproduce themselves. If destroyed, the service they rendered is lost for ever. If a nerve fibre is cut, then that portion which has not been severed from the nerve cells, starts to grow bundles of small new fibres which can reunite under favourable circumstances.

The fibres and cells are arranged in masses called 'nerve centres', or in cords called 'nerves'. The nerve centres contain

fibres and cells: they receive, generate and transmit nervous impulses. The nerves are composed wholly of fibres which only transmit impulses. The system works very much in the same way as an electric bell, the message being conveyed from the bell-push through the wires to the battery, and from the battery to the bell. Quick as they are, travelling at about one hundred feet per second, nervous impulses only work at a fraction of the speed of electricity. It is now believed that all nerve impulses are transmitted chemically, by the formation at nerve-endings of certain chemical substances.

The nervous system is divided into two parts, the central nervous system and the sympathetic nervous system.

The central nervous system consists of the brain and spinal cord, with all the nerves given off by them. From the brain comes twelve pairs which supply the specialized organs of hearing, sight, smell, taste, feeling, and among other things the muscles which control mastication and the expression of the face. From the spinal cord are thirty-one pairs of nerves which are given off in descending levels, each to special areas, and control all the main movements of the body when directed from the brain. They also have the power of receiving stimulation from an outside source and without transmitting the message to the brain respond to that impulse. This is known as a reflex action.

The sympathetic nervous system controls the involuntary movements and functions of the body, circulation of the blood, breathing, digestion, and is quite independent of the brain, continuing during sleep and unconsciousness.

The circulatory system consists of the heart, the arteries, the veins and capillaries. The heart pumps the blood around the body. The arteries carry the blood from the heart. The veins return the blood to the heart. The capillaries form a network of hair-like vessels, as fine as one-thousandth of an inch, with very thin walls, which take blood from the arteries and return it to the veins.

There is a greater and lesser circulation from the heart. The greater circulation comes from the left side of the heart and is known as the systematic circulation and supplies the whole body. The lesser circulation, the pulmonary circulation, carries blood to the lungs via the pulmonary artery and returns it via the pulmonary vein to the left side of the heart. Unlike all the other arteries and veins in the body, the pulmonary artery carries dark venous blood, and the pulmonary vein bright arterial blood.

The blood in the arteries is under high pressure given it by the force of the heart beat; and it is for this reason that when an artery is severed the bright red blood, freshly oxygenated from the lungs, comes in spurts. The venous blood, being carried back to the heart, is dark in colour, and if a vein is cut wells out in a steady stream. Capillary blood is brick red, or midway in colour between arterial and venous blood. It may flow briskly in a continuous stream or merely ooze from all parts of the wound.

The velocity at which the blood flows varies considerably in its course, in a main artery it flows a hundred times faster than in the capillaries. Experiments have shown that the shortest time required for a complete circulation of the blood may be as low as twenty-seven beats of the heart, less than half a minute. The total quantity of blood contained in the body varies a little but is usually about one-thirteenth of the total weight. About one-quarter is in the heart, lungs and large blood vessels. One-quarter in the liver. One-quarter in the muscles. One-quarter in the other organs of the body.

The purpose of the blood is to carry nutriment to the body and to collect from it waste materials. It is also the means by which an even temperature in all parts of the body is maintained. It is essential that blood should remain fluid while contained in the body, yet have the power of clotting when exposed to the air, to prevent excessive bleeding. The blood also

plays a very large part in protecting the body against bacterial infection.

In addition to the circulation of the blood there is a circulation of lymph through the body. The lymph is derived in the first place from the blood, of which the watery constituents exude through the walls of the capillaries into the tissue, carrying nourishment, while the lymphatics absorb and carry away from the tissue all the wastes and material they do not need. Lymphatic capillaries arise in all parts of the body that are supplied with blood. These capillaries unite to form fine vessels, resembling veins which connect up with lymphatic glands, and finally discharge into the blood circulation. The flow of lymph is very slow compared with the blood, but it can be stimulated by exercise or massage to carry away the waste products. The lympathic glands are great safeguards in protecting the body from infection arising from wounds and diseased tissue, as they filter off waste and harmful matter in circulation.

Respiration is carried on by means of the mouth, nose, larynx (voice box), trachae (windpipe), bronchi (main division of the windpipe), and the lungs. An adult normally breathes from sixteen to eighteen times per minute—once to four heartbeats—and increases rapidly with great muscular activity.

At every inspiration the cavity of the chest is enlarged in every direction. The air passes in through the trachea to the lungs, expands them, and keeps them in contact with the walls of the chest and with the diaphragm. Expiration may be active or passive. In quiet breathing the weight of the chest is sufficient. In forced breathing additional help is given by the diaphragm.

In the process of respiration an interchange of gases between the air and the blood takes place. Oxygen is absorbed through the very fine tissues of the lungs, while carbonic acid is carried off in the moist air breathed out.

Lung capacity varies considerably in the individual, from perhaps 200 cubic inches in a slightly built man, to 400 cubic inches

in one of greater stature. The big man needs it to serve his large body, but the actual measurement from fully contracted to full expansion, which is the vital capacity in the function of the chest, is not in proportion to the build; a small, fit man will show perhaps six inches against seven in the man who towers above him.

Deep breathing is excellent preparation in anticipation of any strenuous effort. 'Getting a second wind' is when one finds breathing quite easy after running perhaps 200 yards, means the respiratory system has fully adjusted itself to the effort demanded, and it is a fair test of fitness.

The digestive system is concerned with the breaking-down of food into substances which may be absorbed into the body in a regular and uniform manner and be available for repair, growth, warmth and energy with which to do our work.

The alimentary canal is a long tube beginning at the mouth and ending at the anus. The accessory organs are the teeth, tongue, salivary glands, intestinal glands, liver and pancreas. The nutritive part of food consists of protein, fat and carbohydrates. In order to become available it must be converted into a form in which it is soluble in the fluids of the body so that it can pass through all the inner lining of the gut to the blood-stream and then be carried to all parts of the body to become part of the living tissue.

In the process of digestion, absorption and assimilation, the first stage is effected by the digestive juices, the grinding by the teeth, and the constant kneading by the muscular action of the stomach and intestines; absorption is achieved by the intestinal villi, which are a fine network of vessels lining the intestines; and finally assimilation takes place and what was once part of a living plant or animal lives again in another individual.

The digestive system works best when the body is resting from other activity, while hard, muscular work slows the process, and throws undesirable strain on the organs concerned

in a very complicated performance however simply it may be described.

External conditions produce great differences in the need for food. Cold weather, and the performance of extra heavy work, require additional fats or carbohydrates. Big men are relatively less efficient than small men, while women only require about four-fifths of the carbohydrates and oils of a man of the same height and build. Children and young growing people require much more protein in proportion to their size compared with adults; while old people, if they intend to keep healthy, must severely reduce the intake of animal food.

In this study only the bare outline of the structure and function of the human body has been given, but from it can be found certain basic principles which can be of real help in the approach to physical effort in many aspects of manual work.

Man has certain inherent weaknesses which go back perhaps ten million years to when he first learned, as an apelike creature, that he could see farther and better by standing on his hind legs; and his erect position left his hands free for other purposes, using one of them to lean on a broken-off branch—which later became adapted to his wonderful range of tools—but his anatomy has never really adjusted itself to the change and he gets tired of standing after a few hours. His upright position tends to sag, he gets rounded shoulders, curvature of the spine, protruding abdomen, flat feet and varicose veins. It is significant that the child starts by crawling, each individual going through the evolution of his race, and one of the best exercises for a pregnant woman is to scrub a floor. Even man's intricate nervous system has not completely adjusted itself to the change; in stalking a burglar in a darkened house, in crossing a roof or mountain ridge, he will tend to travel on hands and knees, and even in a moment of emotional stress, such as a proposal of marriage, he has been known to kneel.

The afflictions to which man is heir can only be overcome by

developing a consciousness of the established habits of the body and deliberately overcoming them. Work in itself does not relieve natural disabilities, it may make them worse, or they may be emphasized by over-strain or violence received in the course of work, but if we have a closer picture in our minds of the factors, mechanical and otherwise, which exist, we are in a position to rectify the condition. At the same time the body has remarkable powers of adapting itself to even serious handicaps and injuries, so combined with conscious effort, many defects of structure or function can be overcome.

If we think of physical efficiency in terms of habit and habit-formation, we then realize that there is a tremendous field for study and self-improvement. The man who has trained himself to act with precision will save an enormous amount of nervous and physical energy and accomplish far more with less effort in a given time.

In saving fatigue by economy of effort the first step is to promote better balance of the body, for no matter what movement is made the balance must be restored, and to do that muscular effort is involved. Faulty carriage upsets the harmony of the body and causes nerve and muscle strain, while the body should give an easy balance with the least possible strain on the muscles; the weight being taken by the bones, and the muscles doing no more than the lighter work of holding the bones in the best possible position to do so. The weight is most efficiently carried when the centre of gravity falls through the body's pillar of bones, spine, hips, thighs, shins, and not in front or behind that line.

If you stand so that a vertical line would run from the ears in front of the shoulders through the hip joints and the ankles, the position is quite comfortable. Push the head or the shoulders, or the hips, away from the verticle line and some of the weight is then transferred from the bones to the muscles. The result is strain and the result of strain is pain.

Once a proper stance has been adopted, then each movement of the body must be carefully studied to see that each movement is done without strain and with the greatest possible effectiveness, always bearing in mind the function and structure of the body which makes it possible.

It may seem paradoxical but the best approach to manual work is the conservation of energy, wasting no effort which is not required to achieve a given object, and never over-straining with the body out of balance. Anything that looks awkward is dangerous. Work with the body at a disadvantage and the risk of strain increases. Consider how much weight a walking stick can take on the top in a vertical position, how little in the middle when in an horizontal position. Many of our bones and ligaments are not so strong as a walking stick.

A person who would take exercise in preparation for farm work will find there is nothing to equal walking with a good posture.

Study other people to correct your own faults. The Bible tells us: 'While we look not at the things which are seen, but at the things which are not seen.' That is just what we must do if we are to believe 'The wisdom of the body and the understanding of the heart'.

CHAPTER IX

Accidents and First-Aid

While a good knowledge of how the human machine functions gives a better appreciation of how to apply it to the best advantage in work, it is also useful and sometimes necessary to be able to deal with temporary breakdowns and repairs. In fact the correct remedy applied immediately can save a lot of suffering, perhaps a long absence from work, and in the case of a serious accident may save a life. Farms are isolated, sometimes far from medical help, and a man might easily bleed to death while you run across a field to ask someone else how to deal with it. To know when to call a doctor for family illness, and not for a needless false alarm, ensures that he will come quickly when necessary.

A veterinary surgeon once told me that his most valuable clients were those who knew most about animals, and while many doctors might not agree that it applies to human beings, for doctors themselves are said to be bad patients, they may be thankful when patients exhibit a little common sense in dealing with accident or illness and who, when in doubt, always send for the doctor.

The most common injury from which we may all suffer is a bruise, which may be defined as the crushing of the soft tissues of the body, accompanied by bleeding from damaged vessels but without an open wound. It usually arises from a knock,

kick or collision. It may pass almost unnoticed when one is hot and working hard, but stiffens up rapidly on resting.

With a simple bruise only the deeper layers of the skin are damaged, giving a slight bluish discoloration. With a more severe injury there will be pain on movement, or from outside pressure, swelling and deepening colour from yellow to black. Where the skin is loose the discoloration is more marked, as in the typical 'black eye'. Immediate treatment is to keep the part warm by movement or massage. Later, the application of cold pads or compresses will soon disperse it.

As the result of a more severe blow or kick the muscles may be bruised, which sometimes, although not usually, results in an abscess which can be avoided by prompt treatment. A cold dressing and a tight bandage followed twenty-four hours later by heat and massage to disperse the clot, and followed by non-weight-bearing exercise.

Where a bone is bruised, by a kick or fall, changes similar to an actual fracture may take place, and blood in a joint cavity leads to stiffness, lasting a long time, and medical advice should be sought immediately.

Lacerations and abrasions are more serious than bruises, through risk of infection, and everyone on a farm should be able to deal with them. Wounds are classified according to the effect produced.

The incised wound is usually inflicted with some sharp tool, although sometimes caused by a blow on tightly stretched skin. The edges may remain closed but will open when the part is moved. Bleeding is profuse, but is easily controlled, by pressure on the edges with a clean handkerchief, or if the bleeding is very serious, by putting a finger in the wound and pressing it upon the spot from which the blood is coming. Then, if necessary, a tourniquet may be applied at the pressure point above if an artery has been severed, or below the wound for a vein.

The puncture wounds, which are usually caused by a stab

with a fork, although at the time they may not appear so serious, are the most dangerous. Apart from the depth which may damage a vital organ, bleeding is hard to control and difficult to clean. A doctor may have to enlarge the wound in order to clean it.

Lacerated wounds are those in which great tearing takes place. It covers anything from a slight graze, to serious injury caused by machinery. The blood vessels being torn and twisted prevent excessive bleeding. But this type of wound is very painful, heals slowly, and often scars badly.

A contused wound is accompanied by bruising. It is similar but less severe than a lacerated wound.

The first essential is to keep the wound clean, or clean it at the first opportunity by washing with clean water (preferably boiled) to which may be added one part in twenty of Dettol or similar preparation sold for that purpose. Then covered with an emulsion of acriflavine, a piece of clean lint, and then bandaged. A sling for an arm, or a splint for a leg, will keep the wound at rest.

With a puncture wound, or an extensive dirty wound, the advisability of an anti-tetanus injection should be considered.

Where there has been severe injury, such as half a hand or foot crushed off in a machine, or blown off by a shotgun, look for a spurting artery. It can sometimes be stopped with a clean pad and a tight bandage (in an animal the blood vessel can be tied with a horse hair), but failing in this, then a tourniquet should be applied in the middle of the upper arm, with a pad on the point where the throbbing artery can be felt on anyone; or high up on the thigh at a point where the artery can be felt in a straight line from the centre of the groin to the inside of the knee. Quite a large pad is required, about the size of a tennis ball. Tourniquets must not be left on for more than a quarter of an hour. Nothing should be used on the wound except a clean dressing right over it and then padded with cotton wool, and if possible use a light splint,

Accidents to finger- and toe-nails are common on the farm, from misdirected blows with a hammer, dropping things, or an animal stepping on a foot. Splinters and thorns lodged under the nails also cause suffering which can be very largely avoided by prompt action.

Normally when a nail is bruised it turns dark in colour and throbs painfully, and is often sufficient to keep one awake at night. The discoloration is caused by damaged blood vessels, and the pain by pressure between the bone and the nail. If neglected, in due course the nail will come off and be replaced by new growth. As the nails are quite insensitive the pressure can be relieved quite painlessly by drilling a small hole in the nail with a fine twist drill, although a sharp-pointed knife can be used if necessary, either being sterilized by boiling. The dead blood is easily removed, the hole is covered by adhesive plaster for a day or two, and the nail is saved.

• If a thorn is driven under the nail, the finger is painful, and there is nothing to get hold of, then first hold the finger under a cold tap to numb it, then make a V-shaped cut above the thorn, sufficient to provide a good grip on it with tweezers, and pull it out. Disinfect the place after soaking out any pus, keep it clean, and it should quickly heal.

After cuts and bruises and mechanical damage, a strained muscle is probably the most common accident on a farm. A sudden movement, or extra strain can cause it, especially on a cold wet day. It is caused by slight tearing of the muscle fibres, and feels like a sharp blow with a stick, if in the leg or arm, and is followed by almost complete loss of function in the muscle involved.

Opinion differs as to treatment. Some doctors recommend cold compresses for about twenty minutes, and then tight bandaging followed by thirty-six hours' rest and then heat or massage. Others recommend vigorous massage immediately and then tightly bandaged with a *crêpe* bandage. For practical

farm treatment the latter is probably best. In my experience, providing not even a minute is lost very great benefit is derived from massage, as it dispels the blood from the damaged tissues before the clot forms. This is especially true for a strain in the long, thin muscle on the inner thigh, which is sometimes sustained in riding.

Strained back muscles often come from lifting, or slipping when carrying a weight. Every movement is painful. Warmth, massage and rest are necessary.

While a stiff neck appears to come from quite a small jerk, sitting in a draught from an open window, or similar uneven evaporation from the skin seems responsible for the slight but painful stiffness more often than not. Massage and wrapping it up warmly is usually sufficient to effect a cure.

Synovitis in the wrist and forearm is a common disability from repeated use of the forearm muscles, in milking cows, hammering, and sometimes in pitching sheaves. The wrist feels weak and painful and a swelling appears on the back of the forearm and on the back of the wrist, which is caused by an overflowing of the fluid which lubricates the joint. The best cure is massage, and a change of work. Quite heavy work is quite permissible providing it does not require rapid movement of the wrist. If treated by rest in a sling it may be stiff for many days.

A sprain is a partial or complete tear of a ligament, of which a sprained ankle is a typical example, and quite common on a farm, often as a result of running across a rough field. There is pain and swelling. It is either a sprain or a fracture. If you run your finger down the outer ankle bone and find a very tender spot in the hollow below it, it is probably a sprain. If on the bone above, from ½ to 3 in., it is a break, which can be confirmed by gently squeezing the bone together in the upper part of the calf, which will cause pain at the point of the fracture.

A fracture must have a doctor's attention. A sprain will heal

itself in about three weeks, but may leave the ankle a little weak. If a long distance has to be covered to rest and shelter, the boot should not be removed. Stepping into ice-cold water is a very effective way of controlling the swelling, methylated spirit poured into the boot will serve the same purpose. Then a strap tightly bound round the ankle and under the instep of the boot will enable the injured person to walk to shelter. This is probably the best treatment, providing it is a sprain and not a fracture. Once the boot is removed then the treatment is the same, only wrapping up well in a bandage which has been soaked in cold water to reduce the swelling, and then providing support with a stirrup with any good strapping material, starting 4 in. up on the undamaged side, going under the heel and well up on the other side. Gentle massage can help, and non-weight-bearing exercises should be started as soon as possible. Later heat and more vigorous massage may be necessary, the latter directed upward towards the heart. When a sprain takes a long time to heal it is probably the result of a bone being chipped, although the treatment is the same.

Strained wrists can be treated with cold water, but it is always safest to suspect a fracture and have it X-rayed if not better within two days. Until that can be done it should be held steady with a splint after the cold-water treatment.

Injured knees come from playing football far more often than they are sustained in farm work. But if a knee is injured it is most important to determine the point of injury as soon as possible. This is done by means of a resisted extension of the knee-joint. The leg is held while the patient is asked to extend it against the pressure and the pain is felt where the injury has been sustained. Apart from ensuring no further injury, and rest, there is little first-aid treatment which can be applied. The joint itself is one of the strongest in the body, and injury often comes through weakness in the quadriceps muscles in the front of the thigh. As these are the strongest in the body, if they are

well exercised by properly directed work (as in picking up buckets), the risk of knee injuries is reduced.

Shoulder injuries are fairly common in farming, chiefly arising through falls, although in bygone days were frequently caused by the plough handles jerking up against the weight of the body, and may result in sprains, dislocations and fractures.

In a dislocation the shoulder loses its normal rounded appearance. There is pain, tenderness, and rigidity, the elbow is unable to touch the same side of the body and the patient cannot touch the opposite shoulder. Immediate diagnosis is important for the sooner a doctor can put it back the easier it is. A sling to give the most comfortable support is all that can be done.

With a sprained shoulder there is swelling and pain, and a loss of movement, but nothing like so severe as a dislocation. Heat, massage and gentle exercise will speed recovery.

If the muscles of the upper arm are strained the site of injury can be detected by using the muscles gently against resistance. The treatment is a fairly tight bandage, light exercises and, as it gets better, heat and massage.

A dislocated elbow joint may result from a fall on the hand. It becomes unbendable, and the arm is stiff and the hand held dangling. If it has been dislocated before, it can be put back by instruction from the person who has received the injury, which may involve bending across the knee and pulling on the forearm.

A fractured collar bone is often caused by falls on the hand, or by blows or falls on the point of the shoulder. When it is broken the shoulder droops downwards, forwards, and inwards towards the chest. Relief is given by holding it under the elbow and lifting up. A large pad, about the size of an orange, is put high up in the armpit, and then the elbow tied to the side with a bandage round the waist, which is also used to support the hand. Further relief can be given by drawing the shoulders back with a 'figure-of-eight' bandage from behind.

A fracture of the upper arm is easily recognized, the arm is

useless and abnormally loose, but the shoulder is still rounded. It can be immobilized with two splints about 3 in. wide, and long enough to reach one from the armpit and the other from the shoulder, to beneath the elbow. The splints should be well padded, and tied above and below the injury. The arm being supported across the chest. If the break is near the elbow, then an L-shaped splint is used, tying round the wrist and upper arm, and the whole supported in a broad sling.

A sling is sufficient to support a fractured wrist.

A fractured thigh is recognized by a shortening of the leg in comparison with the other limb. An injured person should not be moved until it can be fixed with a long splint running from the armpit to below the foot on the outside, another on the inside of the leg, and then both legs tied together. The bandages will be fixed round the chest, hips, two on the thigh, above and below the injury, and two more below the knee.

Ribs are often fractured on a farm by a fall or a kick on the side. If only one or two are broken, and there is no complication, it is not serious, although painful. A broad bandage tightly round the chest will give the necessary support until it can be strapped up with plaster.

A broken jaw bone is supported with one bandage to keep the mouth shut, and another round the chin and tied behind the head, and they can then be tied together behind the head to prevent them slipping.

The most serious injury a farmer must be able to recognize is a fractured skull. There are many different symptoms. It should be suspected if there is shock or unconsciousness, blood or fluid from the ears, nose or mouth, bleeding into the whites of the eyes, paralysis of the face muscles, and if any one of these symptoms are present. The patient should be kept warm, without moving him if it can be possibly arranged, with his head on one side. No drinks to be given. Immediate medical attention can make the difference between life and death.

A new and increasing danger to life on the farm is the use of poison sprays for weed-killing and other purposes. Every farmer should make a point of finding out the chemical antidote for every poison he brings on the farm, making sure he has a supply, and looking up the correct treatment, in case of accident, whenever he sends out a man to use a poison in the course of his work. If the farmer is going away, then he should make sure that some responsible person, not doing the actual spraying, does have the necessary knowledge. As a general rule, for most of these poisons drink large quantities of water containing bicarbonate of soda. If the patient is chilled, say from D.D.T. poisoning, then keep him warm. If from one of the others which causes excessive perspiration then cool him down, soak him in water and blow cold air on him. When sending for a doctor always state the poison, so that he can bring the specific drug for injection. Let there be no doubt, for, say, atropine may be very effective with most, but dangerous with some.

A farmer should also know the common poisonous plants which grow on his farm, and the remedy against them, especially if there are children. For common plants like Deadly Nightshade and Foxglove, an emetic of mustard and water should be given, and the stomach washed out with a weak solution of potassium permanganate. Toadstool poisoning requires injections of a doctor's drugs. The correct treatment as quickly as possible is the rule in dealing with poisons.

Another form of poisoning, from the accumulation of gas in wells and silos, is one which with ordinary commonsense precautions should never happen. The treatment is the same as for drowning, artificial respiration, having first removed the patient without endangering your own life. Too often, two or more lives have been lost through rushing to render assistance.

Burns and scalds can occur on a farm. Treatment is the same for both, the only difference being that one is caused by dry heat and the other by wet. For a slight burn a very effective

relief is obtained by holding it under a cold-water tap. Another method, especially suitable for children, is to immerse in a bath of boracic lotion—one part in thirty—or boracic lint can be dipped in water and applied. The main object in treating a burn is to exclude air and keep the injury clean for medical attention.

Bites from animals are treated as punctured or lacerated wounds, they need to be thoroughly cleaned, and dressed twice daily to ensure that no toxic condition is developing. The seriousness of dog bites is often exaggerated from the days when hydrophobia was common. I have known a farm worker make a tremendous fuss over a bite that barely marked the skin, yet was quite careless about a cut on a soil-stained hand.

Snake bites are rare in this country, the adder being our only poisonous snake—and that only appears to bite if caught in any way. Many rural dwellers still kill every snake they see regardless of its potential danger. In districts where adders are common, doctors keep the antivenene, but a tourniquet between the bite and the body will stop the circulation (not longer than twenty minutes) while reaching the doctor. Failing prospects of immediate attention the wound can be opened half an inch deep and an inch long, pressed, sucked and washed. A solution of a teaspoon of permanganate of potassium in a pint of water poured in the wound will help. The person should be kept resting, and if breathing becomes difficult artificial respiration should be performed.

Ant and bee stings can be relieved by ammonia. Wasp stings by vinegar. Where a sting is left in the flesh it should not be pulled out with the fingers, for this injects the poison, but flicked out with a knife blade put close against the skin and the sting. Some doctors do not approve of sucking a poison sting wound, but one can certainly taste it, which means some of the poison has been removed.

The effect of stings vary, some beekeepers become quite hardened, but even then one in a thousand seems to be particu-

larly vicious and they suffer accordingly. Possibly the same insect might inflict a fatal injury on a person unused to them, and that accounts for the rare fatalities which are attributed to a bee or wasp sting. Bees dislike animal scents, and will sting people more readily who work with livestock. If you get stung, it is one of the few occasions in which one is justified in getting really angry—it releases adrenaline in the blood, which is what the doctor will inject to combat the poison.

An insect in the eye can be very dangerous, but can be often floated out with water. Foreign bodies, bits of chaff and the like are common. Few of us get through a year without something lodging in the eye. Pulling the eyelid down and attempting to open the eye will clear the vast majority. If something is stuck under the upper lid, then it can be rolled back on a pencil, by a person standing behind and above you, and the offending object removed. Anything actually in the eye should receive a doctor's attention, he can usually remove it quite painlessly with the aid of a local anaesthetic.

Dealing with sudden illness comes within the farmer's care. The most alarming, to many people, is fainting. The symptoms are well known, and if the warning signs can be detected quickly and acted upon an actual lapse into unconsciousness can be avoided. There is pallor, a sinking feeling, dullness of sight and hearing. Sitting down and leaning forward with the head below the knees is usually sufficient. If a person has actually fainted, he should be laid flat on his back and care taken to see that breathing is not impeded. No attempt should be made to give an unconscious person water or stimulants, although these are permissible once they have recovered. A faint usually only lasts a few minutes, and recovery can be hastened by a handkerchief dipped in cold water and placed on the forehead. The tendency to faint varies with the individual. In the old it may be due to long-standing heart disease. In the young, powerful emotions. To any, the result of pain, such as crushing a finger, a blow on

the head or a kick in the stomach. To some, even the fittest and strongest, the sight of blood will cause it. Although the tendency to faint varies with the individual almost from day to day, and is always due to some temporary disturbance which prevents the heart pumping sufficient blood to the brain. The collapse is Nature's method of restoring the flow, and if it is impeded by failing to lay the person down death may ensue.

If a person faints from cold or exhaustion, and falls in the snow, or is even exposed to an icy wind, frostbite may result in the ears, fingers, toes or limbs. Rubbing with snow was always recommended as the old cure, probably olive oil would be better. The guiding principle is that the more severe the effect of the frostbite, the more time should be spent on restoration. For that reason the victim should not be put in a very warm room or in front of a fire. When the restoration of the circulation has been achieved the injured part should be covered with cotton wool and lightly bandaged.

Sunstroke is less common on farms than was formerly the case. People take less alcohol, wear lighter clothing, and do not do quite so much heavy work, such as pitching hay in the shelter of a rick on a hot day. When it does occur it is more common when the temperature is fairly high with a moist atmosphere than with an even higher temperature with dry conditions.

There are two types of sunstroke. Fainting, following exhaustion, giddiness, and some mental disturbance. There is pallor, coldness, and a weak, intermittent pulse. The person should be placed in the shade, kept warm, and the hands and feet rubbed. On the other hand, if there is sudden collapse, high temperature and full pulse then, after removal to the shade, cold water should be splashed on the head and body. Both should keep out of the sun, and not return to work until cooler conditions prevail.

A disorder which any farmer might experience in an isolated farmhouse is appendicitis; one does not wish to call a doctor

out through snowdrifts for a spasm of colic which might be cured with a hot-water bottle. On the other hand, delay might be fatal if it is an inflamed appendix, leading to peritonitis.

The pain caused by constipation and colic comes in severe spasms with relief between. Food poisoning is indicated by vomiting, following the sharp pains. In appendicitis the pain starts high up in the stomach, without spasms, and gets steadily worse. It is easier lying still, gets worse on movement. Unlike colic, which may be relieved by movement.

If, on gently pressing the stomach, the hand will sink easily into it on both sides, there is nothing serious. But if he is firmer on the right side, and there is a tender point between the navel and the hip bone, about two inches from the bone, do not hesitate to send for the doctor. Until he comes, and for however long he is delayed, restrict the patient to cold water to drink and no food. In half the cases of appendicitis the pain will pass off, if it does not you are at least preparing him for the operation.

We have now covered most of the accidents which occur on a farm, and it only remains for the farmer to make sure he keeps the necessary bandages, etc., in stock. This is now required by law, although I doubt if one farmer in four has complied with it. I once inquired of a dozen farmers if they had any sort of a manual of instruction for first-aid in their houses; only one claimed he had, but doubted if he could find it! Most Farming Clubs and Young Farmers' Clubs would be well advised to arrange a series of lectures on this subject. With care nine-tenths of the accidents on farms can be avoided, but any of us, in this overcrowded island, may be called upon to deal with a motor accident any day.

Not the least important thing about first-aid is that the incidence of accidents among people trained in it is only one-quarter of the accident rate of those without training. Whether it is due to the fact that only the more intelligent and responsible are

likely to take it up, or that the training makes them more accident conscious, may be difficult to determine.

As far as restoration from accident is concerned, very few doctors realize how vital time is to the man on the land. They will sign a man off for a fortnight for the most trifling things. That may be desirable in ordinary industry, but there are some things, such as scaring rooks, or counting the sheep, which you can do with both hands tied up. Rest is also prescribed in many cases where massage could restore the function in half the time, and the general principles of which are easily learned. If you rub towards the heart, and it is soothing to the individual while relieving stiffness, you are seldom likely to be wrong. Where there is inflammation it should not be used. A sovereign remedy for simple things, but very dangerous for tuberculosis of the spine.

CHAPTER X

Miscellaneous Notes

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There is a certain background of knowledge and theory which everyone who works on a farm should have to enable him to do the practical work. Weights and measures, accepted standards of work in output per acre or per hour, to say nothing of traditions and customs. Normally, for example, when you have completed a task you report back to the boss for further orders and instructions, but on the Cotswolds, if you are set to 'Sweep up the barn', after it is already neat and tidy, that means you must keep out of his way until he finds some other job he wants you to do, or it is time to start your ordinary routine stock work. In some districts, it is 'Mending sacks'. It seldom happens except in a very wet time, or it is just the odd half-hour, when he is waiting for a load of feeding stuffs to come in, and wants you on the spot or at call. In point of fact you never finish cleaning up a barn, you can always get a little more dust swept up. Farmers hate anyone to appear idle. On the other hand nothing is more tiring than trying to appear busy when you have nothing to do.

In regard to working in the rain. Stock work has to be done to time regardless of the weather. Few farmers will send their men out to field work if it is actually raining at the start. If it comes in wet, some farmers expect them to go on until they are wet through and then let them go home. Others tell them to

come in for anything more than a shower, for they can profitably employ them under cover. On a well-organized farm there should be sufficient work, painting implements, making hurdles, etc., to keep everyone occupied in bad weather. Some farmers will even say that their regular work interferes with their odd jobs! They are invariably going ahead with improvements.

To the newcomer to farming, land measurement appears very complicated, with its rods, poles, perches, roods, acres, and furlongs. They long for some metric system. Fortunately we have it in the chain with its 100 links. The chain is 22 yards long, and there are ten square chains in an acre. Therefore if an oblong field is 5½ chains by 6¾ chains, we multiply 5.5 by 6.75 which gives us 37•125 chains. We then move the decimal point back one and it gives us 3.7125 acres. For practical purposes, 3¾ acres. If a field is not square or oblong, the ordinary rules of geometry apply. If a triangle, the base multipled by the altitude and divided by two. Almost any field can be divided up into a series of triangles, rectangles or squares, and then added together.

The rod, pole or perch is an interesting survival from the days when an ox team was used. The rod is the goad used for driving on the team, and placed across the strip of ploughing was a convenient measure to hand. It gave ¼ of an acre for a strip 10 chains long, which is the furlong—or long furrow—the distance the beasts could plough without a rest. That is why the most common length of a field in England, other things permitting, is 10 chains. In other words, the enclosures were fitted to the plough.

It is interesting that the European system of land measurement is the hectare, 100 metres by 100 metres. A man can just stride 3 ft. 3 in., with a long stretch. Twenty paces against 22 in our chain of 22 paces at a comfortable stretch. The goad still used in Italy is 5 metres long, or our old familiar rod, pole or perch at 15½ ft. In the Channel Islands, a vergee is the standard

of land measurement, one-tenth of a hectare, one-quarter of an acre. Which is also our rood, or one-quarter of an acre. The rood meaning a cross showing the quarter-acres. An auctioneer's particulars may show a farm for sale at '98 acres, 3 roods, 2 poles or thereabouts'. But for convenience of measuring use chains.

Everyone should train himself to pace a chain correctly, to be able to set sheep pens, check a corn drill, or whatever it may be. Cricket must have originated in England that they make the pitch a chain long! If a chain is used, it consists of 100 links, each 7.92 inches, which means you can work down to 100,000 part of an acre.

With acres we associate corn, for the term comes from the Latin meaning arable. Farmers express quantities of seed in bushels and pecks; and yields in bushels, sacks or quarters. Which is all very confusing to the uninitiated. Since 1920 an Act of Parliament has required all corn to be sold by weight, but a farmer will still offer a merchant 100 quarters of wheat. The merchant makes out the sale note as stated, but adds in brackets 504 lb. If it were oats 336 lb., barley 448 lb., for beans, peas or vetches 528 lb. Giving the weight makes the sale legal.

Dry measure is easy to remember, from the order in which the units increase: 2 pints 1 quart; 4 quarts 1 gallon; 2 gallons 1 peck; 4 pecks 1 bushel; 4 bushels 1 sack; 2 sacks 1 quarter. The familiar hired corn sack contains 4 bushels, but the weight will vary according to the grain it contains; 1½ cwt. of oats, 2 cwt. of barley; 2¼ cwt. of wheat; 2 cwt. and 3 stone of beans. 4 lb. is also allowed for the weight of the sack and has to be added. Grain is sold net, that is without the container. Feeding stuffs are sold gross, which includes the container. A farmer buying 112 tons in a year loses a ton of food in the form of sack. In selling corn he pays sack hire until after the grain is delivered, unless the merchant leaves it with him too long.

To find the capacity of a bin in bushels, you multiply length

by width, by depth, in feet and multiply by .78. For most purposes .8 is near enough. A bin 10 ft. by 10 ft. by 10 ft., will hold 800 bushels or 100 qrs., slightly heaped up.

Drilled or broadcasted seed corn is expressed in bushels and pecks. You have to remember that there are four pecks to the bushel. A farmer might therefore say he drilled 10 pecks in a certain field, it means 2½ bushels per acre.

If corn is to be broadcast, it is usual to do so direct on to well-set-up ploughing, taking 5½ yds. (one pole) to a breadth, and then harrowing in. The corn having fallen in the intersections of the furrows will be well covered, and will give the appearance of having been drilled when it comes up.

If a drill has to be calibrated because the maker's instructions are lost, then the machine is jacked up, and the land wheel turned as many times as is necessary to cover one-tenth of an acre. The number of turns is found by dividing the drilling width in feet by diameter of land wheel in feet into 1,400. The answer is the number of turns. Thus with a drilling width of 10 ft., and diameter of wheel 4 ft., we get $\frac{1400}{10 \times 4} = 35$. Therefore if 35 turns delivers 1 peck of seed, the drill is set for 10 pecks to the acre, or 2½ bushels.

The farmer takes it for granted that everyone can distinguish between the different cereal grains, though he may find it difficult to give a clear definition if you ask him. He speaks of seed corn, but none of them are true seeds, they are fruits or grains.

Wheat and rye are naked grains; that is the grain is not enclosed by chaff. Wheat is plump and has a distinct furrow from top to bottom on one side. At the base, on the side opposite the furrow, is a small circular patch, the embryo, from where the corn sprouts. Rye is similar to wheat, but much more pointed, at the end opposite the embryo, the whole grain being longer. Rye is lighter in colour and more opaque.

Barley is broader than wheat, and is covered with a fine

wrinkled skin. There is an even more distinct furrow, and at the base a slender, hairy structure called the rachilla.

Oats have a more polished skin, and tougher than barley. Oats taper more to the top than any other grain. If skinned it is nearer rye than wheat.

With long practice a farmer can guess the difference between a crop of wheat, oats or barley when it is only a few inches high. To be sure you must look where the shoot comes out of the leaf. There are two tiny claws projecting round the stalk. Weak in wheat. Big in barley. The initial letter is a help to memory. Oats have none, the shoot is simply rolled in the sheath.

To check that a tractor is being run at the recommended engine speed as laid down by the manufacturer. Find the chains per hour, instead of the miles per hour. Three miles per hour, for example, is 240 chains per hour. Multiply by the number of revolutions necessary to cover a chain. With a wheel 11 ft. in circumference, six are necessary as there are 66 ft. in a chain. Divide by 60, and we have the correct number of revolutions per minute.

$$\frac{240 \times 6}{60} = 24 \text{ revolutions per minute.}$$

A spot of paint on the wheel will make it quite easy to check.

Thus a manufacturer who recommends an engine speed of 1,500 revolutions per minute, and a selected ratio as follows:

First, 78.5 to 1	2.5 m.p.h.	Will give 20 per minute
Second, 57 to 1	3.5 m.p.h.	Will give 28 per minute
Third, 41.3 to 1	4.75 m.p.h.	Will give 40 per minute
Fourth, 19.8 to 1	9.75 m.p.h.	Will give 81 per minute

If running at 2,000 r.p.m. then the number of turns will be approximately 25 per cent higher than those given in the last column, as the road speed has been increased in proportion.

As a rough guide to the land which can be covered by an implement, the width of the machine in feet that equals the

speed of the tractor in miles per hour, added together, gives an output per acre of one-quarter of the sum total. 3 ft. wide and 3 miles per hour, gives 1½ acres; 4½ ft. wide and 4½ miles per hour gives 2¼ acres per hour.

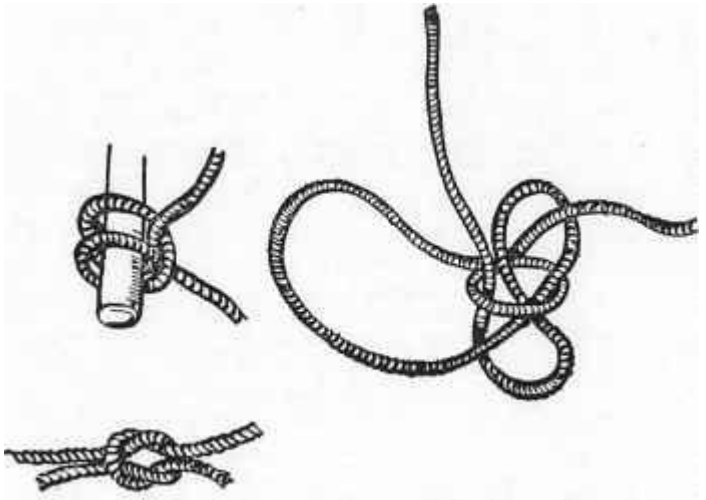

Fig. 31. The Reef, Clove Hitch, and Bowline with a Bight

KNOTS

Everyone on a farm should be able to tie and recognize the few simple knots mentioned in this book.

The Reef, for tying two pieces of string together, balls of binder twine for example, bandages and knots which will not slip and are easy to untie.

The Bowline, for making a loop on the end of a rope which will not slip, and can be easily released if the end is slipped back —making the bowline on a bight.

The Clove Hitch is the thatcher's knot. It is also used for tying wire netting to stakes, tying an animal up to a post, and

can be used for drawing a log. When used for thatching, two loops, as shown, are slipped over the peg. The right-hand loop with the loose end underneath first, and then the left-hand loop with the free end underneath again. It can be tied as easily round a stake or tree, the free end being underneath on each turn.

Index

INDEX